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বই ব্যবহার নির্দেশিকা

- ⊙ প্রতিটি Chapter এর শুরুতে Related Theory গুলো পড়ুন।
- ⊙ Example গুলো নিজে করার চেষ্টা করুন এবং Solution এর সাথে মিলিয়ে নিন।
- ⊙ এবার Chapter এর Math গুলো করুন। Math গুলো পর্যায়ক্রমে Difficulty level অনুযায়ী সাজানো হয়েছে। যেমনঃ

□ Easy ⊗ Medium ▽ Hard

- ⊙ আপনার করা Math এর Answer গুলো বইয়ের Answer Keys এর সাথে মিলিয়ে নিন। যেসব Math পারছেন না কিংবা Answer মিলছে না সেগুলো সাথে সাথে Solution না দেখে আরও সময় নিয়ে ভাবুন এবং সমাধানের চেষ্টা করুন।
- ⊙ কোন Math নিতান্তই বুঝতে অসুবিধা হলে Solution দেখে বুঝে নিন।

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Concept 1

Integer, Positive, Negative, Odd, Even, Consecutive numbers

Integer, Positive, Negative, Odd, Even, Consecutive numbers

- ⊗ **Integers:** Integer (পূর্ণ সংখ্যা) হচ্ছে এমন কিছু number যেগুলোকে fraction (ভগ্নাংশ) বা decimal (দশমিক ভগ্নাংশ) ব্যবহার না করে লেখা যায়।
- ⊗ Set of **Integers** (পূর্ণসংখ্যা) $I = \{\dots-3, -2, -1, 0, 1, 2, 3\dots\}$
- ⊗ Integers can be positive or negative.
- ⊗ Fractions (ভগ্নাংশ $5/4$) and decimals (দশমিক সংখ্যা 2.46) are not integers.
- ⊗ Set of **positive integers** (ধনাত্মক সংখ্যা) = $\{1, 2, 3, 4\dots\}$ (zero is not a positive integer)
- ⊗ Set of **negative integers** (ঋণাত্মক সংখ্যা) = $\{\dots-4, -3, -2, -1\}$
- ⊗ Set of **non-negative integers** (অঋণাত্মক সংখ্যা) = $\{0, 1, 2, 3, 4\dots\}$ (zero is non-negative)
- ⊗ Positive \times Positive = Positive [$3 \times 5 = 15$]
 Positive \times Negative = Negative [$(3 \times (-5) = -15)$]
 Negative \times Negative = Positive [$(-3) \times (-5) = 15$]
- ⊗ Positive \div Positive = Positive [$6 \div 3 = 2$]
 Positive \div Negative = Negative [$(6 \div (-3) = -2)$]
 Negative \div Negative = Positive [$(-6) \div (-3) = 2$]
- ⊗ The product of an even number of negative factors is positive. [$(-1)(-1)(-1)(-1)=1$;
 $(-1)(-1)=1$]
- ⊗ The product of an odd number of negative factors is negative. [$(-1)(-1)(-1)=-1$;
 $(-1)(-1)(-1)(-1)(-1)=-1$]
- ⊗ The sum of two positive numbers is positive. [$6+2=8$]
- ⊗ The sum of two negative numbers is negative. [$(-6)+(-2)=-8$]
- ⊗ Integers which are evenly divisible by 2 (2 দ্বারা নিঃশেষে বিভাজ্য) are called **even** (জোড়).
- ⊗ Integers which are not evenly divisible by 2 are called **odd** (বিজোড়).
- ⊗ Set of **even integers** (জোড়সংখ্যা) = $\{\dots-4, -2, 0, 2, 4\dots\}$ (zero is even)
- ⊗ Set of **odd integers** (বিজোড়সংখ্যা) = $\{\dots-5, -3, -1, 1, 3\dots\}$
- ⊗ All even numbers end with the digits 0, 2, 4, 6 or 8.
- ⊗ All odd numbers end with the digits 1, 3, 5, 7 or 9.
- ⊗ The general formula for even numbers is $2n$ (where n is an integer)
- ⊗ The general formula for odd numbers is $2n-1$ (where n is an integer)
- ⊗ Even + Even = Even ($2+4 = 6$)
 Even + Odd = Odd ($2+3 = 5$)
 Odd + Odd = Even ($3+3 = 6$)
- ⊗ Even \times Even = Even ($2 \times 4 = 8$)
 Even \times Odd = Even ($2 \times 5 = 10$)
 Odd \times Odd = Odd ($3 \times 5 = 15$)

You don't have to memorize these. If you are confused whether odd \times odd is even or odd, just try 3×5

- ⊗ **Consecutive Numbers (ক্রমিক সংখ্যা):** Consecutive numbers বা ক্রমিক সংখ্যা হচ্ছে একই বৈশিষ্ট্য পাশাপাশি কিছু সংখ্যা। যেমনঃ 57, 58, 59, 60, or - 14, - 13, - 12, - 11.
- ⊗ In a series of consecutive integers, each number is 1 greater than the previous number. Hence, if the first number is n , the formula for consecutive numbers is $n, n+1, n+2, n+3, \dots$
- ⊗ In a series of consecutive even (48, 52, 56) or consecutive odd numbers (51, 53, 55) each number is 2 greater than the previous number. Hence, if the first number is n , the formula for consecutive even/odd numbers is $n, n+2, n+4, \dots$

Example 1: If m is an even integer, which of the following must be an odd integer?

- (A) $m + 2$ (B) $m + 4$ (C) $2m + 1$ (D) $2m - 2$ (E) $3m$

Solution: যেহেতু, m even বলা আছে,

$m = 2$ ধরি। তাহলে

- (A) $2+2 = 4$ (B) $2+4=6$ (C) $2(2)+1= 4+1 =5$
 (D) $2 \times 2-2 = 4-2 = 2$ (E) $3(2) = 6$

Example 2: If the sum of three consecutive integers is 210, then the sum of the two smaller integers is

- (A) 141 (B) 139 (C) 110 (D) 70 (E) none of these

Solution: 3 ক্রমিক সংখ্যার যোগফল 210.

210 কে 3 দিয়ে ভাগ করলে 70 পাই।

সংখ্যা 3 টি হবে 69, 70, 71

$69+70=139$

Example 3: If m and n are negative integers which of the following must be true?

- I. $mn < 0$ II. $m + n < 0$ III. $m - n < 0$

- (A) Only I (B) Only II (C) Only III
 (D) I and II (E) All of these

Solution: যেহেতু, m ও n negative integer বলা আছে, ধরি, $m = -2, n = -3$

1. $(-2) \times (-3) = 6$, কাজেই ১ সত্য নয়।

2. $(-2) + (-3) = -5$

3. $(-2) - (-3) = -2+3 = 1$ সত্য নয়। | কিন্তু, $m = -3, n = -2$ ধরলে 3 সত্য হত। But প্রশ্নে বলা আছে,

কোনটি must be true? 3 নম্বরটি can be true but not necessarily must be true. তাই 3 সত্য নয়।

Exercise 1

- 1. Which of the following must be odd?
 I. Even \times Even II. Odd \times Odd III. Even + Odd
 (A) None (B) I only (C) II and III only (D) I and III only (E) I, II and III
- 2. If x is not a negative number, what is the maximum possible value of $2 - 3x$?
 (A) 4 (B) 3 (C) 2 (D) 1 (E) None
- 3. If x and y are both odd integers, which of the following numbers must be an even integer?
 (A) $x^2 + y - 1$ (B) $xy + y^2$ (C) $x + y + 1$ (D) $xy + 2$ (E) none of these
 (BBA 03-04)
- 4. The sum of six consecutive odd number exceeds twice the largest by 38. Find the sum of the six numbers.
 (A) 43 (B) 50 (C) 64 (D) 72 (E) None of these
 (BBA 00-01)
- 5. If n and p are both odd numbers, which of the following must be an even number?
 (A) $n + p + 1$ (B) np (C) $np + 2$ (D) $n + p$ (E) $2n + p$
 (MBA 98-99)
- ⊕ 6. The average of four consecutive odd positive integers is always
 (A) An odd number (B) Divisible by 4 (C) an even number
 (D) Both (b) & (c) (E) Either (b) & (c)
 (BBA 98-99)
- ⊕ 7. If n is an even integer, which of the following must be an odd integer?
 (A) $7n - 2$ (B) $5(n-2)$ (C) $(16n+24)/8$
 (D) $(6n+12)/3$ (E) none of these
 (BBA 01-02)
- ⊕ 8. If x is an odd integer, for which of the following equations must y be an even integer?
 (A) $xy = 5$ (B) $x + y = 8$ (C) $x + 2y = 7$
 (D) $2x + y = 6$ (E) none of these
 (BBA 03-04)
- ⊕ 9. If the 1st number in a series of consecutive odd numbers is 8 less than the last number in the series, how many numbers are there in the series?
 (A) 4 (B) 5 (C) 7 (D) 8 (E) None of these
 (BBA 04-05)
- ⊕ 10. If a , b and c are 3 consecutive integers and $a > b > c$, which of the following has the maximum value?
 (A) $a+b/c$ (B) $b+c/a$ (C) $c+b/a$ (D) $c+a/b$ (E) $a+c/b$
 (BBA 07-08)
- ⊕ 11. Five consecutive integers are given. If the sum of the first three integers is 24, what is the sum of the last three?
 (A) 27 (B) 28 (C) 29 (D) 30 (E) None of these
 (MBA 01-02)
- ⊕ 12. If m is an even integer and n is an odd integer and both are positive numbers, which of the following must be even?
 (A) $m^2 + n^2$ (B) $mn + n^2$ (C) $m^3 + n^2$ (D) $mn + m^2$ (E) None of these
 (MBA 03-04)

- ⊕ 13. M is a set of 5 consecutive integers whose average is 4. N is a set of 7 consecutive integers whose average is 7. How many members of set N are also members of set M? (MBA 03-04)
 (A) 0 (B) 1 (C) 2 (D) 3 (E) None of these
- ⊕ 14. x, y & z are consecutive integers. If $0 < x < y < z$ and $(x+y+z)$ is an odd integer, which of the following could be the value of z ? (MBA 01-02)
 (A) 2 (B) 3 (C) 4 (D) 5 (E) None of these
- ⊕ 15. If X is an odd integer and Y is an even integer, which of the following statements is (are) always true? (MBA 01-02)
 (I) $X + Y$ is odd (II) XY is odd (III) $2X + Y$ is even
 (A) I only (B) II and III only (C) III only
 (D) I and III only (E) None of these
- ⊕ 16. The product of two consecutive numbers is 12 more than the square of the smaller number. Find the greater number. (MBA 07-08)
 (A) 9 (B) 11 (C) 12 (D) 13 (E) None of these
- ∇ 17. If x, y and z are consecutive non-zero integers, and if $x < y < z$, which of the following must be a positive odd integer? (MBA 08-09)
 (A) $x - z$ (B) $x + y + 1$ (C) $x + y + z$
 (D) $xz - y$ (E) none of these
- ∇ 18. If $x/y > 0$, which of the following must be true? (MBA 08-09)
 (A) $x > 0$ (B) $y > 0$ (C) $xy > 0$ (D) $x - y > 0$ (E) all of these
- ∇ 19. If x and y are positive odd integers and z is an even integer, which one of the following statements cannot be true?
 (A) $(x - z)y^2$ is odd (B) $(x - z)^2y$ is even (C) $(x - z)y$ is odd
 (D) $(x - y)^2z$ is even (E) none of these
- ∇ 20. If a and b are integers such that $a + b = 5$, which of the following must be true? (MBA 07-08)
 I. The product of a and b is odd.
 II. If a is odd then b must be even.
 III. If a is negative, then b must be positive.
 (A) I only (B) II only (C) I and II only
 (D) II and III only (E) I, II and III
- ∇ 21. In a certain brick wall, each row of bricks above the bottom row contains one less brick than the row just below it. If there are 5 rows in all and a total of 75 bricks in that wall, how many bricks does the bottom row contain? (MBA 05-06)
 (A) 12 (B) 17 (C) 14 (D) 15 (E) None of these
- ∇ 22. If x is a positive even number, then each of the following is odd except: (MBA 05-06)
 (A) $(x + 3)(x + 5)$ (B) $x^2 + 5$ (C) $x^2 + 6x + 9$
 (D) $3x^2 + 4$ (E) None of these

- ∇ 23. Which of the following must be an integer if x is a positive integer and $(4/x+5/x+6/x)$ is also an integer? (BBA 04-05)
 (A) $x/5$ (B) $5/x$ (C) $x/30$ (D) $30/x$ (E) none of these
- ∇ 24. If x is a non-zero integer which of the following must be a negative integer? (BBA 08-09)
 I. $-(3x^2 + 4)$ II. $-(-x)$ III. $(-x)^3$
 (A) None (B) I only (C) III only (D) I and III only (E) I, II and III
- ∇ 25. If x is an odd integer, in which of the following equations must y be an even integer? (BBA 08-09)
 I. $xy = 5$ II. $x+2y=11$ III. $2x+y=12$
 (A) Only I (B) Only II (C) Only III (D) both II and III (E) all of these
- ∇ 26. If x and y are integers and $(xy + x)$ is odd, which of the following must be even? (BBA 08-09)
 (A) $x + y$ (B) $xy - x$ (C) x (D) y (E) any of these
- ∇ 27. If $xy < 0$ and $y > 0$ which of the following must be positive? (BBA 09-10)
 (A) $x-y$ (B) $2x + 3y$ (C) $\frac{x+10}{y+2}$ (D) $\frac{-y-2}{x}$ (E) $2y^2 + x$
- ∇ 28. If m is an integer, and $y = (m - 1)(m + 2) - (m - 1)(m - 2)$, then which of the following must be true? (BBA 10-11)
 (A) y is odd only when m is odd (B) y is odd only when m is even
 (C) y is even only when m is even (D) y is even only when m is odd
 (E) None of these
- ∇ 29. If a , b and c are odd integers, which of the following expressions must be an even integer? (MBA 13-14)
 (A) $ab + bc + ca$ (B) $a(b + c - 1)$ (C) $a^2 - b^2 + c^2$
 (D) $3(ac - bc)$ (E) none of these
- ∇ 30. What is the largest integer, n , that satisfies the inequality $(n^2 + 7n - 3) < (n^2 + 5n + 9)$? (MBA 13-14)
 (A) 4 (B) 5 (C) 6 (D) 7 (E) none of these
- ∇ 31. What is the next-highest prime number after 67? (BBA 15-16)
 A. 68 B. 69 C. 71 D. 73 E. 76
- ∇ 32. Which one of the following is the minimum value of the sum of two integers whose product is 36? (BBA 15-16)
 A. 37 B. 20 C. 15 D. 12 E. none of these
- ∇ 33. $2pq5$ is a four digit number divisible by 25. If the number formed from the two digits pq is a multiple of 13. Then $pq =$? (BBA 15-16)
 A. 10 B. 25 C. 52 D. 65 E. none of these
- ∇ 34. If n is an integer divisible by 6 but not by 4, then which of the following CANNOT be an integer? (BBA 15-16)
 A. $n/2$ B. $n/3$ C. $n/12$ D. $n/10$ E. none of these

- 35. If x, y and z are consecutive negative integers and if $x > y > z$, which of the following must be a positive odd integer? (BBA 16-17)
 A. xyz B. $(x-y)(y-z)$ C. $x-yz$ D. $x(y+z)$ E. none of these
- ⊕ 36. If $(2x^2+3x+y)$ is an even integer, which of the following must be true? (BBA 16-17)
 A. x is even B. y is odd C. $(x+y)$ is even D. $(x+y)$ is odd E. none of these

Answer Key Exercise 1

1.C	2.C	3.B	4.D	5.D	6.C	7.C	8.D	9.B	10.A
11.D	12.D	13.D	14.C	15.D	16.D	17.D	18.C	19.B	20.D
21.B	22.D	23.D	24.B	25.C	26.D	27.D	28.E	29.D	30.B
31.C	32.D	33.C	34.C	35.B	36.C				

Solution to Exercise 1

1. (C) i even \times even = Even ($2 \times 2 = 4$)
 ii Odd \times Odd = Odd ($3 \times 5 = 15$) iii Even + odd = odd ($2 \times 3 = 5$)
 \therefore ii এবং iii must be odd
2. (C) $2-3x$ এর minimum possible value এর বের করতে হবে।
 x এর value বাড়ালে $2-3x$ এর value কমবে।
 x এর minimum value এর জন্য $2-3x$ এর value minimum হবে।
 আবার বলা আছে x negative হতে পারবে না।
 তাই, x এর minimum value হবে 0.
 $x = 0$ হলে $2 - 3x = 2 - 0 = 2$
3. (B) x কে 1, y কে 3 ধরি,
 (A) $1^2 + 3 - 1 = 3$
 (B) $1 \times 3 + 3^2 = 3 + 9 = 12$, even
 (C) $1 + 3 + 1 = 5$
 (D) $1 \times 3 + 2 = 5$
4. (D) 6 টি Consecutive add number এর sum বের করতে বলা হয়েছে,
 ধরি, 3rd number টি x . তাহলে, গুলো $x - 4, x - 2, x, x + 2, x + 4, x + 6$,

$$x - 4$$

$$x - 2$$

$$x$$

$$x + 2$$

$$x + 4$$

$$x + 6$$

$$\text{Sum} = 6x + 6$$

$$\text{largest number} = x + 6$$

$$\text{প্রশ্নমতে, } 6x + 6 = 2(x + 6) + 38$$

$$\text{বা, } 6x + 6 = 2x + 12 + 38$$

$$\text{বা, } 4x = 44$$

$$\therefore x = 11$$

$$\therefore 6x + 6 = 6(11) + 6$$

$$= 72$$

(এখানে 3rd number টিকে x ধরা হয়েছে। 1st number কিংবা অন্য যে কোন position এর number কে x ধরেও করা যায়)

5. (D) ধরি, $x = p = 1$
 (A) $x + p + 1 = 1 + 1 + 1 = 3$
 (B) $xp = 1 \times 1 = 1$
 (C) $xp + 2 = 1 + 2 = 3$
 (D) $x + p = 1 + 1 = 2$
 (E) $2x + p = 2 \times 1 + 1 = 3$

6. (C) ধরি 8 টি consecutive integer $x, x+2, x+4, x+6$

$$\therefore \text{sum} = 4x + 12$$

$$= 4(x+3)$$

$$\text{Average} = \frac{4(x+3)}{4} = x+3$$

যেহেতু x odd, তাই $x+3 = (\text{odd} + \text{odd}) = \text{even}$ হবে।

সুতরাং (C) সত্য।

- (B) সত্য হবে কি না পরীক্ষার জন্য বিভিন্ন odd number x এর Value হিসেবে বসাই।

$$1+3=4, 4 \text{ দ্বারা বিভাজ্য}$$

$$3+3=6, 4 \text{ দ্বারা বিভাজ্য নয়।}$$

সুতরাং (D) is not always true.

7. (C) let $n=2$

(A) $7(2) - 2 = 12$

(B) $5(2-2) = 0$

(C) $\frac{16(2)+24}{8} = \frac{56}{8} = 7$

(D) $\frac{6(2)+12}{3} = \frac{24}{3} = 8,$

যেহেতু, must be odd বলা আছে তাই আরেকটু যাচাই করে দেখা যাক।

$$\frac{16n+24}{8} = \frac{8(2n+3)}{8} = 2n+3$$

$$= \text{even} + \text{odd}$$

$$= \text{odd}$$

অর্থাৎ n এর সকল even value এর জন্য (C) always odd হবে। অর্থাৎ (C) must be odd.

8. (D) x কে 1 ধরি,

(A) $1 \times 5 = 5$

(B) $1+7 = 8$

(C) $1+2(3) = 7$

(D) $2(1) + 4 = 6, y \text{ even}$

9. (B) $x, x+2, x+4, x+6, x+8,$

$$x+8-x=8$$

Series টিতে number আছে 5 টি।

10. (A) a, b, c কে 3, 2, 1 ধরি, ($a > b > c$ দেওয়া আছে)

fraction (ভগ্নাংশ) গুলোর denominator (হর) যত বড় হবে value তত কম হবে। তাই, নিচের সংখ্যা minimum হলে value minimum হবে। Option (A) তে c নিচে রয়েছে তাই (A) এর value minimum এভাবে সবচেয়ে দ্রুত সমাধান করা যায়।

Alternatively, a, b, c এর value বসিয়েও সমাধান করা যাবে তবে সময় বেশি লাগবে। .

11. (D) 5 টি consecutive integer এর প্রথম 3 টির Sum 24

$$\frac{24}{3} = 8 \therefore \text{সংখ্যাটি } 7, 8, 9$$

পুরো series টি হচ্ছে 7,8,9,10,11, Last 3 number এর sum = $9+10+11=30$

[অথবা, $10 \times 3 = 30$]

$$\begin{aligned} 9 \text{ কে } 10-1 \text{ এবং } 11 \text{ কে } 10+1 \text{ লেখা যায়। তাই } 9+10+11 &= 10-1+10+10+1 \\ &= 10+10+10 \end{aligned}$$

12. (D) m কে 2 ধরে n কে 1 ধরে সহজেই সমাধান করা যায়।

13. (D) বলা আছে,

M is a set of 5 consecutive integers whose average is 4

$$\begin{aligned} \therefore \text{Set } M &= \{(4-2), (4-1), 4, (4+1), (4+2)\} \\ &= \{2, 3, 4, 5, 6\} \end{aligned}$$

N is a set of 7 consecutive integers whose average is 7

$$\therefore \text{set } N = \{4, 5, 6, 7, 8, 9, 10\}$$

common members are 4, 5, 6

14. (C) বলা আছে, x, y, z are consecutive integer.

$$0 < x < y < z.$$

$$x + y + z = \text{odd.}$$

$$x \text{ কে odd ধরলে, } 1+2+3+ = 6 \text{ (even)}$$

\therefore x odd হতে পারবে না, x must be even.

x even হলে z even হবে (2,3,4 for example)

so (B) আর (D) বাদ।

(A) তে আছে 2, তাহলে series টি হবে 0, 1, 2 কিন্তু $0 < x$ বলা আছে। তাই (A) হতে পারবে না।

15. (D) $x = 1$ এবং $y = 2$ ধরে সমাধান করা যাবে।

16. (D) ধরি, consecutive number 2টি x ও (x+1)

$$\text{প্রথমতে, } x(x+1) = x^2 + 12$$

$$\text{বা, } x^2 + x = x^2 + 12$$

$$\therefore x = 12$$

$$\therefore \text{ বড় সংখ্যাটি হচ্ছে } 12 + 1 = 13$$

17. (D) এটি বেশ critical.

x, y, z কে consecutive non-zero integers বলা আছে।

$$x < y < z$$

option এর কোনটি must be positive odd integer বের করতে হবে। যেহেতু must be বলা আছে তাই সকল value নিয়েই যাচাই করতে হবে।

x কে even, odd ও negative ধরে 3টি series নিয়ে যাচাই করে দেখি।

$$1, 2, 3 \text{ এর জন্য (A) } 1-3 = -2$$

$$(B) 1+2+1=4$$

$$(C) 1+2+3=6$$

so (A), (B), (C), eliminate করতে পারি।

$$(D) 1 \times 3 - 2 = 3 - 2 = 1 \text{ (odd)}$$

$$\text{আবার, } 2, 3, 4 \text{ এর জন্য (D) } 2 \times 4 - 3 = 8 - 3 = 5 \text{ (odd)}$$

$$\text{আবার, } -3, -2, -1 \text{ এর জন্য (D) } (-3) \times (-1) - (-2) = 3 + 2 = 5 \text{ (odd)}$$

অর্থাৎ সকল ক্ষেত্রেই (D) (odd)

\therefore (D) must be odd.

18. (C) $\frac{x}{y} > 0$ দেওয়া আছে।

কাজেই হয়, x ও y উভয়েই positive ($x > 0, y > 0$)

অথবা x ও y উভয়েই negative ($x < 0, y < 0$)

তাই (A) ও (B) eliminated.

x, y উভয়েই positive হলে (C) $xy > 0$ সত্য হবে। ($2 \times 3 = 6, 6 > 0$)

আবার, x, y উভয়েই negative হলেও (C) $xy > 0$ সত্য হবে। ($(-2) \times (-3) = 6, 6 > 0$)

কাজেই (c) must be true.

19. (B) $x \& z = 1$ and $y = 2$ ধরে সমাধান করা যাবে।

20. (D) দেওয়া আছে, $a+b = 5$. a ও b এর সকল সম্ভাব্য value বের করি।

$$0 + 5 = 5 \quad (a = 0, b = 5)$$

$$1 + 4 = 5 \quad (a = 1, b = 4)$$

$$2 + 3 = 5 \quad (a = 2, b = 3)$$

$$-1 + 6 = 5 \quad (a = -1, b = 6)$$

এখন, I. $1 \times 4 = 4$ (even) I সত্য নয়।

II. a এর odd value 1 এর জন্য b এর value 4 even. তাই II সত্য

III. a এর negative value -1 এর জন্য $b = 6$ তাই III সত্য

21. (B) এটিকে consecutive number problem হিসেবে বিবেচনা করা যায়।

$$\frac{75}{5} = 15 \therefore \text{series চিহ্ন হচ্ছে } 13, 14, 15, 16, 17 \text{ অর্থাৎ bottom row তে 17টি brick আছে।}$$

22. (D) $x = 2$ ধরে সমাধান করা যাবে

$$(A) (2 + 3)(2 + 5) = 35$$

$$(B) 2^2 + 5 = 9$$

$$(C) 2^2 + 6 \times 2 + 9 = 25$$

$$(D) 3 \times 2^2 + 4 = 16$$

23. (D) দেওয়া আছে, x is a positive integer

$$\frac{4}{x} + \frac{5}{x} + \frac{6}{x} \text{ is a positive integer}$$

এখন, $\frac{4}{x} + \frac{5}{x} + \frac{6}{x} = \frac{15}{x}$

$\frac{15}{x}$ integer হবার জন্য x এর value অবশ্যই 1,3,5 বা 15 হবে।

x এর সম্ভাব্য value গুলো বসিয়ে দেখা যায় একমাত্র option (D) তেই x এর সকল সম্ভাব্য value এর জন্য integer পাওয়া যায়।

24. (B) x can be both positive and negative.

x এর value 1 ও -1 বসিয়ে test করি।

$x = 1$ হলে I. $- \{3(1)^2 + 4\} = -7$

$x = -1$ হলে I. $- \{3(-1)^2 + 4\} = -7$

অতএব, I. always negative.

$x = 1$ হলে II. $-(-1) = 1 \therefore$ II হবে না।

$x = -1$ হলে III. $\{-(-1)^3\} = 1 \therefore$ III হবে না।

25. (C) $x = 1$ ধরি,

I. $1 \times y = 5 \therefore y = 5$, not even.

II. $1 + 2y = 11 \therefore 2y = 10 \therefore y = 5$, not even

III. $2 \times 1 + y = 12 \therefore y = 10$, even.

\therefore III must be true.

26. (D) দেওয়া আছে, $(xy + x)$ is odd

আমরা জানি, only (odd + even) can be odd.

so, either, x is even, xy is odd.

or x is odd, xy is even.

কিন্তু x even হলে, xy odd হওয়া অসম্ভব। [কেননা, even \times even = even
even \times odd = even]

তাই, x even হতে পারে না।

$\therefore x$ is odd, xy is even সত্য।

আবার, x odd হলে, xy even হওয়ার জন্য y অবশ্যই even হতে হবে। [কেননা, odd \times even = even]

$\therefore y$ must be even.

27. (D) দেওয়া আছে, $xy < 0, y > 0$

$x > 0$ হলে $xy < 0$ হতে পারত না।

তাই x must be less than 0

$\therefore y$ is positive, x is negative.

option (A), (B), (C) and (E) might be either positive or negative depending on different values of x and y .

Only option (D), $\frac{(-y-2)}{x}$ must be positive. [উপরে-নিচে negative কাটাকাটি হয়ে যাবে।]

$$28. (E) y = (m - 1)(m + 2) - (m - 1)(m - 2)$$

$$= (m - 1)(m + 2 - m + 2)$$

$$= 4(m - 1)$$

(A) $m = 1$ ধরে, $y = 4(1 - 1) = 0$ \therefore A is not true.

(B) $m = 2$ ধরে, $y = 4(2 - 1) = 4$ \therefore B is not true.

$m = 3$ হলে, $y = 4(3 - 1) = 8$

শুধুমাত্র m এর odd value এর জন্য y even হতে পারে না।

Option (C) এ বলা আছে y শুধুমাত্র তখনই even হবে যখন m even হবে।

তাই (C) সত্য নয়।

একই কারণে (D) সত্য নয়।

29. (D) a, b, c are odd integers.

তাই 'ac' odd হবে এবং 'bc' ও odd হবে। কিন্তু এদের বিয়োগফল $(ac - bc) = \text{even}$ হবে।

So $3(ac - bc)$ must be even.

30. (B) $n^2 + 7n - 3 < n^2 + 5n + 9$

$$7n - 5n < 9 + 3$$

$$2n < 12 \quad \text{or, } n < 6$$

So largest integer value of n is 5.

31. (C) 67 এর পরের মৌলিক সংখ্যা 71।

32. (D) 36 এর factors হতে পারে $6 \times 6, 4 \times 9, 18 \times 2$ এবং 36×1 । এই factors গুলোর যোগফলের minimum value হয় $(6+6) = 12$ ।

33. (C) Option গুলোর মধ্যে 52 ও 65 হল 13 এর multiple। কিন্তু 2655 সংখ্যাটি 25 divisible নয়। অতএব, উত্তর হল 52, যেহেতু 2525 সংখ্যাটি 25 দ্বারা divisible।

34. (C) n সংখ্যাটি 6 এর গুণিতক, কিন্তু 4 এর গুণিতক নয়। তাই n সংখ্যাটি কখনোই 12 দ্বারা divisible নয়।

35. (B) x, y, z consecutive negative integers এবং $x > y > z$ । তিনটি number ই negative হওয়ায় xy negative. তাই option (A) ভুল।

$(x - y)$ একটি positive odd number কারণ $x > y$ এবং $(y - z)$ positive odd number কারণ $y > z$. তাই $(x - y) * (y - z)$ positive odd number. Option (B) সঠিক।

y, z এর product positive তাই $x - yz$ negative. তাই option (C) ভুল।

x even number হলে $x(y + z)$ positive even number হয়। তাই option (D) ভুল।

সুতরাং Answer (B).

36. (C) $2x^2 + 3x + y$ একটি even integer.

$$\text{এখন, } 2x^2 + 3x + y = 2x^2 + 2x + x + y$$

$$= 2(x^2 + x) + (x + y)$$

এখানে $x^2 + x$ এর সাথে 2 multiply হওয়ায় $2(x^2 + x)$ even. তাই, $2x^2 + 3x + y$ even হতে হলে $(x + y)$ অবশ্যই even হবে।

সঠিক Answer (C).

Concept 2

Basic operations, Factors, Multiples

Concept 2 (Basic operations, Factors, Multiples)

- ⊗ When you **add** (যোগ করা) numbers together, the result is **Sum or Total** (যোগফল).
($2+3=5$). If we add 2 and 3, we get 5. So the sum of 2 and 3 is 5.
- ⊗ When you **subtract/deduct** (বিয়োগ করা) one number from another, the result is **Difference** (বিয়োগফল).
($5-3=2$). If we subtract/deduct 3 from 5, we get 2. So, the difference of 5 and 3 is 2.
- ⊗ When you **multiply** (গুণ করা) numbers together, the result is **product** (গুণফল).
($2 \times 3=6$). If we multiply 2 and 3, we get 6. So the product of 2 and 3 is 6.
2 and 3 each are **factors** (উৎপাদক) of 6
6 is **multiple** (গুণিতক) of both 2 and 3
6 is a **divisible** (বিভাজ্য) by both 2 and 3
Each number is divisible by its factors; so factors are also called **divisors** (গুণনীয়ক).
- ⊗ When we **divide** (ভাগ করা) a number by another, the result is **quotient** (ভাগ ফল).
($6/3=2$). If we divide 6 by 3, we get 2. So, when 6 is divided by 2, the quotient is 3.
The division of one integer by another yields either a zero **remainder** (ভাগশেষ), or a positive-integer remainder. For example, 6 is evenly divided (নিঃশেষে বিভাজ্য) by 3 and the remainder is 0. But $7/2 = 3$ plus a remainder of 1.
When we say that an integer N is divisible by an integer x, we mean that N divided by x yields a zero remainder.
- ⊗ If a number N is divisible by a number x, then N is also divisible by all factors of x. 32 is divisible by 16. Therefore, 32 must be divisible by 1, 2, 4, and 8 which are all factors of 16.
- ⊗ If the remainder is r when p is divided by k then it can be written, $p = kq + r$ where q is an integer.

Example 1: How many positive integers are both multiples of 4 and divisors of 64?

- (A) Two (B) Three (C) Four (D) Five (E) None of these

Example 2: If 89 and 125 is divided by a positive integer X, then the remainders are 4 and 6 respectively. What is the value of X?

- (A) 17 (B) 13 (C) 11 (D) 9 (E) none of these

Exercise 2

- 1. The difference between two hundred nine thousand fourteen and ninety three thousand seven hundred nine is (BBA 93-94)
 (A) 116,315 (B) 115,315 (C) 116,305 (D) 115,305 (E) None of these
- 2. A club collected exactly Tk 599 from its members. If each member contributed at least Tk 12, what is the greatest number of members the club could have? (BBA 04-05)
 (A) 48 (B) 49 (C) 50 (D) 51 (E) none of these
- 3. In Rajshahi 5 adults are unemployed for every 120 adults who have jobs. Out of 2125 adults, how many have jobs? (BBA 06-07)
 (A) 89 (B) 425 (C) 2040 (D) 1896 (E) None of these
- 4. If a typist can type 125 pages, 36 lines each, 11 words to each line in 5 day, how many pages of 30 lines each and 12 words to each line can he type in 6 days? (MBA 96-97)
 (A) 180 (B) 175 (C) 170 (D) 165 (E) none of these
- 5. If 4 is subtracted from one-fourth of a number, the result is 20. The number is (MBA 02-03)
 (A) 84 (B) 92 (C) 108 (D) 116 (E) none of these
- 6. If the product of 3 consecutive integers is 120, then the sum of the integers is (MBA 03-04)
 (A) 9 (B) 12 (C) 14 (D) 15 (E) 18
- 7. What is the total number of integers between 100 and 200 that are divisible by 3? (MBA 05-06)
 (A) 33 (B) 32 (C) 31 (D) 30 (E) None of these
- ⊕ 8. 3 and 5 are factors of F. From this information, we can conclude that (BBA 94)
 (A) 8 is a factor of F (B) F is a multiple of 15 (C) $F = 3 \times 5$
 (D) 15 is a multiple of 15 (E) 3 and 5 are the only factors of F
- ⊕ 9. If the product of $(1+2)$, $(2+3)$ and $(3+4)$ is equal to one half the sum of 20 and x, then $x = ?$ (BBA 96-97)
 (A) 210 (B) 190 (C) 105 (D) 85 (E) 10
- ⊕ 10. A man invested in a life insurance policy. He paid the insurance company an annual premium of Tk. 20 for insurance of every thousand taka. His insurance was for Tk 4,500. The man died after making 27 annual installments. Total sum paid by the insurance company was Tk. 7,800. By how much did the sum paid by the insurance company exceed the total amount of premium that the man paid to the insurance company? (BBA 96-97)
 (A) 5370 (B) 4750 (C) 4500 (D) 3300 (E) none of these

- ⊕ 11. Jubair has Tk. 1,80,000 in his bank account. He made the following transactions: checks were written for Tk 20,000, Tk 13,000, Tk 40,000 and Tk 18,000. Deposits of Tk 60,000 and Tk 103,000 were made in the account. Interest amount added in the balance was Tk 50,000 and service fees charged by the bank was Tk 15,000. What is the final balance to the account? (BBA 06-07)
 (A) Tk 45,000 (B) Tk 285,000 (C) Tk 215,000 (D) Tk 185,000 (E) None of these
- ⊕ 12. If CAC multiplied by DD equals to DDDD and if $D=7$, then what is the value of A? (BBA 09-10)
 (A) 7 (B) 6 (C) 0 (D) 2 (E) none of these
- ⊕ 13. Which of the following is the product of two positive integers whose sum is 3? (MBA 03-04)
 (A) 0 (B) 1 (C) 2 (D) 3 (E) 4
- ⊕ 14. How many positive integers less than 20 are equal to the sum of a positive multiple of 3 and a positive multiple of 4? (MBA 03-04)
 (A) Eleven (B) Five (C) Seven (D) Ten (E) none of these
- ⊕ 15. Janata Garments Ltd. (JGL) has specific sales targets for all its sales managers. One of the managers Mr. Dhiman has a sales target of taka 50 million per quarter. Accounts show that during the first three quarters he has sold taka 10, 15, and 20 million worth of goods respectively. How much in taka should Mr. Dhiman sell during the fourth quarter in order to maintain the average sales target? (MBA 09-10)
 A) 10 million (B) 5 million (C) 250 million (D) 155 million (E) None of these
- ∇ 16. If an electric typewriter prints one word per second, what is the approximate time required for this typewriter to print a million words? (BBA 94)
 (A) 10 hours (B) 10 days (C) 10 weeks (D) 10 months (E) 10 years
- ∇ 17. If $x/y = 3/7$, then which of the following cannot be a possible value of $(y - x)$? (BBA 94-95)
 (A) 4 (B) 21 (C) 24 (D) 84 (E) None of these
- ∇ 18. What is the greatest positive integer n such that 2^n is a factor of 12^{10} ? (BBA 00-01)
 (A) 10 (B) 12 (C) 16 (D) 20 (E) 60
- ∇ 19. A number when divided by a divisor leaves a remainder of 24. When twice the original number is divided by the same divisor the remainder is 11. What is the value of the divisor? (BBA 08-09)
 (A) 13 (B) 59 (C) 35 (D) 37 (E) 12
- ∇ 20. When positive integer x is divided by positive integer y , the remainder is 9. If $x/y = 96.12$, what is the value of y ? (BBA 08-09)
 (A) 96 (B) 75 (C) 48 (D) 25 (E) 12

- ∇ 21 Find the smallest number which when divided by 18 and 24 will have a remainder of 4 and 10 respectively? (MBA 96-97)
 (A) 56 (B) 52 (C) 58 (D) 54 (E) none of these
- ∇ 22 If # is an operator such that $(4 \# 2 = 14)$ and $(2 \# 3 = 6)$, what will be the value of $(5 \# 2)$? (BBA 14-15)
 (A) 11 (B) 19 (C) 23 (D) 25 (E) none of these.
- ∇ 23. If $(a + a + a) = (b + b + b + b)$ and $(a + b) = 7$, then what is the value of $(a^2 - b^2)$? (BBA 15-16)
 (A) 0 (B) 3 (C) 4 (D) 7 (E) none of these

Answer Key Exercise 2

1. D	2. B	3. C	4. D	5. E	6. D	7. A	8. B	9. B	10. A	11. E
12. C	13. C	14. D	15. D	16. B	17. E	18. D	19. D	20. B	21. C	22. C
23. D										

Solution to Exercise 2

1. (D) The difference between two hundred nine thousand fourteen and ninety three thousand seven hundred nine is. $209014 - 93709 = 115305$ সুতরাং (D) সঠিক answer.
2. (B) মোট 599 টাকা collected হয়েছে এবং minimum contribution 12 টাকা হলে সম্ভাব্য সর্বোচ্চ লোকের সংখ্যা = 49 কারণ $49 \times 12 = 588$ কিন্তু $50 \times 12 = 600$, যা সীমার অতিরিক্ত। সুতরাং (B) সঠিক answer.
3. (C) In 125 adults 120 have jobs.
In 1 adult $120/125$ have jobs
 \therefore In 2125 adults $(120 \times 2125)/125 = 2040$ have jobs.
4. (D) 5 দিনে 11 word এর 36 line = 125 page.
1 দিনে 1 word এর 1 line = $\frac{125 \times 36 \times 11}{5}$
6 দিনে 12 word এর 30 line = $\frac{125 \times 36 \times 11 \times 6}{12 \times 30 \times 5} = 165$ page. সুতরাং (D) সঠিক answer.
5. (E) ধরি, number টি x
অতএব, $\frac{x}{4} - 4 = 20; \rightarrow x = (20 + 4) \times 4 = 96$
সুতরাং none of these হচ্ছে answer.
6. (D) 120 এর উৎপাদকগুলো হচ্ছে, 1, 2, 3, 4, 5, 6 ইত্যাদি।
4, 5 ও 6 কে গুণ করলে 120 হয়।
 $4 + 5 + 6 = 15$.
7. (A) Total number of integers between 100 and 200 that are divisible by 3 starts from 102 and ends at 198. Therefore, total number is $100/3 = 33$ সুতরাং answer: A.
8. (B) প্রশ্নে শুধু বলা হয়েছে, 3 এবং 5 হলো F1 এর factor. 3 এবং 5 ছাড়া F এর আরো factor থাকতে পারে। অতএব, (A) কে নিশ্চিতভাবে বলা যায় না। আবার 3 এবং 5 দ্বারা বিভাজ্য হওয়াতে (3×5) দ্বারাও F বিভাজ্য। অতএব, answer: B.
9. (B) $(1 + 2)(2 + 3)(3 + 4) = \frac{20 + x}{2} \Rightarrow 105 \times 2 = 20 + x \Rightarrow 210 - 20 = x \Rightarrow x = 190$
10. (A) 1000 টাকায় premium 20 টাকা
 \therefore 4500 টাকায় premium $((20 \times 4500)/1000) = 90$ টাকা \therefore 27 বৎসরে প্রদত্ত premium = $90 \times 27 = 2430$ টাকা \therefore উত্তর = $7800 - 2430 = 5370$ টাকা।
11. (E) $180,000 - 20000 - 13000 - 40000 - 18000 + 60000 + 103000 + 50000 - 15000 = 277000$
12. (C) DD = 77
DDDD = 7777
 $\therefore CAC = \frac{DDDD}{DD} = \frac{7777}{77} = 101 = A = 0$.
13. (C) দুটি ধনাত্মক পূর্ণসংখ্যার যোগফল 3 অর্থাৎ সংখ্যা 2 ও 1. অতএব, তাদের গুণফল = $2 \times 1 = 2$

14. (D) 20 এর চেয়ে ছোট positive multiples of 3 = 3, 6, 9, 12, 15, 18
 20 এর চেয়ে ছোট positive multiples of 4 = 4, 8, 12, 16.
 যোগ করলে দেখা যায়, $3 + 4 = 7, 3 + 8 = 11, 3 + 12 = 15, 3 + 16 = 19;$
 $6 + 4 = 10, 6 + 8 = 14, 6 + 12 = 18;$
 $9 + 4 = 13, 9 + 8 = 17;$
 $12 + 4 = 16;$
 $15 + 4 = 19.$
 মোট positive integer = 7, 10, 11, 13, 14, 15, 16, 17, 18, 19
 = 10 টি
15. (D) Target হচ্ছে 50 million per quarter.
 ১ম তিন quarter এ যথাক্রমে 10,15 and 20 million sell করে। ১ম তিন quarter এ যথাক্রমে 40,35 & 30 million short থাকবে target থেকে। তাই target fulfil করার জন্য last quarter এ 50 million এর সাথে সাথে এই shortage cover করতে হবে।
 Last quarter এ sales = $50 + 40 + 35 + 30 = 155$ million .
 অথবা Target হচ্ছে 50 million per quarter.
 4 quarters এ মোট target sales = $4 \times 50 = 200$ million
 last quarter এ sales = $200 - 10 - 15 - 20 = 155$ million.
16. (B) 1 word is printed in 1 second; $\therefore 10^6$ words are printed in 10^6 sec = $\frac{10^6}{60 \times 60 \times 24}$ days
 $= \frac{10 \times 10 \times 10 \times 10}{34 \times 24}$ days = $\frac{625}{54} = 12$ days.
17. (E) x এবং y যদি integer হত, তাহলে $y - x$ এর value 7 - 3 বা 4 এর multiple হত। কিন্তু এখানে x এবং y integer কিনা তা উল্লেখ করা নেই। কাজেই প্রদত্ত options A, B, C, D এর যেকোনটিই $y - x$ এর value হতে পারে।
18. (D) $12^{10} = 3^{10} \times 4^{10} = 3^{10} \times (2^2)^{10} = 3^{10} \times 2^{20}$
19. (D) Let the dividend be A and the divisor be D
 $\therefore A = n \cdot D + 24$ (i) [n is any integer]
 And $2A = k \cdot D + 11$ (ii) [k is any integer]
 Multiplying (i) by 2 and subtracting (ii) from (i), we get,
 $D(k - 2n) - 37 = 0$
 $\Rightarrow D(k - 2n) = 37$
 Because 37 is prime number, the equation only makes sense if $(k - 2n) = 1$
 $\therefore D = 37.$
20. (B) $\frac{9}{y} = 0.12$
 $y = 75$
21. (C) 18 আর 24 এর ল,সা,ত = 72. আবার $18 - 4 = 14$ এবং $24 - 10 = 14$, এখন $72 - 14 = 58$ হবে smallest number.
22. (C) The system is such that $(4^2) - 2 = 14$ and $(2^3) - 2 = 6$
 Therefore $(5^2) - 2 = 23$ Ans (C)
23. (D) $3a = 4b$ এবং $a + b = 7$ থেকে পাই $a = 4$ ও $b = 3$ । অতএব, $(a^2 - b^2) = (4^2 - 3^2) = 7$ ।

Concept 3, 4, 5

Divisibility Rules

Prime Numbers

HCF and LCM^{*}

Concept 3 (Divisibility Rules)

- ⊗ A number is divisible by 2 if the last digit of the number is divisible by 2 or in other words the units digit (একক স্থানীয় সংখ্যা) is either 2,4,6,8 or 0. Numbers divisible by 2 are even numbers.
- ⊗ A number is divisible by 3 if the sum of its digits is divisible by 3.
- ⊗ A number is divisible by 4 if the number formed by the last two digits is divisible by 4
- ⊗ A number is divisible by 5 if its last digit is either 0 or 5
- ⊗ A number is divisible by 6 if it is divisible by both 2 and 3. Simply speaking, if an even number is divisible by 3, it's divisible by 6.
- ⊗ A number is divisible by 8 if the number formed by the last three digits is divisible by 4
- ⊗ A number is divisible by 9 if the sum of its digits is divisible by 9.
- ⊗ A number is divisible by 10 if its last digit is 0.
- ⊗ A number is divisible by 11 if the sum of the digits in the odd position from the right, and the sum of the digits in the even position differ by a multiple of 11. E.g. in the number 29623, from the right, 3 is the first digit, 2 is the second digit, 6 is the third digit, 9 is the fourth digit and 2 is the fifth digit. So, sum of the digits in the first, third and fifth positions (odd positions) = $3+6+2=11$. The sum of the digits in the second and fourth positions (even positions) = $2+9=11$. Difference of the two sums = $11-11=0$. 0 is divisible by 11. So, the original number is also divisible by 11.

Concept 4 (Prime Numbers)

- ⊗ A prime number (মৌলিক সংখ্যা) is an integer more than 1 that is divisible only by 1 and itself. So a prime number has exactly 2 different positive divisors, not more, not less. 11 is a prime number because it only has two different positive divisors, 1 and itself (1, 11). 15 is not a prime number because 15 has four different positive divisors, 1, 3, 5, 15.
- ⊗ 1 is not a prime number because it has only one positive divisor.
- ⊗ 0 is not a prime number because it has no divisor.
- ⊗ 2 is the only even prime number. It has exactly 2 factors, 1 and itself.
- ⊗ Every integer greater than 1 either is prime or can be uniquely expressed as a product of prime factors. For example, $14 = (2)(7)$, $81 = (3)(3)(3)(3)$, and $484 = (2)(2)(11)(11)$.
To determine if a number is a prime, follow these steps:

Step 1: Determine a rough approximate square root of the number

Step 2: Divide the number by all of the primes which are less than the approximate square root. If the number is not divisible by any of these primes, then it is a prime, otherwise not. To determine whether 167 is a prime number or not, first we determine an estimated square root of 168. $13^2 = 169$; $12^2 = 144$. So the square root of 167 is within 12 and 13. We take the greater value which is 13 and attempt to divide 167 by all prime numbers less than 13 which are 2, 3, 5, 7 and 11. We find that 167 is not evenly divisible by 2, 3, 5, 7 and 11. So, 167 is a prime number as it has no factors other than 1 and itself.

When estimating square root, we choose the greater value to minimize error.

- ⊗ There are 25 prime numbers within 1 – 100
- ⊗ Prime numbers up to 100 are:
2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89 and 97
- ⊗ **4422322321** – Memorize this sequence. The first number is 4 meaning there is 4 prime numbers within 1 – 10. Second number is 4, so within 11 – 20 there are 4 prime numbers. Within 21 – 30 there are 2 prime numbers and so on up to 100. This sequence will save your time in counting prime numbers within an interval.
To determine how many prime numbers are within 45 – 72, the 5th number in the sequence is 3. So there are 3 prime numbers between 41 – 50. The 6th and 7th number in the sequence is 2 and 2. So there are $3+2+2=7$ prime numbers within 40-70, 71 is a prime. So, $7+1=8$ prime numbers between 40 – 72. 41 and 43 are primes. So, there are $8 - 2 = 6$ prime numbers between 45 – 72. The answer is 6

Concept 5 (HCF and LCM)

- ⊗ The factors of 12 are 1, 2, 3, 4, 6 and 12
 The factors of 16 are 1, 2, 4, 8 and 16
 The common factors of 12 and 16 are 1, 2 and 4
 The highest of these common factor is 4.
 Therefore, the **HCF or highest common factor** (গসাও বা গরিষ্ঠ সাধাৰণ গুণনীয়ক) of 12 and 16 is 4
- ⊗ The multiples of 12 are 12, 24, 36, 48, 60, 72, 84, 96....144...192...
 The multiples of 16 are 16, 32, 48, 64, 80, 96, 112....144...192...
 The common multiples of 12 and 16 are 48, 96, 144, 192....
 The least of these common multiple is 48
 Therefore, the **LCM or lowest common multiple** (লসাও বা লঘিষ্ঠ সাধাৰণ গুণিতক) of 12 and 16 is 48
- ⊗ The product of HCF and LCM of any group of numbers is equal to the product of those numbers.
 If the HCF of a and b is x and the LCM of a and b is y Then, $ab = xy$
 The HCF of 4 & 5 is 1. The LCM of 4 & 5 is 20.
 So, $4 \times 5 = \text{LCM} \times \text{HCF} = 20 \times 1 = 20$

Exercise 3, 4, 5

- 1. How many prime numbers are there between 1 and 10? (BBA 94)
 (A) 2 (B) 3 (C) 4 (D) 5 (E) 6
- 2. How many integers between 110 and 120 are prime numbers? (MBA 03-04)
 (A) 0 (B) 1 (C) 2 (D) 3 (E) 4
- 3. How many prime numbers are there between 56 and 100? (MBA 03-04)
 (A) 8 (B) 9 (C) 10 (D) 11 (E) none of these
- 4. If $y/3$, $y/4$ and $y/7$ represent integers, then y can be (MBA 03-04)
 (A) 42 (B) 56 (C) 70 (D) 84 (E) 126
- 5. If n is an integer divisible by 6 but not by 4, then which of the following CANNOT be an integer? (MBA 03-04)
 (A) $n/2$ (B) $n/3$ (C) $n/6$ (D) $n/10$ (E) $n/12$
- ⊕ 6. 180 students in a group are to be seated in rows so that there are an equal number of students in each row. Each of the following could be the number of rows EXCEPT (MBA 05-06)
 (A) 4 (B) 20 (C) 30 (D) 40 (E) 90
- ⊕ 7. What is the minimum number of chocolates that must be added to the existing stock of 270 chocolates so that the total stock can equally be divided among 6, 8 or 12 persons? (BBA 03-04)
 (A) 12 (B) 16 (C) 18 (D) 20 (E) none of these
- ⊕ 8. What is the smallest number of apples that can distributed equally among 4, 6, 9 or 15 students having a surplus of two apples each time? (MBA 96-97)
 (A) 422 (B) 362 (C) 182 (D) 62 (E) none of these
- ▽ 9. One third, one fourth, one fifth and one-seventh of the human population of Island X, which has fewer than 5000 human inhabitants, are all whole numbers and their sum is exactly the population of Island Y. What is the population of Island Y? (BBA 02-03)
 (A) 4200 (B) 4279 (C) 4581 (D) 4800 (E) Cannot be determined
- ▽ 10. The greatest common factor of two positive integers is A. The least common multiple of the two integers is B. If one of the integers is C, what is the other number? (MBA 00-01)
 (A) $\frac{AB}{C}$ (B) $\frac{BC}{A}$ (C) $\frac{A}{C} + B$ (D) $A + \frac{B}{C}$ (E) none of these

- ∇ 11. If y is an integer divisible by 3 but not by 2 then which of the following will never be an integer? (BBA 09-10)
 (A) $\frac{y-1}{2}$ (B) $\frac{y}{7}$ (C) $\frac{y}{24}$ (D) $\frac{y^3}{3}$ (E) none of these
- ∇ 12. $(4^{41}+4^{42}+4^{43})$ is divisible by- (BBA 09-10)
 (A) 7 (B) 13 (C) 15 (D) 17 (E) none of these
- ∇ 13. If x and y are two distinct positive integers divisible by 4, then which of the following is necessarily divisible by 8? (MBA 2013)
 (A) $x + y$ (B) $x - y$ (C) $x^2 + y^2$ (D) $2x + y$ (E) none of these
- ⊕14. Mr. Saif has n luxury apartments, where n is an integer such that $20 < n < 50$. If he divides the apartments equally among his 5 children, he will have 2 apartments remaining. If he divides the apartments among 6 children, he will have 1 apartment remaining. How many apartments will remain if he divides the apartments among 7 children? (BBA 13-14)
 (A) 3 (B) 2 (C) 4 (D) 1 (E) none of these
- ∇ 15. After a long career, Mr. Iqbal is retiring. If there are 25 associates who contribute equally to a parting gift for Iqbal in an amount that is an integer, what is the total value of the parting gift? (BBA 13-14)
 Statement 1: If four associates were fired for underperformance, the total value of the parting gift would have decreased by Tk 200.
 Statement 2: The value of the parting gift is greater than Tk 1,225 and less than Tk 1,275.
- ∇ 16. When x is divided by 13, the answer is y with a remainder of 3. When x is divided by 7, the answer is z with a remainder of 3. If x , y , and z are all possible integers, what is the remainder of $yz/13$? (3,4,5) (BBA 15-16)
 (A) 0 (B) 3 (C) 4 (D) 7 (E) none of these

Answer Key Exercise 3, 4, 5

1. C	2. C	3. B	4. D	5. E	6. D	7. C	8. C	9. E	10. A	11. C	12. A
13. C	14. B	15. D	16. A								

Solution to Exercise 3, 4, 5

1. (C) 1 and 10 এর ভিতর prime number হলো 2, 3, 5, 7; অতএব, চারটা মৌলিক সংখ্যা।
2. (C) 110 ও 120 এর মধ্যে prime no. গুলো হচ্ছে, 113 ও 119, সুতরাং (C) সঠিক answer.
3. (B) using the shortcut 4422322321, There are 10 prime numbers from 50 – 100. But 53 is a prime. So, There is one prime number from 50 – 56 which should not be added. So, there are 9 prime numbers from 56 – 100.
4. (D) y হবে এমন একটি সংখ্যা যা 3, 4, 7 দ্বারা বিভাজ্য। যেমন, 84. সুতরাং (D) সঠিক answer.
5. (E) n, 6 দ্বারা বিভাজ্য কিন্তু 4 দ্বারা নয় যেমন, 18, 30, 42 ইত্যাদি n এর মান হতে পারে। এরা যেহেতু জোড় সংখ্যা এবং 6 দ্বারা বিভাজ্য তাই 2, 3, 6 দ্বারাও বিভাজ্য হবে। 30, 10 দ্বারা বিভাজ্য। কিন্তু এরা 12 দ্বারা কখনই বিভাজ্য হবে না।
6. (D) এই ক্ষেত্রে, number of rows কে 180 এর factor হতে হবে যেহেতু প্রত্যেক row তে সমান সংখ্যক students বসে। যেহেত 40, 180 এর factor না, এখানে 40 টা row থাকতে পারবেন। সুতরাং (D) সঠিক answer.
7. (C) 6, 8 এবং 12 এর ল. সা. গু = 24
অর্থাৎ মোট no of chocolates হবে 24 এর গুণিতক। 270 এর থেকে minimum উপরে 24 এর গুণিতক = 288
অর্থাৎ, add করতে হবে $(288 - 270) = 18$ টি।
8. (C) 4, 6, 9, 15 এর ল.সা.গু = 180. কাজেই কমপক্ষে $180 + 2 = 182$ টি apple কে ভাগ করা যায়।
9. (E) 3, 4, 5, ও 7 এর ল. সা. গু বের করতে হবে। ল. সা. গু = 420
বলা হয়েছে Island x এর জনসংখ্যা 5000 এর কম। এখন x এর জনসংখ্যা 4620, 4200, 420, 840 (আরও অনেক) যেকোন কিছু হতে পারে। 4620 ধরে নিলে Island y এর জনসংখ্যা 4279 হয় (Answer choice B) সুতরাং, answer হওয়া উচিত cannot be determined.
10. (A) সূত্র অনুসারে, সংখ্যাটি = $\frac{\text{সংখ্যা দুটির G.C.T (গ.সা. গু)} \times \text{L.C.M (ল.সা.গু)}}{\text{অপর সংখ্যা}}$
$$= \frac{A \times B}{C}$$
11. (C) y যেহেতু 2 দিয়ে বিভাজ্য নয়, তাই কোন জোড় সংখ্যা দিয়ে y কে ভাগ করা যাবে না।
12. (A) $4^{41} + 4^{42} + 4^{43} = 4^{41}(1 + 4 + 4^2)$
 $= 21 \times 4^{41} = 7 \times 3 \times 4^{41}$
13. (C) x and y are both positive integers and both divisible by 4. তাহলে তাদের square এর যোগফল অবশ্যই 8 দিয়ে divisible হবে। Let, $x = 4$ and $y = 16$, then $x^2 + y^2 = 272$, which is divisible by 8.

14. (B) Mr. Saif এর apartment এর সংখ্যা $20 < n < 50$

যখন তিনি apartments 5 জন এর মধ্যে ভাগ করে দেন, বাকি থাকে 2 টি apartment.

সুতরাং, 20 থেকে 50 এর মধ্যে 5 দিয়ে ভাগ করলে 2 ভাগশেষ থাকে এমন সংখ্যা আছে 22, 27, 32, 37, 42 এবং 47. যখন তিনি apartments 6 জন এর মধ্যে ভাগ করে দেন, বাকি থাকে 1 টি apartment.

সুতরাং, উপর্যুক্ত সংখ্যাগুলোর মধ্যে 6 দিয়ে ভাগ করলে 1 ভাগশেষ থাকে এমন সংখ্যা আছে শুধুমাত্র 37.

37. টি apartment 7 জন এর মধ্যে ভাগ করলে বাকি থাকবে 2 টি apartment.

15. (D) Statement are individually sufficient.

Statement-1 If number of associates decreases by 4 and the total value of the gift decreases by Tk. 200. this means that each of them had contributed $200/4 = \text{Tk. } 50$. This means that everyone else had also contributed Tk. 50, as everyone contributed equally. So the total value of the gift is $50 \times 25 \text{ Tk. } 1250$

Statement-2 The value of the gift must be divisible by 25 as everyone contributes equally. And there is only number divisible by 25 that is greater than 1225 but less than 1275, and that is 1250 Tk.

16. (A) For 1st case, $x = 13y + 3 \dots \dots \dots (i)$

For 2nd case, $x = 7z + 3 \dots \dots \dots (ii)$

From (i) and (ii), $13y + 3 = 7z + 3$

$$\Rightarrow 13y = 7z$$

As 7 and 13 both are prime numbers, the only possible value for y and z would be

7 and 13 (If one of them is 7, other would be 13).

So, $yz/13 = 7 \cdot 13 / 13 = 7$ (No remainder)

Concept 6, 7

Fractions, Decimals

Concept 6, 7 (Fractions, Decimals)

<p>Adding and Subtracting Fractions</p>	$5\frac{1}{3} + \frac{1}{4} - \frac{4}{3}$ $= \frac{(5 \times 3) + 1}{3} + \frac{1}{4} - \frac{4}{3}$ $= \frac{16}{3} + \frac{1}{4} - \frac{4}{3}$ $= \frac{(12/3 \times 16) + (12/4 \times 1) - (12/4 \times 4)}{12}$ $= \frac{(4 \times 16) + (3 \times 1) - (4 \times 4)}{12}$ $= \frac{64 + 3 - 16}{12}$ $= \frac{51}{12}$	<p>(First simplify improper fractions)</p> <p>(Determine LCM of the denominator and divide the LCM with each denominator. Multiply each numerator with the answer)</p>
<p>Multiplying and Dividing Fractions</p>	$5\frac{1}{3} \times \frac{3}{8} \div \frac{1}{4}$ $= \frac{16}{3} \times \frac{3}{8} \times \frac{4}{1}$ $= \frac{\cancel{16}^8 \times \cancel{3} \times \cancel{4}^4}{\cancel{3} \times \cancel{8}_2 \times 1} = 8$	<p>(Dividing any number by $\frac{1}{4}$ is the same as multiplying it by 4. We can reverse the fraction after division sign and change the division sign to multiplication sign)</p>
<p>Raising and Reducing Fractions</p>	$\frac{25}{100} = \frac{25 \times 4}{100 \times 4} = \frac{100}{400}$ $\frac{25}{100} = \frac{\cancel{25}}{\cancel{100}_4} = \frac{1}{4}$	<p>(Multiplying both numerator and denominator by the same number doesn't change the value of the fraction)</p> <p>(Dividing both numerator and denominator by the same number doesn't change the value of the fraction. Dividing the fraction by the HCF of the numerator and denominator gives the fraction in its lowest forms.)</p>
<p>Adding and</p>	$3.09 + 3.009 - 3.9 + 39$ $= 3.090$	<p>(Align the points and do like normal addition or subtraction.)</p>

Subtracting Decimals	$\begin{array}{r} 3.009 \\ (-)3.900 \\ \hline 39.000 \\ \hline 41.199 \end{array}$	Keep in mind that adding zero after any decimal number doesn't change value)
Multiplying Decimals by a power of 10 (10, 100, 1000...	$3.1614 \times 100 = 316.14$	(The point moves one place left for every zero after 1. Since in 100 there are two zeros, the point moves 2 places to the left)
Dividing Decimals by a power of 10 (10, 100, 1000...	$316.14 \div 100 = 3.1614$	(The point moves one place right for every zero after 1. Since in 100 there are two zeros, the point moves 2 places to the right)
Multiplying Decimals	$\begin{array}{r} 2.5 \times .008 \\ 25 \\ \times 8 \\ \hline 200 \end{array}$ $\therefore 2.5 \times .008 = 0.0200$	(First multiply the numbers as if the decimal is not there) (In the first number 2.5, point is after one place from right. in the second number .008, point is after three places from right. So put the point in the result $1+3=4$ places from right)
Dividing Decimals	$26.5 \div 5 = \frac{26.5}{5} = \frac{26.5 \times 10}{5 \times 10} = \frac{265}{50} = 5.3$ $26.5 \div 0.05 = \frac{26.5}{0.05} = \frac{26.5 \times 100}{0.05 \times 100} = \frac{2650}{5} = 530$	Eliminate the decimals by multiplying both numerator and denominator with the same power-of 10 (10, 100, 1000 etc). Then do like normal division.

Two fractions are equivalent if multiplying or dividing both the numerator and denominator of the first fraction by the same number gives the second fraction. E.g. $\frac{1}{2}$ and $\frac{4}{8}$ are equivalent because $\frac{(1 \times 4)}{(2 \times 4)} = \frac{4}{8}$.

Exercise 6, 7

- 1. A piece of rope is cut into three sections so that the first section is three times as long as the second and the second section is three times as long as the third. What fraction of the entire piece is the smallest section? (BBA 93-94)
 (A) $\frac{1}{5}$ (B) $\frac{1}{7}$ (C) $\frac{1}{9}$ (D) $\frac{1}{12}$ (E) $\frac{1}{13}$
- 2. A cake is divided into three pieces so that the first piece is four times as big as the second and the second piece is three times as big as the third. What fraction of the entire cake is the smallest piece? (BBA 01-02)
 (A) $\frac{1}{8}$ (B) $\frac{1}{12}$ (C) $\frac{1}{13}$ (D) $\frac{1}{16}$ (E) none of these
- 3. Some chocolates were divided among 3 children in such a way that the first child got three times as much as the second child and the second child got three times as much as the third child. What portion of the chocolates did the third child get? (MBA 99-00)
 (A) $\frac{1}{12}$ (B) $\frac{1}{9}$ (C) $\frac{1}{3}$ (D) $\frac{1}{13}$ (E) none
- 4. Rakib, Raja, and Rajib paid a total of 369 taka for their dinner at a restaurant. If Rakib paid $\frac{2}{3}$ of the total amount, Raja paid 82 taka, and Rajib paid the rest, what fraction of the total amount did Rajib pay? (BBA 09-10)
 (A) $\frac{1}{9}$ (B) $\frac{1}{3}$ (C) $\frac{39}{82}$ (D) $\frac{82}{369}$ (E) $\frac{2}{11}$
- 5. There are 18 bananas on a tree. If one monkey eats $\frac{1}{3}$ of the bananas and another monkey eats $\frac{1}{3}$ of the rest. How many bananas are still on the tree? (BBA 95-96)
 (A) 16 (B) 10 (C) 8 (D) 6 (E) 4
- 6. If $x \neq 0$, then $\frac{x+7}{7x - \frac{1}{x}}$ (BBA 08-09)
 (A) $(x+6)/6x$ (B) $(x+6)/7x$ (C) $(-6x+7)/7x$ (D) $\frac{1}{7}$ (E) none of these
- 7. If a man's weekly salary is Tk. P and he saves Tk. M, what fraction of his weekly salary does he spend? (BBA 93-94)
 (A) $\frac{M}{P}$ (B) $\frac{P-M}{P}$ (C) $\frac{M-P}{P}$ (D) $\frac{M-P}{M}$ (E) $\frac{P-M}{M}$
- 8. What must be added to x/y to make $2y/x$? (BBA 95-96)
 (A) $2x^2/y$ (B) $(xy-y^2)/x$ (C) $(2y^2-x^2)/xy$ (D) x/y (E) none of these
- 9. If $(a+b+c)/4 = (a+b)/3$, then what is the value of c? (BBA 96-97)
 (A) $(a+b)/3$ (B) $(a+b)/4$ (C) $(a+b)/8$ (D) $(a+b)/12$ (E) none of these
- 10. If $a/x + b = 1$, what is the value of x? (BBA 96-97)
 (A) $(1-a)$ (B) $(b-1)$ (C) $(1-a)/b$ (D) $a/(1-b)$ (E) none of these
- 11. If $1/y = 3\frac{1}{2}$ then $\frac{1}{y+2}$? (BBA 00-01)
 (A) $\frac{7}{16}$ (B) $\frac{2}{7}$ (C) $\frac{7}{9}$ (D) $\frac{7}{8}$ (E) $\frac{16}{7}$

- 12. If $1/x + 5/y = 4/3$ and $x = 3y$, then $y = ?$ (BBA 07-08)
 (A) 2 (B) 3 (C) 3.33 (D) 4 (E) none of these
- 13. If the value of a certain fraction is equal to 0.4 and the denominator of the fraction is 15, then the numerator of the fraction is (MBA 03-04)
 (A) 6 (B) 8 (C) 9 (D) 12 (E) none of these
- 14. By how much is $\frac{3}{7}$ larger than 20% of 2? (MBA 00-01)
 (A) $\frac{1}{35}$ (B) $\frac{1}{7}$ (C) $\frac{4}{7}$ (D) $\frac{3.3}{7}$ (E) $\frac{3.4}{7}$
- 15. $(1/4)^3 + (3/4)^3 + 3(1/4)(3/4)(1/4 + 3/4) = ?$ (MBA 08-09)
 (A) 7 (B) 27/64 (C) 49/64 (D) 1 (E) None of these
- 16. If the value of X and Y in the fraction XZ/Y are both tripled, how does the value of the fraction change? (MBA 09-10)
 (A) Increases by half (B) Decreases by half (C) Triples
 (D) Doubles (E) Remains the same
- 17. Which of the following numbers is the least? (BBA 93-94)
 (A) 0.09200 (B) 0.180000 (C) 0.1049 (D) 0.111 (E) 0.19
- ⊕18. A cylindrical jar that can hold 1.5 liters of water is $7/10^{\text{th}}$ full. Approximately how much water, in liters, should be poured out of the jar so that it becomes $7/10^{\text{th}}$ empty? (BBA 94)
 (A) 1 (B) 0.9 (C) 0.75 (D) 0.6 (E) 0.5
- ⊕19. A gas tank is $1/5^{\text{th}}$ full and requires 32 gallons more to make it $3/7^{\text{th}}$ full. What is the capacity of the tank? (BBA 94-95)
 (A) 115 (B) 120 (C) 135 (D) 140 (E) 145
- ⊕20. Of the animals in Dhaka Zoo, $1/3$ are Zebras, $1/6$ are Giraffes, $1/5$ are Tigers, and the rest is comprised of 36 Deer. How many Zebras are there in the Zoo? (BBA 00-01)
 (A) 12 (B) 20 (C) 36 (D) 40 (E) 120
- ⊕21. In one classroom exactly two third of the seats are occupied. In another classroom with double the seating capacity of the first, exactly three quarters of the seats are occupied. If the students from both rooms are transferred into a third empty classroom that has a seating capacity exactly equal to the first two combined, what fraction of the seats in the third class room is occupied? (BBA 04-05)
 (A) $3/4$ (B) $2/3$ (C) $6/11$ (D) $13/18$ (E) $12/17$
- ⊕22. Sabina needs to make a cake and some cookies. The cake requires $3/8$ cup of sugar and the cookies require $3/5$ cup of sugar. Sabina has $15/16$ cup of sugar. Does she have enough sugar, or how much more does she need? (BBA 09-10)
 (A) She has enough sugar (B) She needs $\frac{1}{8}$ of a cup of sugar
 (C) She needs $\frac{3}{80}$ of a cup of sugar (D) She needs $\frac{4}{19}$ of a cup of sugar
 (E) none of these

- ⊕23. A store has five shelves and average weekly sale is Tk. 30000. shelf 1 accounted for $\frac{1}{4}$ of the store's average weekly sales and shelves 2 and 3 each accounted for $\frac{2}{3}$ as much as shelf 1. 4 shelf 4 alone accounted for as much as shelf 1, then which of the following could have been the average weekly sales of shelf 5 for the store? (MBA 04-05)
 (A) 5000 (B) 6500 (C) 10000 (D) 11000 (E) 12500
- ⊕24. Rate of call is Tk. 4.5 per minute for all outgoing and Tk. 2.5 for all incoming from and to my mobile telephone. Find the charge if I made 13 calls – 7 for 3 minutes and 6 for 2 minutes and received 12 calls – 5 for 5 minutes and 7 for 4 minutes? (MBA 97-98)
 (A) 396 (B) 322 (C) 281 (D) 224 (E) 175
- ⊕25. If $x = \frac{3}{4}$, then $\frac{16x^2}{9} + \frac{2}{9} + \frac{10}{16x^2} = ?$ (BBA 94)
 (A) 3 (B) 2 (C) $2\frac{1}{3}$ (D) $3\frac{2}{3}$ (E) $2\frac{2}{3}$
- ⊕26. If $x = 3$ and $y = \frac{1}{6}$ then the value of x in terms of y is (BBA 96-97)
 (A) $2y$ (B) $\frac{1}{2}y$ (C) $\frac{62}{3}y$ (D) $\frac{31}{6}y$ (E) $18y$
- ⊕27. What is 10% of $y/3$, if $2y/3$ is 10% of 600? (BBA 99-00)
 (A) 1 (B) 2 (C) 3 (D) 4 (E) none of these
- ⊕28. If $\frac{a}{x} + \frac{x}{a} = \frac{x}{b} + \frac{b}{x}$, then $x = ?$ (BBA 01-02)
 (A) $\pm\sqrt{ab}$ (B) $\pm\sqrt{\left(\frac{a}{b}\right)}$ (C) $\pm\sqrt{\left(\frac{ab}{2}\right)}$ (D) $\pm\sqrt{\left(\frac{b}{a}\right)}$
 (E) None of these
- ⊕29. $0.03 \times 0.0004 \times 1.003 = ?$ (BBA 94)
 (A) .000012036 (B) .0001236 (C) .00001236
 (D) .12036 (E) .00112036
- ⊕30. Which of the following fractions is the smallest? (BBA 98-99)
 (A) $\frac{2}{9}$ (B) $\frac{5}{12}$ (C) $\frac{5}{8}$ (D) $\frac{1}{2}$ (E) $\frac{3}{10}$
- ⊕31. Which of the following is the largest? (BBA 01-02)
 (A) $\frac{12}{15}$ (B) $\frac{11}{14}$ (C) $\frac{5}{7}$ (D) $\frac{9}{11}$ (E) $\frac{1}{2}$
- ⊕32. Which of the following fractions is the largest? (BBA 03-04)
 (A) $\frac{12}{15}$ (B) $\frac{5}{6}$ (C) $\frac{17}{21}$ (D) $\frac{11}{14}$ (E) $\frac{16}{23}$
- ⊕33. Which of the following is greater than $\frac{2}{3}$? (BBA 06-07)
 (A) $\frac{13}{21}$ (B) $\frac{16}{25}$ (C) $\frac{7}{11}$ (D) $\frac{5}{7}$ (E) None of these
- ⊕34. Which of the following is greater than $\frac{2}{3}$? (BBA 07-08)
 (A) $\frac{33}{50}$ (B) $\frac{8}{11}$ (C) $\frac{3}{5}$ (D) $\frac{16}{27}$ (E) none of these

- ⊕35. Which of the following fractions is the largest? (MBA 98-99)
 (A) $12/15$ (B) $11/14$ (C) $5/6$ (D) $17/21$ (E) $29/35$
- ⊕36. Which of the following is true? (MBA 03-04)
 (A) $0 < \frac{1}{10} < 0.01$ (B) $0.12 < \frac{1}{8} < 0.13$ (C) $0.3 < \frac{1}{4} < .5$
 (D) $0.3 < \frac{1}{3} < 0.33$ (E) None of these
- ⊕37. Which of the following is greater than 1? (MBA 03-04)
 (A) $0.00004/0.005$ (B) $0.000006/0.0001$ (C) $0.01/0.003$
 (D) $0.003/0.006$ (E) $0.001/0.01$
- ∇38. Which of the following is the largest? $\sqrt{0.3}, \frac{1}{3}, \frac{2}{5}, \frac{3}{7}, \frac{4}{11}$ (BBA 94)
 (A) $\sqrt{0.3}$ (B) $\frac{1}{3}$ (C) $\frac{2}{5}$ (D) $\frac{3}{7}$ (E) $\frac{4}{11}$
- ∇39. Which of the following fractions is the smallest? (BBA 02-03)
 (A) $23/45$ (B) $24/46$ (C) $28/57$ (D) $2/3$ (E) $29/58$
- ∇40. Which of the following fractions is the smallest? (MBA 02-03)
 (A) $33/128$ (B) $45/138$ (C) $53/216$ (D) $83/324$ (E) $15/59$
- ∇41. Which of the following fractions has the greatest value? (BBA 08-09)
 (A) $1/(32 \times 52)$ (B) $2/((32 \times 52))$ (C) $7/(33 \times 52)$
 (D) $45/(33 \times 53)$ (E) $75/(34 \times 54)$
- ∇42. If $x = (0.08)^2$, $y = 1/(0.08)^2$ and $z = (1 - 0.08)^2 - 1$, which of the following is true? (BBA 05-06)
 (A) $x = y = z$ (B) $y < z < x$ (C) $z < x < y$ (D) $y < x$ and $x = z$ (E) None of these
- ∇43. $2/100 + 7/10000 + 4/50000 = ?$ (BBA 08-09)
 (A) 0.0278 (B) 0.02078 (C) 0.00278 (D) 0.020078 (E) none of these
- ∇44. $0.004 \times 0.12 \times 0.01^2 \times 10 = ?$ (MBA 07-08)
 (A) .000048 (B) .0048 (C) .000048 (D) .0000048 (E) none of these
- ∇45. If $\frac{x}{b-c} = \frac{y}{c-a} = \frac{z}{a-b}$ then $x + y + z = ?$ (BBA 01-02)
 (A) 0 (B) $a+b+c$ (C) $\frac{a+b+c}{abc}$ (D) 1 (E) none of these
- ∇46. You took $1/3$ of the chocolates from a box and your brother took $3/5$ of the remaining chocolates. If 20 chocolates were left in the box, how many chocolates did the box contain originally? (BBA 94-95)
 (A) 25 (B) 45 (C) 50 (D) 75 (E) 80

- ∇47. Mr Jamil, a renowned engineer, designed a ball so that when it was dropped, it rose with each bounce exactly one-half as high as it had fallen. The engineer dropped the ball from a 24-foot platform and caught it after it had traveled 23.25 yards. How many times did the ball bounce?
 (A) 7 (B) 11 (C) 6 (D) 5 (E) none of these (BBA 10-11)
- ∇48. In a nationwide poll, p people were asked 2 questions. If $\frac{2}{5}$ of them answered "yes" to question 1, and of those $\frac{1}{3}$ also answered "yes" to question 2, which of the following represents the number of people polled who did not answer "yes" to both questions?
 (A) $\frac{11}{13}$ (B) $\frac{3}{13}$ (C) $\frac{13}{15}$ (D) $\frac{2}{15}$ (E) none of these (BBA 10-11)
- ∇49. You want to make some candy using a recipe that calls for $1\frac{1}{2}$ cups of sugar, $\frac{1}{2}$ cup of boiling water and several other ingredients. You find that you have only 1 cup of sugar. How many cup of water will you have to use?
 (A) $\frac{1}{3}$ (B) $\frac{3}{4}$ (C) 1 (D) $\frac{1}{6}$ (E) $\frac{1}{4}$ (BBA 96-97)
- ∇50. A certain football team that has played $\frac{2}{3}$ of its games has a record of 17 wins and 3 losses. What is the greatest number of the remaining games that the team can lose and still win at least $\frac{3}{4}$ of all of its games?
 (A) 7 (B) 6 (C) 5 (D) 4 (E) 3 (MBA 05-06)
- ∇51. In 2004, approximately $\frac{1}{3}$ of the 37.3 million airline passengers traveling to or from Bangladesh used Dhaka Airport. If the number of such passengers that used Chittagong Airport was $\frac{1}{2}$ the number that used Dhaka Airport and 4 times the number that used Jessore Airport, approximately how many millions of these passengers used Jessore Airport that year?
 (A) 18.6 (B) 9.3 (C) 6.2 (D) 3.1 (E) 1.6 (MBA 05-06)
- ∇52. Equal amount of water was poured into two empty jars of different capabilities, which made one jar $\frac{1}{4}$ full and the other jar $\frac{1}{3}$ full. If the water in the jar with lesser capacity is then poured into the jar with the greater capacity, what fraction of the larger jar will be filled with water?
 (A) $\frac{1}{7}$ (B) $\frac{3}{4}$ (C) $\frac{1}{2}$ (D) $\frac{7}{12}$ (E) none of these (MBA 07-08)
- 53. Event E is defined to be rolling an even number on a 6-sided die and Event F is defined to be rolling a 1, 2 or 3. Calculate the probability of rolling a die such that events E and F occur simultaneously on a single roll of the die.
 (A) $\frac{1}{2}$ (B) $\frac{1}{6}$ (C) 0 (D) $\frac{5}{6}$ (E) 1 (BBA 13-14)

- ⊕54. There are six different models who are to appear in a fashion show. Two are from Europe, two are from South America, and two are from North America. If all the models from the same continent are to stand next to each other, how many ways can the fashion show organizer arrange the models? (BBA 13-14)
 (A) 48 (B) 64 (C) 24 (D) 8 (E) 72
- ⊕55. One-fourth of a number is equal to two-fifth of another number. If 50 is added to the larger number, it becomes two times the second number. What is the smaller number? (BBA 14-15)
 (A) 75 (B) 80 (C) 100 (D) 125 (E) none of these
- ∇56. Two containers, x and y of the same capacity, are each $\frac{4}{5}$ full of water. If 4 litres of water from container x is added to container y, the ratio of water in the two containers becomes 2:3. What is the capacity of container x? (BBA 14-15)
 (A) 16 (B) 20 (C) 25 (D) 32 (E) none of these
- ∇57. Arif contributed $\frac{2}{3}$ of his salary to a charity, which is half the salary of Babu. Babu contributed $\frac{3}{4}$ of his salary to the same charity, which is twice the salary of Malek. Malek contributed $\frac{1}{4}$ of his salary to the charity. If Babu's salary is Tk. 20,000, what was the total contribution to the charity? (BBA 14-15)
 (A) Tk. 26875 (B) Tk. 27325 (C) Tk. 28525 (D) Tk. 29675 (E) none of these
- ∇58. A club has equal number of male and female members. On a certain day, two thirds of the members were absent. Of the members present, one third was male. What is the ratio of male and female who were not present on that day? (BBA 14-15)
 (A) $\frac{1}{3}$ (B) $\frac{2}{3}$ (C) $\frac{3}{5}$ (D) $\frac{7}{5}$ (E) none of these
- ∇59. A certain test consists of 8 sections with 25 questions numbered from 1 to 25, in each section. If a student answered all of the even-numbered questions correctly and $\frac{3}{4}$ of the odd numbered questions correctly, what was the total number of questions he answered correctly? (BBA 17-18)
 A) 150 B) 172 C) 174 D) 175 E) None of these

Answer Key Exercise 6, 7

1.E	2.D	3.D	4.A	5.C	6.E	7.B	8.C	9.A	10.D
11.A	12.D	13.A	14.A	15.D	16.E	17.A	18.D	19.D	20.D
21.D	22.C	23.A	24.C	25.C	26.E	27.C	28.A	29.A	30.A
31.D	32.B	33.D	34.B	35.C	36.B	37.C	38.A	39.C	40.C
41.E	42.C	43.B	44.E	45.A	46.D	47.D	48.C	49.A	50.D
51.E	52.C	53.B	54.A	55.D	56.C	57.A	58.D	59.C	-

Solution to Exercise 6.7

1. (E) ধরি, Smallest section = x , বোঝা যাচ্ছে 3rd section = x ; অতএব, 2nd section = $3x$ এবং 1st section = $9x$ [$3x \times 3$]; সুতরাং, entire piece = $x + 3x + 9x = 13x$; অর্থাৎ, fraction টি হবে।

$$\frac{x}{13x} = \frac{1}{13}$$
2. (D) let, smallest piece = x
 \therefore second piece = $3x$ \therefore first piece = $12x$
 \therefore smallest piece = $\frac{x}{16x}$ of the cake = $\frac{1}{16}$
3. (D) মনে করি, third child এর পাওয়া chocolate এর সংখ্যা = x । \therefore second child পেলো $3x$ chocolates
 \therefore 1st child পেলো = $3 \times 3x = 9x$; \therefore total chocolate = $9x + 3x + x = 13x$ ।
 প্রশ্নে চাওয়া হয়েছে যে মোট chocolate এর কত অংশ third child পেলো। তার মানে third child এর পাওয়া chocolate এর সংখ্যা এবং total chocolate এর সংখ্যার অনুপাত বের করতে হবে। \therefore উত্তর = $\frac{x}{13x} = \frac{1}{13}$
4. (A) Rakib = $369 \times \frac{2}{3} = 246$
 Raja = 82
 \therefore Rajib = $369 - 246 - 82 = 41$
 \therefore Fraction = $\frac{41}{369} = \frac{1}{9}$
5. (C) প্রথম monkey $\frac{1}{3}$ অর্থাৎ $\frac{18}{3} = 6$ টি banana খেয়ে ফেললে বাকী থাকে $18 - 6 = 12$ টা। দ্বিতীয় monkey $\frac{1}{3}$
 অর্থাৎ $\frac{12}{3} = 4$ টা খায়। \therefore বাকী = $12 - 4 = 8$ টা।
6. (E)
$$\frac{x+7}{7x-\frac{1}{x}}$$

$$= \frac{x^2+7x}{7x^2-1}$$
7. (B) Salary = P , Savings = M , \therefore Spending = $P - M$, \therefore fraction = $\frac{\text{Spending}}{\text{Salary}} = \frac{P-M}{P}$
8. (C)
$$\frac{2y}{x} - \frac{x}{y} = \frac{2y^2 - x^2}{xy}$$
9. (A) $(a+b+c)/4 = (a+b)/3 \Rightarrow 3a+3b+3c = 4a+4b \Rightarrow 3c = a+b \therefore c = (a+b)/3$
10. (D) $a/x + b = 1 \therefore x = a/(1-b)$

11. (A) $\frac{1}{y} = 3\frac{1}{2} = \frac{7}{2} \therefore y = \frac{2}{7}$

Therefore, $\frac{1}{y+2} = \frac{1}{\frac{2}{7}+2} = \frac{1}{\frac{16}{7}} = \frac{7}{16}$

12. (D) $\frac{1}{x} + \frac{5}{y} = \frac{4}{3}$

$\Rightarrow \frac{1}{3y} + \frac{5}{y} = \frac{4}{3}$ [যেহেতু $7x = 3y$]

$\Rightarrow \frac{1+15}{3y} = \frac{4}{3}$

$\Rightarrow \frac{16}{3y} = \frac{4}{3}$

$\Rightarrow y = 4$

13. (A) $0.4 = \frac{4}{10} = \frac{x}{15}$

$\Rightarrow 10x = 60 \Rightarrow x = 6$

14. (A) $20\% \text{ of } 2 = 2 \times \frac{20}{100} = \frac{2}{5}$

অতএব, $\frac{3}{7} - \frac{2}{5} = \frac{1}{35}$

15. (D) $\left(\frac{1}{4}\right)^3 + \left(\frac{3}{4}\right)^3 + 3\left(\frac{1}{4}\right)\left(\frac{3}{4}\right)\left(\frac{1}{4} + \frac{3}{4}\right)$

$= \left(\frac{1}{4} + \frac{3}{4}\right)^3$; $[a^3 + b^3 + 3ab(a+b) = (a+b)^3]$

$= \left(\frac{1+3}{4}\right)^3 = \left(\frac{4}{4}\right)^3 = 1^3 = 1$

16. (E) $\frac{XZ}{Y}$ এই fraction টিতে যদি X & Y উভয়কে triple করা হয়, তাহলে fraction এ কোন change হবে না।

কারণ, X আছে numerator (লব) এ এবং Y আছে denominator (হর) এ.

17. (A) চারটা মান শুরু হয়েছে 0.1 দিয়ে। শুধু (D) শুরু 0.0 দিয়ে।

18. (D) পানি আছে $1.5 \times (7/10) = 1.05$ liter. (7/10)th empty অর্থাৎ (3/10)th full হওয়া মানে $1.5 \times (3/10) = 0.45$ liter পানি থাকতে হবে। $1.05 - .45 = 0.60$ liter ফেলতে হবে।

19. (D) মনে করি, capacity of the tank x । $\frac{3x}{7} - \frac{x}{5} = 32$ gallons

$\Rightarrow \frac{8x}{35} = 32$ gallons

$\Rightarrow x = \frac{35 \times 32}{8} = 140$ gallons

20. (D) Total no of animals = x

$$\text{Zebra} = \frac{x}{3}, \text{ Giraffes} = \frac{x}{6}, \text{ Tigers} = \frac{x}{5}, \text{ Deer} = 36 \quad \therefore \frac{x}{3} + \frac{x}{6} + \frac{x}{5} + 36 = x$$

$$36 = x - \frac{x}{3} - \frac{x}{6} - \frac{x}{5} \quad 36 = x - \left(\frac{10x + 5x + 6x}{30} \right) \Rightarrow 36 = \frac{9x}{30}$$

$$x = \frac{36 \times 30}{9} = 120 \quad \therefore \text{no of Zebras} = \frac{120}{3} = 40$$

21. (D) Capacity

1st room x

Occupied

$$x \times \frac{2}{3} = \frac{2x}{3}$$

2nd room 2x

$$2x \times \frac{3}{4} = \frac{3x}{2}$$

3rd room 3x

$$\frac{2x}{3} + \frac{3x}{2} = \frac{13x}{6}$$

$$\text{অতএব, নির্ণেয় fraction} = \frac{13x}{6} = \frac{13}{18}$$

22. (C) প্রয়োজনীয় চিনির amount = $\left(\frac{3}{8} + \frac{3}{5} \right)$ cup = $\frac{39}{40}$ cup

যেহেতু $\frac{15}{16}$ cup, $\frac{39}{40}$ cup অপেক্ষা ছোট,

$$\begin{aligned} \text{অতিরিক্ত চিনি প্রয়োজন} &= \left(\frac{39}{40} - \frac{15}{16} \right) \text{ cup} \\ &= \frac{78 - 75}{80} = \frac{3}{80} \text{ cup} \end{aligned}$$

Ans: (C) She needs $\frac{3}{80}$ of a cup of sugar

23. (A) shelf 1 = $30000 \times \frac{1}{4} = 7500$

shelf 4 = 7500

$$\text{shelf 2} = 7500 \times \frac{2}{3} = 5000 \quad \text{shelf 3} = 5000$$

$$\therefore \text{shelves (1 + 2 + 3 + 4)} = 7500 + 7500 + 5000 + 5000 = 25000$$

অর্থাৎ, shelf 5 = $30000 - 25000 = 5000$

24. (C) outgoing call = $(7 \times 3 + 6 \times 2) \times 4.5 = 148.5$, incoming call = $(5 \times 5 + 7 \times 4) \times 2.5 = 132.5$, total = 281 Taka.

$$25. (C) \frac{16}{9} \left(\frac{3}{4} \right)^2 + \frac{2}{9} + \frac{10}{16 \left(\frac{3}{4} \right)^2} = 1 + \frac{2}{9} + \frac{10}{9} = \frac{9+2+10}{9} = \frac{21}{9} = \frac{7}{3} = 2\frac{1}{3}$$

26. (E) $x = 3 = (1/6) \times 18 = 18y$

27. (C) 10% of $y/3$ means $\frac{10}{100} \times \frac{y}{3} = \frac{y}{30}$

$$\frac{2y}{3} = 10\% \text{ of } 600$$

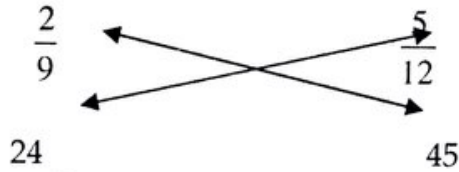
$$\frac{2y}{3} = 60 \quad \text{or, } \frac{y}{3} = 30 \quad \text{or, } \frac{y}{30} = 3$$

28. (A) $\frac{a}{x} + \frac{x}{a} = \frac{x}{b} + \frac{b}{x}$ or, $\frac{a}{x} - \frac{b}{x} = \frac{x}{b} - \frac{x}{a}$ or, $\frac{a-b}{x} = \frac{x(a-b)}{ab}$

or, $ab(a-b) = x^2(a-b)$ or, $x^2 = ab$ or, $x = \pm \sqrt{ab}$

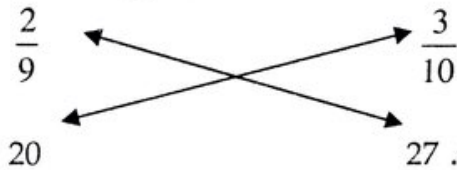
29. (A) $0.03 \times 0.0004 \times 1.003 = 0.000012036$

30. (A) B এবং C এর মধ্যে (B) হলো smaller; B এবং D এর মধ্যে B হলো smaller: B এর A এর তুলনায়



$24 < 45$; $2/9$ হলো smaller;

(A) $2/9$ এবং (E) $3/10$ এর মধ্যে তুলনায়



$20 < 27 \Rightarrow 2/9$ হলো smallest

31. (D) A. $\frac{12}{15} = 8$ B. $\frac{11}{14} = 78$ C. $\frac{5}{7} = 7$ D. $\frac{9}{11} = 81$ E. $\frac{1}{2} = 5$

32. (B) $12 \times 6 = 72$; $15 \times 5 = 75 \therefore \frac{5}{6} > \frac{12}{15}$; $5 \times 21 = 105$; $6 \times 17 = 102 \therefore \frac{5}{6} > \frac{17}{21}$

$5 \times 14 = 70$; $6 \times 11 = 66 \therefore \frac{5}{6} > \frac{11}{14}$; $5 \times 23 = 115$; $6 \times 16 = 96 \therefore \frac{5}{6} > \frac{16}{23}$

33. (D) $5 \times 3 = 15$; $7 \times 2 = 14 \therefore 5/7 > 2/3$

34. (B) $8 \times 3 = 24$; $11 \times 2 = 22 \therefore 8/11 > 2/3$

35. (C) $\frac{a}{b}$ ও $\frac{x}{y}$ এর মধ্যে compare করার নিয়ম;

if $ay > bx \Rightarrow \frac{a}{b} > \frac{x}{y}$; if $bx > ay \Rightarrow \frac{x}{y} > \frac{a}{b}$

$$\begin{array}{rcl} 12 \times 14 & & 11 \times 15 \\ 168 & > & 165 \\ \frac{12}{15} & > & \frac{11}{14} \end{array}$$

Largest বের করতে হবে, \therefore (B) বাদ। এখন (A) এবং (C) এর মধ্যে তুলনা।

$$\frac{12}{15} \leftarrow \frac{5}{6} \rightarrow$$

$$\frac{72}{72} > \frac{75}{75}$$

∴ (A) বাদ। এখন (C) এবং (D) এর মধ্যে তুলনা।

$$\frac{5}{6} \leftarrow \frac{17}{21} \rightarrow$$

$$\frac{105}{105} > \frac{102}{102}$$

∴ (D) বাদ। এখন (C) এবং (E) এর মধ্যে তুলনা।

$$\frac{5}{6} \leftarrow \frac{29}{35} \rightarrow$$

$$\frac{175}{175} > \frac{174}{174}$$

36. (B) A) $0 < \frac{1}{10}$ ঠিক আছে; কিন্তু $\frac{1}{10} < 0.01$ হতে পারে না।

C) $0.3, \frac{1}{4}$ অর্থাৎ 0.25 এর চেয়ে ছোট নয়।

D) $0.3 < \frac{1}{3}$ ঠিক আছে; কিন্তু $\frac{1}{3} < 0.33$ নয়।

B) $0.12 < \frac{1}{8} (0.125) < 0.13 \Rightarrow$ এটি ঠিক statement.

37. (C) 1 এর চেয়ে বড় হতে হলে numerator এর মান denominator এর মানের চেয়ে বড় হবে। একমাত্র (C) তেই এরকম option আছে।

38. (A) এ ধরনের অঙ্কে একসাথে সবগুলো fraction নিয়ে কোনটা সবচেয়ে বড় তা বের করতে গেলে calculation গুলো বড় এবং জটিল হয়ে যায়। তাই দুটো নিয়ে করলে দ্রুত করা যায়। যেমনঃ $\frac{1}{3}$ এবং $\frac{2}{5}$ এর মধ্যে কোনটা বড় তা বের করার জন্য প্রথমে $\frac{1}{3} = \frac{2}{6}$ লিখি। এখন $\frac{2}{6}$ এবং $\frac{2}{5}$ এর মধ্যে দুটোরই লব সমান হওয়াতে তুলনা করা সহজ হলো। দুটো fraction এর লব সমান হলে, যেটার হর ছোট, সেই সংখ্যাটাই বড় হবে। অতএব, $\frac{2}{6}$ এবং $\frac{2}{5}$ এর মধ্যে $\frac{2}{5}$ হলো বড়।

এখন, $\frac{2}{5}$ এবং $\frac{3}{7}$ এর মধ্যে তুলনা করার জন্য এ দুটোর লবও সমান করা যায় :

$$\frac{2}{5} \times \frac{3}{3} = \frac{6}{15}; \frac{3}{7} \times \frac{2}{2} = \frac{6}{14}; \frac{6}{15} \text{ এবং } \frac{6}{14} \text{ এর মধ্যে } \frac{6}{14} \text{ হলো বড়। অর্থাৎ } \frac{3}{7} \text{ হলো বড়।}$$

$$\text{আবার } \frac{3}{7} = \frac{3 \times 4}{7 \times 4} = \frac{12}{28}; \frac{4}{11} = \frac{4 \times 3}{11 \times 3} = \frac{12}{33}; \text{ অতএব, } \frac{12}{28} \text{ মানে } \frac{3}{7} \text{ বড়। এখন } \sqrt{0.3} = .55. \text{ কিন্তু } \frac{3}{7} = .441;$$

অতএব, $\sqrt{0.3}$ হলো largest. এই অঙ্কে $\sqrt{0.3} = .55$ বের করে নিলে সবচেয়ে দ্রুত হতো। কেননা; সহজেই দেখা যাচ্ছে কোন fraction ই 0.5 এর চেয়ে বড় হবে না। কেননা $\frac{1}{3}$ এর 1 হলো 3 এর অর্ধেকেরও কম; $\frac{2}{5}$ এর 2 হলো 5 এর অর্ধেকেরও কম $\frac{3}{7}$ এর 3 হলো 7 এর অর্ধেকেরও কম $\frac{4}{11}$ এর 4 হলো 11 এর অর্ধেকেরও কম। তাই প্রতিটিই $.5$ এর চেয়ে

কম। অথচ যেহেতু $\sqrt{0.3} = .55$, সুতরাং $\sqrt{0.3}$ হলো বৃহত্তম। উত্তর A

39. (C) A. $\frac{23}{45} > \frac{23}{46} = \frac{1}{2}$; B. $\frac{24}{46} > \frac{24}{48} = \frac{1}{2}$ D. $\frac{2}{3} > \frac{1}{2}$; E. $\frac{29}{58} = \frac{1}{2}$

কিন্তু C. $\frac{28}{57} < \frac{28}{56} = \frac{1}{2}$

40. (C) (A) $\frac{33 \times 4}{128} = \frac{132}{128}$; (B) $\frac{45 \times 4}{138} = \frac{180}{138}$; (C) $\frac{53 \times 4}{216} = \frac{212}{216}$;
 (D) $\frac{83 \times 4}{324} = \frac{332}{324}$; (E) $\frac{15 \times 4}{59} = \frac{60}{59}$

শুধুমাত্র (C) তে numerator, denominator হতে ছোট।

41. (E) Option E এর Numerator অন্যগুলোর তুলনায় সবচেয়ে বড় যেখানে সকলের denominator গুলো প্রায় সমান।

42. (C) $x = 0.0064$ $y = \frac{1}{0.0064}$ $z = (.92)^2 - 1$ (বের করার দরকার নেই; এটি negative হবে সেটা নিশ্চিত
 অর্থাৎ, $z < x < y$ অথবা, $y > x > z$.)

43. (B) $\frac{2}{100} + \frac{7}{10000} + \frac{4}{50000}$
 $= \frac{1039}{50000}$
 $= 0.02078$.

44. (E) $0.004 \times 0.12 \times 0.01 \times 0.01 \times 10 = 0.004 \times 0.12 \times 0.01 \times 0.1 = 0.00000048$ যা option এ নেই।

45. (A) এটি cyclic order related problem.

let, $\frac{x}{b-c} = \frac{y}{c-a} = \frac{z}{a-b} = K$

$\therefore x = k(b-c); y = k(c-a); z = k(a-b)$

যোগ করে পাই, $x + y + z = k(b-c+c-a+a-b) = 0$

46. (D) ধরি, chocolate ছিল x টি। প্রথমে নেয়া হলো $\frac{x}{3}$ টি এবং পরে নেয়া হলো $\left(x - \frac{x}{3}\right) \times \frac{3}{5} = \frac{2x}{5}$ টি

প্রশ্নমতে, $x - \left(\frac{x}{3} + \frac{2x}{5}\right) = 20 \Rightarrow x = 75$ টি

47. (D) বলটি 23.25 yards = 3×23.25 feet = 69.75 feet দূরত্ব অতিক্রম করল।
 বলটি প্রথম bounce এর পূর্বে 24 feet অতিক্রম করে, দ্বিতীয় bounce এর পূর্বে মোট $24 + 12 \times 2 = 48$ feet অতিক্রম করে। একই ভাবে তৃতীয়, চতুর্থ, পঞ্চম, ষষ্ঠ bounce এর পূর্বে যথাক্রমে মোট $48 + 6 \times 2 = 60$, $60 + 3 \times 2 = 66$, $66 + 1.5 \times 2 = 69$, $69 + .75 \times 2 = 70.5$ feet দূরত্ব অতিক্রম করে।
 $\therefore 23.25$ yards দূরত্ব অতিক্রম করতে বলটি 5 বার bounce করে।

48. (C) Question 1 এ yes বলছে $\frac{2p}{5}$ জন। Question 2 তে yes বলছে, $\frac{2p}{5} \times \frac{1}{3} = \frac{2p}{15}$ জন।

সুতরাং 2টি প্রশ্নেই yes বলছে $\frac{2p}{15}$ জন।

\therefore 2টি প্রশ্নে yes বলেনি $p - \frac{2p}{15} = \frac{13p}{15}$

\therefore Fraction = $\frac{\frac{13p}{15}}{p} = \frac{13}{15}$

49. (A) Sugar এর সাথে water এর ratio = $1\frac{1}{2} \text{ cup} : \frac{1}{2} \text{ cup} = 3:1$. কাজেই 1cup sugar use করলে $\frac{1}{3}$ cup water use করতে হবে।
50. (D) $\frac{2}{3}$ of total number of games = $17 + 3 = 20$
So, total number of games = 30
Number of wins required to get $\frac{3}{4}$ wins = $30 \times \frac{3}{4} = 22.5 \approx 23$
Maximum number of losses = 7
Number of games the team can lose more = $7 - 3 = 4$
51. (E) Chittagong = Dhaka \div 2, and Chittagong = 4 \times Jessore
Therefore, Jessore = Dhaka \div 8
Now Dhaka = $37.3 \div 3$
Therefore, Jessore = $37.3 \div 24 = 1.55$ millions
52. (C) মনে করি, equal amount of water = 12 liter
First jar এর capacity = $4 \times 12 = 48$ liter & Second jar এর capacity = $3 \times 12 = 36$ liter
এখন, ছোট jar থেকে বড় জারে পানি ঢালা হয়েছে। \therefore বড় jar এ পানির পরিমাণ দাঁড়াবে = $12 + 12 = 24$ liter. তাহলে
fraction টি হবে = $\frac{\text{larger জারে পানির পরিমাণ}}{\text{larger জারের capacity}} = \frac{24}{48} = \frac{1}{2}$
53. (B) Event E তখনই হবে, যখন একটি dice এ কোন জোড় সংখ্যা পড়বে।
একটি dice এ জোড় সংখ্যা 3 টি। 2, 4 and 6.
Event F তখনই হবে, যখন একটি dice এ 1, 2 বা 3, এই 3 টি সংখ্যার কোন একটি পড়বে।
সুতরাং, Event E এবং Event F 2 টি হবে তখনই, যখন উভয় dice-এই 2 পড়বে।
যেহেতু শুধুমাত্র 2 পড়লেই, উভয় event ই হচ্ছে, উভয় হবার probability $\frac{1}{6}$
54. (A) 8 টি আলাদা model 2 জন Europe, 2 জন North America এবং 2 জন South America থেকে। একই মহাদেশের সবাই সবসময় একসাথে থাকবে।
Europe, North America এবং South America র 2 জন কে নিজেদের মধ্যে সাজানো যায় প্রত্যেক 2! ভাবে। এবং 3 টি মহাদেশ কে নিজেদের মাঝে সাজানো যায় 3! ভাবে।
সুতরাং, 6 জন model কে সাজানো যাবে $2! \times 2! \times 2! \times 3! = 48$ ভাবে।
55. (D) প্রশ্ন অনুযায়ী, ধরা যাক বড় X and ছোট Number Y
তাহলে equation হবে $\frac{1}{4}x = \frac{2}{5}y$
এবং $x + 50 = 2Y$
Solving the equation we get, $x=200$ and $Y=125$
thus Answer Option D
56. (C) From the question,
if we Back Calculate, we see using Option C it means at $\frac{4}{5}$ th capacity they are 20 litres
Transfer of 4 litres will make it $16:24 = 2:3$ litres
Thus Option C

57. (A) Babu's Salary = 20,000
 Babu Contributed = $\frac{3}{4}$ th of 20000 + 15000
 Malek Contributed = $\frac{1}{4}$ th of half of Babu's donation = $(\frac{1}{4}) \times 7500 = 1875$
 Arif Contributed = Half of Babu's salary = 10,000
 Total = 26875
 So Option A

	Present	Absent	
Male	a) 200	b) 700	c) Total Male = 900
Female	b) 400	e) 500	f) Total Female = 900
	g) Total Present = 600	h) Total Absent = 1200	i) Total members = 1800

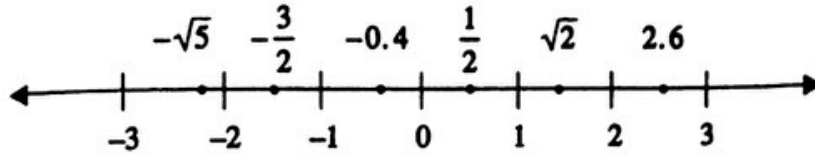
58. (D) এই অংকটি ছক করে সহজে করা যায়। ধরি, c) Total Male এবং f) Total Female প্রত্যেকে 900.
 অর্থাৎ i) Total Members = c+f = 900+900=1800. যেহেতু $\frac{2}{3}$ rd absent, তাহলে h) Total absent = $(\frac{2}{3}) \times 1800 = 1200$. অতএব, g) Total Present = i-g = 1800-1200 = 600. এরপর, a) Present Male Members = $(\frac{1}{3}) \times 600 = 200$. অতএব d) Present Female Members = g-a = 600-200 = 400. অতএব, e) Absent Female Members = f-d = 900-400 = 500. পরিশেষে, b) Absent Male Members = c-a = 900-200 = 700. ছকের সকল মান বের হয়ে আসলে Absent Male: Absent Female = b:e = 700:500 = 7:5.
59. (C) 174
 There are 8 sections with 25 questions numbered from 1 to 25, in each section. So, in each section there are 12 even-numbered questions and 13 odd-numbered questions.
 Total number of even-numbered questions = $8 \times 12 = 96$ and total number of odd-numbered questions = $8 \times 13 = 104$.
 So, total number of questions answered correctly = $96 + \frac{3}{4} \times 104 = 174$.

Concept 8, 9

**Real Number, Number Line, Absolute Value, Reciprocals
Special Properties of 1 and 0**

Concept 8 (Real Number, Number Line, Absolute Value, Reciprocals)

- ⊗ The set of **Real Numbers** (বাস্তব সংখ্যা) which include all integers (both positive and negative) and all numbers in between them such as fractions, decimals etc has a natural ordering represented by the **Number Line** (সংখ্যারেখা)



- ⊗ All real numbers correspond to a point in the real number line. The number line is infinitely long in both directions.
- ⊗ Any number left of zero is negative and any number right of zero is positive
- ⊗ The more left a number is, the smaller it is, and the more right a number is, the greater it is.
- ⊗ For any two numbers, the number to the left is less than (কমতর) the number to the right. In other words, for any two numbers, the number to the right is greater than (বৃহত্তর) the number to the left.
- ⊗ The **absolute value** or **modulus** (পরম মান) of a number is the numerical value (সাংখ্য মান) of the number without regard to its sign. So, for example, the absolute value of 3 is 3, and the absolute value of -3 is also 3.
- ⊗ The absolute value of a number may be thought of as its distance from zero.
- ⊗ Since distance can never be negative, absolute value can never be negative.
 Absolute value of 3 = $|3| = 3$ (in the number line, the distance of 0 to +3 is 3)
 Absolute value of -3 = $|-3| = 3$ (in the number line, the distance of 0 to -3 is 3)
- ⊗ For any number a and positive number b: $|a| = b \Rightarrow a = b$ or $a = -b$
- ⊗ a/b and b/a are inverse or **reciprocals** of each other.
 When two reciprocals are multiplied the answer is 1

$$\frac{1}{4} \times \frac{4}{1} = 1$$

Concept 9 (Special Properties of 1 and 0)

⊗ $n \times 1 = n; \frac{n}{1} = n; \frac{n}{n} = 1 (n \neq 0); 1^n = 1$

⊗ $n \pm 0 = 0; n \times 0 = 0; \frac{0}{n} = 0, 0^n = 0$

⊗ $1 \times 1 = 1; \frac{1}{1} = 1$

⊗ $\frac{n}{0} = \text{undefined}$ (অসংজ্ঞায়িত)

⊗ Generally, when two positive integers are multiplied the product is larger. But when two numbers between 1 and 0 (1/4 or 0.35) are multiplied or one integer is multiplied with a number between one and zero the product is smaller!

For example $0.5 \times 0.4 = 0.2; 0.2 < 0.4$ or 0.5
 $0.25 \times 100 = 25$

If, $0 < x < 1$ and $0 < y < 1$
 $xy < x, xy < y$

⊗ 0 is a multiple of every integer.

⊗ 1 is a divisor of every integer.

⊗ Generally, square or cube of a positive integer is bigger than the integer itself ($2^2=4$). But square or cube of a number between 1 and 0 is smaller than the number number itself.

For example $(0.5)^2 = 0.25$
 $(0.5)^3 = 0.125$

If, $0 < x < 1,$
 $x > x^2 > x^3$

Exercise 8, 9

- 1. Which of the columns below has the greatest value?

Column 1	Column 2	Column 3	Column 4
$(-6)^3$	$(-6)^4$	$(-6)^5$	$(-6)^6$

(MBA 09-10)

- (A) Column 1 B) Column 2 C) Column 3 D) Column 4 E) All are equal

- 2. The sum of a number and its inverse (or reciprocal) is equal to twice the number. What is the number?
 (A) 1 (B) -1 (C) 1 or -1 (D) -2 (E) 2
 (BBA 94-95)

- ⊕ 3. The reciprocal of p/n is n/p and vice versa. Which of the following is the reciprocal of $\frac{2}{\sqrt{18}}$?
 (BBA 06-07)

- (A) $\frac{\sqrt{2}}{3}$ (B) $\frac{2}{\sqrt{3}}$ (C) $\frac{12}{9}$ (D) $\frac{4\sqrt{3}}{3}$ (E) None of these

- ⊕ 4. If $(x + 4)^2 = 9$ and $(y + 3)^2 = 25$ then the minimum value of y/x is
 (A) -1 (B) -2 (C) -8 (D) -7 (E) none of these
 (MBA 08-09)

- ∇ 5. If y is between 0 and 1, which of the following increases as y increases?
 i. $(1-y^2)$ ii. $(y-1)$ iii. $\frac{1}{y^2}$
 (A) I and II (B) II and III (C) II only (D) I, II, and III (E) none of these
 (BBA 09-10)

- ∇ 6. If X is greater than zero, but less than 1, which of the following is the largest?
 (A) X^3 (B) X^2 (C) X (D) $1/X^3$ (E) $1/X^2$
 (MBA 97-98)

- ∇ 7. If x is between 0 and 1, which of the following increases as x increases?
 I. $1 - x^2$ II. $x - 1$ III. $1/x^2$
 (A) I and II (B) II and III (C) I & III (D) II only (E) I only
 (MBA 99-00)

- ∇ 8. Which is closest to 1?
 (A) $\frac{3}{3+.03}$ (B) $\frac{3}{(3+.03)^2}$ (C) $\frac{3}{3+.3}$ (D) $\frac{3}{3+(.03)^2}$ (E) $\frac{3}{(3+.3)^2}$
 (MBA 05-06)

- ⊕ 9. If $(2x + 4y + 6z)/6 = (x + 2y)/2$, then $z =$?
 (A) $(x + 2y)/6$ (B) $(x + 2y)/3$ (C) $(2x + y)/6$
 (D) $(2x + y)/3$ (E) none of these
 (MBA 2013)

- ⊕ 10. If $A = 7C/(B+0.5C)$, then $C =$
 (A) $2AB/(7 - 0.5A)$ (B) $AB + 2A/7$ (C) $A(B+0.5)/7$
 (D) $2AB/(14 - A)$ (E) none of these
 (MBA 2013)

- ⊕ 11. If z is the sum of x and y , and $x < y$, which of the following is equal to $(z - 2x)$? (MBA 2013)
 (A) $z - x - y$ (B) $z + x - y$ (C) $2y - z$ (D) $2z - x + y$ (E) none of these
- ⊕ 12. If $5/8$ of a number is 11 more than $1/6$ of the number, what is $3/4$ of that number? (MBA 2013)
 (A) 18 (B) 20 (C) 2 (D) 32 (E) none of these
- ⊕ 13. If x and y are integers and $-9 < x < 9$ and $0 < y < 14$, what is the greatest possible value of $(y - x)$? (MBA 2013)
 (A) 23 (B) 21 (C) 19 (D) 17 (E) none of these
- ⊕ 14. If x and y are negative and z is positive, which of the following must be true? (MBA 2013)
 (I) $(x - y) < (x - z)$ (II) $x/z < y/z$ (III) $1/y < 1/z$
 (A) only I (B) only II (C) only III (D) both II and III (E) none of these
- ⊕ 15. The quantity $2^6 5^7 3^7$ will end in how many zeroes? (BBA 14-15)
 (A) 4 (B) 5 (C) 6 (D) 7 (E) none of these
- ⊕ 16. The sum of all solutions for x in the equation $x^2 - 8x + 21 = [x - 4] + 5$ is equal to: (BBA 15-16)
 (A) -7 (B) 7 (C) 10 (D) 12 (E) none of these

Answer Key Exercise 8, 9

1.D	2.C	3.E	4.B	5.C	6.D	7.D	8.D	9.A	10. D
11.C	12.A	13.B	14.C	15.C	16.E				

Solution to Exercise 8, 9

1. (D) A এবং C এর মান negative হয়। $(6)^4 = 1296$ এবং $(-6)^6 = 16656$ ।
 2. (C) ধরি, number = x প্রশ্নমতে, $x + \frac{1}{x} = 2x \Rightarrow \frac{x^2 + 1}{x} = 2x \Rightarrow x^2 + 1 = 2x^2 \Rightarrow x^2 = 1$
 $\Rightarrow x = \pm 1$

3. (E) $\frac{\sqrt{18}}{2} = \frac{\sqrt{2 \times 9}}{2} = \frac{3\sqrt{2}}{(\sqrt{2})^2} = \frac{3}{\sqrt{2}}$

4. (B) $(x + 4)^2 = 9$
 $\therefore x + 4 = \pm 3$
 $\therefore x = -1$ বা $x = -7$
 $\frac{y}{x}$ এর minimum value = $\frac{2}{-1} = -2$.

|
 $(y + 3)^2 = 25$
 $\Rightarrow y + 3 = \pm 5$
 $\therefore y = 2$ বা $y = -8$

5. (C) Given $0 < x < 1$, অর্থাৎ X হলো একটি positive fraction. X যদি increase করে, তবে I, II এবং III এর কোনটি increase করবে, সেটি বের করতে হবে, তাই ধরে নিই, প্রথমে $x = \frac{1}{4}$ এবং বৃদ্ধির পরে $x = \frac{1}{2}$,

for $x = \frac{1}{4}$

for $x = \frac{1}{2}$

I. $1 - x^2 = 1 - \left(\frac{1}{4}\right)^2 = 1 - \frac{1}{16} = \frac{15}{16}$

I. $1 - \left(\frac{1}{2}\right)^2 = 1 - \frac{1}{4} = \frac{3}{4} = \frac{12}{16}$

II. $x - 1 = \frac{1}{4} - 1 = \frac{3}{4} = -0.75$

II. $\frac{1}{2} - 1 = -\frac{1}{2} = -0.5$

III. $\frac{1}{x^2} = \frac{1}{\left(\frac{1}{4}\right)^2} = 16$

III. $\frac{1}{\left(\frac{1}{2}\right)^2} = 4$

\therefore শুধুমাত্র II এর $x - 1$ expression টি $-\frac{3}{4}$ থেকে বৃদ্ধি পেয়ে $-\frac{1}{2}$ হলো। বাকি দুটো x এর বৃদ্ধির সাথে সাথে decrease করলো।

6. (D) $1 > x > 0$ অর্থাৎ x positive fraction like $\frac{1}{2}, \frac{1}{3}, \frac{1}{5}$, তাহলে $\frac{1}{x^3}$ ই সবচেয়ে বড়। যেমন $\frac{1}{\left(\frac{1}{5}\right)^3} = 125$. আর মনে রাখবেন, integer কে square করলে মান বাড়ে কিন্তু fraction কে square করলে মান কমে।

7. (D) Given $0 < x < 1$, অর্থাৎ X হলো একটি positive fraction. X যদি increase করে, তবে I, II এবং III এর কোনটি increase করবে, সেটি বের করতে হবে, তাই ধরে নিই, প্রথমে $x = \frac{1}{4}$ এবং বৃদ্ধির পরে $x = \frac{1}{2}$,

for $x = \frac{1}{4}$

for $x = \frac{1}{2}$

$$\text{I. } 1 - x^2 = 1 - \left(\frac{1}{4}\right)^2 = 1 - \frac{1}{16} = \frac{15}{16}$$

$$\text{II. } x-1 = \frac{1}{4} - 1 = \frac{3}{4} = -0.75$$

$$\text{III. } \frac{1}{x^2} = \frac{1}{\left(\frac{1}{4}\right)^2} = 16$$

$$\text{I. } 1 - \left(\frac{1}{2}\right)^2 = 1 - \frac{1}{4} = \frac{3}{4} = \frac{12}{16}$$

$$\text{II. } \frac{1}{2} - 1 = -\frac{1}{2} = -0.5$$

$$\text{III. } \frac{1}{\left(\frac{1}{2}\right)^2} = 4$$

∴ শুধুমাত্র II এর $x-1$ expression টি $-\frac{3}{4}$ থেকে বৃদ্ধি পেয়ে $-\frac{1}{2}$ হলো। বাকি দুটো x এর বৃদ্ধির সাথে সাথে decrease করলো।

$$8. \text{ (D) } \frac{3}{3+0.03} = \frac{3}{3.03} = 0.99$$

$$\frac{3}{(3+0.03)^2} = \frac{3}{9.0189} = 0.327$$

$$\frac{3}{3+0.3} = \frac{3}{3.3} = 0.909$$

$$\frac{3}{3+(0.03)^2} = 0.9997, \frac{3}{(3+0.3)^2} = 0.275$$

$$9. \text{ (A) } \frac{2x+4y+6z}{6} = \frac{x+2y}{2}$$

$$\text{Or, } 4x + 8y + 12z = 6x + 12y$$

$$\text{Or, } 12z = 2x + 4y$$

$$\text{Or, } z = (x + 2y) / 6$$

$$10. \text{ (D) } A = \frac{7C}{B+0.5C}$$

$$\text{Or, } AB + AC/2 = 7C; \text{ or, } 2AB + AC = 14C; \text{ or, } 14C - AC = 2AB$$

$$\text{Or, } C(14 - A) = 2AB; \text{ or, } C = 2AB / (14 - A)$$

$$11. \text{ (C) } z = x + y; \text{ or, } x = z - y; \text{ or } 2x = 2z - 2y$$

$$\text{Now, } (z - 2x) = z - (2z - 2y) = 2y - z$$

$$12. \text{ (A) } \frac{5x}{8} - \frac{x}{6} = 11$$

$$\text{Or, } \frac{15x - 4x}{24} = 11$$

$$\text{Or, } 11x = 24 \times 11; \text{ or, } x = 24$$

$$\text{So } 3/4^{\text{th}} \text{ of that number} = 24 \times \frac{3}{4} = 18$$

$$13. \text{ (B) } -9 < x < 9 \text{ and } 0 < y < 14.$$

As x and y are integers, so greatest possible value of $(y - x) = 13 - (-8) = 21$

14. (C) ধরি, $x = -1, y = -2, z = 1$. i) থেকে পাই $-1 - (-2) < -1 + (-1) \Rightarrow -1 + 2 < -1 - 1 \Rightarrow 1 < -2$ যা কিনা অসম্ভবযোগ্য।
 ii) থেকে পাই $-1/1 < -2/1 \Rightarrow -1 < -2$ যা কিনা অসম্ভবযোগ্য। iii) থেকে পাই $1/-2 < 1/1$ যা কিনা সকল ক্ষেত্রে গ্রহণযোগ্য
 কেননা y negative এবং z positive।

15. (C) $2^{65737} = (2^{656}) \times (3^{75}) = (3^{75}) \times 10^6$
 যেহেতু 10^6 আছে, অতএব 6 টি 0 আছে

16. (E) $x^2 - 8x + 21 = [x - 4] + 5$

$$\Rightarrow x^2 - 9x + 20 = 0$$

$$\Rightarrow x = 4, 5$$

অতএব, x এর সকল solutions এর যোগফল = $4 + 5 = 9$

Concept 10

Exponents, Square, Cube, Square root, Cube root

Concept 10 (Exponents, Square, Cube, Square root, Cube root)

- ⊗ Exponents (or power) provide a shortcut notation for repeated multiplication of a number by itself. For example, 3^4 means (3) (3) (3) (3), which equals 81. (3^4 is read as 3 to the power 4)
- ⊗ When the exponent is 2 we call it square
 5^2 is called 5 square (instead of 5 to the power 2). $5^2 = (5)(5) = 25$
- ⊗ when the exponent is 3 we call it cube
 5^3 is called 5 cube (instead of 5 to the power 3). $5^3 = (5)(5)(5) = 125$
- ⊗ $x^a \cdot x^b = x^{a+b}$ example, $2^3 \times 2^5 = 2^{3+5} = 2^8 = 256$. (Caution: $x^a + x^b \neq x^{a+b}$)
- ⊗ $(x^a)^b = x^{ab}$ example, $(2^3)^2 = 2^{3 \cdot 2} = 2^6 = 64$
- ⊗ $(xy)^a = x^a \cdot y^a$ example, $(2y)^2 = 2^2 \cdot y^2 = 4y^2$
- ⊗ $(x/y)^a = x^a / y^a$ example, $(x/3)^3 = x^3 / 3^3 = x^3 / 27$
- ⊗ $x^a / x^b = x^{a-b}$ example, $2^6 / 2^3 = 2^{6-3} = 2^3 = 8$
- ⊗ $x^{-a} = \frac{1}{x^a}$ example, $3^{-2} = \frac{1}{3^2} = \frac{1}{9}$, $3^{-1} = \frac{1}{3}$
- ⊗ $x^0 = 1$ example, $5^0 = 1$, $9^0 = 1$
- ⊗ $x^1 = x$ example $5^1 = 5$
- ⊗ A square root of a positive number N is a real number which, when squared, equals N.
 $\sqrt{16}$ is 4 because $4^2 = 16$.
 Also, $\sqrt{16}$ is -4 because $(-4)^2 = (-4)(-4) = 16$.
 In fact, all positive numbers have two square roots that differ only in sign.
- ⊗ A cube root of a positive number N is a real number which, when cubed, equals N.
 $\sqrt[3]{27}$ is 3 because $3^3 = 27$.
- ⊗ The square of a real number can never be negative. Hence, negative numbers don't have square roots.
 $(-5)^2 = (-5)(-5) = +25$, $\sqrt{25} = \pm 5$
- ⊗ For any positive numbers a and b: $\sqrt{a \times b} = \sqrt{a} \times \sqrt{b}$ and $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$
- ⊗ For any positive numbers a and n, $a^{\frac{1}{n}} = \sqrt[n]{a}$
- ⊗ The cube of a real number can be negative. Hence negative numbers can have cube roots.
 $(-5)^3 = (-5)(-5)(-5) = 25(-5) = -125$, $\sqrt[3]{-125} = -5$

Appendix 1(Square, Cube and Square root table)

1^2	1
2^2	4
3^2	9
4^2	16
5^2	25
6^2	36
7^2	49
8^2	64
9^2	81
10^2	100
11^2	121
12^2	144
13^2	169
14^2	196
15^2	225
16^2	256
17^2	289
18^2	324
19^2	361
20^2	400
21^2	441
22^2	484
23^2	529
24^2	576
25^2	625

Memorizing these tables will help you calculate faster and save time during exam

1^3	1
2^3	8
3^3	27
4^3	64
5^3	125
6^3	216
7^3	343
8^3	512
9^3	729
10^3	1000

$\sqrt{1}$	1
$\sqrt{2}$	1.414
$\sqrt{3}$	1.732
$\sqrt{4}$	2.000
$\sqrt{5}$	2.236
$\sqrt{6}$	2.449
$\sqrt{7}$	2.646
$\sqrt{8}$	2.828
$\sqrt{9}$	3
$\sqrt{10}$	3.162

Exercise 10

- 1. $(\sqrt{3}-2)(\sqrt{3}+2) = ?$
 (A) $\sqrt{3} - 4$ (B) $\sqrt{6} - 4$ (C) -1 (D) 1 (E) None of these (BBA 05-06)
- 2. Six years from now, Sumi's age will be the square of her age six years ago. What is Sumi's age?
 (A) 8 (B) 10 (C) 12 (D) 15 (E) none of these (BBA 01-02)
- 3. What is the value of $(\sqrt[3]{26})^2$?
 (A) 16 (B) 12 (C) 8 (D) 4 (E) 2 (BBA 96-97)
- 4. If $2^x + 2^x + 2^x + 2^x = 2^n$, what is x in terms of n ?
 (A) $n/4$ (B) $4n$ (C) $2n$ (D) $n - 2$ (E) none of these (BBA 08-09)
- 5. If $32^{a+b} = 16^{a+2b}$, then $a = ?$
 (A) b (B) $b + 2$ (C) $2b$ (D) $3b$ (E) None of these (MBA 05-06)
- 6. Which of the following CANNOT be expressed as the sum of the squares of two integers?
 (A) 13 (B) 17 (C) 21 (D) 29 (E) 34 (MBA 03-04)
- 7. What number must be added to $(x^2 - 18x)$ to make the result a perfect square?
 (A) 81 (B) 27 (C) $x + 3$ (D) $x + 9$ (E) $x - 3$ (MBA 96-97)
- 8. What is x in terms of y and z given that $(xy)^{1/3} = z^{1/6}$?
 (A) \sqrt{z} / y (B) $\frac{z^{1/6}}{y}$ (C) y / z (D) $\frac{y}{z^6}$ (E) none of these (MBA 96-97)
- 9. If $2^x = (16^2 \times 8^3 \times 4^4) / 2^{20}$, then $x = ?$
 (A) 4 (B) 5 (C) 6 (D) 7 (E) none of these (MBA 08-09)
- 10. $10^2 + 10^5 + 10^4 = ?$
 (A) 10^{11} (B) $10^2 \times 1101$ (C) $10^2 \times 10^5$ (D) 11100 (E) none of these (MBA 08-09)
- 11. If $3^x = y$, then what is $3^{(4-x)}$?
 (A) $64/y$ (B) $27/y$ (C) $9y$ (D) $81/y$ (E) none of these (BBA 94)
- 12. If $3^x = 729$ then what is x ?
 (A) 6 (B) 7 (C) 243 (D) 16 (E) 9 (BBA 03-04)
- 13. $10^2(10^8+10^8) / 10^4 =$
 (A) 10^{14} (B) $2(10^6)$ (C) 10^8 (D) $2(10^8)$ (E) none of these

- 14. If M is a positive integer and $k+2 = 3^M$, which of the following cannot be a value of k ? (BBA 08-09)
 (A) 1 (B) 4 (C) 7 (D) 25 (E) 79
- ⊕15. The difference between $\sqrt{150}$ and $\sqrt{54}$ is (BBA 93-94)
 (A) $2\sqrt{6}$ (B) $16\sqrt{6}$ (C) $9\sqrt{6}$ (D) $6\sqrt{6}$ (E) $8\sqrt{6}$
- ⊕16. If $X^4 = 81$ and $Y^2 = 49$, then maximum possible value for $Y - X$ is (BBA 93-94)
 (A) 21 (B) 10 (C) 4 (D) -4 (E) -10
- ⊕17. If x is not a negative number, what is the maximum possible value of $2^2 - 3^x$? (BBA 93-94)
 (A) 4 (B) 3 (C) 2 (D) 1 (E) none of these
- ⊕18. $\left(\frac{1}{\sqrt{2}}\right)^7 \left(\frac{1}{\sqrt{2}}\right)^5 = ?$ (BBA 94)
 (A) $\frac{1}{8}$ (B) $\frac{1}{16}$ (C) $\frac{1}{32}$ (D) $\frac{1}{128}$ (E) $\frac{1}{64}$
- ⊕19. At room temperature, bacterium doubles in every 20 minutes. In two hours what will be the total number of bacteria from an initial number of 3? (BBA 94)
 (A) 18 (B) 192 (C) 144 (D) 96 (E) 729
- ⊕20. How many integers in the set of all integers from 10 to 150 (all inclusive) are not the square of an integer? (BBA 07-08)
 (A) 101 (B) 111 (C) 12 (D) 132 (E) none of these
- ⊕21. $R^C \times R^D \times R^E = R^{-12}$. If $R > 0$ and C, D and E are each different negative integers, what is the possible smallest value of C ? (MBA 07-08)
 (A) -10 (B) -9 (C) -6 (D) -1 (E) none of these
- ⊕22. If $(0.0016 \times 10^x) / (0.04 \times 10^y) = 4 \times 10^4$, then $x - y = ?$ (MBA 08-09)
 (A) 5 (B) 6 (C) 7 (D) 8 (E) 9
- ∇23. If $x < -1$, then which of the following must be true? (BBA 93-94)
 (A) $x^3 > x^2 > x$ (B) $x^2 > x^3 > x$ (C) $x^2 > x > x^3$ (D) $x > x^3 > x^2$ (E) $x > x^2 > x^3$
- ∇24. Which of the following is the largest? (BBA 94)
 $\sqrt{0.3}, \frac{1}{3}, \frac{2}{5}, \frac{3}{7}, \frac{4}{11}$
 (A) $\sqrt{0.3}$ (B) $\frac{1}{3}$ (C) $\frac{2}{5}$ (D) $\frac{3}{7}$ (E) $\frac{4}{11}$
- ∇25. What is the greatest positive integer n such that 2^n is a factor of 12^{10} ? (BBA 00-01)
 (A) 10 (B) 12 (C) 16 (D) 20 (E) 60

- ∇26. What is the last digit of 4^{218} ?
 (A) 2 (B) 4 (C) 6 (D) 8 (E) none of these (BBA 04-05)
- ∇27. $\sqrt{(2985)}/\sqrt{(0.2985)} = ?$
 (A) 0.0001 (B) 0.01 (C) 100 (D) 1000 (E) none of these (BBA 04-05)
- ∇28. If $x = (0.08)^2$, $y = 1/(0.08)^2$ and $z = (1-0.08)^2 - 1$, which of the following is true?
 (A) $x = y = z$ (B) $y < z < x$ (C) $z < x < y$ (D) $y < x$ and $x = z$ (E) None of these (BBA 05-06)
- ∇29. If $2^n = n^2$, then which of the following must be true?
 (A) $n > 1$ (B) $n = 2$ (C) n can be any even number (D) n should be a multiple of 2 (E) none of these (BBA 07-08)
- ∇30. If both 5^2 and 3^2 are factors of x where $x = n \times 2^5 \times 6^2 \times 7^3$, what is the smallest possible positive value of n ?
 (A) 25 (B) 27 (C) 45 (D) 75 (E) none of these (MBA 07-08)
- ∇31. $\frac{1}{3^8} + \frac{1}{3^9} + \frac{2}{3^9}$?
 (A) $\frac{1}{3^6}$ (B) $\frac{2}{3^8}$ (C) $\frac{\sqrt{3}}{3^9}$ (D) $\frac{4}{3^8}$ (E) none of these (MBA 07-08)
32. If x is a positive integer, what is the units digit of $(24)^{5+2x}(36)^6(17)^{3x}$?
 (A) 2 (B) 3 (C) 4 (D) 6 (E) none of these (BBA 15-16)
33. The expression $\sqrt{(2+\sqrt{(2+\sqrt{(2+\sqrt{(2+\sqrt{(2+\dots))}))}))})}$ extends to an infinite number of roots. Which of the following choices most closely approximates the value of this expression?
 (A) $\sqrt{3}$ (B) 2 (C) $1+\sqrt{2}$ (D) $1+\sqrt{3}$ (E) none of these (BBA 15-16)
- ⊕34. If $(ax)^{16}(by)^{12}(cxy)^{17}(dxy)^{11} > 0$, and all the variables are non zero numbers, which of the following must be true?
 (A) $ab > 0$ (B) $ab < 0$ (C) $cd > 0$ (D) $cd < 0$ (E) none of these (BBA 16-17)
- ⊕35. What is the value of $\sqrt{(3/2)} - \sqrt{(2/3)}$?
 A) $(\sqrt{3}-\sqrt{2})/\sqrt{6}$ B) $1/\sqrt{6}$ C) $\sqrt{3}/3$ D) $\sqrt{3}/2$ E) None of these (BBA 17-18)

Answer Key Exercise 10

1.C	2.B	3.A	4.D	5.D	6.C	7.A	8.A	9.B	10.B
11.D	12.A	13.B	14.B	15.A	16.B	17.B	18.E	19.B	20.D
21.B	22.B	23.C	24.A	25.D	26.C	27.C	28.C	29.E	30.A
31.B	32.A	33.B	34. A	35.B	-	-	-	-	-

Solution to Exercise 10

1. (C) $(\sqrt{3} - 2)(\sqrt{3} + 2) = (\sqrt{3})^2 - (\sqrt{2})^2 = 3 - 4 = -1.$
2. (B) let, Sumi's age = $x \therefore x + 6 = (x - 6)^2$
 or, $x + 6 = x^2 - 12x + 36$ or, $x^2 - 13x + 30 = 0$ or, $x^2 - 10x - 3x + 30 = 0$
 or, $(x - 10)(x - 3) = 0 \therefore x = 3$ or 10
 এখানে 3 acceptable নয়
3. (A) $(2^6)^{\frac{2}{3}} = (2)^{6 \times \frac{2}{3}} = 2^4 = 16$
4. (D) $4 \times 2^x = 2^n$
 $\Rightarrow 2^{(2+x)} = 2^n$
 $\Rightarrow x + 2 = n$
 $\therefore x = n - 2$
5. (D) $32^{a+b} = 16^{a+2b}$
 $\Rightarrow 2^{5a+5b} = 2^{4a+8b}$
 $\Rightarrow 5a + 5b = 4a + 8b$
 $\Rightarrow a = 3b$
6. (C) $13 = 9 + 4 = 3^2 + 2^2$
 $17 = 16 + 1 = 4^2 + 1^2$
 $21 =$ cannot be expressed as the sum of the squares of 2 integers.
 $29 = 25 + 4 = 5^2 + 2^2$
 $34 = 25 + 9 = 5^2 + 3^2$
7. (A) $x^2 - 18x = (x)^2 - 2 \cdot x \cdot 9$. এটাকে $a^2 - 2ab$ এর সাথে compare করা যায় $a^2 - 2ab$ এর সাথে b^2 যোগ করলে $(a-b)^2$ হয়। কাজেই এখানে $9^2 = 81$ যোগ করতে হবে।
8. (A) $(xy)^{\frac{1}{3}} = z^{\frac{1}{6}}$, $(xy)^{\frac{1}{3}} = (z^{\frac{1}{2}})^{\frac{1}{3}}$, $xy = z^{\frac{1}{2}}$, $x = z^{\frac{1}{2}} / y$, $x = \frac{\sqrt{z}}{y}$
9. (B) $2^x = (16^2 \times 8^3 \times 4^4) / 2^{20}$
 $= \left\{ (2^4)^2 \times (2^3)^3 \times (2^2)^4 \right\} / 2^{20}$
 $= (2^8 \times 2^9 \times 2^8) / 2^{20}$
 $= 2^{25} / 2^{20} = 2^5 \therefore x = 5.$
10. (B) $10^2 + 10^5 + 10^4 = 10^2(1 + 10^3 + 10^2)$
 $= 10^2(1 + 1000 + 100)$
 $= 10^2 \times 1101$
11. (D) $3^x = y$
 $3^{(4-x)} = \frac{3^4}{3^x} = \frac{3^4}{y} = \frac{81}{y}$
12. (A) $3^x = 729$; $729 = 3 \times 243 = 3 \times 3 \times 81 = 3 \times 3 \times 3^4 = 3^6$, $3^x = 3^6$, $x = 6.$

13. (B) $10^2 (10^8 + 10^8) / 10^4 = \frac{10^2 \times 10^8 + 10^2 \times 10^8}{10^4} = \frac{10^{10} + 10^{10}}{10^4} = \frac{10^{10}}{10^4} + \frac{10^{10}}{10^4}$
 $= 10^6 + 10^6 = 2(10^6)$
14. (B) $3^m \neq 6$ (Ans. B)
15. (A) $\sqrt{150} = \sqrt{75 \times 2} = \sqrt{25 \times 3 \times 2} = 5\sqrt{3 \times 2} = 5\sqrt{6}$
 $\sqrt{54} = \sqrt{9 \times 6} = 3\sqrt{6}$, \therefore difference $= 5\sqrt{6} - 3\sqrt{6} = 2\sqrt{6}$
16. (B) $X^4 = 81 \Rightarrow X^4 = 3^4$ অথবা, $X^4 = (-3)^4 \Rightarrow$ সুতরাং $x = 3$ অথবা -3
 $Y^2 = 49 \Rightarrow Y = 7$ অথবা $-7 \Rightarrow Y - X$ এর maximum value $= 7 - (-3) = 7 + 3 = 10$
17. (B) x এর value হয় 0 অথবা যে কোন positive number $2^2 - 3^x = 4 - 3^x$. এখন, x এর value 0 বসালে $3^x = 3^0 = 1$ অর্থাৎ $4 - 3^x = 4 - 1 = 3$. x এর value 0 এর বেশী বসালে 3^x এর value বাড়তে থাকবে। অর্থাৎ $(4 - 3^x)$ এর value কমবে।
18. (E) $\left(\frac{1}{\sqrt{2}}\right)^7 \left(\frac{1}{\sqrt{2}}\right)^5 = \left(\frac{1}{\sqrt{2}}\right)^{12} = \frac{1}{2^6} = \frac{1}{64}$
19. (B) প্রথমে ব্যাকটেরিয়ার সংখ্যা = 3; \therefore 20 মিনিট পরে সংখ্যা = $3 \times 2 = 6$; আরও 20 মিনিট পরে সংখ্যা = $6 \times 2 = 12$
 আরও 20 মিনিট পরে সংখ্যা = $12 \times 2 = 24$; অর্থাৎ 1 ঘন্টা পরে সংখ্যা = 24 \therefore আরও 1 ঘন্টায় ব্যাকটেরিয়া তিনবার double হবে। অতএব, তখন সংখ্যা হবে $24 \times 2 \times 2 \times 2 = 192$.
20. (D) From 10 - 150 (inclusive) there are 141 numbers.
 $4^2 = 16$, $12^2 = 144$. So, there are 9 squares of integers (from 4 to 12) within 10 - 150. So there are $141 - 9 = 132$ nonsquare integers.
21. (B) $R^C \times R^D \times R^E = R^{-12} \Rightarrow R^{C+D+E} = R^{-12} \Rightarrow C + D + E = -12$; এখানে, C, D, E তিনটিই different interger.
 D & E যদি maximum হয়, তাহলে C minimum হবে, D এবং E কে আমরা maximum ধরতে পারি -1 এবং -2
 $C + D + E = -12 \Rightarrow C - 1 - 2 = -12 \Rightarrow C = -12 + 3 \Rightarrow C = -9$;
22. (B) $\frac{0.0016 \times 10^x}{0.04 \times 10^y} = 4 \times 10^4$
 $\Rightarrow 0.04 \times 10^{x-y} = 4 \times 10^4$
 $\Rightarrow 4 \times 10^{-2} \times 10^{x-y} = 4 \times 10^4$
 $\Rightarrow 4 \times 10^{x-y-2} = 4 \times 10^4$
 $\therefore x - y - 2 = 4 \Rightarrow x - y = 6$
23. (C) $x < -1$ অর্থাৎ x একটি negative number যা -1 এর থেকে ছোট, অতএব, x^2 এর value হবে positive অর্থাৎ $x^2 > x$; কিন্তু x^3 এর value হবে negative যা x এর চেয়েও ছোট। সুতরাং, $x^2 > x > x^3$
24. (A) এ ধরনের অঙ্কে একসাথে সবগুলো fraction নিয়ে কোনটা সবচেয়ে বড় তা বের করতে গেলে calculation গুলো বড় এবং জটিল হয়ে যায়। তাই দুটো নিয়ে করলে দ্রুত করা যায়। যেমন: $1/3$ এবং $2/5$ এর মধ্যে কোনটা বড় তা বের করার জন্য প্রথমে $1/3 = 2/6$ লিখি। এখন $2/6$ এবং $2/5$ এর মধ্যে দুটোরই লব সমান হওয়াতে তুলনা করা সহজ হলো। দুটো fraction এর লব সমান হলে, যেটার হর ছোট, সেই সংখ্যাটাই বড় হবে। অতএব, $2/6$ এবং $2/5$ এর মধ্যে $2/5$ হলো বড়। এখন, $2/5$ এবং $3/7$ এর মধ্যে তুলনা করার জন্য এ দুটোর লবও সমান করা যায় :
- $\frac{2}{5} \times \frac{3}{3} = \frac{6}{15}$; $\frac{3}{7} \times \frac{2}{2} = \frac{6}{14}$; $\frac{6}{15}$ এবং $\frac{6}{14}$ এর মধ্যে $\frac{6}{14}$ হলো বড়। অর্থাৎ $\frac{3}{7}$ হলো বড়।
- আবার $\frac{3}{7} = \frac{3 \times 4}{7 \times 4} = \frac{12}{28}$; $\frac{4}{11} = \frac{4 \times 3}{11 \times 3} = \frac{12}{33}$; অতএব, $\frac{12}{28}$ মানে $\frac{3}{7}$ বড়।
- এখন $\sqrt{0.3} = .55$. কিন্তু $3/7 = .441$; অতএব, $\sqrt{0.3}$ হলো largest. এই অঙ্কে $\sqrt{0.3} = .55$ বের করে নিলে সবচেয়ে দ্রুত হতো। কেননা; সহজেই দেখা যাচ্ছে কোন fraction ই 0.5 এর চেয়ে বড় হবে না। কেননা $1/3$ এর 1 হলো 3 এর

অর্ধেকেরও কম; $2/5$ এর 2 হলো 5 এর অর্ধেকেরও কম $3/7$ এর 3 হলো 7 এর অর্ধেকেরও কম $4/11$ এর 4 হলো 11 এর অর্ধেকেরও কম। তাই প্রতিটিই .5 এর চেয়ে কম। অথচ যেহেতু $\sqrt{0.3} .55$, সুতরাং $\sqrt{0.3}$ হলো বৃহত্তম।

25. (D) $12^{10} = 3^{10} \times 4^{10} = 3^{10} \times (2^2)^{10} = 3^{10} \times 2^{20}$.

26. (C) Last digits:

$4^1 = 4$

$4^2 = (16) = 6$

$4^3 = (6 \times 4) = (24) = 4$

$4^4 = (4 \times 4) = (16) = 6$

∴ Since power is even, last digit = 6

27. (C) $\frac{\sqrt{2985}}{\sqrt{0.2985}} = \frac{\sqrt{2985 \times \sqrt{10000}}}{\sqrt{2985}} = 100$.

28. (C) $x = 0.0064$ $y = \frac{1}{0.0064}$ $z = (.92)^2 - 1$ (বের করার দরকার নেই; এটি negative হবে সেটা নিশ্চিত) অর্থাৎ,

$z < x < y$ অথবা, $y > x > z$.

29. (E) যেহেতু $2^n = n^2$, সুতরাং $n=2$ হতে হবে। এছাড়া যদি $n = 4$ হয়, তাহলে $2^n = n^2$ হয়। কিন্তু, শুধু এই দুটো value কোন option এ দেয়া নেই।

30. (A) $x = n \times 2^5 \times 6^2 \times 7^3 = n \times 2^5 \times (2 \times 3)^2 \times 7^3 = n \times 2^5 \times 2^2 \times 3^2 \times 7^3$

x এর factor 5^2 & 3^2 এর মধ্যে 3^2 already আছে। কিন্তু 5 এর কোন multiple নেই।

∴ n এর smallest possible value = $5^2 = 25$.

31. (B) $\frac{1}{3^8} + \frac{1}{3^9} + \frac{2}{3^9} = \frac{3+1+2}{3^9} = \frac{6}{3^9} = \frac{2 \times 3}{3^9} = \frac{2}{3^8}$;

32. (A) $5+2x$ একটি odd number, তাই $(24)^{5+2x}$ এর unit digit হবে 4। আবার $(36)^6$ এর unit digit 6 এবং

$(17)^3$ এর unit digit 3। অতএব, $(4 \times 6 \times 3) = 72$; $(24)^{5+2x}(36)^6(17)^3$ এর unit digit হবে 2।

33. (B) We know, $\sqrt{2} = 1.41$ $\sqrt{3} = 1.72$

Now, in this mathematical expression, $\sqrt{(2+\sqrt{(2+\sqrt{(2+\sqrt{(2+\sqrt{(2+\dots))}))}))})}$ goes upto infinity. For the sake of argument, lets consider this goes upto 5th place only which would be $\sqrt{(2+\sqrt{(2+\sqrt{(2+\sqrt{(2+\sqrt{2}))}))})}$

For the 5th $\sqrt{2}$ at the very right, $\sqrt{2} = 1.41$ and when it gets added to 2 (under the same parentheses) it becomes $2 + \sqrt{2} = 3.41$. Now, when the root function is applied on 3.41, the result will be somewhere in between 1.72 to 2.

If we keep continuing the steps mentioned above, the summed result under each parenthese will increase, but it will never cross 4. So, the approximate value of this expression would be 2.

34. (A) $(ax)^{16}(by)^{12}(cxy)^{17}(dxy)^{11} > 0$

Or, $a^{16} b^{12} c^{17} d^{11} x^{44} y^{40} > 0$

এখানে a ও b উভয়ের exponents positive. তাই ab এর product always positive হবে।

Correct Answer (A)

35. (B) $1/\sqrt{6}$

$\sqrt{(3/2)} - \sqrt{(2/3)} = (\sqrt{3} \times \sqrt{3} - \sqrt{2} \times \sqrt{2}) / (\sqrt{3} \times \sqrt{2}) = (3 - 2) / \sqrt{6} = 1/\sqrt{6}$

Concept 11

Average

Concepts 11 (Average)

- ⊗ For a group of numbers, average (११) of the numbers represents a central value for the numbers.
- ⊗ The average of n numbers is the sum of the numbers divided by n .
- ⊗
$$\text{Average} = \frac{\text{Sum of elements}}{\text{number of elements}}$$

For example, the average of 6, 9, 18 and 15 is $\frac{6+9+18+15}{4} = 12$

- ⊗ If all numbers in a set are the same, then that number is the average.
- ⊗ If the numbers in a set are not all the same, then the average must be greater than the smallest number and less than the largest number. Equivalently, at least one of the numbers is less than the average and at least one is greater.
- ⊗ Whenever n numbers form an arithmetic sequence:
 1. If n is odd, the average is the middle term.
 2. If n is even, the average is the average of the two middle terms.
- ⊗ To calculate the weighted average of a set of numbers, multiply each number by its weight, add all the products and divide by the total number of numbers in the set.
- ⊗ $\text{Sum} = \text{avg.} \times \text{number of elements.}$
 For example, the avg. of 3 numbers 10, 15 and 20 is 15.
 $\text{Sum} = 15 \times 3 = 45 = 10 + 15 + 20$

Exercise 11

- 1. In a group of four people, the heights of the group members are 5 feet 4 inches, 5 feet, 5 feet 6 inches, and 4 feet 10 inches. The average height of the group members is (BBA 93)
 (A) 5 feet (B) 5 feet 1 inches (C) 5 feet 2 inches
 (D) 5 feet 3 inches (E) none of these
- 2. Francis had an average of 75 on her first four Geography tests, After taking the next test, her average dropped to 72. How much did she get in the fifth test? (BBA 93)
 (A) 54 (B) 56 (C) 58 (D) 60 (E) 73.5
- 3. The average of three numbers is 6 and the average of four numbers including the previous three numbers is 8. What is one half of the fourth number? (BBA 93-94)
 (A) 7 (B) 8 (C) 6 (D) 12 (E) 14
- 4. The average of 15 consecutive integers is 15. What is the smallest of the 15 integers? (BBA 94-95)
 (A) 6 (B) 7 (C) 8 (D) 9 (E) 15
- 5. The average of five numbers is 25. After one of the numbers is removed, the average of the remaining is 31. What number has been removed? (BBA 94-95)
 (A) 1 (B) 6 (C) 11 (D) 24 (E) Data insufficient
- 6. The average weight of 3 men is 53 kg. None of them weighs less than 51 kg. What is the maximum possible weight (in kg) of a person in that group? (BBA 99-00)
 (A) 53 (B) 55 (C) 57 (D) 59 (E) None of these
- 7. If the average of 5 consecutive odd integers is 55, what is the average of the last two integers?
 (A) 56 (B) 57 (C) 58 (D) 60 (E) None of these
- 8. The cost of a cake is Tk x which is to be shared by 8 people. But at the last moment, 2 people left the group without paying. How many more taka in terms of x will it cost each person? (BBA 04-05)
 (A) $x/8$ (B) $x/12$ (C) $x/24$ (D) $3x/16$ (E) None of these
- 9. Two cartons weigh $(3x-2)$ kgs and $(2x-3)$ kgs respectively. If the average weight of the cartons is 10 kgs, the heavier carton weighs how many kgs more than the lighter carton? (BBA 04-05)
 (A) 2 (B) 4 (C) 5 (D) 6 (E) 10
- 10. Which of the following is equal to the average of $(x+2)^2$ and $(x-2)^2$? (BBA 05-06)
 (A) x^2 (B) x^2+2 (C) x^2+4 (D) x^2+2x (E) None of these
- 11. The average of a set of 12 numbers which includes 34 is N . If 34 is removed from the set and 38 is added to the set, what is the average of the new set of numbers in terms of N ? (BBA 05-06)
 (A) $N+1/3$ (B) $N+19/6$ (C) $N+4$ (D) $N+6$ (E) None of these

- 12. The average of 5 numbers is 40. If 2 more numbers, with an average of 21, are added to these numbers, what will be the average of the combined 7 numbers? (A) 8.7 (B) 30.1 (C) 30.3 (D) 34.6 (E) None of these (BBA 06-07)
- 13. While travelling on a train Mr. Saif noticed three different numbers were written on the roof of the train. He calculated that the average of the three numbers was V. If one of the numbers was Z and another was Y, what was the remaining number? (A) $ZY-V$ (B) $Z/V-3-Y$ (C) $Z/3-V-Y$ (D) $3V-Z-Y$ (E) $V-Z-Y$ (BBA 09-10)
- 14. Average of P numbers is x and average of N numbers is y. Find average of all the numbers? (A) $\frac{x+y}{P+N}$ (B) $\frac{x+y}{2}$ (C) $\frac{Px+Ny}{P+N}$ (D) $\frac{Py+Nx}{xy(P+N)}$ (E) $x+y$ (MBA 96-97)
- 15. A garments worker is paid d Takas per hour for the first 8 hours she works in a day. For every hour after the first 8 hours, she is paid c Takas per hour. If she works 12 hours in one day, what is her average hourly wage for that day? (A) $\frac{2d+c}{3}$ (B) $8d+4c$ (C) $\frac{8d+12c}{12}$ (D) $\frac{4d+8c}{12}$ (E) $d + \left(\frac{1}{3}\right)c$ (MBA 00-01)
- 16. Today is Arif's 12th birthday and his father's 40th birthday. How many years from today will Arif's father be twice as old as Arif at that time? (A) 12 (B) 16 (C) 18 (D) 24 (E) None of these (MBA 01-02)
- 17. If $b = 8d - c$, and $a = d/3$, what is the average (arithmetic mean) of a, b, c, and d? (A) 4a (B) 7a (C) a/7 (D) 4a + 7 (E) None of these (MBA 04-05)
- ⊕18. A set of 6 flower vases of different sizes cost Manik taka 825. Each vase costs 25 taka more than the next one below it in size. What was the cost of the largest vase? (A) 175 (B) 185 (C) 200 (D) 215 (E) None of these (MBA 09-10)
- ⊕19. The average of four consecutive positive odd integers is always (A) An odd number (B) Divisible by 4 (C) an even number (D) Both (b) & (c) (E) Either (b) or (c) (BBA 98-99)
- ⊕20. If m is the average of the first 10 positive multiples of 5 and if M is the median of the first 10 positive multiple of 5, what is the value of $M - m$? (A) -5 (B) 0 (C) 5 (D) 25 (E) None of these (BBA 05-06)
- ⊕21. The average of 5 positive integers is 60. If the average of 3 of these integers is 67, what is the greatest possible value that one of the other two integers can have? (A) 98.5 (B) 63.5 (C) 99 (D) 98 (E) Cannot be determined (BBA 09-10)

- ⊕22. The electric company charges Tk. 0.30 per kilowatt hour (KWH). Rahim used 2800 KWH in April, 3200 KWH in May, and 3600 KWH in June. What was his average costs of electricity for the 3 months? (BBA 10-11)
 (A) Tk. 72 (B) Tk. 96 (C) Tk. 48 (D) Tk. 144 (E) None of these
- ⊕23. A school had 100 students aged 20 years on an average. At the end of the year, 20 students aged 22 years on an average left and 25 students of 18 years on an average joined the school. What is the average age of the present students of the school? (MBA 96-97)
 (A) 20 (B) 22 (C) 18 (D) 20.1 (E) none of these
- ⊕24. If the average of 5, 9, k, and m is 12, what is the average of $k + 7$ and $m - 3$? (MBA 04-05)
 (A) 14 (B) 17 (C) 19 (D) 21 (E) 38
- ∇25. Rahim averaged 70 in his first m number of exams. After taking n more exams, he had an overall average of 75. In terms of m and n, his average for the last n exams was? (MBA 10-11)
 (A) $(5m + 75) / n$ (B) $(5m / n) + 75$ (C) $(5n / m) + 75$
 (D) $(70m + 75n) / (m + n)$ (E). None of these
- ∇26. In a group of five men, no two men have the same age. The oldest man is 50 years old, and the youngest 30 years old. If X is the average age of the men in the group, which of the following best indicates all and only possible values of X? (All ages are in whole numbers) (BBA 93)
 (A) $30 < X < 50$ (B) $31 < X < 49$ (C) $32 < X < 48$ (D) $33 < X < 46$ (E) $35 < X < 45$
- ∇27. Find the average of all whole numbers between 1 and 100 that end in 3. (BBA 93)
 (A) 44 (B) 45 (C) 46 (D) 47 (E) None of these
- ⊕28. The average daily wages of 10 employees is Tk. 400. If the lowest wage is Tk. 300, what is the possible maximum wage in Tk.? (MBA 2013)
 (A) 800 (B) 900 (C) 1000 (D) 1300 (E) none of these
- ⊕29. The average of the ages of a man and his son is 35 years. After 10 years, the ratio of their ages will be 2:1. What is the son's present age in years? (BBA 14-15)
 (A) 15 (B) 16 (C) 20 (D) 25 (E) none of these
- ∇30. In a particular course, Arif appeared in 10 quizzes. The average of his best 9 quizzes is 10% more than the average of all the quizzes he attended. The total marks obtained in best 9 quizzes is what percent of the total marks obtained in 10 courses? (BBA 14-15)
 (A) 80% (B) 88% (C) 90% (D) 99% (E) none of these
- 31. After 2 quizzes, Apu had an average of 15 marks per quiz. In order to increase the average by n marks, what should be his score in the 3rd quiz? (BBA 16-17)
 (A) 3n (B) $30 + 3n$ (C) 15n (D) $15 + 3n$ (E) none of these

Answer Key Exercise 11

1.C	2.D	3.A	4.C	5.A	6.C	7.C	8.C	9.D	10.C
11.A	12.D	13.D	14.C	15.A	16.B	17.B	18.C	19.C	20.B
21.D	22.E	23.E	24.C	25.B	26.E	27.C	28. D	29.C	30.D
31.D									

Solution to Exercise 11

1. (C) Four people এর group ও height যথাক্রমে 5'4", 5', 5'6", 4'10"
Total height = 20'8"
 \therefore average = $\frac{20'8''}{4} = 5'2''$
2. (D) পাঁচটি test এর average (75 - 72) = 3 কমে যাওয়ার অর্থ total $5 \times 3 = 15$ কমে যাওয়া। অর্থাৎ 5th test এর mark হবে (75 - 15) = 60.
3. (A) 3 numbers এর যোগফল = $3 \times 6 = 18$ 4 numbers এর যোগফল = $4 \times 8 = 32$
 \therefore 4th number = $32 - 18 = 14$. \therefore অর্থাৎ number এর অর্ধেক = $\frac{14}{2} = 07$.
4. (C) 15 টি integer এর average 15 হলে 7th integer টি 14 অর্থাৎ, 15th বা smallest integer টি 8.
5. (A) sum of 5 numbers = $5 \times 25 = 125$
sum of 4 numbers = $4 \times 31 = 124$
So, the removed number is $125 - 124 = 1$
6. (C) একজনের weight এর maximum মান জানতে হলে বাকিগুলো minimum ধরতে হবে। তাহলে অন্য দুজনে weight 51 ধরতে হবে, 3 জনের total থেকে 2 জনের total বিয়োগ করে অথবা shortage = excess ধরে solve করা যাবে।
7. (C) ৫টি ক্রমিক বিজোড় সংখ্যার গড় 55, অর্থাৎ, 3rd সংখ্যাটি 55; শেষের দুটি সংখ্যা হচ্ছে 57 ও 59 এই সংখ্যাদুটির average 58.
8. (C) ১ম ক্ষেত্রে, cost per person = $\frac{x}{8}$ টাকা। ২য় ক্ষেত্রে, cost per person = $\frac{x}{6}$ টাকা
 \therefore ২য় ক্ষেত্রে cost বেশি পড়ল = $\left(\frac{x}{6} - \frac{x}{8}\right)$ টাকা = $\frac{x}{24}$ টাকা
9. (D) প্রথমতে $\frac{(3x - 2) + (2x - 3)}{2} = 10 \Rightarrow x = 5$
একটির weight = $(3 \times 5) - 2 = 13$ Kg এক অপরটির weight = $(2 \times 5) - 3 = 7$ Kg. অর্থাৎ, ভারীটির weight $(13 - 7) = 6$ kg. বেশি।
10. (C) $\frac{(x+2)^2 + (x+2)^2}{2} = \frac{2(x^2 + 4)}{2} = x^2 + 4$
11. (A) Since the avg. of 12 numbers is N, their sum is 12N
If 34 is removed and 38 is included the sum becomes 12N + 4
So the avg. is $(12N + 4)/12 = (3N + 1)/3 = N + 1/3$
12. (D) $\frac{5 \times 40 + 2 \times 21}{7} = 34.6$
13. (D) মনে করি, অপর সংখ্যাটি = X
এখন $\frac{X + Y + Z}{3} = V \Rightarrow X = 3V - Y - Z$ Ans: (D) $3V - Z - Y$

14. (C) P সংখ্যক number এর average = x. N সংখ্যক number এর average = y. তাহলে P number এর total = Px আর N- number এর total = Ny. মোট Px + Ny. সংখ্যা আছে = P + N. average = $(Px + Ny) / (P + N)$.
15. (A) প্রথম 8 বছর 8d টাকা। পরের $(12 - 8) = 4$ বছর 4c টাকা। মোট wage = $8d + 4c$ টাকা। \therefore average wage = $\frac{8d + 4c}{12}$ টাকা = $\frac{4(2d + c)}{12}$ টাকা = $\frac{2d + c}{3}$ টাকা
16. (B) Let, in x years Arif's father will be twice as old as Arif.
 $\therefore 2(12 + x) = 40 + x$ or, $24 + 2x = 40 + x$ or, $x = 16$
17. (B) $a + b + c + d = d/3 + 8d - c + c + d = 28d/3$
 Arithmetic mean = $7d/3 = 7a$
18. (C) মনেকরি, smallest size এর vase এর price x টাকা
 $x + (x + 25) + (x + 50) + (x + 75) + (x - 100) + (x + 125) = 825$
 $\Rightarrow 6x + 375 = 825 \Rightarrow 6x = 825 - 375 = 450 \Rightarrow x = \frac{450}{6} = 75$
 Largest size এর vase এর price = $x + 125$
 $= 75 + 125 = 200$ Taka.
19. (C) সংখ্যা চারটি n, n+2, n+4, n+6;
 \therefore average = $\frac{4n + 12}{4} = n + 3$; n odd, \therefore average টা সব সময় even
20. (B) যেহেতু 5 এর positive multiples গুলো একটি consecutive series তৈরী করে; সেহেতু average এবং median একই হবে। অর্থাৎ, $M - m = 0$
21. (D) 5টি সংখ্যার Average = 60
 Total = $60 \times 5 = 300$
 3টি সংখ্যার Average = 67
 Total = $67 \times 3 = 201$
 বাকি 2টি সংখ্যার Total = $300 - 201 = 99$
 একটির smallest ধরলেই অপরটির greatest value পাওয়া যায়।
 Smallest value = 1
 Greatest value = $99 - 1 = 98$ Ans: (D) 98
22. (E) Avg. Consumption = 3200 KWH. \therefore Avg cost = $3200 \times 0.30 = 960$ Tk
23. (E) 100 student এর total age = $100 \times 20 = 2000$. যারা চলে গেল তাদের total age = $20 \times 22 = 440$. যারা আসল $25 \times 8 = 450$. বর্তমান $100 - 20 + 25 = 105$ জন student আছে যাদের total age = $2000 - 440 + 450 = 2010$. Average age of present students = $2010 / 105 = 19.14$ years.
24. (C) $5 + 9 + k + m = 12 \times 4 = 48$
 $\Rightarrow k + m = 48 - 14 = 34 \Rightarrow k + 7 + m - 3 = 34 + 7 - 3 = 38$
 $\therefore \frac{k + 7 + m - 3}{2} = \frac{38}{2} = 19$

25. (B) প্রথম m পরীক্ষার total = 70m
 এবং over all total = 75 (m + n)
 \therefore n পরীক্ষার total = 75 (m + n) - 70
 = 5m + 75 n
 এবং average = $\frac{5m + 75n}{n} = \frac{5m}{n} + 75$

26. (E) Oldest = 50 yrs; Youngest = 30 yrs. \Rightarrow x = average

এখন, যেহেতু কোন দুজনের বয়সই সমান নয়, সেহেতু সবচেয়ে কম average হতে পারে $\frac{30 + 31 + 32 + 33 + 50}{5} =$

35.2 এবং সবচেয়ে বেশি average $\frac{30 + 47 + 48 + 49 + 50}{5} = 44.8$

অর্থাৎ x এর value 35 এর চেয়ে বড় এবং 45 এর চেয়ে ছোট।

27. (C) If we look at the numbers that end with 3, we get an arithmetic sequence- 3, 13, 23, 33.....93. Average of arithmetic sequence = (a+l)/2, where a= first term, l= last term. So, required answer-

$$\frac{3+93}{2} = 46$$

28. (D) 10 জনের average = 400

10জনের total = 400 x 10 = 4000

1জনের Possible maximum wage বের করার জন্য বাকি 9 জনের wage lowest ধরে নিতে হবে।

তাই বাকি 9 জনের total wage = 300 x 9 = 2700

1 জনের Possible maximum wage = 4000 - 2700 = 1300

29. (C) ধরলাম Father বয়স X and BOY er age Y

thus, $\frac{x+y}{2} = 35$

thus x+y=70.....equation-1

Again,

10 বছর পর,

$$\frac{x+10}{y+10} = 2$$

Solving we get, x=50 and y=20

thus Answer is 20 (C)

30. (D) ধরি, 10 টি পরিক্ষায় সে গড়ে 100 পেয়েছে। অর্থাৎ Total Marks= 10 X 100 = 1000. এবার, 9 টি পরিক্ষায় সে গড়ে 10% মার্কস বেশি পেয়েছে। অর্থাৎ, Average Marks in 9 quizzes= (10% of 100) + 100= ((10/100) X 100) + 100= 10+100 = 110. অতএব, Total marks in 9 quizzes = 9 X 110= 990. এখন, (Total Marks in 9 quizzes / Total Marks in 10 quizzes) X 100 = (990/1000) X 100 = 99%

31. (D) 1st 2 quiz এ average 15.

Average n বাড়ালে 3 quiz এর average হবে 15+n.

অর্থাৎ total number হবে 3*(15+n)=45+3n

১ম 2 quiz এ total number = 2*15=30

Third quiz এ score করতে হবে = 45+3n-30

$$=15+3n$$

সঠিক Answer (D)

Concept 12

Ages

Concept 12 (Ages)

এই ধরনের Maths পরীক্ষার্থীর Equation তৈরী ও সমাধানে সামর্থ দেখা হয়। সাধারণত এই ধরনের Maths এ কোন বিশেষ Formula বা তাত্ত্বিক আলোচনার দরকার হয় না। Competitive Examগুলোতে এ ধরনের Maths এর উপস্থিতি প্রায়ই থাকে।

Exercise 12

- 1. If a man was r years old s years ago, how many years old will he be t years from now?
(MBA 01-02)
(A) $s+r+t$ (B) $rs+t$ (C) $s-r+t$ (D) $r-s+t$ (E) none of these
- 2. Mr. Rahim who is 28 years of age has a son who is 4 years old. In how many years will Mr. Rahim be 4 times as old as his son?
(MBA 02-03)
(A) 1 (B) 2 (C) 3 (D) 4 (E) 5
- 3. After 30 years, Zaman will be four times as old as he is now. Find out his present age.
(BBA 96-97)
(A) 10 (B) 11 (C) 7.5 (D) 30 (E) none of these
- 4. Lima is 6 years older than her sister Sharmin, and Jamal is 5 years older than Lima. If the total of their ages is 41, how old is Jamal?
(BBA 08-09)
(A) 8 (B) 10 (C) 14 (D) 19 (E) none of these
- 5. Arif has a brother one third of his age and a sister three times his age. If the combined age of all three children is five less than twice the oldest, how old is Arif?
(MBA 97-98)
(A) 12 (B) 9 (C) 6 (D) 3 (E) 1
- 6. Dina is 10 years younger than Mimi. If in 5 years, Mimi will be twice as old as Dina, how old will Dina be in 3 years?
(MBA 98-99)
(A) 10 (B) 9 (C) 8 (D) 7 (E) none of these
- 7. Six years from now, Sumi's age will be the square of her age six years ago. What is Sumi's age?
(BBA 01-02)
(A) 8 (B) 10 (C) 12 (D) 15 (E) none of these
- ⊕8. Rahim is 10 years older than his brother Shabbir. However, P years ago Rahim was twice as old as Shabbir. If Shabbir is now N years old and $N > P$; find the value of $N-P$
(BBA 93)
(A) 10 (B) 11 (C) 12 (D) 13 (E) 14
- ⊕9. Nishi is two years older than Mishi, who is twice as old as Rishi. If the ages of the 3 total 27 years, how old is Mishi?
(BBA 98-99)
(A) 12 years (B) 8 years (C) 10 years (D) 9 years (E) 5 years
- ⊕10. Today Jim is twice as old as Fred and Sam is 2 years younger than Fred. Four years ago Jim was 4 times as old as Sam. How old is Jim now?
(BBA 06-07)
(A) 8 (B) 12 (C) 16 (D) 20 (E) None of these
- ⊕11. Harun is three times as old as Tamim. In eight years, he will be twice as old as Tamim. How old was Harun 3 years ago?
(BBA 07-08)
(A) 27 (B) 25 (C) 24 (D) 21 (E) none of these

- ⊕12. Shabbir has a brother one-fourth of his age and a sister two times of his age. If the combined age of all the three siblings is twenty more than thrice the age of the youngest, how old is Shabbir's sister? (BBA 09-10)
 (A) 2 (B) 16 (C) 2.5 (D) 8 (E) none of these
- ⊕13. A woman was thirty years old when her daughter was born. Her age is now 6 years more than three times her daughter's age. How old will be the daughter in 5 years? (MBA 97-98)
 (A) 19 (B) 18 (C) 17 (D) 15 (E) None of these
- ⊕14. The present ages of A and B are in the ratio of 6:4. Five years ago their ages were in the ratio of 5:3. How old is A now? (MBA 08-09)
 (A) 42 (B) 36 (C) 30 (D) 24 (E) none of these
- ∇15. Y is four times as old as X. After 6 years, the sum of half of X's age and a fourth of Y's age will be the same as three times the present age of X. How old will X be after 6 years? (BBA 94-95)
 (A) 3 (B) 9 (C) 10 (D) 12 (E) 15
- ∇16. The age of the father of two children is twice that of the elder one added to four times that of the youngest one. If the arithmetic mean and product of the ages of the two children is 8 years and 48 years respectively, then what is the age of the father? (BBA 10-11)
 (A) 48 years (B) 32 years (C) 40 years (D) 42 years (E) None of these
- ∇17. In 5 years, the ratio of Mr. X's age to his brother will be 1: 2. 5 years ago the ratio was 1: 4. How old is Mr. X? (MBA 97-98)
 (A) 20 (B) 15 (C) 12 (D) 10 (E).None
- ∇18. Age of the father is equal to the sum of ages of his three sons. If in 19 years, one third of father's age will be equal to one fifth the sum of the ages of the sons. What is the age of the father? (MBA 07-08)
 (A) 28 (B) 38 (C) 48 (D) 58 (E) none of these

Answer Key Exercise 12

1.A	2.D	3.A	4.D	5.D	6.C	7.B	8.A	9.C	10.D
11.D	12.B	13.C	14.C	15.B	16.C	17.D	18.B	-	-

Solution to Exercise 12

1. (A) s years ago his age was = r years
current age = $r + s$ years
 t years from now age will be $r + s + t$ years
2. (D) ধরি, x বছর পরে মিঃ রহিমের বয়স ছেলের বয়সের 4 গুণ হবে। অতএব, $28 + x = (4 + x)4 \Rightarrow x = 4$.
3. (A) Say, present age = $x \therefore x + 30 = 4x \Rightarrow x = 10$
4. (D) $J + L + S = 41$
 $J + J - 5 + J - 11 = 41$
 $\Rightarrow 3J = 57$
 $\therefore J = 19$.
5. (D) মনে করি, Arif এর বয়স $3x$, brother = x , sister = $9x$ তাহলে $3x + x + 9x = 2 \times 9x - 5$, $5x = 5$, $x = 1$, তাহলে Arif এর বয়স $3x = 3 \times 1 = 3$ বছর।
6. (C) দেয়া আছে, Dina হলো Mimi-র চেয়ে 10 বছর ছোট। $\Rightarrow D = M - 10 \dots (1)$: 5 years পরে Dina-র বয়স হবে $D + 5$ এবং Mimi হবে $M + 5$: $M + 5 = 2 \times (D + 5) \Rightarrow M + 5 = 2D + 10 \Rightarrow M = 2D + 5 \dots (II)$ এখন, (I) থেকে, $M = D + 10$: $\therefore 2D + 5 = D + 10 \Rightarrow D = 5$; \therefore ঠিক তিন বছর পরে Dina-র বয়স $D + 3 = 8$
7. (B) let, Sumi's age = $x \therefore x + 6 = (x - 6)^2$
or, $x + 6 = x^2 - 12x + 36$ or, $x^2 - 13x + 30 = 0$ or, $x^2 - 10x - 3x + 30 = 0$
or, $(x - 10)(x - 3) = 0 \therefore x = 3$ or 10
এখানে 3 acceptable নয়
8. (A) ধরি, Rahim's age = R , Shabbir's age = N (দেওয়া আছে)
এখন, $R - 10 = N$; $R = N + 10$; P বছর আগে, Rahim's age = $R - P$, Shabbir's age = $N - P$
অর্থাৎ $R - P = 2(N - P) \Rightarrow N + 10 - P = 2N - 2P \Rightarrow N + 10 - 2N = -2P + P$
 $\Rightarrow -N + 10 = -P \Rightarrow 10 + P = N$
 $\Rightarrow N - P = 10$ [$N > P$]
9. (C) $N = M + 2$; $M = 2R$; $N + M + R = 27 \Rightarrow M + 2 + M + \frac{M}{2} = 27 \Rightarrow 2M + \frac{M}{2} = 25 \Rightarrow 5M = 50$, So, $M = 10$
10. (D) ধরি, Fred এর বয়স x বছর
 \therefore Jim এর বয়স $2x$ বছর
এবং Sam এর বয়স $x - 2$ বছর
 $\therefore 2x - 4 = 4(x - 2 - 4)$
 $\Rightarrow 2x - 4 = 4x - 24$
 $\Rightarrow 24 - 4 = 4x = 2x$
 $\Rightarrow 20 = 2x$
 $\therefore x = 10$
 \therefore Jim এর বয়স (2×10) বা 20 years.
11. (D) Let, Tamim's age = x . Therefore, Harun's age = $3x$.
Given that, $2x + 16 = 3x + 8 \Rightarrow x = 8$. \therefore Harun's age = $3 \times 8 = 24$. 3 years ago Harun was 21.

12. (B) মনেকরি, Sabbir -এর বয়স = x বছর

$$\text{Sabbir -এর ভাইয়ের বয়স} = \frac{x}{4} \text{ বছর}$$

$$\text{Sabbir -এর বোনের বয়স} = 2x \text{ বছর}$$

Now,

$$x + \frac{x}{4} + 2x = 3 \times \frac{x}{4} + 20 \Rightarrow x = 8$$

Sabbir -এর বোনের বয়স = $8 \times 2 = 16$ years Ans: (B) 16 years

13. (C) মনে করি বর্তমানে daughter's age = x তাহলে woman এর বয়স = $3x + 6$, daughter- এর সাথে woman এর বয়সের ব্যবধান 30 years । কাজেই $3x + 6 - 30 = x$, $2x = 24$, $x = 12$, 5 বছর পরে daughter এর বয়স হবে $12 + 5 = 17$.

14. (C) মনে করি,
- | | | | |
|---|----|-------------|------|
| A | এর | present age | $6x$ |
| B | " | " | $4x$ |

তাহলে, 5 years আগে, তাদের age এর ratio বের করলে,

$$\frac{6x - 5}{4x - 5} = \frac{5}{3}$$

$$\Rightarrow 20x - 25 = 18x - 15 \Rightarrow 2x = 10 \Rightarrow x = 5$$

$$\therefore \text{A এর present age} = 6x = 6 \times 5 = 30 \text{ years.}$$

15. (B) $Y = 4X$

$$\text{প্রশ্নমতে, } \frac{x+6}{2} + \frac{y+6}{4} = 3x \Rightarrow \frac{x+6}{2} + \frac{4x+6}{4} = 3x \Rightarrow 2X + 12 + 4X + 6 = 12X \Rightarrow$$

$$6X = 18 \Rightarrow X = 3 \text{ অর্থাৎ, 6 বছর পরেও X এর বয়স} = 3 + 6 = 9.$$

16. (C) Let, elder son's age = x
 younger son's age = y
 father's age = f

$$\text{given that, } 2x + 4y = f \dots (1)$$

$$x + y = 16 \dots (2)$$

$$xy = 48 \dots (3)$$

solving 2 and 3 we get, $x = 12$, $y = 4$. \therefore fathers age = $2 \times 12 + 4 \times 4 = 40$.

17. (D) মনে করি 5 বছর পরে, Mr X এর বয়স x তাহলে brother = $2x$ এখন $x - 10 : 2x - 10 = 1 : 4$ তাহলে $x = 15$,
 X- এর বর্তমান বয়স $15 - 5 = 10$.

18. (B) মনে করি, father's age = F ; Sum of ages of three sons = S এখন, $F = S$
 এখন, 19 বছর পরে, father এর age = $F + 19$; & Sum of ages of 3 son = $S + 19 \times 3 = S + 57$.

$$\therefore \frac{1}{3}(F + 19) = \frac{1}{5}(S + 57) \Rightarrow 5F + 95 = 3S + 171 \Rightarrow 5F + 95 = 3F + 171 \Rightarrow F = 38.$$

Concept 13

Numbers

Concept 13 (Numbers)

These maths are the most common maths in any competitive exams. It basically judges your ability to juggle with numbers, form equations and solve those using basic mathematical operations. Below are some useful formulae.

- ⊗ $a^2 - b^2 = (a + b)(a - b)$
- ⊗ $(a + b)^2 = a^2 + 2ab + b^2$
- ⊗ $(a - b)^2 = a^2 - 2ab + b^2$
- ⊗ $a^2 + b^2 = (a + b)^2 - 2ab$
- ⊗ $a^2 + b^2 = (a - b)^2 + 2ab$
- ⊗ $(a + b)^2 = (a - b)^2 + 4ab$
- ⊗ $(a - b)^2 = (a + b)^2 - 4ab$
- ⊗ $(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$
- ⊗ $(a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$

Exercise 13

- Q1. If $\frac{1}{4}$ of a number is 2 then $\frac{1}{2}$ of the number is-
 (A) $\frac{1}{8}$ (B) $\frac{1}{4}$ (C) 1 (D) 4 (E) 8 (BBA 95-96)
- Q2. If $(a + b + c)/4 = (a + b)/3$. Then what is the value of c?
 (A) $(a+b)/3$ (B) $(a+b)/4$ (C) $(a+b)/8$ (D) $(a+b)/12$ (E) none of these (BBA 95-96)
- Q3. If $a/x + b = 1$, what is the value of x?
 (A) $(1-a)$ (B) $(b-1)$ (C) $(1-a)/b$ (D) $a/(1-b)$ (E) none of these (BBA 95-96)
- Q4. If $x^2 - y^2 = 27$. Then $3(x+y)(x-y) = ?$
 (A) 81 (B) 36 (C) 27 (D) 24 (E) 9 (BBA 95-96)
- Q5. What is the value of $(x-2)$. When $3x-5 = 1$?
 (A) $\frac{5}{3}$ (B) 1 (C) $\frac{2}{3}$ (D) $\frac{1}{3}$ (E) 0 (BBA 95-96)
- Q6. When $x^2 - 3x + 2 = 0$ and $x^2 - x - 2 = 0$, what is the value of x?
 (A) -2 (B) 2 (C) 3 (D) 1 (E) 4 (BBA 97-98)
- Q7. If $x/4 - 8/x = 1$, x = ?
 (A) -2 (B) -4 (C) 8 (D) both a & b (E) both b & c (BBA 99-00)
- Q8. If $x/2 + 3 = x/3 + 4$, x = ?
 (A) 6 (B) 8 (C) 12 (D) -4 (E) none of these (BBA 99-00)
- Q9. If $\frac{ab - b + a - b^2}{a - b} = 4$, then b = ?
 (A) 2a (B) 3 (C) $2\sqrt{a}$ (D) 1 (E) none of these (BBA 01-02)
- Q10. If $\frac{x}{a} + \frac{a}{b} = 4$, what is the value of x?
 (A) $(-a^2/b) + 4a$ (B) $a^2/b - 2b$ (C) $a^2b - 4$ (D) $a + b$ (E) none of these (BBA 02-03)
- Q11. If $y = 8x + 12$ and $x = z + 2$, what is y in terms of z?
 (A) $z + 14$ (B) $8z - 4$ (C) $8z + 10$ (D) $8z + 16$ (E) none of these (BBA 03-04)
- Q12. If one number exceeds another number by 18 and the larger number is $\frac{5}{2}$ times the smaller number, then the smaller number is
 (A) 12 (B) 14 (C) 15 (D) 16 (E) None of these (BBA 03-04)
- Q13. If $y/x = 1/5$ and $2x + y = 33$, then what is the value of x?
 (A) $33/5$ (B) 13 (C) 15 (D) 17.5 (E) None of these (BBA 03-04)
- Q14. If 4 is subtracted from one-fourth of a number, the result is 20. Which of the following is the number?
 (A) 12 (B) 24 (C) 36 (D) 96 (E) None of these (BBA 05-06)

15. Which of the following is equal to the average of $(x + 2)^2$ and $(x - 2)^2$? (BBA 05-06)
 (A) x^2 (B) $x^2 + 2$ (C) $x^2 + 4$ (D) $x^2 + 2x$ (E) None of these
16. If one number exceeds another number by 13 and the larger number is $\frac{3}{2}$ times the smaller number, then the smaller number is- (BBA 05-06)
 (A) 13 (B) 26 (C) 31 (D) 39 (E) None of these
17. When 10 is divided by a positive integer n , the remainder is $n - 4$, which of the following could be the value of n ? (BBA 05-06)
 (A) 3 (B) 4 (C) 7 (D) 8 (E) None of these
18. Ruma earns \$ 8.5 per hour on days other than Sundays and twice that rate on Sundays. Last week she worked a total of 40 hours, including 8 hours on Sunday. What were her earnings for the week? (BBA 05-06)
 (A) \$272 (B) \$340 (C) \$398 (D) \$408 (E) None of these
19. If $\frac{1}{x} + \frac{5}{y} = \frac{4}{3}$ and $x = 3y$, then $y = ?$ (BBA 07-08)
 (A) 2 (B) 3 (C) 3.33 (D) 4 (E) None of these
20. If $\frac{x}{y} = 2$, then $\frac{(x-y)}{x} = ?$ (BBA 07-08)
 (A) -1 (B) $-\frac{1}{2}$ (C) $\frac{1}{2}$ (D) 1 (E) 2
21. If $\frac{m^2 + m - 3}{3} = 1$, then m could equal (BBA 07-08)
 (A) -1 (B) 0 (C) 1 (D) 2 (E) 3
22. If $\frac{x}{y+1} = \frac{2}{5}$, then $y = ?$ (BBA 08-09)
 (A) $\frac{2x}{5}$ (B) $\frac{2x}{5} + \frac{2}{5}$ (C) $\frac{2x}{5} + 1$ (D) $\frac{2x}{5} - 1$ (E) None of these
23. If 9 is $\frac{3}{4}$ th of x , what number is $\frac{5}{6}$ th of x ? (BBA 08-09)
 (A) 10 (B) 12 (C) 14.4 (D) 15 (E) 27
24. There were n books in a store. After $\frac{1}{6}$ th of the books were sold and 5 more books were procured, the total number of books in the shop stood at 65. What was the original number of books in the shop? (BBA 08-09)
 (A) 72 (B) 75 (C) 85 (D) 96 (E) None of these
25. Farhana earns Tk. 5.00 for every hour she works in a book store. Last week she worked for x hours. She purchased y kg of rice. Price of per kg rice is Tk.12.00. She saved the remaining amount. Which expression below shows her savings? (BBA 09-10)
 (A) Tk.(5.00 x + 12.00 y) (B) Tk.(5.00 x - 12.00 y) (C) Tk.5.00 ($x - y$)
 (D) Tk.7.00 (xy) (E) None of these
26. Tickets to a cricket game costs Tk.40 for reserved seats and Tk.30 for general seats. If all 500 tickets were sold for Tk.17600, how many reserved seats were sold? (MBA 97-98)
 (A) 240 (B) 275 (C) 270 (D) 260 (E) None

- 27. One third the sum of 13 and a certain number is the same as 1 more than twice the number. Find the number. (MBA 97-98)
 (A) 6 (B) 5 (C) 4 (D) 3 (E) None
- 28. A number is 20 less than another. $\frac{2}{3}$ rd of small number is equal to $\frac{1}{4}$ th of greater number. The greater number is (MBA 97-98)
 (A) 32 (B) 30 (C) 20 (D) 24 (E) None
- 29. If $x^2 + 3x + 10 = 1 + x^2$, then $x^2 = ?$ (MBA 98-99)
 (A) 0 (B) 4 (C) 7 (D) 9 (E) None of these
- 30. A batsman scored 96 runs from hitting a total of 21 boundaries and over boundaries. How many boundaries did he hit? (MBA 98-99)
 (A) 15 (B) 16 (C) 18 (D) 17 (E) None of these
- 31. Five times a number is 22 more than 4 times another number. If the sum of three times the bigger number and 7 times the smaller number is 32, what is the smaller number? (MBA 99-00)
 (A) 5 (B) 4 (C) 3 (D) 2 (E) 1
- 32. If $\frac{5}{x} = 3$ and $\frac{y}{6} = 2$ then $\frac{3+y}{x+5} = ?$ (MBA 99-00)
 (A) 3 (B) $\frac{11}{3}$ (C) $9/4$ (D) $\frac{3}{11}$ (E) none of these
- 33. A boy purchased some chocolates from a shop for Tk. 120. In the next shop he found that the price per piece of chocolate is Tk. 3 less than that charged at the previous shop, and as such he could have purchased 2 more chocolates. How many chocolates did he buy from the first shop? (MBA 00-01)
 (A) 7 (B) 8 (C) 9 (D) 10 (E) None of these
- 34. What must be subtracted from $3y/x$ to get x/y ? (MBA 02-03)
 (A) $\{2y^2 + (y-x)(y+x)\}/xy$ (B) $2y/x$ (C) $(x^2 - 3y^2)/xy$
 (D) $(3y-x)/xy$ (E) None of these
- 35. On an average, Arif sells 10 dozens of apple per day and Karim sells 12 dozens of apple per day. Arif's selling price is 1.5 times as much as that of Karim's. If Karim's weekly sales is Tk. 4,200, what is Arif's weekly sales in taka? (MBA 02-03)
 (A) 4,800 (B) 5,000 (C) 5,250 (D) 5,500 (E) none of these
- 36. If one number exceeds another number by 13 and the larger number is $\frac{3}{2}$ times the smaller number, then the smaller number is- (MBA 03-04)
 (A) 13 (B) 26 (C) 31 (D) 39 (E) 65
- 37. The difference between the sum of two numbers and the difference of the two numbers is 6. Find the larger of the two numbers if their product is 15. (MBA 03-04)
 (A) 3 (B) 5 (C) 17 (D) 20 (E) 23

- ⊕38. A post office imposes a service charge of Tk. 75 per order on any money order in the amount of Tk. 2500 or less, and Tk. 100 per order on any money order in the amount from Tk. 2501 through Tk. 70000. If Mariam purchases 3 money orders in the amounts of Tk. 1825, Tk. 2500, and Tk. 12750, what is the total service charge for her money orders?
 (A) 175 (B) 225 (C) 250 (D) 275 (E) 300 (MBA 04-05)
- ⊕39. Of the 400 students in a graduating class, 30 percent were women and, of these, one-fifth became instructors. If the number of men who became instructors was twice the number of women who became instructors, how many of the men became instructors?
 (A) 120 (B) 48 (C) 40 (D) 24 (E) 20 (MBA 04-05)
- ⊕40. Which of the following equals $x + xy + (x + xy)y$?
 (A) $x(1 + y)^2$ (B) $x(2 + y + y^2)$ (C) $2x(1 + y)$ (D) $2xy(1 + y)$ (E) $x^2y(1 + y^2)$ (MBA 04-05)
- ⊕41. Coins are to be put into 7 pockets so that each pocket contains at least one coin. At most 3 of the pockets are to contain the same number of coins and no two of the remaining pockets are to contain an equal number of coins. What is the least possible number of coins needed for the pockets?
 (A) 7 (B) 13 (C) 17 (D) 22 (E) None of these (MBA 05-06)
- ⊕42. There were 36,000 hardback copies of a certain novel sold before the paperback version was issued. From the time the first paperback copy was sold until the last copy of the novel was sold, 9 times as many paperback copies as hardback copies were sold. If a total of 441,000 copies of the novel were sold in all, how many paperback copies were sold?
 (A) 45,000 (B) 360,000 (C) 364,500 (D) 392,000 (E) 396,900 (MBA 05-06)
- ⊕43. A parking garage rents parking spaces for Tk. 100 per week or Tk. 300 per month. How much does a person save in a year by renting by the month rather than by the week?
 (A) Tk. 1400 (B) Tk. 1600 (C) Tk. 2200 (D) Tk. 2400 (E) None of these (MBA 05-06)
- ⊕44. At a certain cafeteria, burger and french fries cost Tk. 39.50, and a burger and salad cost tk. 44.00. If salad cost twice as much as French fries, how much do french fries cost?
 (A) Tk. 3.00 (B) Tk. 4.50 (C) Tk. 6.00 (D) Tk. 7.50 (E) None of these (MBA 05-06)
- ⊕45. For a certain performance, x tickets for lower-level seats were sold at Tk. 10 each and y tickets for balcony seats were sold at Tk. 6 each. If there were no other tickets sold and the number of tickets sold for lower-level seats was 3 times the number of tickets sold for balcony seats, which of the following expresses the total number of dollars from ticket sales in terms of x ?
 (A) $12x$ (B) $16x$ (C) $28x$ (D) $32x$ (E) $36x$ (MBA 05-06)

- ⊕46. A two-digit number has 3 in its unit digit. The sum of its digits is one seventh of the number itself. What is the number? (MBA 05-06)
 (A) 73 (B) 63 (C) 53 (D) 50 (E) None of these
- ⊕47. Half the difference between two numbers is 2. The sum of the greater number and twice the smaller number is 13. Find the smaller number. (MBA 07-08)
 (A) 2 (B) 3 (C) 5 (D) 7 (E) None of these
- ⊕48. If $y\%$ of $x = 29$ then $x = ?$ (MBA 07-08)
 (A) 2900 (B) $\frac{29x}{y}$ (C) $\frac{29y}{x}$ (D) $29xy$ (E) None of these
- ⊕49. If $2x + y = 4$, and $2x - y = 8$, then $3x - y = ?$ (MBA 08-09)
 (A) 5 (B) 7 (C) 9 (D) 11 (E) None of these
- ⊕50. If Anwar gets 2 taka from Bobby, they will have the same amount of money. If Bobby gets 2 taka from Anwar, he will have thrice as much money as Anwar. How much money did Bobby have? (MBA 08-09)
 (A) 6 (B) 8 (C) 10 (D) 12 (E) None of these
- ⊕51. A rope is cut into 3 pieces with each piece twice as long as the previous one. If the length of the longest piece is 3 meters, what was the length of the rope in meter? (MBA 08-09)
 (A) 6.5 (B) 6 (C) 5.5 (D) 5.25 (E) None of these
- ⊕52. The cost, in taka of manufacturing X units of products is $(9,000 + 400 X)$. The amount received when selling these x units of products is taka $500 x$. What is the least number of products that must be manufactured and sold so that the amount received is at least equal to the manufacturing cost? (MBA 09-10)
 (A) 10 (B) 18 (C) 45 (D) 90 (E) None of these
- ⊕53. A class of 20 students borrowed library books for their research projects. Some of the students borrowed 3 books each, and the rest borrowed 2 books each. If a total of 52 books were borrowed, how many of the students borrowed 3 books each? (MBA 09-10)
 (A) 8 (B) 9 (C) 10 (D) 12 (E) 13
- ⊕54. Which of the following equals $x + xy + (x + xy) y$? (MBA 10-11)
 (A) $x(1 + y)^2$ (B) $x(2 + y + y^2)$ (C) $2x(1 + y) + y$
 (D) $2xy(1 + y)$ (E) None of these
- ⊕55. Nasreen weighs X pounds where X is a whole number. If she gains 7 pounds, she will weigh less than 120 pounds. If she gains 9 pounds, she will weigh more than 120 pounds. What is Nasreen's weight in pounds? (BBA 93-94)
 (A) 110 (B) 111 (C) 112 (D) 113 (E) None of these

- ⊕56. If $a + b = \sqrt{5}$ and $a - b = \sqrt{3}$, then $a^2 + b^2 = ?$
 (A) 8 (B) $\sqrt{8}$ (C) 6 (D) 4 (E) $4\sqrt{2}$ (BBA94)
- ⊕57. Total production cost is measured by the following rule:
 Total production cost = Material cost + Labor Cost + Overhead Cost (BBA94)
 production period, material cost was Tk. 30 and was $\frac{3}{4}$ of the labor cost. Overhead cost was Tk. 10 more than labor cost. What was the total production cost in Taka?
 (A) 85 (B) 90 (C) 100 (D) 110 (E) 120
- ⊕58. If $x/y = 3/7$, then which of the following cannot be a possible value of $(y - x)$?
 (A) 4 (B) 21 (C) 24 (D) 84 (E) None of these (BBA 94-95)
- ⊕59. If x is an integer and $y = 9x + 13$, what is the greatest value of x for which y is less than 100?
 (A) 12 (B) 11 (C) 10 (D) 9 (E) 8 (BBA 95-96)
- ⊕60. A man buys some pens and pencils. The pen costs Tk. 7 each and the pencil costs Tk. 3 each. If the man spends exactly Tk. 81 and buys the maximum number of pen possible under these conditions, what is the ratio of pen to pencil? (BBA 97-98)
 (A) 3:2 (B) 5:2 (C) 4:3 (D) 5:3 (E) none of these
- ⊕61. In a concert, 100 tickets were sold in two unequal lots at two different rates. First lot was sold at Tk.5 per ticket and the second lot was sold at Tk3.50 per ticket. If the total sales proceeds was Tk.410, how many people got the cheaper tickets? (BBA 97-98)
 (A) 75 (B) 60 (C) 50 (D) 40 (E) 30
- ⊕62. If the product of $(1+2)$, $(2+3)$ and $(3+4)$ is equal to one half the sum of 20 and x , then $x = ?$
 (A) 210 (B) 190 (C) 105 (D) 85 (E) 10 (BBA 96-97)
- ⊕63. If $x = 3$ and $y = 1/6$ then the value of x in terms of y is (BBA 96-97)
 (A) $2y$ (B) $1/2 y$ (C) $6^2/3 y$ (D) $3^{1/6} y$ (E) $18y$
- ⊕64. Mr. Quddus rents a room for N months. He pays Tk. K for each of the first 7 months, and half that rate for each additional month. Find the total charge if $N > 7$. (BBA 93-94)
 (A) $7k + 2kN$ (B) $7k + N/2$ (C) $K + 2k(N-7)$ (D) $k+k/2(N-7)$ (E) $7k + k/2(N-7)$
- ⊕65. The ancient Arabs calculated the area of a circle by subtracting $1/7$ the diameter of the circle from the diameter and then squaring the result. If d represents the diameter and A the area, which of the following represents a formula for this method? (BBA 94)
 (A) $A = 2(d - \frac{1}{7}d)^2$ (B) $A = d^2 - (\frac{1}{7}d)^2$ (C) $A = (d - \frac{1}{7}d)^2$
 (D) $A = (d - \frac{1}{7})^2$ (E) $A = d - (\frac{1}{7}d)^2$

- ⊕66. Three apples and four oranges cost Tk. 32. Four apples and three oranges cost Tk. 30. One apple, 1 orange and 1 papaya cost Tk. 28. What is the cost of a papaya? (BBA 98-99)
 (A) 18 (B) 20 (C) 21 (D) 17 (E) 19
- ⊕67. The expression $(x + 4)(2x - 3)$ is equivalent to which of the following? (BBA 95-96)
 I. $2x(x+4) - 3(x+4)$ II. $(x+4)(2x+3)$ III. $2x^2 - 12$
 (A) I only (B) II only (C) III only (D) II & III (E) 1, II, III
- ⊕68. Which of the following information alone is sufficient to find out the value of $4x^2 - 12xy + 9y^2$? (BBA 97-98)
 (A) $yx = 9$ (B) $2x = 3y$ (C) $2x + 3y = 2$ (D) $x = 4$ (E) none of these
- ⊕69. A cake weighing 750g has three ingredients: flour, sugar, and fruits. There is twice as much flour as sugar and one and a half times as much sugar as fruits. What is the quantity of sugar (in gram) in the cake? (BBA 97-98)
 (A) 50g (B) 125g (C) 250g (D) 100g (E) none of these
- ⊕70. The sum of $\frac{1}{4}$ of the price of a pen and $\frac{1}{3}$ rd of the price of a pencil is Tk. 11. If $\frac{1}{8}$ th of the price of the pen is equal to $\frac{1}{5}$ th of the price of the pencil, what is the price of the pen in Taka? (BBA 98-99)
 (A) 32 (B) 16 (C) 12 (D) 24 (E) None of these
- ⊕71. An amount of money was divided between some people in such a way that if there had been 4 more people, everyone would have got Tk 16 less. But if there had been 4 less people, everyone would have got Tk 24 more. How many people were there in the group? (BBA 98-99)
 (A) 32 (B) 24 (C) 20 (D) 16 (E) None of these
- ⊕72. There are 200 questions in a three hour examination. Among these questions are 50 mathematical problems. It is suggested that twice as much time be allowed for each mathematical problems as for each of the other questions. How many minutes should be spent on the mathematical problems? (BBA 98-99)
 (A) 100 (B) 72 (C) 60 (D) 36 (E) 120
- ⊕73. If $(x - y)^2 = 12$ and $xy = 1$, then $x^2 + y^2 = ?$ (BBA 98-99)
 (A) 10 (B) 11 (C) 12 (D) 13 (E) 14
- ⊕74. In a picnic there were 240 persons. There were 20 more men than women and there were 20 more adults than children. How many men were there in the picnic? (BBA 99-00)
 (A) 240 (B) 75 (C) 110 (D) 130 (E) None
- ⊕75. A trader purchased some pens for Tk. 120. If the price of each pen were Tk. 3 less, he would have got 2 more pens. How many pens did he buy? (BBA 99-00)
 (A) 6 (B) 8 (C) 10 (D) 12 (E) None of these

- ⊕76. 80 apples were stored in two baskets in such a way that 6 times the content of the larger basket is 16 more than 10 times the content of the smaller basket. How many apples were stored in the smaller basket? (A) 20 (B) 23 (C) 24 (D) 25 (E) 29 (BBA 99-00)
- ⊕77. Seven kg of mangoes cost as much as 10 kg of apples and 1 kg of oranges. 7 kg of oranges cost as much as 1 kg of mangoes and 2 kg of apples. How many kg of apples can be purchased by the amount of money required to purchase 12 kg of mangoes? (A) 8 (B) 14 (C) 16 (D) 18 (E) 24 (BBA 99-00)
- ⊕78. On an average, Dr. X attends 12 patients per day and Dr. Y attends 16 patients per day. If Dr. X's charge is $\frac{3}{2}$ times as much as that of Dr. Y, who earns Tk. 72,000 per month (30 days), what is the monthly income of Dr. X? (A) 64000 (B) 72000 (C) 76000 (D) 81000 (E) None of these (BBA 99-00)
- ⊕79. What is 10% of $\frac{y}{3}$, if $\frac{2y}{3}$ is 10% of 600? (A) 1 (B) 2 (C) 3 (D) 4 (E) None of these (BBA 99-00)
- ⊕80. A machine costs m taka per day to maintain and n paisa for each unit it produces. If the machine is operated 7 days a week and produces r units in a week, which of the following is the total cost, in taka of operating the machine for a week? (A) $7m + 10nr$ (B) $\frac{700m + nr}{100}$ (C) $7m + nr$ (D) $7m + 7nr$ (E) $700mnr$ (BBA 00-01)
- ⊕81. Nasreen lost a purse containing Tk. 120. Incidentally, she had only notes of Tk. 2 and Tk. 5 denominations in the purse. If the total number of notes was 30, how many Tk. 5 denomination notes did she have? (A) 15 (B) 16 (C) 18 (D) 20 (E) None of these (BBA 00-01)
- ⊕82. Weight of Anwar is equal to $\frac{1}{5}$ th of his own weight plus the weight of his sister, who is 10 kg less than Anwar. How much does Anwar weigh? (A) 50 (B) 45 (C) 40 (D) 35 (E) None of these (BBA 01-02)
- ⊕83. If $\frac{a}{x} + \frac{x}{a} = \frac{x}{b} + \frac{b}{x}$, then $x = ?$ (A) $\pm\sqrt{ab}$ (B) $\pm\sqrt{\frac{a}{b}}$ (C) $\pm\sqrt{\frac{ab}{2}}$ (D) $\pm\sqrt{\frac{b}{a}}$ (E) None of these (BBA 01-02)
- ⊕84. If $\frac{y}{x+1} = 4$ and $\frac{4x+3}{y+2} = 1.5$, what is the value of x ? (A) 5 (B) 2 (C) -1 (D) -3 (E) None of these (BBA 02-03)
- ⊕85. If x books can be purchased for Tk. y , how many books can be purchased for Tk. m ? (A) $\frac{xm}{y}$ (B) $\frac{ym}{x}$ (C) $\frac{y}{xm}$ (D) $\frac{(x+m)}{y}$ (E) None of these (BBA 02-03)

- ⊕86. If all chocolates from a box were equally distributed among some children, each would get 3 chocolates. If three more children are added to the group and you give each child 2 chocolates, you will run short by one chocolate. How many chocolates do you have for distribution? (BBA 02)
- (A) 12 (B) 15 (C) 16 (D) 18 (E) None of these
- ⊕87. A trader bought 48 tube lights and found that 8 of the tube lights were broken during transportation. As a result his per unit cost was increased by Tk. 24. What was the original cost of each tube light? (BBA 02)
- (A) 100 (B) 104 (C) 112 (D) 120 (E) none of these
- ⊕88. If the product of 2,3 and $(x + 5)$ is equal to one half the sum of 68 and x , what is the value of x ? (BBA 04)
- (A) 2 (B) 3 (C) 4 (D) 5 (E) None of these
- ⊕89. The daily rate of a hotel room that accommodates 4 people is Taka 3900 for one person and Taka x for each additional person. If 3 people take the room for one day and pay Taka 2100 for the room, what is the value of x ? (BBA 05)
- (A) 600 (B) 800 (C) 1200 (D) 1300 (E) None of these
- ⊕90. If $x + y = a$ and $x - y = b$, then $2xy = ?$ (BBA 05)
- (A) $(a^2 - b^2)/2$ (B) $(b^2 - a^2) / 2$ (C) $(a - b) / 2$ (D) $ab / 2$ (E) None of these
- ⊕91. A cashier reversed the digits of one customer's correct amount of change and gave the customer an incorrect amount of change. If the cash register contained 75 more than it should have as a result of this error, which of the following could have been the correct amount of change in Taka? (BBA 05)
- (A) 83 (B) 45 (C) 54 (D) 65 (E) None of these
- ⊕92. After 2 females leave a party there are twice as many males as females. Then 2 males leave the party and there are twice as many females as male. How many females attended the party? (BBA 06)
- (A) 6 (B) 8 (C) 16 (D) 24 (E) None of these
- ⊕93. A picnic was arranged by m students. Total cost of the picnic was estimated to be y taka. Unfortunately, z students withdrew their names from the picnic. How much more taka would each of the remaining students have to pay? (BBA 09)
- (A) $\frac{y}{m}$ (B) $\frac{y}{m - z}$ (C) $\frac{y}{m - z} - \frac{y}{m}$ (D) $\frac{y}{m} - \frac{y}{z}$ (E) Cannot be determined
- ⊕94. It costs Tk. 1000 to make the first thousand copies of a book and X Tk. to make each additional copy. If it costs a total of Tk. 7,230 to make the first 8,000 copies of the book, what is X ? (MBA 98)
- (A) 0.92 (B) 0.89 (C) 1.1 (D) 1 (E) None of these

- ⊕95. If $(x - y) = 1$ and $xy = 2$, then $x^3 - y^3 = ?$
 (A) 7 (B) 9 (C) 11 (D) 18 (E) 29 (MBA 98-99)
- ⊕96. If $1 + 1/x = (x + 1)/x$, what is the value of x ?
 (A) 1 only (B) + 1 or - 1 only (C) + 1 or 2 only (MBA 99-00)
 (D) 0 (E) all values except 0
- ⊕97. The price of a front circle seat in a cinema hall is $\frac{1}{3}$ the price of a rear circle seat. The cinema has only these two types of seat. When completely sold out, the total receipts from the 600 rear circle seats and the 450 front circle seats are Tk. 4500. What is the price of one rear circle set?
 (A) Tk. 2.00 (B) Tk. 2.30 (C) Tk. 4.00 (D) Tk. 6.00 (E) Tk. 10.00 (MBA 00-01)
- ⊕98. The 356 members of Metro Chamber of Commerce will vote to choose a President. With 5 candidates seeking office, what is the least number of votes a successful candidate could receive and yet have more votes than any other candidate?
 (A) 71 (B) 72 (C) 89 (D) 178 (E) 179 (MBA 00-01)
- ⊕99. Arif gave x no. of stamps to Sharif. Then he gave Babu one more stamp than he gave Sharif and he gave Asif two stamps fewer than he gave Babu. In terms of x , how many stamps did Arif give to Babu, Sharif and Asif?
 (A) $3x$ (B) $3x + 1$ (C) $3x - 1$ (D) $3x + 2$ (E) None of these (MBA 01-02)
- ⊕100. Before anybody could notice, Arif took $1/3$ of the chocolates from a box. Later, his three sisters arrived and the remaining chocolates were distributed equally among the four of them. Arif received a total of 48 chocolates. How many did each of her sisters receive?
 (A) 16 (B) 18 (C) 21 (D) 24 (E) None of these (MBA 01-02)
- ⊕101. The cost of a pen is twice that of a pencil. If you buy x pens for Tk. y , how many pencils can you buy with Tk $(x + y)$?
 (A) $x(x+y)/y$ (B) $4x^2y/(x+y)$ (C) $(x^2+xy)/0.5y$ (D) $2xy^2/y$ (E) None of these (MBA 02-03)
- ⊕102. The mile meter of a car misses every eleventh mile being traveled. After a certain time, the meter shows that 1251 miles were traveled. How many miles were actually travelled?
 (A) 1291 (B) 1325 (C) 1376 (D) 1421 (E) None of these (MBA 02-03)
- ⊕103. A picnic was attended by 240 persons. There were 20 more men than women and 20 more adults than children. How many men were there in the picnic?
 (A) 240 (B) 75 (C) 110 (D) 130 (E) 200 (MBA 02-03)

- ⊕104. The cost of four rolls, six samuchas and three loaves of bread is Taka 91. The cost of two rolls, three samuchas and a loaf of bread is Taka 39. What is the cost (in taka) of a loaf of bread? (MBA 04-05)
 (A) 10.50 (B) 11.00 (C) 12.00 (D) 12.50 (E) 13.00
- ⊕105. Maruf, Jasim and Khalil had lunch together. Khalil's meal cost 50% more than Jasim's meal and Maruf's meal cost $\frac{5}{6}$ as much as Khalil's meal. If Jasim paid Tk. 1000 for his meal, what was the total that the three of them paid for lunch? (MBA 04-05)
 (A) 2833 (B) 3000 (C) 3500 (D) 3750 (E) 4000
- ⊕106. Last year Mrs. Latif received Tk. 160 in dividends on her shares of Company X stock, all of which she had held for the entire year. If she had had 12 more shares of the stock last year, she would have received Tk. 15 more in total annual dividends. How many shares of the stock did she have last year? (MBA 05-06)
 (A) 128 (B) 140 (C) 172 (D) 175 (E) 200
- ⊕107. Ali, Leema, and Kabir pooled their funds to buy a gift for a friend. Ali contributed Tk. 2 less than $\frac{1}{3}$ of the cost of the gift and Leema contributed Tk. 2 more than $\frac{1}{4}$ of the cost. If Kabir contributed the remaining Tk. 15, what was the cost of the gift? (MBA 05-06)
 (A) Tk. 24 (B) Tk. 33 (C) Tk. 36 (D) Tk. 43 (E) None of these
- ⊕108. In a class of 400 students, 72 received A's. If 15% of the male students and 20% of the female students received 'A', then the number of male students in the class is- (MBA 08-09)
 (A) 160 (B) 175 (C) 180 (D) 300 (E) None of these
- ⊕109. Faruk has x more marbles than Sanwar has, and together they have a total of y marbles. Which of the following represents the number of marbles that Sanwar has? (MBA 08-09)
 (A) $(y - x)/2$ (B) $y - x/2$ (C) $y/2 - x$ (D) $2y - x$ (E) $y - 2x$
- ⊕110. A box contains only marbles. If $\frac{1}{4}$ of the marbles were removed, the box would be filled to $\frac{1}{2}$ of its capacity. If instead 100 marbles were added, the box would be full. How many marbles are in the box? (MBA 09-10)
 (A) 100 (B) 200 (C) 250 (D) 300 (E) None of these
- ⊕111. Monwar, Jasmin and Khairul had lunch together. Khairul's meal cost 50% more than Jasmin's meal and Monwar's meal cost $\frac{5}{6}$ as much as Khairul's meal. If Jasmin paid Tk. 1000 for her meal, what was the total amount they paid for lunch? (MBA 10-11)
 (A) 2833 (B) 3000 (C) 3500 (D) 3750 (E) None of these
- ⊕112. If $8x + 5x + 2x + 4x = 114$, then $5x + 3 = ?$ (MBA 10-11)
 (A) 12 (B) 25 (C) 33 (D) 47 (E) None of these
- ⊕113. The expression $\frac{1-5x^2}{x^2}$ will achieve highest value when $x = ?$ (BBA 94)
 (A) $\frac{1}{3}$ (B) $\sqrt{5}$ (C) 3 (D) 2 (E) $\frac{1}{2}$

- ⊕114. During a cricket match, Akram scored a century in just 40 deliveries. The number of boundaries he hit was twice that of overboundaries. He couldn't score from 6 deliveries and he could take singles from rest of the deliveries. How many boundaries did he score?
 (A) 16 (B) 14 (C) 12 (D) 10 (E) none of these (BBA 97-98)
- ⊕115. Find the value of K if $(x+1)$ is a factor of $x^3 + Kx + 3x^2 - 2$.
 (A) 6 (B) 5 (C) 4.5 (D) 4 (E) none of these (BBA 97-98)
- ⊕116. If half female students enjoy watching movies and one-third male students do not like to watch movies, what fractional part of the student body enjoys watching movies?
 (A) $5/12$ (B) $2/5$ (C) $3/4$ (D) $1/6$ (E) Can't be determined (BBA 99-00)
- ⊕117. Which of the following is a solution to $x + x^2 - 1$?
 (A) -1 (B) 0 (C) $1/2$ (D) 1 (E) None of these (BBA 00-01)
- ⊕118. If $xy = 4$, $yz = 9$ and $zx = 25$, and $x > 0$, what is the value of y ?
 (A) 1 (B) $6/5$ (C) $5/6$ (D) $4/3$ (E) None of these (BBA 01-02)
- ∇119. If $(x + \frac{1}{x})^2 = 3$, calculate the value of $x^3 + \frac{1}{x^3}$?
 (A) 3 (B) $\sqrt{3}$ (C) $3\sqrt{3}$ (D) 0 (E) None of these (BBA 01-02)
- ∇120. If $x + 1/x = 2$ what is the value of $x/(x^2 + x - 1)$?
 (A) $1/4$ (B) $1/5$ (C) $3/4$ (D) 1 (E) None of these (BBA 02-03)
- ∇121. A rope, x feet long, is cut into two pieces such that the length of one piece is 1 foot more than twice the length of the other piece. Which of the following is the length, in feet, of the larger piece?
 (A) $(x+2)/2$ (B) $(2x+1)/2$ (C) $(2x+3)/3$ (D) $(2x+3)/3$ (E) None of these (BBA 03-04)
- ∇122. If x , y , w and z correspond to four numbers -3 , $1/2$, -4 and 2 but not necessarily in the same order, what is the largest possible value of the expression $(wx/y)z^2$?
 (BBA 03-04)
 (A) 92 (B) 36 (C) 24 (D) 12 (E) None of these
- ∇123. If $10 > x > 9$ and $x^2 = (10-y)(10+y)$, which of the followings is a possible value of y ?
 (BBA 04-05)
 (A) -7 (B) -6 (C) 3 (D) 4 (E) None of these
- ∇124. Seven pounds of mangoes cost as much as 10 pounds of apples and 1 pound of oranges. Seven pounds of oranges cost as much as 1 pound of mangoes and 2 pounds of apples. How many pounds of apples can be purchased for the amount of money required to purchase 12 pounds of mangoes?
 (BBA 05-06)
 (A) 8 (B) 14 (C) 16 (D) 18 (E) None of these

- ∇125. If $a = 1$ and $(a-b)/c = 1$, which of the following is NOT a possible value of b ? (BBA 05-06)
 (A) -2 (B) -1 (C) 0 (D) 1 (E) None of these
- ∇126. A bus is traveling with 60 passengers. When it arrives at a stop, x number of passengers get off and 8 get on. At the next stop, one third of the passengers on board get off and 5 get on. There are now 37 passengers on the bus. Find x . (BBA 07-08)
 (A) 15 (B) 20 (C) 25 (D) 30 (E) None of these
- ∇127. Mary is reviewing her algebra quiz. She has determined that one of her solutions is incorrect. Which one is it? (BBA 09-10)
 (A) $2x + 5(x-1) = 9, x = 2$ (B) $p-3(p-5) = 10, p = 2.5$ (C) $4y + 3y = 28, y = 4$
 (D) $5w + 6w - 3w = 64, w = 8$ (E) $t-2t - 3t = 32, t = 8$
- ∇128. A man purchased equal number of bananas at two different rates—one at the rate of 8 taka per dozen and the other at the rate of 10 taka per dozen. After that, he sold those bananas at an average rate of 11 taka per dozen and thus made a profit of 100 taka. How many dozens of banana did he purchase altogether? (BBA 09-10)
 (A) 60 (B) 50 (C) 55 (D) 45 (E) 40
- ∇129. There are 200 questions in a 3-hour examination. Among the questions are 50 mathematics problems. It is suggested that twice as much time be allowed for each mathematics problem as for each of the other questions. How many minutes should be spent on the mathematics problems? (MBA 00-01)
 (A) 36 (B) 60 (C) 72 (D) 100 (E) 120
- ∇130. If $\frac{1}{x} - \frac{1}{y} = 7$ and $\frac{1}{x^2} - \frac{1}{y^2} = 21$, what is the value of x ? (MBA 00-01)
 (A) $\frac{1}{2}$ (B) $\frac{1}{3}$ (C) $\frac{1}{5}$ (D) $\frac{1}{7}$ (E) None of these
- ∇131. An oddly shaped rock having uniform density and weighing 64 grams is broken into two pieces. One of the two pieces weighs 48 grams and has volume of 33 cc. What is the volume of the original rock? (MBA 03-04)
 (A) 11 (B) 22 (C) 33 (D) 44 (E) 66
- ∇132. In a journey from Banani to Motijheel half the people on a bus exit at each stop and no additional passengers board the bus. If on the third stop the next to last person exits the bus, then how many people were on the bus at the time of the start of the journey? (MBA 09-10)
 (A) 20 (B) 16 (C) 8 (D) 6 (E) None of these

- ∇133. A shop in the IDB bhaban quotes the price of a local brand of computer with or without a DVD writer. The computer with the DVD writer costs 29,000 taka. The computer without the DVD writer costs 19,500 taka more than the DVD writer alone. What is the cost of the DVD writer?
 (A) tk 4,000 (B) tk 4,500 (C) tk 4,750 (D) tk 5,000 (E) None of these (MBA 09-10)
- ⊕134. When the positive integer x is divided by 9, the remainder is 5. Which of the following must be true?
 (A) x is odd (B) x is even (C) $x-1$ is divisible by 2
 (D) $x+1$ is divisible by 3 (E) none of these (MBA 2013)
- ⊕135. The product of three positive integers is 600. If one of the integers is 5, what is the least possible value of the sum of the other two?
 (A) 18 (B) 20 (C) 22 (D) 24 (E) none of these (MBA 2013)
- ∇136. In dividing a number by 585, a student employed the method of short division. He divided the number successively by 5, 9 and 13 (factors of 585) and got the remainders 4, 8, 12 respectively. If he had divided the number by 585, what would have been the remainder?
 (A) 24 (B) 144 (C) 292 (D) 584 (E) none of these (BBA 13-14)
- ⊕137. The integers between 1 and 100, inclusive, are put in list A if they are divisible by 2 and in list B if they are divisible by 3. How many integers in list A are not in list B?
 (A) 11 (B) 16 (C) 25 (D) 33 (E) 34 (BBA 13-14)
- 138. Azhar plans to visit the National Museum once each month in 2014 except in March and May when he plans to go three times each month. A single admission costs Tk 5.50, a pass valid for unlimited visits in any 3 month period can be purchased for Tk 27, and an annual pass costs Tk 80. What is the least amount that Azhar can spend for his intended number of visits?
 (A) Tk 70 (B) Tk 75 (C) Tk 76.50 (D) Tk 80 (E) none of these (BBA 13-14)
- ⊕139. A certain integer n is a multiple of both 5 and 9. Which of the following must be true?
 (BBA 13-14)
 I. n is an odd integer II. n is equal to 45 III. n is a multiple of 15
 (A) II only (B) III only (C) I and II only (D) I and III only (E) II and III only
- ∇140. If x , y and z are positive integers such that when x is divided by y , the remainder is z and when x is divided by z , the remainder is $(y - 2)$, then which of the following must be true?
 (A) $z = y - 1$ (B) $x + z$ is divisible by y
 (C) $x - 1$ is divisible by y (D) y is even (E) none of these (BBA 14-15)
- ⊕141. If x and y are positive integers and $1/x + 1/y = 1/9$, what is the difference between the maximum and minimum value of x ?
 (A) 40 (B) 60 (C) 80 (D) 100 (E) none of these (BBA 14-15)

- ⊕142. If $|x - 1| > 2$, which of the following must be true? (BBA 14-15)
 I. $|x| > 3$ II. $x^2 > 9$ III. $x > 3$
 (A) I only (B) II only (C) I and II only
 (D) II and III only (E) none of these
- 143. An integer x , when divided by 4 or 6, results in a remainder of 1. Which of the following cannot be a remainder when the same number is divided by 9? (BBA 14-15)
 (A) 2 (B) 3 (C) 4 (D) 7 (E) none of these
- 144. If $x > z$ and $y < -z$, where z is a positive integer, then which of the following must be true? (BBA 14-15)
 (A) $x/y > 1$ (B) $x/y < -1$ (C) $x/y < 0$ (D) $x + y > 0$ (E) none of these.
- 145. If x and y are integers and $-2 < x < 5$ and $-5 < y < 7$, what is the greatest possible value of $|y - x|$? (BBA 14-15)
 (A) 6 (B) 7 (C) 8 (D) 9 (E) none of these
- ⊕146. If $x > y > 1$, which of the following must be greater than x ? (BBA 14-15)
 (A) $7y/5x$ (B) $x/(2y - x)$ (C) $(x + y)/y$ (D) $6x/(y + 5x)$ (E) none of these
- ∇147. If x men can do a work in y days, how many days will it take $(x + z)$ men to do the same work? (BBA 14-15)
 (A) $xy/(x + z)$ (B) $(x + z)/xy$ (C) $y - z$ (D) $(xy + zy)/x$ (E) none of these
- ∇148. If x is a positive even integer and y is a positive odd integer, which of the following will be even? (BBA 14-15)
 (A) $x^3 + y^2$ (B) $3x + y + y^2$ (C) $(x - y)(x + y)$ (D) $xy + y^2$ (E) none of these
- ∇149. In the sequence a_n , the n -th term is defined as $(a_{n-1} - 1)^2$. If $a_3 = 64$, then what is the value of a_1 ? (BBA 15-16)
 (A) 1 (B) 3 (C) 4 (D) 9 (E) none of these
- 150. If $x < 10$ and $5y - 2x = 0$, which of the following must be true? (BBA 16-17)
 (A) $y > -2$ (B) $y < 4$ (C) $y >$ (D) $y > 4$ (E) none of these
- 151. Arif bought 17 pens of three colors - black, green and red which cost Tk 5, Tk 10 and Tk. 25 each. The total amount that Arif paid was Tk 205. If Arif bought twice as many green pens as red pens, how many black pens did he buy? (BBA 16-17)
 (A) 4 (B) 5 (C) 7 (D) 8 (E) none of these
- 152. The average salary of Arif and Babu is Tk. 10,000 and that of Sabbir and Babu is Tk 12,000. What is the difference between Sabbir's salary and Arif's salary? (BBA 16-17)
 (A) 4000 (B) 5000 (C) 6000 (D) 6250 (E) none of these

- Q153. The members of an association decided to contribute equally to create a fund of Tk. 45,000. Five members refused to contribute, so each of the other members had to contribute additional tk. 15 for that fund. How many members were there in the association? (BBA 16-17)
 (A) 120 (B) 125 (C) 130 (D) 135 (E) none of these
- Q154. If x/z is more than y/z , then $y = ?$ (BBA 16-17)
 (A) $x-1$ (B) $zx-1$ (C) $x-z$ (D) $(x-1)/z$ (E) none of these
- Q155. A certain bag contains 6 marbles, of which 4 are red and 2 are white in color. If Babu is to pick out 2 marbles from the bag simultaneously and at random, what is the probability that one is red and the other is white? (BBA 16-17)
 (A) $1/5$ (B) $1/3$ (C) $1/15$ (D) $8/15$ (E) none of these
- Q156. When x is divided by 7, the remainder is 6. Which of the following must be an even number? (BBA 16-17)
 (A) $x+6$ (B) $x^3 + x^2 + x$ (C) $x^2 + x$ (D) $x - 4$ (E) none of these
- Q157. What is the sum of all the integers from -557 to 559, inclusive? (BBA 17-18)
 (A) 1 (B) 2 (C) 1116 (D) 1117 (E) None of these
- Q158. When x is divided by 10, the quotient is y with a remainder of 4. If x and y both are positive integers, what is the remainder when x is divided by 5? (BBA 17-18)
 (A) 1 (B) 2 (C) 3 (D) 4 (E) None of these
- Q159. What is the units digit of the sum $344+543+212$? (BBA 17-18)
 (A) 2 (B) 4 (C) 8 (D) 9 (E) None of these
- Q160. In a working group of a class project, the number of boys is 3 fewer than twice the number of girls. If one boy were replaced by a girl, there would be an equal number of boys and girls in the group. How many students are in the class? (BBA 17-18)
 (A) 14 (B) 12 (C) 10 (D) 9 (E) None of these
- Q161. This year Rana will save certain amount of his income, and he will spend the rest. Next year Rana will have no income, but for each taka that he saves this year, he will have $(1 + r)$ taka available to spend. In terms of r , what fraction of his income should Rana save this year so that next year the amount available for his spending will be equal to half the amount that he spends this year? (BBA 17-18)
 (A) $1/(r+2)$ (B) $1/(2r+2)$ (C) $1/(r+3)$ (D) $1/(2r+3)$ (E) None of these
- Q162. XYZ company hired an accountant and 8 office assistants to do a job. The daily wage for the accountant is 4 times more than that of an office assistant. If the company paid a total of Tk m for the work, how much was paid to the accountant? (BBA 17-18)
 (A) $m/3$ (B) $m/4$ (C) $4m/11$ (D) $2m/13$ (E) None of these

Answer Key Exercise 13

1.D	2.A	3.D	4.A	5.E	6.B	7.E	8.A	9.B	10.A
11.E	12.A	13.C	14.D	15.C	16.B	17.C	18.D	19.D	20.C
21.D	22.E	23.A	24.A	25.B	26.D	27.E	28.A	29.D	30.A
31.D	32.C	33.B	34.A	35.C	36.B	37.B	38.C	39.B	40.A
41.C	42.C	43.B	44.B	45.A	46.B	47.B	48.E	49.D	50.C
51.D	52.D	53.D	54.A	55.C	56.D	57.E	58.E	59.D	60.A
61.B	62.B	63.E	64.E	65.C	66.E	67.A	68.C	69.E	70.D
71.C	72.B	73.E	74.B	75.B	76.E	77.D	78.D	79.C	80.B
81.D	82.A	83.A	84.D	85.A	86.B	87.D	88.E	89.C	90.A
91.A	93.B	93.C	94.B	95.A	96.E	97.D	98.B	99.A	100.A
101.C	102.C	103.D	104.E	105.D	106.A	107.C	108.A	109.A	110.B
111.D	112.C	113.A	114.C	115.E	116.E	117.E	118.B	119.D	120.D
121.E	122.E	123.D/C	124.D	125.D	126.B	127.E	128.B	129.C	130.C
131.D	132.C	133.C	134.D	135.C	136.D	137.E	138.C	139.B	140.E
141.C	142.D	143.A	144.C	145.D	146.E	147.A	148.B	149.C	150.B
151.B	152.A	153.	154.E	155.E	156.D	157.D	158.D	159.A	160.B
161.D	162.A								

1. (D)
 2. x/4
 3. (A)
 4. (D)
 5. (A)
 6. (E)
 7. T
 8. (B)
 9. =>
 10. (E)
 11. =
 12. (A)
 13. (A)
 14. (C)
 15. (C)

Solution to Exercise 13

1. (D) Let, the number be x .
 $x/4 = 2 \Rightarrow x = 8 \Rightarrow x/2 = 4$
2. (A) $(a + b + c)/4 = (a + b)/3 \Rightarrow 3a + 3b + 3c - 4a - 4b = 0 \Rightarrow 3c = a + b \Rightarrow c = (a+b)/3$
3. (D) $a/x + b = 1 \Rightarrow a/x = 1 - b \Rightarrow x = a/(1 - b)$
4. (A) $3(x + y)(x - y) = 3(x^2 - y^2) = 3 \times 27 = 81$
5. (E) $3x - 5 = 1 \Rightarrow x = 2$
 Therefore $x - 2 = 0$
6. (B) $x^2 - 3x + 2 = 0 \Rightarrow (x - 1)(x - 2) = 0 \Rightarrow x = 1, 2$ আবার, $x^2 - x - 2 = 0 \Rightarrow (x + 1)(x - 2) = 0$
 $\Rightarrow x = -1, 2; \therefore x = 2$
7. (E) $x/4 - 8/x = 1 \Rightarrow (x^2 - 32)/4x = 1 \Rightarrow x^2 - 4x - 32 = 0 \Rightarrow (x - 8)(x + 4) = 0$
 $\Rightarrow x = 8, -4$
8. (A) $x/2 + 3 = x/3 + 4 \quad \therefore x/2 - x/3 = 1 \therefore x/6 = 1 \therefore x = 6$
9. (B)
 $\frac{ab - b + a - b^2}{a - b} = 4$ or, $\frac{ab + a - b^2 - b}{a - b} = 4$
 or, $\frac{a(b+1) - b(b+1)}{a - b} = 4$ or $\frac{(a - b)(b + 1)}{a - b} = 4 \therefore b + 1 = 4$
 or, $b = 3$ [এখানে $a - b$ cross out না করলে $a = b$ হবে যার ফলে denominator 0 হয়ে যাবে যা গ্রহণযোগ্য নয়]
10. (A) $\frac{x}{a} + \frac{a}{b} = 4 \Rightarrow \frac{x}{a} = 4 - \frac{a}{b} \Rightarrow x = 4a - \frac{a^2}{b} = (-a^2/b) + 4a$
11. (E) $y = 8x + 12 \Rightarrow y = 8(z + 2) + 12$ [x = z + 2 দেয়া আছে]
 $\Rightarrow y = 8z + 28$.
12. (A) Larger number is $5/2$ times the smaller number means if the larger number is 5, the smaller one is 2. i.e. the difference is $(5 - 2) = 3$
 Therefore, when the difference is 3, smaller number is 2
 \therefore when the difference is 18, smaller number is $\frac{2 \times 18}{3} = 12$
13. (C) $\frac{y}{x} = \frac{1}{5} \Rightarrow y = \frac{x}{5}$ আবার, $2x + y = 33 \Rightarrow 2x + \frac{x}{5} = 33 \Rightarrow \frac{11x}{5} = 33$
 $\therefore x = 15$
14. (D) let, the number is x
 Given, $x/4 - 4 = 20 \Rightarrow x/4 = 24 \Rightarrow x = 96$
15. (C) $\frac{(x+2)^2 + (x+2)^2}{2} = \frac{2(x^2 + 4)}{2} = x^2 + 4$

16. (B) Larger number is $\frac{3}{2}$ times the smaller number means if the larger number is 3, smaller one is 2. i.e. the difference is $(3 - 2) = 1$
Therefore, when the difference is 1, smaller number is 2
 \therefore when the difference is 13, smaller number is $\frac{2 \times 13}{1} = 26$
17. (C) Back calculation করলে দেখবেন 7 দিয়ে 10 কে ভাগ করলে $(7 - 4) = 3$ ভাগফল থাকে।
18. (D) Sunday এর 8 hours এর জন্য পাবে = $8 \times (8.5 \times 2) = 8 \times 17 = 136$
বাকি $(40 - 8) = 32$ hours এর জন্য পাবে = $32 \times 8.5 = 272$
অর্থাৎ, মোট পাবে = $\$ (136 + 272) = \408
19. (D) $\frac{1}{x} + \frac{5}{y} = \frac{4}{3} \Rightarrow \frac{1}{3y} + \frac{5}{y} = \frac{4}{3} \Rightarrow \frac{16}{3y} = \frac{4}{3} \Rightarrow \frac{4}{y} = 1 \Rightarrow y = 4$
20. (C) $\frac{x}{y} = 2 \Rightarrow \frac{(x-y)}{x} = \frac{(2-1)}{2} = \frac{1}{2}$ (rule of subtraction)
21. (D) $\frac{(m^2 + m - 3)}{3} = 1 \Rightarrow m^2 + m - 6 = 0 \Rightarrow m^2 + 3m - 2m - 6 = 0 \Rightarrow (m+3)(m-2) = 0$
 $m = 2, -3$
22. (E) $\frac{x}{y+1} = \frac{2}{5}$
 $\Rightarrow y = \frac{5x}{2} - 1$
23. (A) $x \times \frac{3}{4} = 9$
 $\therefore x = 12$
the number is $12 \times \frac{5}{6} = 10$
24. (A) $n - \frac{n}{6} + 5 = 65$
 $\Rightarrow 6n - n = 60 \times 6$
 $\therefore n = 72$
25. (B) Total income = $5x$
Total cost = $12y$
Savings = Tk $(5x - 12y)$
Ans: (B) Tk. $(5x - 12y)$
26. (D) মনে করি reserved ticket এর সংখ্যা x , তাহলে general seat = $500 - x$, সুতরাং $40x + 30(500 - x) = 17600$, $10x = 2600$, $x = 260$.
27. (E) মনে করি, number = x তাহলে $\frac{1}{3}(13+x) = 2x + 1$, $13+x = 6x + 3$, $5x = 10$, $x = 2$
28. (A) মনে করি, বড় number x তাহলে ছোট number $x-20$, প্রশ্ন অনুযায়ী, $\frac{2}{3}(x-20) = \frac{1}{4}x$,
 $x = 32$.
29. (D) $x^2 + 3x + 10 = 1 + x^2 \Rightarrow 3x = -9 \Rightarrow x = -3 \therefore x^2 = 9$

30. (A) ধরি, number of boundaries = x ; $\therefore 4x + 6(21 - x) = 96$; $\Rightarrow 4x + 126 - 6x = 96 \Rightarrow x = 15$.

31. (D) say, one number = x and another number = y $\therefore 5x = 22 + 4y \dots (1)$ and $3x + 7y = 32 \dots \dots \dots (2)$ $\therefore (1) \times 3 - (2) \times 5$ gives, $-35y = 66 + 12y - 160 \Rightarrow -47y = -94 \therefore y = 2$

32. (C) $\frac{5}{x} = 3 \Rightarrow x = \frac{5}{3}$ এবং $\frac{y}{6} = 2 \therefore y = 12$
 $\therefore \frac{(3+y)}{(x+5)} = \frac{(3+12)}{(\frac{5}{3}+5)} = \frac{15}{20} = 15 \times \frac{3}{20} = \frac{9}{4}$

33. (B) ধরি, x টি chocolates কিনেছিল।
 \therefore প্রতিটির দাম = $\frac{120}{x}$ টাকা। ২য় দোকান থেকে সে একই দামে কিনতে পারত $(x + 2)$ টি chocolates একত্রে

প্রতিটির দাম = $(\frac{120}{x} - 3)$ টাকা।

প্রশ্নমতে, $(x+2)(\frac{120}{x} - 3) = 120 \Rightarrow x = 8$ বা, $x = -10$ negative হওয়া সম্ভব নয়।

34. (A) $\frac{3y}{x} - \frac{x}{y} = \frac{3y^2 - x^2}{xy} = \frac{2y^2 + y^2 - x^2}{yx} = \frac{2y^2 + (y+x)(y-x)}{xy}$

(A) $\frac{2y^2 + (y-x)(y+x)}{xy} = \frac{2y^2 + (y^2 + xy - xy - x^2)}{xy} = \frac{3y^2 - x^2}{xy}$

35. (C) করিম দিনে বিক্রি করে 12 dozen; সুতরাং 1 সপ্তাহে বিক্রি করে $(7 \times 12) = 84$ dozen;
 মোট sales 4200 টাকা হলে 1 dozen এর দাম = $\frac{4200}{84} = 50$ টাকা।

\therefore আরিফ এর বিক্রয়মূল্য = (50×1.5) টাকা/ dozen = 75 টাকা

\therefore সপ্তাহে মোট sales = $75 \times 10 \times 7 = 5250$ টাকা.

36. (B) ধরি, smaller number = x

\therefore larger number = $\frac{3x}{2}$

প্রশ্নমতে, $\frac{3x}{2} = x + 13 \Rightarrow 3x = 2x + 26 \Rightarrow x = 26$ ।

37. (B) $(x + y) - (x - y) = 6$

$\Rightarrow x + y - x + y = 6$

$\Rightarrow 2y = 6$

$\Rightarrow y = 3$

Again, $xy = 15$

$\Rightarrow x = 15/3 = 5$

38. (C) প্রথমটির জন্য 75 টাকা, দ্বিতীয়টির জন্য 75 টাকা; কিন্তু তৃতীয়টির জন্য 100 টাকা
 \therefore মোট service charge = $75 + 75 + 100 = 250$ টাকা।

39. (B) মোট women = $400 \times \frac{30}{100} = 120$ জন।

অর্থাৎ, women instructors = $120 \times \frac{1}{5} = 24$ জন।

অতএব, men instructors = $24 \times 2 = 48$ জন।

40. (A) $x + xy + (x + xy)y = x + xy + xy + xy^2 = x + 2xy + xy^2 = x(1 + 2y + y^2) = x(1 + y)^2$

41. (C) যেহেতু smallest possible number of coins জানতে চাওয়া হয়েছে, কম সংখ্যক coins বেশি pocket এ দিতে হবে। তাই আমরা 3টি pocket এ 1টি করে coin দিব। বাকিগুলোতে যথাক্রমে 2, 3, 4 এবং 5 টি coins থাকবে।
 So, total number of coins = $1 + 1 + 1 + 2 + 3 + 4 + 5 = 17$

42. (C) মনে করি, পরবর্তীতে hardback copies বিক্রয় হয়েছে = x টি।

অতএব, paperback copies বিক্রয় হয়েছে = $9x$ টি

প্রশ্নমতে, $36,000 + x + 9x = 441,000$

$\Rightarrow 10x = 405,000 \Rightarrow x = 40,500$

$\Rightarrow 9x = 364,500$

43. (B) Per month rent করলে 1 year এ rent হয় = $300 \times 12 = 3600$

Per week rent করলে 1 year এ rent হয় = $100 \times 52 = 5200$

So, savings = $5200 - 3600 = 1600$

44. (B) Here, $B + F = 39.50$(i)

$B + S = 44.00$(ii)

As, $S = 2F$

We get, $B + 2F = 44.00$(iii)

From (i) and (iii), we get,

$F = 4.50$

45. (A) Total sales from lower level seats = $10x$ and that from balcony seats = $6y$.

According to the question, $x = 3y$. Therefore,

Total sales (in dollar) = $10x + 6y = 10x + 2x = 12x$

46. (B) Let us assume that the tens place is 'a'. Therefore, the number is $(10a + 3)$.

According to the question, $7(a+3) = 10a+3$. Therefore, $a = 6$

47. (B) এখানে, number দুটির difference হবে 4 (কেননা half the difference হচ্ছে 2), তাই একটি number x হলে, বড় number টি হবে $x + 4$.

$x + 4 + 2x = 13 \Rightarrow 3x = 13 - 4 \Rightarrow 3x = 3 \Rightarrow x = 3$

\therefore smaller number টি হচ্ছে 3;

48. (E) $y\%$ of $x = 29$ এখন $\frac{xy}{100} = 29$, so $x = \frac{2900}{y}$

49. (D) $2x + y = 4$
 $2x - y = 8$
 $\therefore 4x = 12$ (যোগ করে)
 $\Rightarrow x = 3$
 $\therefore 2 \times 3 + y = 4$ (মান বসিয়ে)
 $\Rightarrow y = -2$
 $\therefore 3x - y = 3 \times 3 - (-2) = 9 + 2 = 11$

50. (C) মনেকরি, Anwar এর আছে a টাকা
 Bobby " " b টাকা

$a + 2 = b - 2$
 $\Rightarrow a - b = -4$ (i)
 আবার, $b + 2 = 3(a - 2)$
 $\Rightarrow b + 2 = 3a - 6$
 $\Rightarrow 3a - b = 8$ (ii)

(ii) - (i) $\Rightarrow 2a = 12 \therefore a = 6$
 আবার, (i) এর মান বসিয়ে পাই, $b = 10$

51. (D) মনেকরি, ১ম piece টি x meter
 ২য় piece টি 2x meter
 ৩য় piece টি 4x meter

এখন, $4x = 3 \Rightarrow x = \frac{3}{4}$

\therefore rope টির length = $x + 2x + 4x = 7x = 7 \times \frac{3}{4} = \frac{21}{4} = 5.25$ meter.

52. (D) প্রশ্নমতে, $500x = 9000 + 400x$
 $\Rightarrow 100x = 9000 \Rightarrow x = 90$

53. (D) মনেকরি, 3 books নেয় x জন
 2 books নেয় (20-x) জন $\therefore 3x + 2(20 - x) = 52 \Rightarrow 3x + 40 - 2x = 52$
 $\Rightarrow x = 12$ অর্থাৎ, Answer D

অথবা

Elimination method এ করা যায়।

যেমন: 8 জন 3 books করে নিলে, 12 জন 2 books করে নিবে।

$\therefore 8 \times 3 + 12 \times 2 = 24 + 24 = 48$ (বাদ)

এখানে, option D তে, 12 জন 3 books করে নিলে, 8 জন 2 books করে নিবে।

$\therefore 12 \times 3 + 8 \times 2 = 36 + 16 = 52$ (match করে)

54. (A) $x + xy + (x + xy) y$
 $= x + xy + xy + xy^2 = x + 2xy + xy^2 = x(1 + 2y + y^2) = x(1+y)^2$

55. (C) $X + 7 < 120$
 $\left. \begin{array}{l} X + 7 < 120 \\ X + 9 > 120 \end{array} \right\} X \text{ is a whole number}$

$X + 9 > 120$

অতএব, $x < 113$, এবং $x > 111 \Rightarrow x$ এর একটি value ই হওয়া সম্ভব, 112.

56. (D) $2(a^2 + b^2) = (a + b)^2 - (a - b)^2 = (\sqrt{5})^2 + (\sqrt{3})^2 = 5 + 3$
 $\Rightarrow (a^2 + b^2) = 8/2 = 4$

57. (E) $M = 30(3/4)L$; $\therefore L = 40$; $\therefore O = L + 10 = 50$; Total cost = $30 + 40 + 50 = 120$

58. (E) এখানে শুধু x ও y এর ratio দেয়া আছে কিন্তু আর কোন তথ্য নেই। কাজেই $(y - x)$ সম্পর্কে নির্দিষ্ট করে কোন option choose করা যাচ্ছেনা।
59. (D) $y = 9x + 13$. If $x = 9$, $y = 94$
If $x = 10$, $y = 103$
So, 9 is the highest value of x for which y is less than 100
60. (A) লোকটা maximum $\frac{81}{7} = 11$ টা pen কিনতে পারে। কিন্তু, তখন বাকী থাকে $81 - 7 \times 11 = 4$ টাকা, যেটা দিয়ে একটা pencil কেনার পরও কিছু টাকা বাকী থেকে যায়। অথচ exactly 81 টাকাই খরচ করা হয়েছে। \therefore correct উত্তর হবে সেই সংখ্যক pen, যেগুলোর মলা 81 থেকে বাদ দেওয়ার পর অবশিষ্টটা 3 দিয়ে বিভাজ্য হয়। একটু চিন্তা করলেই দেখা যায়, 9 টা pen এর দাম $7 \times 9 = 63$ কে 81 থেকে বাদ দিলে থাকে $81 - 63 = 18$, যেটা 3 দিয়ে বিভাজ্য ($18/3 = 6$ টা pencil) \therefore pen : pencil = $9 : 6 = 3 : 2$
61. (B) মনে করি, cheaper tickets পেল x জন, $\therefore 5(100-x) + 3.5x = 410 \Rightarrow 500 - 5x + 3.5x = 410 \Rightarrow 1.5x = 90 \Rightarrow x = 60$
62. (B) $(1 + 2)(2 + 3)(3 + 4) = \frac{20 + x}{2} \Rightarrow 105 \times 2 = 20 + x \Rightarrow 210 - 20 = x \Rightarrow x = 190$
63. (E) $x = 3 = (1/6) \times 18 = 18y$
64. (E) প্রথম 7 month এ দিল = $7K$ টাকা
পরবর্তী প্রতি মাসের rent $\frac{K}{2}$ টাকা এবং মোট মাসের সংখ্যা N যা 7 এর থেকে বেশী
অর্থাৎ বাকী মাস = $N - 7 \Rightarrow \therefore$ rent $\frac{K}{2}(N - 7)$
অতএব, total charge = $7K + \frac{K}{2}(N - 7)$.
65. (C) $1/7$ the diameter of the circle = $1/7$ of $d = d/7$ এটাকে subtract করতে হবে diameter থেকে।
অতএব, পাওয়া যায় $d - \frac{d}{7}$ square করলে হয় $(d - d/7)^2$
66. (E) $3A + 4O = 32$ ----- (1); $4A + 3O = 31$ --- (2)
(2) - (1) gives, $A - O = -1 \Rightarrow A = O - 1$; \therefore (i) gives, $3(O - 1) + 4O = 32; \Rightarrow 7O = 35; \therefore O = 5; \therefore A = 5 - 1 = 4$; এখন, $A + O + P = 28 \Rightarrow P = 28 - 5 - 4 = 19$
67. (A)
68. (C) $4x^2 + 12xy + 9y^2 = (2x)^2 + 2.2x.3y + (3y)^2 = (2x + 3y)^2$. এখন, D থেকে $(2x + 3y) = 2$ বসালে answer পাওয়া যায়।
69. (E) সুগারের পরিমাণ = $(3/2) \times$ (quantity of fruits) \Rightarrow quantity of fruits = $2s/3$, flour পরিমাণ = $2s$. $\therefore s + 2s/3 + 2s = 750 \Rightarrow 3s + 6s + 2s = 2250 \Rightarrow 11s = 2250 \Rightarrow s = 2250/11 = 204.5$
70. (D) মনে করি pen এর price = x ; pencil এর price = y ; $\therefore \frac{x}{4} + \frac{y}{3} = 11$,
আবার, $\frac{x}{8} = \frac{y}{5} \therefore x = \frac{8y}{5}$
 $\therefore \frac{8y}{5 \times 4} + \frac{y}{3} = 11 \Rightarrow \frac{24y + 20y}{60} = 11 \Rightarrow 44y = 660 \Rightarrow y = \frac{660}{44} = 15;$
 $\therefore x = \frac{8 \times 15}{5} = 24$

71. (C) মনে করি, people এর সংখ্যা = x এবং money = m; $\therefore \frac{m}{x+4} = \frac{m}{x} - 16 \dots\dots (i)$

$$\therefore m \left(\frac{1}{x} - \frac{1}{x+4} \right) = 16 \Rightarrow m \frac{4}{x^2 + 4x} = 16m = 4x^2 + 16x \text{ এবং } \frac{m}{x-4} = \frac{m}{x} + 24$$

$$\Rightarrow \frac{m}{x-4} = \frac{m}{x} = 24 \Rightarrow \frac{x-x+4}{x(x+4)} = 24 \Rightarrow m = \frac{24(x^2 - 4x)}{4}$$

$$= 4x^2 + 16x = 6x^2 - 24x \Rightarrow 2x^2 - 40x = 0 \Rightarrow x - 20 = 0 \Rightarrow x = 20$$

72. (B) মনে করি, প্রতি problem এ x minute লাগবে। $\therefore 50x + 150 \times \frac{x}{2} = 180 \Rightarrow \frac{180}{125} = \frac{36}{25}$

$$\therefore 50x = \frac{36}{25} \times 50 = 72 \text{ minutes}$$

73. (E) $(x - y)^2 = 12; \Rightarrow x^2 + y^2 = 12 + 2xy = 12 + 2 \times 1 = 14$

74. (B) No. of adults = $(240/2) + 10 = 130$ (As, no. of adults is 20 more than that of children)

$$\therefore \text{No. of men} = (130/2) + 10 = 75 \text{ (As, no. of men is 20 more than that of women).}$$

75. (B) Pen এর পর্ব সংখ্যা x হলে

$$\frac{120}{x} - 3 = \frac{120}{x+2} \quad \text{বা, } \frac{120-3x}{x} = \frac{120}{x+2} \Rightarrow (120-3x)(x+2) = 120$$

$$\Rightarrow 120x - 3x^2 + 240 - 6x = 120x \Rightarrow 3x^2 + 6x - 240 = 4 \Rightarrow x^2 + 2x - 80 = 0 \Rightarrow (x+10)(x-8) = 0$$

$$\therefore x = -10 \text{ or } 8. \quad x = 8; \text{ Back calculation করলে easily solve করা যাবে।}$$

76. (E) Let, larger basket contains x

$$\therefore \text{smaller basket contains } (80 - x)$$

$$\text{Given, } 6x = 10(80 - x) + 16 \Rightarrow 6x - 800 + 10x - 16 = 0 \Rightarrow 16x = 816 \therefore x = 51$$

$$\therefore \text{smaller basket contains } 29$$

77. (D) $7 \text{ Mn} = 10 \text{ Ap} + 1 \text{ Or} \dots\dots\dots (i)$ $7 \text{ Or} = 1 \text{ Mn} + 2 \text{ Ap} \dots\dots\dots (ii)$

$$\therefore 7(7\text{Mn} - 10\text{Ap}) = 1\text{Mn} + 2\text{Ap}$$

$$\therefore 49\text{Mn} - 70\text{Ap} = 1\text{Mn} + 2\text{Ap}$$

$$\text{or, } 48\text{Mn} = 72\text{Ap} \quad \therefore 12\text{Mn} = \frac{72}{48} \times 12\text{Ap} = 18\text{Ap}$$

78. (D) per day per patient earning of Mr. Y = $\frac{72000}{30 \times 16}$

$$\text{per day per patient earning of Mr. X} = \frac{72000}{30 \times 16} \times \frac{3}{2}$$

$$\therefore \text{per day patient earning of Mr. X} = \frac{72000}{30 \times 16} \times \frac{3}{2} \times 12$$

$$\text{per month patient earning of Mr. X} = \frac{72000}{30 \times 16} \times \frac{3}{2} \times 12 \times 30$$

$$= 81000$$

79. (C) 10% of $y/3$ means $\frac{10}{100} \times \frac{y}{3} = \frac{y}{30}$

$$\frac{2y}{3} = 10\% \text{ of } 600$$

$$\frac{2y}{3} = 60 \quad \text{or, } \frac{y}{3} = 30 \quad \text{or, } \frac{y}{30} = 3$$

80. (B) Total maintenance cost = 7m Taka

$$\text{Total production cost} = m \text{ Paisa} = \frac{m}{100} \text{ Taka}$$

$$\text{Total cost} = 7m + \frac{m}{100} \text{ Taka} = \frac{700m + m}{100} \quad \text{Answer: B}$$

81. (D) Total amount of Taka = 120

$$\text{Total no. of notes} = 30$$

$$\text{Suppose, no. of 5 Tk. Notes} = x$$

$$\therefore \text{no. of 2 Tk. Notes} = 30 - x$$

Therefore,

$$5x + 2(30 - x) = 120 \quad 5x + 60 - 2x = 120 \quad 3x = 60$$

$$\therefore x = 20.$$

82. (A) Let, weight of Anwar = x

\therefore According to the problem

$$x = \frac{x}{5} + (x - 10) \text{ or, } \frac{x}{5} = 10 \quad \text{or, } x = 50.$$

83. (A) $\frac{a}{x} + \frac{x}{a} = \frac{x}{b} + \frac{b}{x}$ or, $\frac{a}{x} - \frac{b}{x} = \frac{x}{b} - \frac{x}{a}$ or, $\frac{a-b}{x} = \frac{x(a-b)}{ab}$

$$\text{or, } ab(a-b) = x^2(a-b) \quad \text{or, } x^2 = ab \quad \text{or, } x = \pm \sqrt{ab}$$

84. (D) $\frac{y}{x+1} = 4 \Rightarrow y = 4x + 4$

$$\text{আবার, } \frac{4x+3}{y+2} = 1.5 \Rightarrow \frac{4x+4-1}{y+2} = 1.5$$

$$\Rightarrow \frac{y-1}{y+2} = 1.5 \Rightarrow y-1 = 1.5y+3 \quad \Rightarrow .5y = -4 \rightarrow y = -8$$

$$\therefore -8 = 4x + 4 \Rightarrow 4x = -12 \Rightarrow x = -3$$

85. (A) y টাকায় পাওয়া যায় x টি বই

$$\therefore 1 \text{ টাকায় পাওয়া যায় } \frac{x}{y} \text{ টি বই } \therefore m \text{ টাকায় পাওয়া যায় } \frac{mx}{y} \text{ টি বই}$$

86. (B) সব চকলেট সমানভাবে ভাগ করলে প্রত্যেকে 3 টি করে পেল।
অর্থাৎ, মোট চকলেটের সংখ্যা 3 দিয়ে বিভাজ্য।

ধরি, চকলেটের সংখ্যা x বাচচার জন্য $= \frac{x}{3}$

প্রশ্নমতে, $\left(\frac{x}{3} + 3\right)2 = x + 1$

$\rightarrow \frac{2x}{3} - x = 1 - 6 \rightarrow \frac{-x}{3} = -5 \rightarrow x = 15$

87. (D) ধরি, per unit cost = x টাকা

\therefore মোট cost = $48x$ টাকা

8 টি ভেঙ্গে যাওয়ায় মোট light = 40 টি এখন, per unit cost = $(x + 24)$ টাকা

প্রশ্নমতে, $48x = 40(x + 24) \Rightarrow 48x - 40x = 960 \Rightarrow x = 120$

Answer: D

88. (E) প্রশ্নমতে $2 \times 3 \times (x+5) = \frac{68+x}{2}$

অর্থাৎ, $x = \frac{8}{11}$.

89. (C) Total rent paid = $2100 \times 3 = 6300$

Payment for one person is 3900. \therefore Other 2 person pays $(6300 - 3900) = 2400$.

\therefore Payment per additional person is $2400/2 = 1200$.

90. (A) $a^2 = x^2 + 2xy + y^2 \Rightarrow 2xy = a^2 - x^2 - y^2$

$b^2 = x^2 - 2xy + y^2 \Rightarrow x^2 + y^2 - b^2$

(+) করে $4xy = a^2 - b^2 \Rightarrow 2xy = \frac{a^2 - b^2}{2}$

91. (A) Back calculation করলে দেখা যায়, $83 - 38 = 45$

92. (B) $M = 2(F - 2)$ ----- (i)

$M - 9 = \frac{1}{2}(F - 2)$

$\Rightarrow 2M = F + 16$ ----- (ii)

(ii) - (i) $\times 2 \Rightarrow$

$0 = -3F + 24$

$\therefore F = 8$.

93. (C) প্রথমে, per student cost = $\frac{y}{m}$

পরে, per student cost = $\frac{y}{m-z}$

\therefore Excess payment = $\frac{y}{m-y} - \frac{y}{m}$ Ans: (C) $\frac{y}{m-z} - \frac{y}{m}$

94. (B) $7230 = 1000 + (8000-1000)X \Rightarrow 6230 = 7000X \therefore X = \frac{6230}{7000} = 0.89$
95. (A) $(x+y)^2 = (x-y)^2 + 4xy = 1^2 + 4 \cdot 2 = 9 \Rightarrow x+y = +3 \therefore (x+y) + (x-y) = 3+1 \Rightarrow x=2$
 $\therefore y=1; \therefore x^3 - y^3 = 2^3 - 1^3 = 8 - 1 = 7$
96. (E) $1 + \frac{1}{x} = \frac{x+1}{x} \Rightarrow \frac{x+1}{x} = \frac{x+1}{x} \Rightarrow 1=1$ s

এখন, x কাটাকাটি চলে যাওয়াতে x এর যে কোন মানের জন্যই $1 + \frac{1}{x} = \frac{x+1}{x}$ সত্য। কিন্তু, x denominator হর হিসেবে থাকতে x এর মান শূন্য হতে পারবে না। $\therefore x \neq 0, \therefore$ (E) উত্তর।

97. (D) ধরি, rear circle seat এর price = x টাকা

\therefore front circle seat এর price = $\frac{x}{3}$ টাকা

প্রশ্নমতে, $600x + \frac{450x}{3} = 4500 \Rightarrow 1800x + 450x = 13500 \Rightarrow 2250x = 13,500$

$\Rightarrow x = \frac{13,500}{2250} \Rightarrow x = 6$

98. (B) 356 সংখ্যাটি 5 জনের মধ্যে সমান ভাগে ভাগ করে দেয়া যায়না। $356 - 1 = 355 \div 5 = 71$ অর্থাৎ, বাকি চারজনকে 71 ভোট দিলে winner কে দেয়া যায় $71 + 1 = 72$ টি ভোট। ন্যূনতম 72 ভোট পেলেই অন্য সবার চেয়ে বেশি ভোট পাওয়া সম্ভব।

99. (A) Arif, Sharif কে দিল x টি stamp Arif, Babu কে দিল $(x+1)$ টি stamp

Arif, Asif কে দিল $\{(x+1) - 2\}$ টি stamp = $(x-1)$ টি stamp

মোট stamp = $x + x + 1 + x - 1 = 3x$ টি

100. (A) ধরি, মোট chocolate = x টি

প্রথমে Arif নিল = $\frac{x}{3}$ টি \therefore বাকি রইল = $x - \frac{x}{3} = \frac{2x}{3}$ টি

4 টি সমান ভাগে ভাগ করলে প্রতি ভাগ = $\frac{2x}{3} \times \frac{1}{4} = \frac{x}{6}$ টি

আরিফ মোট পেল = $\frac{x}{3} \times \frac{x}{6} = \frac{3x}{6} = \frac{x}{2}$ টি

প্রশ্নমতে, $\frac{x}{2} = 48 \therefore x = 96$ অর্থাৎ, প্রতিব্যক sister পেল $\frac{96}{6} = 16$ টি chocolate.

101. (C) কলমের দাম পেন্সিলের দামের দ্বিগুণ;

x pens এর দাম y টাকা; 1 টির দাম $\frac{y}{x}$ টাকা; অর্থাৎ, 1 টি পেন্সিলের দাম $\frac{y}{2x}$ টাকা

$\frac{y}{2x}$ টাকায় পাওয়া যায় 1 টি পেন্সিল

$\therefore (x+y)$ টাকায় পাওয়া যায় $\frac{x+y}{\frac{y}{2x}}$ টি পেন্সিল

$= (x+y) \times \frac{2x}{y} = \frac{2x^2 + 2xy}{y} = \frac{(x^2 + xy)}{0.5y}$ (2 দিয়ে ভাগ করে)

102. (C) যেহেতু প্রত্যেক 10 মাইল পর 1 মাইল বাড়ে so total 1251 মাইলে 1 কে বাদ ধরে হয় 1250
 এখন 1250 মাইলে 1250 মাইলে $\frac{1250}{10} = 125$ মাইল অতিরিক্ত হয়
 Total distance হয় $1251 + 125 = 1376$ মাইল।
103. (B) Confusion create করার জন্য adult আর children এর information টি দেয়া হয়েছে 20 জন men কে
 separate করলে 220 জন (240 - 20) ছেলে মেয়ে সমান. \therefore male হবে $110 + 20 = 130$ জন।
104. (E) 4 rolls + 6 samochas + 3 loaves = 91 ----- (1)
 2 rolls + 3 samochas + loaf = 39 ----- (II)
 (II) $\times 2 = 4$ rolls + 6 samochas + 2 loaves = 78 ----- (III)
 (I) - (III) \Rightarrow 1 loaf = 13
105. (D) ধরি, Jasim's meal = 100 টাকা
 \therefore Khalil's meal = 150 টাকা
 এবং Maruf's meal = $150 \times \frac{5}{6} = 125$ টাকা
 \therefore মোট খরচ = $100 + 150 + 125 = 375$ টাকা
 Jasim এর খরচ 100 টাকা হলে মোট বিল = 375 টাকা
 \therefore Jasim এর খরচ 1000 টাকা হলে মোট বিল = 3750 টাকা
106. (A) Tk.15 dividend আসে 12 টি share এ। অতএব, Tk.160 dividend আছে = $(12 \times 160) \div 15$, or,
 128 টি share এ।
107. (C) মনে করি, Cost = x. অতএব, Ali's amount = $(x/3) - 2$. Leena's amount = $(x/4) + 2$.
 According to the question,
 $(x/3) - 2 + (x/4) + 2 + 15 = x$
 $\Rightarrow x = 36$
108. (A) মনেকরি, male students x
 female " (400-x)
 15% of x + 20% of (400 - x) = 72
 $\Rightarrow \frac{15x}{100} + \frac{20(400-x)}{100} = 72$
 $\Rightarrow 15x - 20x + 8000 = 7200$
 $\Rightarrow 5x = 800 \therefore x = 160$ অর্থাৎ, Answer A.
- অথবা
 elimination মেথডে করা যায়। option A তে,
 160 male, A পায় $160 \times \frac{15}{100} = 24$
 240 female, A পায় $240 \times \frac{20}{100} = 48$
 A পায় = $24 + 48 = 72$ জন অর্থাৎ, match করে \therefore Answer A.

109. (A) মনেকরি, Faruk has f merbles
Sanwar has s merbles

$$\therefore f = s + x$$

আবার, $f + s = y$ [f বসিয়ে]

$$\Rightarrow s + x + s = y \Rightarrow 2s + x = y$$

$$\Rightarrow x = \frac{y - x}{2}$$

110. (B) মনেকরি, marble আছে, x টি
Capacity = $x + 100$

$$\text{এখন, } x - \frac{x}{4} = \frac{1}{2}(x + 100)$$

$$\Rightarrow \frac{3x}{4} = \frac{x+100}{2} \Rightarrow 6x = 4x + 400 \Rightarrow 2x = 400 \Rightarrow x = 200$$

111. (D) Jasmin দিয়েছে 1000 Tk.; অর্থাৎ Khairul দিয়েছে $1000 + (1000 \text{ এর } 50\%) = 1500$ Tk.
এবং Monwar দিয়েছে $(1500 \times \frac{5}{6})$ Tk. = 1250 Tk.

$$\text{অর্থাৎ Total amount} = (1000 + 1500 + 1250) \text{ Tk.} = 3750$$

112. (C) $19x = 114 \Rightarrow x = 6$

$$\text{অতএব, } 5x + 3 = 5 \times 6 + 3 = 33$$

113. (A) $\frac{1-5x^2}{x^2}$ এর highest value বের করতে হলে x এর এমন একটা value হবে যাতে x fraction হয়। কিন্তু তখন fraction দ্বারা fraction ভাগ হলে ভাগফল আরো বড় হবে। এখন, উত্তরে শুধু দুটো মান ভগ্নাংশ দেয়া আছে: $1/3$ এবং $1/2$ । ভগ্নাংশটা যত ছোট হবে, ভাগফলটা তত বড় হয়। অতএব, $x = 1/3$ ।

114. (C) মনে করি, boundaries এর সংখ্যা = $x \therefore$ over boundaries এর সংখ্যা = $x/2$

$$\therefore 4x + \frac{6x}{2} + (40 - 6 - x - \frac{x}{2}) \times 1 = 100 \Rightarrow 7x + 34 - \frac{3x}{2} = 100$$

$$\Rightarrow \frac{11}{2}x = 66 \therefore x = 12$$

115. (E)

116. (E) female students আর male students দের সংখ্যা কিংবা ratio বা অন্য কোন relation ছাড়া এটা solve করা যাবে না।

117. (E) $x + x^2 - 1 = x^2 + x - 1$;

$$x = \frac{-1 \pm \sqrt{1 - 4 \cdot 1 \cdot (-1)}}{2 \cdot 1} = \frac{-1 \pm \sqrt{5}}{2}$$

118. (B) $xy = 4 \dots$ (I), $yz = 9 \dots$ (II) এবং $zx = 25 \dots$ (III)

(II) + (III) করে পাই, $\frac{y}{x} = \frac{9}{25} \dots$ (iv)

(I) থেকে পাই, $x = \frac{4}{y}$

x এর মান (iv) এ স্থাপন করি,

$$\frac{y}{\frac{4}{y}} = \frac{9}{25} \text{ or, } \frac{y^2}{4} = \frac{9}{25} \text{ or, } y^2 = \frac{36}{25} \text{ or, } y = \pm \frac{6}{5}$$

কিন্তু $x > 0 = \therefore y > 0 \therefore y = \frac{6}{5}$

119. (D) $\left(x + \frac{1}{x}\right)^2 = 3$ or $x + \frac{1}{x} = \sqrt{3}$

$$\therefore x^3 + \frac{1}{x^3} = \left(x + \frac{1}{x}\right)^3 - 3x \cdot \frac{1}{x} \left(x + \frac{1}{x}\right)$$

$$= (\sqrt{3})^3 - 3(\sqrt{3}) = 3\sqrt{3} - 3\sqrt{3} = 0$$

120. (D) দেয়া আছে, $x + \frac{1}{x} = 2 \Rightarrow \frac{x^2 + 1}{x} = 2 \Rightarrow x^2 + 1 = 2x$

$$\Rightarrow x^2 - 2x + 1 = 0 \Rightarrow (x - 1)^2 = 0 \rightarrow x - 1 = 0$$

$$\therefore x = 1$$

অতএব, $\frac{x}{(x^2 + x - 1)} = \frac{1}{(1 + 1 - 1)} = \frac{1}{1} = 1$

121. (E) ধরি larger piece এর দৈর্ঘ্য = y feet. \therefore smaller piece এর দৈর্ঘ্য = $\frac{y-1}{2}$ feet

এখন, $y + \frac{y-1}{2} = x \Rightarrow \frac{3y-1}{2} = x \Rightarrow 3y-1 = 2x \Rightarrow y = \frac{2x+1}{3}$

122. (E) w, x এর value -3 এবং -4 এর যে কোনটি ধরলে positive গুণফল পাওয়া যাবে এবং y এর value $\frac{1}{2}$ ধরলে

পুরো expression কে 2 দিয়ে গুণ করা যাবে।

$$\text{অর্থাৎ সর্বোচ্চ} = \left\{ \frac{(-3)(-4)}{\frac{1}{2}} \right\} 2^2$$

$$12 \times 2 \times 4 = 96$$

123. (D) 1ম expression এ x এর value 10 এবং 9 এর মধ্যে; অর্থাৎ x integer নয়। অর্থাৎ x^2 এর value 81 থেকে

বড় এবং 100 এর থেকে ছোট যেকোন number.

২য় Expression এ $x^2 = (10-y)(10+y) = 100 + 10y - 10y - y^2 = 100 - y^2$

$\Rightarrow y^2 = 100 - x^2$ (অর্থাৎ, y^2 এর value $100 - 81 = 19$ থেকে ছোট এবং $100 - 100 = 0$ থেকে বড়) অতএব, y এর value 3 বা 4 দুটোই হতে পারে। সুতরাং, এই প্রশ্নের দুটি answer হতে পারে (C) এবং (D).

124. (D) প্রথমতে, $7mn = 10ap + 1$ or
 $\Rightarrow 49mn = 70ap + 7$ or (উভয়পক্ষে 7 দিয়ে গুণ করে)
 $\Rightarrow 49mn = 70ap + (1mn + 2ap)$ [কলা আছে, $7or = 1mn + 2ap$]
 $\Rightarrow 48mn = 72ap \Rightarrow 12mn = 18ap$ [উভয়পক্ষে 4 দিয়ে ভাগ করে]
125. (D) $\frac{a-b}{c} = 1$
 $\Rightarrow 1 - b = c$
 $\Rightarrow c = 1 - b \neq 0$; (কারণ $c = 0$ হলে denominator 0 হয়ে যায়, যা অসম্ভব)
126. (B) এখানে, 60 জন থেকে x জন নেমে যায় এবং 8 জন ওঠে
 সূত্রাং first stoppage এ $(60 - x + 8)$
 বা, $68 - x$ জন থাকে।
 এখন $(68 - x)$ জন থেকে $\frac{1}{3}$ নেমে যায়
 অর্থাৎ, এর $\frac{2}{3}$ বাসে রয়ে যায় এবং আরও 5 জন বাসে ওঠে

$$\frac{2}{3}(68 - x) + 5 = 37$$

$$\Rightarrow \frac{2}{3}(68 - x) = 32$$

$$\Rightarrow 68 - x = 48$$

$$\therefore x = 20$$
127. (E) If $t = 8$
 $t - 2t - 3t = -4t = -4 \times 8 = -32$.
128. (B) ধরি, 8 taka per dozen এ কেনা হয় x টা কলা
 \therefore 10 taka per dozen এ কেনা হয় x টা কলা
 Total cost = $8x + 10x = 18x$
 Total no of bananas = $2x$
 \therefore Total selling price = $11 \times 2x = 22x$
 Profit = $22x - 18x = 4x$
 এখন, $4x = 100 \therefore 2x = 50$
129. (C) মনে করি, math এর 1টি problem এর জন্য ব্যয় হয় = x মিনিট।
 \therefore 50 টি math solve করতে লাগবে = $50x$ মিনিট। প্রথমতে, বাকি problem গুলোর 1টি solve করতে ব্যয় হয় =
 $\frac{x}{2}$ মিনিট। math ছাড়া বাকী $(200 - 50) = 150$ টির জন্য লাগবে = $\frac{150x}{2}$ মিনিট।
 এখন, $50x + \frac{150x}{2} = 3 \times 60 \Rightarrow 250x = 360 \Rightarrow x = \frac{36}{25} \therefore$ Math এ মোট সময় লাগবে = $\frac{36}{25} \times 50$
 $= 72$ মিনিট।

130. (C) $\frac{1}{x^2} - \frac{1}{y^2} = 21 \Rightarrow \left(\frac{1}{x} + \frac{1}{y}\right) \left(\frac{1}{x} - \frac{1}{y}\right) = 21$
 $\Rightarrow 7 \left(\frac{1}{x} - \frac{1}{y}\right) = 21 \Rightarrow \left(\frac{1}{x} - \frac{1}{y}\right) = 3$

আবার, $\frac{1}{x} + \frac{1}{y} = 7$ so, $\frac{2}{x} = 10 \Rightarrow x = \frac{1}{5}$

131. (D) 48 gram এর value = 33 cc
 $\therefore 64 \text{ gram এর value} = \frac{33 \times 64}{48} \text{ c.c} = 44 \text{ c.c}$

132. (C) এই math টি Elimination method এ করলে সহজ হয়।
 Option A তে,

1st stoppage এ নামে $\left(20 \times \frac{1}{2}\right) = 10$ জন (বাকি 10)

2nd stoppage এ নামে $\left(20 \times \frac{1}{2}\right) = 5$ জন (বাকি 5)

3rd stoppage এ নামে $\left(5 \times \frac{1}{2}\right) = 2.5$ জন (বাকি 2.5) \therefore এই option বাদ।

এভাবে option C তে আসলে,

1st stoppage এ নামে $\left(8 \times \frac{1}{2}\right) = 4$ জন (বাকি 4)

2nd stoppage এ নামে $\left(4 \times \frac{1}{2}\right) = 2$ জন (বাকি 2)

3rd stoppage এ নামে $\left(2 \times \frac{1}{2}\right) = 1$ জন (বাকি 1) অর্থাৎ, Answer C

অথবা

মনেকরি, শুরুতে ছিল x জন

1st stoppage এ নামে $\left(\frac{x}{2}\right)$ জন (বাকি $x - \frac{x}{2} = \frac{x}{2}$)

2nd stoppage এ নামে $\left(\frac{x}{4}\right)$ জন (বাকি $\frac{x}{2} - \frac{x}{4} = \frac{x}{4}$)

3rd stoppage এ নামে $\left(\frac{x}{8}\right)$ জন (বাকি $\frac{x}{4} - \frac{x}{8} = \frac{x}{8}$)

এখন, $\frac{x}{8} = 1 \Rightarrow x = 8$.

Alternatively, On the third stop the next to last person exits the bus.

So, on the 3rd stop there were 2 people

On the 2nd stop there were $2 \times 2 = 4$ people

On the 1st stop there were $4 \times 2 = 8$ people

133. (C) মনেকরি cost of DVD alone x .
 Cost of a computer without DVD $(x + 19500)$
 Cost of a computer with DVD 29000
 এখন, $x + 19500 + x = 29000$
 $\Rightarrow 2x = 29000 - 19500 \Rightarrow x = \frac{9500}{2} = x = 4750.$
134. (D) x কে 9 দিয়ে ভাগ করলে 5 remainder থাকে, সুতরাং $x+1$ কে 9 দিয়ে ভাগ করলে 6 remainder থাকবে। 6 কে 3 দিয়ে ভাগ করা যায়, আবার কোন সংখ্যাকে 9 দিয়ে ভাগ করা গেলে 3 দিয়ে অবশ্যই ভাগ করা যাবে।
 সুতরাং $x+1$ কে অবশ্যই 3 দিয়ে ভাগ করা যাবে।
135. (C) তিনটি positive integer x, y, z এর product, $xyz = 600$.
 If $x = 5$, then $yz = 600/5 = 120$.
 বের করতে হবে y ও z এর যোগফল এর least possible value অর্থাৎ y ও z এর value যত সম্ভব কাছাকাছি হতে হবে।
 $120 = 10 \times 12$, তাই y ও z এর value যথাক্রমে 10 ও 12.
 $y + z = 10 + 12 = 22.$
136. (D) 5, 9 এবং 13 র ল.সা.ও 585. সুতরাং বলতে পারি 5, 9 এবং 13 দিয়ে ভাগ করলে 4, 8 এবং 12 ভাগশেষ থাকবে এমন সবচেয়ে ছোট সংখ্যা 584 (এতে প্রতি ক্ষেত্রেই 1 কমে যাচ্ছে নিঃশেষে বিভাজ্য সংখ্যা 585 থেকে)
 সুতরাং, বলা যাই উক্ত সংখ্যা কে 585 দ্বারা ভাগ করলে ভাগশেষ থাকবে 584.
137. (E) 1 to 100 এর মধ্যে 2 দ্বারা বিভাজ্য সকল সংখ্যা Set A তে। সুতরাং, এই set এ 50 টি সংখ্যা আছে।
 1 to 100 এর মধ্যে 3 দ্বারা বিভাজ্য সকল সংখ্যা Set B তে। সুতরাং, এই set এ 33 টি সংখ্যা আছে।
 যেসকল সংখ্যা 2 এবং 3 উভয় দ্বারা বিভাজ্য, অর্থাৎ 6 দ্বারা বিভাজ্য, তারা উভয় set এ আছে।
 1 to 100 এর মধ্যে 6 দ্বারা বিভাজ্য সংখ্যা 16 টি।
 সুতরাং, Set A র $(50-16) = 34$ টি সংখ্যা Set B তে নাই।
138. (C) 3 month pass বছরে 4 বার নেওয়া হলে খরচ হবে $27 \times 4 = 108$ taka
 May to March এর মধ্যে সর্বমোট 7 বার যাওয়া হয়। সুতরাং এই 3 month এ 3 month pass নিয়ে বাকী সময় এর জন্য pay per visit package নিলে খরচ হয় $27 + (5.5 \times 9) = 76.5$ taka which is less than 80 and 108 both.
139. (B) I. না ও হতে পারে. Example: 45 is an odd integer, but 90 is not odd.
 II. না ও হতে পারে. Example : 90
 III. 9 এবং 5 দ্বারা বিভাজ্য হলে এদের L.C.M 45 এর সকল factor দিয়ে ও বিভাজ্য হবে। সুতরাং 15 দিয়ে ও বিভাজ্য হবে।
140. (E) When X is divided by Y and remainder is Z, we can write $(\frac{x-z}{y})$
 Again When X Is divided by Z and remainder is $y-2$, we can write $(\frac{x-y+2}{z})$
 No definite conclusion thus Option E
141. (C) $\frac{1}{x} + \frac{1}{y} = \frac{1}{9}$
 for this, x and y value can be either 90 and 10 interchangeably
 So difference is $= 90-10 = 80$ Option (C)

142. (D) According to question,
as this is a modulus, by solving twice
first,

$$x-1 > 2$$

$$\text{so } x > 3$$

again

$$-x+1 > 2$$

$$\text{thus } x < -1$$

So closest answer $X^2 > 9$, because after solving we get $X > +3$ or -3 which satisfies the above equation

So Option D

143. (A) one more than a number which is both a multiple of 4 and 6.

$$\text{When } \frac{25}{9} = \text{remainder } 7$$

$$\text{When } \frac{49}{9} = \text{remainder } 4$$

Since answer is 2 Thus Option A

144. (C)

$$x > z, y > -z, z = \text{positive integer}$$

$$\text{ধরি, } x = 4$$

$$y = -100$$

$$z = 100$$

$$x/y = 100/-100 = -1 (> 1 \text{ হচ্ছে না})$$

$$x/y = 100/-100 = -1 (> 1 \text{ হচ্ছে না})$$

$$x/y = 100/-100 = -1 (> 0 \text{ হচ্ছে})$$

$$x+y = 100-100 = 0 (> 0 \text{ হচ্ছে})$$

145. (D)

$$-2 < x < 5 \text{ and } -5 < y < 7$$

$$[y-x]$$

যখন এরকম Range এ $(y-x)$ বা similar কিছু বের করতে বলবে, সবক্ষেত্রে
Extreme values/ Corner values গুল নিয়ে calculation করতে হবে।

$$y = 7, x = 5, (y-x) = 2$$

$$y = 7, x = -2, (y-x) = 9$$

$$y = -5, x = 5, (y-x) = -10$$

$$y = -5, x = -2, (y-x) = -3$$

$$\text{Highest value} = 9$$

146. (E)

$$x > y > 1$$

$$\text{ধরি, } x = 100 \text{ and } y = 2$$

তাহলে,

$$7y/5x = 14/500 (< x)$$

$$\frac{x}{2y-x} = \frac{100}{4-100} = \frac{100}{-96} (< x)$$

$$\frac{x+y}{y} = \frac{102}{2} = 51 (< x)$$

$$\frac{6x}{y+5x} = \frac{600}{502} (< x)$$

151.

147. (A)

x men ----- y days

$$(x+z) \text{ men ----- } (y) \times \frac{x}{x+z}$$

$$\frac{xy}{x+z}$$

152.

148. (B)

x = positive even

y = positive odd

ধরি, x=2 and y=3

$$x^3+y^2=2^3+3^2=17 \text{ (odd)}$$

$$3x+y+y^2=3(2)+3+3^2=18 \text{ (even)}$$

$$(x-y)(x+y)=x^2-y^2=2^2-3^2=-5 \text{ (odd)}$$

$$xy+y^2=(2)(3)+(3)^2=15 \text{ (odd)}$$

153

149. (C) $a_3 = (a_2 - 1)^2 \Rightarrow 64 = a_2 - 1 \Rightarrow a_2 = 9$

একইভাবে, $a_2 = (a_1 - 1)^2 \Rightarrow 9 = (a_1 - 1)^2 \Rightarrow a_1 = 4$

150. (B) $5y - 2x = 0$

Or, $5y = 2x$

Or, $x = \frac{5}{2}y$

Again,

$x < 10$

or, $\frac{5}{2}y < 10$

or, $5y < 20$

or, $y < 4$

সঠিক Answer (B)

15

15

15

151. (B) ধরি, red pen কিনে x টি
এক black pen কিনে y টি
সুতরাং green pen কিনে $2x$ টি
 $x+y + 2x = 17$
or, $3x + y = 17 \dots(i)$
এক $5y + 20x + 25x = 205$
Or, $5y + 45x = 205 \dots(ii)$
(ii) - (i)*5 \rightarrow
 $30x = 120$
Or, $x = 4$
 $3*4 + y = 17$
Or, $y = 5$
সঠিক Answer (B)

152. (A) Average of Arif & Babu's salary = 10,000 Taka
So, total salary = $2 * 10000$ taka
 $= 20,000$ taka
Again, Sabbir and babu's total salary = 24,000 taka
The difference between sabbir's salary and Arif's salary = sabbir's salary - arif's salary
 $= (\text{Sabbir and Babu's salary}) - (\text{Arif and babu's salary})$
 $= 24000 - 20000$
 $= 4000$ Taka

Answer (A)

153. (B) Let, Number of members = x
Contribution per person = y
So, $xy = 45,000 \dots(i)$
Or, $y = \frac{45000}{x}$
Again, $(x-5)(y+15) = 45,000$
Or, $xy - 5y + 15x - 75 = xy \dots[from (i)]$
Or, $15x - 5y - 75 = 0$
Or, $x(x-125) + 120(x-125) = 0$
Or, $(x-125)(x+120) = 0$
Or, $x = 125$
So, answer B.

154. (E) এখানে, x, y, z positive বা negative বলা নেই। তাই বের করা সম্ভব নয়।
Answer (E)

155. (E) একটি red এবং একটি white marble পাওয়ার probability = $\frac{4}{6} * \frac{2}{5}$
 $= \frac{4}{15}$

Correct Answer (E)

156. (C) আমাদের condition অনুযায়ী x can be both odd and even.
 x odd হলে, (A) (B) (D) options invalid হয়।
(C) এর জন্য x odd/even যেকোনটি হতে পারে।
সঠিক Answer (C)

157. (D) 1117

$$\begin{aligned} \text{Sum} &= -557-556-555-554-\dots-1+0+1+\dots+554+555+556+557+558+559 \\ &= 0+0+0+0+\dots+0+0+0+558+559 \\ &= 1117 \end{aligned}$$

-555 থেকে +557 পর্যন্ত সব সংখ্যার যোগফল 0 হয়। তাই, শুধু 558 and 559 যোগ করে আমরা উত্তর পাই।

158. (D) 4

দেওয়া আছে, if x is divided by 10, the quotient is y with a remainder of 4.

$$\text{So, } x = 10y + 4$$

এখন যদি X - কে 5 দিয়ে ভাগ করা হয়, the remainder will be 4, since $10y$ will be divisible by 5, but 4 will not be divisible.

159. (A) 2

Units digit of the sum of $3^{44}+5^{43}+2^{12}$ will be the units digit of sum of the units digit of 3^{44} , 5^{43} and 2^{12} . The units digit of 3^{44} is 1. The units digit of 5^{43} is 5. And the units digit of 2^{12} is 6. So the sum is 12. Therefore the units digit of the whole sum will be 2.

160. (B) 12

Let the number of girls be x . Then the number of boys will be $2x - 3$. এখন, একজন ছেলের জায়গায় একজন মেয়ে আসলে group- টায় ছেলে এবং মেয়ের সংখ্যা সমান হয়ে যাবে।

$$\text{So, } 2x - 3 - 1 = x + 1$$

$$x = 5.$$

$$\text{So total number of students in the class} = x + 2x - 3 = 25 - 3 = 12.$$

161. (D) $1/(2r+3)$

ধরি নেই, Rana spend করে X taka এবং save করে Y taka. So his income is $(X + Y)$ taka this year. Amount of money he will have for his spending next year will be $Y \times (1 + r)$ taka. If he wants his next year's spending to be half of this year's spending,

$$Y \times (1 + r) = X/2$$

$$\text{so, } Y = X/(2 + 2r).$$

$$\text{So fraction of his income to be saved this year} = Y/(X + Y)$$

$$= \{X/(2 + 2r)\} / \{X + X/(2 + 2r)\}$$

$$= 1/(2r + 3)$$

162. (A) $m/3$

Suppose the daily wage for an office assistant is X . So the daily wage for an accountant is $4X$

$$\text{So, the total daily wage for one accountant and 8 office assistants} = (4X + 8X) = 12X = m$$

$$\text{So, } 4X = m/3.$$

Concept 14

Percent

Concept 14 (Percent)

- ⊗ **Percent** (শতকরা) means per hundred or number out of 100
- ⊗ Percent can be expressed as a fraction with denominator of 100 or as a decimal

$$45\% = \frac{45}{100} = 0.45$$

- ⊗ To find a certain percent of a number, multiply the number by the percent expressed as a decimal or fraction.

$$20\% \text{ of } 90 = \frac{20}{100} \times 90 = 18$$

$$20\% \text{ of } 90 = 0.2 \times 90 = 18$$

- ⊗ Percents greater than 100% are represented by numbers greater than 1.

$$300\% = \frac{300}{100} = 3$$

- ⊗ To convert a fraction into percentage, multiply the fraction by 100

$$\frac{3}{4} = \frac{3}{4} \times 100\% = 75\%, \quad \frac{1}{4} = \frac{1}{4} \times 100\% = 25\%$$

- ⊗ To convert a decimal into percentage, simply convert the decimal to fraction first and then multiply the fraction by 100%

$$0.01 = \frac{1}{100} = \frac{1}{100} \times 100\% = 1\%. \quad 0.54 = \frac{54}{100} = \frac{54}{100} \times 100\% = 54\%$$

- ⊗ To find the percent increase (or decrease), first find the amount of the increase (decrease); then divide this increase (decrease) by the original amount, and express this quotient as a percent.

If the price of an item increases from \$24 to \$30 the amount of the increase is $(30 - 24$

$$= 6. \text{ Therefore, percent increase is } \frac{6}{24} = 0.25 = 25\%$$

Example 1: Three friends shared the cost of a tape recorder. If Andy, Barbara, and Donna each paid Tk. 12, Tk. 30 and Tk. 18 respectively, then Donna paid what percent of the cost of the tape recorder?

- (A) 10% (B) 30% (C) $33\frac{1}{3}\%$ (D) 50% (E) $66\frac{2}{3}\%$

Solution:

Total cost = $12 + 30 + 18 = 60$. Donna paid $(18/60) \times 100\% = 30\%$

Answer is (B)

Example 2: If the population of a town was 20,000 in 1970 and 16,000 in 1980, what was the percent decline in the town's population?

- (A) 50% (B) 25% (C) 20% (D) 10% (E) 5%

Solution:

Decline = $20000 - 16000 = 4000$.

Percent decline = $(4000/20000) \times 100\% = 20\%$

Answer is (C)

Example 3: A football team has won 40 games out of 60 played. It has 32 more games to play. How many of these must the team win to make it record 75% win for the season?

- (A) 20 (B) 25 (C) 29 (D) 32 (E) None of these

Solution:

Team won 40 games out of 60 and remaining games is 32.

Total games = $60 + 32 = 92$

75% of 92 = 69

Team has to win 69 games in total. Team has already won 40.

\therefore Games to win = $69 - 40 = 29$

Answer is (C)

Exercise 14

- 1. Mr. X spends 72% of his income on clothing, 20% on food, 5% on gifts and the remaining Tk. 330 on lottery tickets. What is his income in Taka thousands?
(BBA 94-95)
(A) 8 (B) 9 (C) 10 (D) 11 (E) 12
- 2. If a jar contains 24 white marbles and 48 black marbles, then what percent of all the marbles in the jar are black?
(BBA 95-96)
(A) 20% (B) 25% (C) $33\frac{1}{3}\%$ (D) 60% (E) $66\frac{2}{3}\%$
- 3. Three friends shared the cost of a tape recorder. If Andy, Barbara, and Donna each paid Tk. 12, Tk. 30 and Tk. 18 respectively, then Donna paid what percent of the cost of the tape recorder?
(BBA 95-96)
(A) 10% (B) 30% (C) $33\frac{1}{3}\%$ (D) 50% (E) $66\frac{2}{3}\%$
- 4. If the population of a town was 20,000 in 1970 and 16,000 in 1980, what was the percent decline in the town's population?
(BBA 95-96)
(A) 50% (B) 25% (C) 20% (D) 10% (E) 5%
- 5. In a class, 25% of the students voted for Mr. X. Two thirds of the remaining students voted for Mr. Y. The remaining 11 students didn't cast their votes. How many students are there in the class?
(BBA 96-97)
(A) 64 (B) 44 (C) 36 (D) 22 (E) 16
- 6. Karim bought a ticket to a cricket match for Tk. 25 and later sold the ticket to Rahim for Tk. 75. What was the percent increase in the price of the ticket?
(BBA 97-98)
(A) 50% (B) 100% (C) 200% (D) 300% (E) 400%
- 7. What is 10% of $y/3$, if $2y/3$ is 10% of 600?
(BBA 99-00)
(A) 1 (B) 2 (C) 3 (D) 4 (E) None of these
- 8. If 55 percent of the people who purchase a certain product is female, what is the ratio of the number of females who purchase the product to the number of males who purchase the product?
(BBA 00-01)
(A) 11/9 (B) 10/9 (C) 9/10 (D) 9/11 (E) 5/9
- 9. At a company, 70% of this year's new employees are graduates of business school and the remainders are graduates of liberal arts colleges. If 550 new employees were hired this year, what is the difference between the number of new business school employees and the number of new liberal arts employees?
(BBA 00-01)
(A) 55 (B) 220 (C) 240 (D) 385 (E) None of these

- 10. A jar contains marbles of 4 different colors. The number of blue marbles is three times as many as the yellow ones. The number of red marbles is half that of the yellow ones. The number of orange marbles is equal to the number of red ones. What percent of the marbles are orange colored? (BBA 02-03)
 (A) 10 (B) 15 (C) 20 (D) 21.5 (E) None of these
- 11. The cost of a pen is 20% more than that of a book and the cost of a CD is $\frac{3}{4}$ as much as the cost of the pen. If the cost of the pen is Tk. 90 more than that of the CD, what is the cost of the book in taka? (BBA 03-04)
 (A) 120 (B) 126 (C) 192 (D) 200 (E) none of these
- 12. If the price of a product is increased by 15% then the seller would get Tk 450 more. If instead, the price were increased by 10% then how much more would he get? (BBA 04-05)
 (A) 150 (B) 200 (C) 300 (D) 325 (E) None of these
- 13. Thirty percent of the members of a swimming club have passed the lifesaving test. Among the members who have not passed the test, 12 have taken the preparatory course and 30 have not. How many members are there in the swimming club? (BBA 05-06)
 (A) 80 (B) 60 (C) 100 (D) 120 (E) None of these *
- 14. In a certain shipment 2% of the boxes shipped were damaged. If the loss per damaged box was Tk. 35 and the total loss due to damage was Tk. 700, how many boxes were shipped? (BBA 08-09)
 (A) 20 (B) 100 (C) 200 (D) 1000 (E) 2000
- 15. A box contains 24 red socks and 43 green socks. How many green socks must be removed from the box so that 60% of the socks in the box will be green? (BBA 08-09)
 (A) 6 (B) 7 (C) 8 (D) 9 (E) None of these
- 16. In a market survey, 20% opted for product A whereas 60% opted for product B. The remaining individuals were not certain. If the difference between those who opted for product B and those who were uncertain was 720, how many individuals were covered in the survey? (BBA 10-11)
 (A) 1,200 (B) 1,800 (C) 3,600 (D) 1,440 (E) None of these
- 17. Thirty prizes were distributed to five percent of the contestants. No contestants got more than one prize. The number of entrants in the contest was (MBA 96-97)
 (A) 150 (B) 600 (C) 300 (D) 15 (E) 60
- 18. A machine is producing 800 units per minute. If its productivity fall by a half percent, how many units will it produce now? (MBA 96-97)
 (A) 4 (B) 40 (C) 400 (D) 800 (E) None of these
- 19. Mr. X bought 400 shares of Tk. 25 each at Tk. 32.5. If the dividend declared is 4%, what is his income on the shares? (MBA 96-97)
 (A) 1000 (B) 400 (C) 800 (D) 200 (E) None of these

- 20. There are 50 students enrolled in a business school. Of the enrolled students, 90% took the final exam. $\frac{2}{3}$ of the students who took the final exam passed it. How many students passed the final exam? (MBA 98-99)
 (A) 45 (B) 35 (C) 34 (D) 33 (E) 30
- 21. In the football league of 1998, Arambag won 50% of their games. In 1999, Arambag won 65% of their games. If there were twice as many games played in the second season as in the first, what percentage of the games did Arambag win in the 2 years? (MBA 99-00)
 (A) 115% (B) 60% (C) 57.5% (D) 55% (E) 40%
- 22. Mr. X bought a property for Tk. 100000 in 1995. In 1999 he sold the house for 25% more than he paid for it. But he had to pay 50% of his profit to the broker. What was the amount that he paid to the broker? (MBA 99-00)
 (A) 10000 (B) 12500 (C) 15000 (D) 17500 (E) None of these
- 23. A trader purchased some pens for Tk. 8 and some pencils for Tk. 4.5 a piece respectively. If he purchased a total of 12 pens and pencils for Tk. 82, how many pens did he purchase? (MBA 99-00)
 (A) 6 (B) 7 (C) 8 (D) 9 (E) None of these
- 24. The salary of Mr. X is 33.33% more than that of Mr. Y, and the salary of Mr. Y is 25% less than that of Mr. Z. If the salary of Mr. Z is Tk. 20000, what is the salary of Mr. X? (MBA 99-00)
 (A) 20000 (B) 18000 (C) 17500 (D) 15000 (E) None of these
- 25. Last year, Mr. X saved 10% of his annual earnings. This year he earned more than last year and he saved 12% of his annual earnings. If the amount saved this year is 26% of the savings of previous year, how much more did he earn this year? (MBA 99-00)
 (A) 2% (B) 5% (C) 7.5% (D) 10% (E) None of these
- 26. 40% of the students of a class passed the English test. Among the students who have not passed the test, 15 have taken a preparatory course and 33 have not taken the course. How many students are there in the class? (MBA 99-00)
 (A) 60 (B) 70 (C) 80 (D) 81 (E) None of these
- 27. Last year 60 students enrolled in the Business communication course. Of the enrolled students, 90% took the final exam. Two-thirds of the students who took the final exam passed the final exam. What percentage of the enrolled students did not pass in the exam? (MBA 00-01)
 (A) 40% (B) 45% (C) 60% (D) 75% (E) cannot be determined

- 28. At a club, 70% of the members are women and 60% of the members are married. If $\frac{2}{3}$ of the men is single, what fraction of the women is married? (MBA 00-01)
 (A) $\frac{5}{7}$ (B) $\frac{7}{10}$ (C) $\frac{1}{3}$ (D) $\frac{7}{30}$ (E) None of these
- 29. Karim received a 10% raise each month for 3 consecutive months. If his salary after the 3 raises is 13310, what was his starting salary? (MBA 00-01)
 (A) 9000 (B) 10000 (C) 11000 (D) 12000 (E) None of these
- 30. A sales person earns a commission of 5% on all sales between Tk. 2000 and Tk. 6000, and 8% on all sales over Tk. 6000. What is his total commission in a week in which his sales total Tk. 10,000? (MBA 01-02)
 (A) 500 (B) 540 (C) 620 (D) 720 (E) None of these
- 31. If the sales tax on an appliance priced at 300 is between 5 percent and 8 percent, then the cost (price plus sales tax) of the appliance is- (MBA 03-04)
 (A) 310 (B) 312 (C) 314 (D) 318 (E) 325
- 32. Of the 3,600 employees of Company X, $\frac{1}{3}$ are clerical. If the clerical staff were to be reduced by $\frac{1}{3}$, what percent of the total number of the remaining employees would then be clerical? (MBA 05-06)
 (A) 25% (B) 22.2% (C) 20% (D) 12.5% (E) None of these
- 33. In a class of 400 students, 72 received A's. If 15% of the male students and 20% of the female students received 'A', then the number of male students in the class is (MBA 08-09)
 (A) 160 (B) 175 (C) 180 (D) 300 (E) None of these
- 34. Mr. Asif is a potato seller in a local bazaar. When he brings potatoes from the village market to his shop in the town he has to pay 7% toll on the portion of the total value of the potatoes in excess of taka 1,000 to the local *mastaan*. If the amount of toll he paid was taka 87.50 then what was the value of the potatoes that he brought to sell? (MBA 09-10)
 (A) Tk 1,250 (B) Tk 2,250 (C) Tk 2,500 (D) Tk 2,750 (E) Tk 2,333
- 35. Of 400 students in a graduating class, 30 percent were women and, of these, one-fifth became instructors. If the number of men who became instructors was twice the number of women who became instructors, how many of the men became instructors? (MBA 10-11)
 (A) 120 (B) 48 (C) 40 (D) 24 (E) None of these
- ⊕36. A company pays a tax of 10% on its first Tk. 100,000 earnings and 15% on all earnings in excess of Tk. 100,000. What will be the amount of tax, in taka, if its earning is Tk. 275,000? (BBA 03-04)
 (A) 36,250 (B) 37,500 (C) 35,000 (D) 35,250 (E) None of these

- ⊕37. In a season, a football team has won 30 games out of 50 played. It has 46 more games to play. How many of these must the team win to make its record of 75% wins of season? (BBA 93-94)
 (A) 24 (B) 32 (C) 36 (D) 42 (E) 46
- ⊕38. A football team has won 40 games out of 60 played. It has 32 more games to play. How many of these must the team win to make it a record 75% win for the season? (MBA 01-02)
 (A) 20 (B) 25 (C) 29 (D) 32 (E) None of these
- ⊕39. If the price of onion goes up by 25%, by how much should usage be reduced in order to keep the total expense for onion as before? (BBA 94)
 (A) $33\frac{1}{3}\%$ (B) 25% (C) 20% (D) 24% (E) $17\frac{1}{2}\%$
- ⊕40. Due to booming business, a company increased its staff salary by 25%. By what percent must it now decrease the salary to return to the original amount? (BBA 96-97)
 (A) 22.5 (B) 20 (C) 18 (D) 15 (E) None of these
- ⊕41. The price of sugar in 1994 increased by 10% from that in 1993. In 1995 the price decreased by 5% from that in 1994. In 1995 what is the increase in price with respect to the price in 1993? (BBA 94-95)
 (A) 4% (B) 4.5% (C) 5% (D) 5.5% (E) 6%
- ⊕42. The price of sugar in the year 1995 increased by 10% from that of the previous year. In 1996 the price decreased by 5%. In 1996, what was the increase in price with respect to that of 1994? (BBA 97-98)
 (A) 5.5% (B) 5% (C) 4.5% (D) 4% (E) None of these
- ⊕43. Which of these is NOT a correct way to find 75% of 35? (BBA 94)
 (A) 75.00×35 (B) $(75 \times 35) / 100$ (C) $\frac{75}{100} \times 35$ (D) $\frac{3}{4} \times 35$ (E) $.7500 \times 35$
- ⊕44. If the radius of a circle is increased by 100%, by what percent is the area of the circle increased? (BBA 93-94)
 (A) 500% (B) 400% (C) 300% (D) 200% (E) 100%
- ⊕45. The length and width of a rectangle are 15 meters and y meters respectively. If the length is reduced by 10% and the width is increased by 10%, what is the change in area of the rectangle? (BBA 94)
 (A) Increase by 1% (B) Remains the same (C) Decrease by 10%
 (D) Decrease by 1% (E) Cannot be determined

- ⊕46. The length and breadth of a room are increased by 20 percent and 25 percent respectively. What is the corresponding percentage increase in the floor area of the room? (BBA 94-95)
 (A) 20 (B) 25 (C) 45 (D) 50 (E) 60
- ⊕47. Width of a rectangle is increased by 25% & length is decreased by 25%. New area is what percent of original area? (BBA 98-99)
 (A) 90% (B) 100% (C) 93.75% (D) 1.25% (E) None of these
- ⊕48. The length of a rectangle is increased by 60%. By what percent would the width have to be decreased to maintain the same area? (BBA 01-02)
 (A) 40% (B) 50% (C) 60% (D) 62.5% (E) None of these
- ⊕49. A blanket is X meter long and Y meters wide. When washed it lost 12.5% of its length and 10% of its width. What is its percentage loss of area? (MBA 96-97)
 (A) 11.50 (B) 22.5 (C) 11.0 (D) 11.25 (E) None of these
- ⊕50. The length of a rectangular plot is increased by 20% and the breadth is decreased by 20%. Then the area of the plot is- (MBA 99-00)
 (A) increased by 20% (B) decreased by 4% (C) same as before
 (D) decreased by 20% (E) increased by 4%
- ⊕51. Written as a percent $5 = ?$ (BBA 94)
 (A) 0.50% (B) 500% (C) 5% (D) 50% (E) 5.00%
- ⊕52. Price of a hammer is twice that of a screwdriver. If price of a hammer is raised by 5% & the price of a screwdriver is decreased by 4%, how much more or less will it cost to buy 3 screwdriver & 3 hammers? (BBA 98-99)
 (A) 2% more (B) 2% less (C) 4% more (D) 4% less (E) None of these
- ⊕53. In a store, the ratio of red socks to green socks is 3:2. The socks are made of either cotton or wool. If 60% of the red socks are made of cotton and 80% of the green socks are made of wool, what percentages of socks are made of cotton? (BBA 99-00)
 (A) 44 (B) 48 (C) 50 (D) 52 (E) None of these
- ⊕54. The total price for a watch and a chain is Tk. 500. If the price of the watch increases by 10% and that of the chain by 5%, the total price becomes Tk. 545. What is the price of the chain? (BBA 99-00)
 (A) 75 (B) 80 (C) 100 (D) 120 (E) 125
- ⊕55. The average price of a new car increased by 20% from 1990 to 1995, and again increased by 20% from 1995 to 2000. If the average price of a new car was Tk. 450,000 in 1995, what is the difference in average price of a car between year 1990 and 2000? (BBA 00-01)
 (A) Tk. 120,000 (B) Tk. 145,000 (C) Tk. 165,000 (D) Tk. 175,000 (E) None of these

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- ⑤6. This year the school allotted 60% of its budget for development of the computer center and its budget this year is 15% higher than that of the last year. If the last year's budget compared that of the last year, calculate the allocation to the computer center last year (in taka).
(A) 500,000 (B) 525,000 (C) 550,000 (D) 575,000 (E) None of these (BBA 03-04)
- ⑤7. If 20% of x is 30% of y and $xy \neq 0$, then percent of y is x ?
(A) 10% (B) 6% (C) 90% (D) 150% (E) None of these (BBA 04-05)
- ⑤8. A union contract specifies a 6% salary increase plus a Tk 450 bonus for each employee. For a certain employee, this is equivalent to an 8 percent increase in total salary. What was the employee's salary in taka before the new contract?
(A) 21500 (B) 22500 (C) 23500 (D) 24000 (E) None of these (BBA 04-05)
- ⑤9. An economist estimates that the cost of living will increase by 8.50 percent over the next three years. How much should a piece of candy cost in three years if it cost Tk. 1.50 today?
(A) Tk 12.75 (B) Tk 0.1275 (C) Tk 1.37 (D) Tk 1.63 (E) None of these (BBA 06-07)
- ⑥0. A colony of 15,000 ants increased by 50% after being fed. Then after 4 weeks without food, the number of ants dropped by 60%. What percentage decline did the original population undergo?
(A) 72.5 (B) 75 (C) 90 (D) 95.5 (E) None of these (BBA 07-08)
- ⑥1. In January, 55 percent of a hospital's 300 patients were women. In February, 30 percent of its 440 patients were women. What was the percent change in the number of women patients from January to February?
(A) Decrease of 20% (B) Increase of 20% (C) Decrease of 25%
(D) Increase of 25% (E) Increase of 46.67% (BBA 08-09)
- ⑥2. In a shop, 40% socks are white and rest are black. 60% socks are made of cotton & rest made of wool. 25% white socks are made of cotton and 20 black socks are made of wool. How many black socks are made of cotton?
(A) 100 (B) 80 (C) 60 (D) 50 (E) 25 (MBA 97-98)
- ⑥3. A sales person earns as commission 5% on all sales between Tk. 2000 and 6000, and 8% on all sales over Tk. 6000. If in a week his commission is Tk. 460, what were his total sales?
(A) 8000 (B) 9000 (C) 10000 (D) 12000 (E) None (MBA 99-00)
- ⑥4. Hasib's weight is 140% of Shawkat's weight. Mowla's weight is 90% of Misha's weight. Misha weighs twice as much as Shawkat. What percent of Hasib's weight is Mowla's weight?
(A) $64\frac{2}{7}$ (B) 90 (C) $77\frac{7}{9}$ (D) $155\frac{5}{9}$ (E) $128\frac{4}{7}$ (MBA 00-01)

- ⊕65. In a school with the same number of boys and girls, $\frac{1}{8}$ th of the girls and $\frac{5}{6}$ th of the boys are residing in the hostel. What percent of the students consists of boys who do not reside in the hostel? (MBA 01-02)
 (A) $\frac{1}{12}$ (B) $\frac{1}{6}$ (C) $\frac{7}{48}$ (D) $\frac{13}{48}$ (E) None of these
- ⊕66. The import duty on a car is 50% of its cost. An additional supplementary tax of 30% is charged on the cost plus import duty. If the total of import duty and supplementary tax is Tk. 2,85,000, what is the cost of the car? (MBA 02-03)
 (A) 3,00,000 (B) 3,20,000 (C) 3,75,000 (D) 4,00,000 (E) None of these
- ⊕67. This year, a city has allotted 60 percent of its budget for school expenditures, and its budget is 15 percent higher than last year's budget of n dollars. In terms of n , how many dollars of this year's budget has the city allotted for school expenditures? (MBA 04-05)
 (A) $(0.6)(0.85n)$ (B) $(0.6)(1.15n)$ (C) $(0.6) / (1.15n)$
 (D) $0.85n / 0.6$ (E) $(n / 1.15) + 0.6n$
- ⊕68. In 1995, 45% of a Data Analysis Company's 60 customers were banks, and in 1997, 25% of its 144 customers were banks. What was the percent increase from 1995 to 1997 in the number of bank customers the company had? (MBA 05-06)
 (A) 10.7% (B) 58.33% (C) 25% (D) 33.33% (E) None of these
- ⊕69. Last year, there were 1172 students at Beaton High School. This year there are 15 percent more students than last year. Approximately how many students are at Beaton High School this year? (MBA 05-06)
 (A) 1800 (B) 1600 (C) 1500 (D) 1400 (E) 2000
- ⊕70. You have to pay 15% tax on a Mercedes car and 20% tax on a BMW car. If the price of BMW is 20% more than that of the Mercedes, then the tax paid for a BMW is what percent of the tax paid for Mercedes? (MBA 07-08)
 (A) 120 (B) 133.33 (C) 145 (D) 160 (E) None of these
- ⊕71. A litre of water is evaporated from 8 litres of salt solution containing 5% salt. What will be the Percentage of salt in the solution after evaporation? (MBA 07-08)
 (A) 6.2 (B) 5.7 (C) 7.2 (D) 4.6 (E) None of these
- ⊕72. If x is 30% greater than y , what percent of y is x ? (MBA 08-09)
 (A) 70 (B) 77 (C) 120 (D) 130 (E) None of these
- ⊕73. Recently, Sohan's hourly wage has been increased by 10 percent. Before this increase Sohan's total weekly wage was Taka 1370. If his weekly hours were to decrease by 10 percent from last week's total hours, what would be the change in Taka, if any, in Sohan's total weekly wage? (MBA 10-11)
 (A) An increase of 13.70 (B) An increase of 5.5 (C) No Change
 (D) A decrease of 13.70 (E) None of these

- Q74. The price of a pen is twice that of a pencil. If the price of the pen is increased by 5% and that of the pencil is decreased by 4%, how much more or less (in percentage) will it cost to buy 5 pens and 5 pencils? (BBA 01-02)
 (A) 2% less (B) 2.5% less (C) 2.5% more (D) 2% more (E) None of these
- Q75. You can now purchase 5 more bananas with Tk. 75 due to a reduction in price by 20%. Calculate the current price of one dozen of Bananas. (BBA 99-00)
 (A) 24 (B) 30 (C) 32 (D) 36 (E) none of these
- Q76. After X% of their games had been played, Abahani had won 40% of their games. They won 30% of the rest of the games. In terms of X which of the following expresses the percentage of games Abahani had won at the end of the season? (BBA 00-01)
 (A) $70x$ (B) $\frac{x}{10} + 30$ (C) $\frac{x}{10} + 35$ (D) $10x + 30$ (E) None of these
- Q77. The length of a rectangular plot is increased by a certain percentage while the width is decreased by the same percentage. The area of the new plot will (BBA 01-02)
 (A) remain the same (B) increase (C) decrease
 (D) either increase or decrease (E) cannot be determined
- Q78. In a factory X out of every Y items produced were found to be defective. If 5% of the items produced during a day were found to be defective, what was the total number of items produced that day? (BBA 02-03)
 (A) $x/.05$ (B) $95x$ (C) $20x/y$ (D) $20y$ (E) None of these
- Q79. A room has 160 people, 15% of whom are women. A group of people, 30% of whom are women leaves the room. If 10% of the people remaining in the room are women, how many people left the room? (BBA 04-05)
 (A) 10 (B) 20 (C) 30 (D) 40 (E) None of these
- Q80. Mr. Jaman is insured completely for Tk. 1,50,000 against damages to his machinery. For any damage over Tk 1,50,000, the insurance company will pay Tk 1,50,000 plus only 15% of the additional damage. For a recent accident, Mr. Jaman was paid Tk 1,56,000 by the insurance company. What was the total amount of the damage estimated? (BBA 06-07)
 (A) Tk 1,04,000 (B) Tk 90,000 (C) Tk 40,000
 (D) Tk 80,000 (E) None of these
- Q81. If $m > 0$ and x is m percent of y, y is what percent of x? (Wrong ans. In answer sheet) (BBA 07-08)
 (A) $100m$ (B) $1/100m$ (C) $1/m$ (D) $10/m$ (E) None of these
- Q82. What is 0.04×0.03^2 in terms of percent? (BBA 07-08)
 (A) 0.0036 (B) 0.036 (C) 0.36 (D) 0.00036 (E) 0.000036

- ∇83. A number is divided by $\frac{3}{7}$ and then multiplied by $\frac{5}{8}$. The net effect (approx) is (BBA 07-08)
 (A) the number decreases by 22% (C) the number decreases by 33%
 (B) the number increases by 46% (D) the number increases by 33%
 (E) none of these
- ∇84. The price of sugar increases by 32%. A family reduces its consumption so that expenditure of the sugar is up by 10% only. If the total consumption of sugar before the price rise was 10 kg per month, then the consumption of sugar per month is approximately? (BBA 10-11)
 (A) 8.33 kg (B) 8.5 kg (C) 8.35 kg (D) 8.75 kg (E) None of these
- ∇85. The surface of a certain planet reflects 80 percent of the light that strikes it. If the clouds around the planet absorb 40 percent of the reflected light, what percent of the light that strikes the planet is reflected from the surface that passes through the clouds without being absorbed? (BBA 10-11)
 (A) 32% (B) 40% (C) 48% (D) 60% (E) None of these
- ∇86. In a sample of 900 university students, all students are either freshmen or sophomores or junior or seniors, 24 percent are juniors and 72 percent are not sophomores. If there are 144 seniors, how many more freshmen than sophomores are there among the sample of students? (BBA 10-11)
 (A) 252 (B) 36 (C) 48 (D) 288 (E) None of these
- ∇87. You can now purchase 5 more bananas with Tk. 75 because of reduction in price by 20%. Calculate the current price of one dozen of bananas. (MBA 99-00)
 (A) 24 (B) 30 (C) 32 (D) 36 (E) none of these
- ∇88. Jalal started work 2 years ago. His starting salary was $\frac{1}{2}$ of Millat's salary at that time. Each year since then Jalal has received a raise of 5% in his salary and Millat has received a raise of 10% in his salary. What percentage (to the nearest percent) of Millat's current salary is Jalal's current salary? (MBA 04-05)
 (A) 45 (B) 46 (C) 48 (D) 50 (E) 220
- ∇89. Recently, Sohan's hourly wage has been increased by 10 percent. Before this increase, Sohan's total weekly wage was \$ 137. if his weekly hours were to decrease by 10 percent from last week's total hours, what would be the change, if any, in Sohan's total weekly wage? (MBA 04-05)
 (A) An increase of \$ 1.37 (B) An increase of \$ 0.55 (C) No change
 (D) A decrease of \$ 0.55 (E) A decrease of \$ 1.37
- ∇90. A candidate scoring 25% marks in an examination fails by 30 marks while another candidate who scores 50% marks gets 30 marks more than the pass mark. What is the pass mark? (MBA 07-08)
 (A) 33.33 (B) 50 (C) 66.66 (D) 70 (E) None of these

991. You can buy 16 pens for y Taka. How many pens can you buy for z Taka if the price of the pen is reduced by 20%?
 (A) $20z/y$ (B) $80y/2$ (C) $20y/z$ (D) $(20yz)/16$ (E) none of these (MBA 2013)
992. The price of 1 kg. of sugar was Tk. 60 in April. The price of sugar was increased by 12% in May. The price was again increased by Tk. 3 in July. Calculate the percentage of total increase in the price compared to the price of April.
 (A) 17% (B) 21% (C) 22% (D) 22.5% (E) none of these (MBA 2013)
993. Kalim is asked to write a study guide for a textbook. For his work, the publishing company is giving him a choice of a one-time payment of Tk 13,375 or Tk 2,000 plus 10% royalties per copy sold. If the proposed royalty rate results in a royalty of Tk 3.25 per study guide sold, how many study guides need to be sold for the total income received by Kalim to be the same from either choice?
 (A) 3,250 (B) 3,437 (C) 3,500 (D) 3,550 (E) none of these (BBA 13-14)
994. If the length of each sides of three square garden plots is increased by 50%, by what percent is the sum of the areas of the three plots increased?
 (A) 375% (B) 200% (C) 150% (D) 125% (E) 50% (BBA 13-14)
995. A restaurant meal had cost Tk 35.50 and there was no tax. If the service charge was more than 10 percent but less than 15 percent of the cost of the meal, then the total amount paid must have been between Tk -
 (A) 40 and 42 (B) 39 and 41 (C) 36 and 42 (D) 37 and 39 (E) 36 and 37 (BBA 13-14)
996. Mathematically, Force (F) is proportionate to Mass (m) multiplied by Acceleration (a); i.e. symbolically, $F \propto m * a$. If an object increases its acceleration by 10%, and loses 5% of its mass, by how much will the resultant force change?
 (A) Increase by 5% (B) Decrease by 5% (C) Increase by 4.5% (D) Decrease by 4.5% (E) No change (BBA 13-14)
997. A store charges Tk 52 for a video game. This price is 30% greater than the store's cost to buy the game from its supplier. As an incentive to the store's clerks, the manager allows a clerk to purchase the video game for 10% less than the store's cost. How much would a store clerk have to pay for this video game?
 (A) Tk 15.60 (B) Tk 20.80 (C) Tk 31.20 (D) Tk 32.76 (E) Tk 36.00 (BBA 13-14)
998. A drink contains 20% cranberry juice, 20% raspberry juice and the rest is apple juice. You added 250 ml of water to 750 ml of the drink. Now, what is the ratio of water to apple juice in the drink?
 (A) 6 : 5 (B) 9 : 5 (C) 5 : 12 (D) 5 : 9 (E) none of these (BBA 15-16)
999. Asif buys 100 shares of stock at Tk. 100 per share. The price goes up by 10% and he sells 50 shares. Then, price drops by 10% and he sells his remaining 50 shares. How much did he get for the last 50 shares?
 (A) Tk. 5000 (B) Tk. 5500 (C) Tk. 4900 (D) Tk. 5050 (E) Tk. 4950 (BBA 15-16)

- ⊕100. What percentage of numbers from 11 to 90 has 0 or 5 in the unit's digit? (BBA 15-16)
 (A) 10% (B) 15% (C) 20% (D) 21% (E) none of these
- 101. In a class, 120 students are male and 100 students are female. 25% of the male students and 20% of the female students are engineering students, 20% of the male engineering students and 25% of the female engineering students passed the final exam. What percentage of engineering students passed the exam (BBA 16-17)
 (A) 5% (B) 10% (C) 16% (D) 22% (E) none of these
- 102. Sixty percent members of a club are female. Fifty percent of the female members are doctors. The number of female doctors is twice the number of male non-doctors. What percent of the members are doctors? (BBA 16-17)
 (A) 45% (B) 55% (C) 57.5% (D) 60% (E) none of these
- ⊕103. There is 50% chance that Rafiq will go to a fast food restaurant for lunch and 50% chance that he will skip lunch. If he goes to a fast food restaurant there is 60% chance that he will take only a sandwich and nothing else. If he decides not to take a sandwich he will take a burger or a chicken pie. What is the probability that he will take a burger? (BBA 16-17)
 (A) 5% (B) 1% (C) 2% (D) 25% (E) none of these
- ⊕104. Two friends Moinul and Nuru have 40% and 60% share in a business. After some time a third friend Azmal joined the business by investing Tk 500,000 and acquired 20% shares in the business. What is the amount (in Tk) of Moinul in the business now? (BBA 17-18)
 A) 500,000 B) 800,000 C) 900,000 D) 1000,000 E) None of these
- ⊕105. Hasan bought a pen for his friend. The cost of the pen was Tk 80 before tax. If the total price including tax was Tk 96, what was the tax rate? (BBA 17-18)
 A) 6% B) 6.5% C) 7% D) 20% E) None of these
- ∇106. There is a 15% discount for a conference ticket if it is bought 5 to 29 days in advance. The discount is 30%, if the ticket is bought 30 to 59 days in advance. The discount is 40%, if the ticket is bought 60 to 89 days in advance. Sheela paid Tk 252 for the conference ticket. If she had purchased the ticket one day later, she would have paid Tk 306. How many days in advance did she purchase the ticket? (BBA 17-18)
 A) 5 B) 30 C) 59 D) 60 E) None of these

Answer Key Exercise 14

1.D	2.E	3.B	4.C	5.B	6.C	7.C	8.A	9.B	10.A
11.E	12.C	13.B	14.D	15.B	16.B	17.B	18.E	19.B	20.E
21.B	22.B	23.C	24.A	25.B	26.C	27.A	28.A	29.B	30.C
31.D	32.A	33.A	34.B	35.B	36.A	37.D	38.C	39.C	40.B
41.B	42.C	43.A	44.C	45.D	46.D	47.C	48.E	49.E	50.B
51.B	52.A	53.A	54.C	55.C	56.D	57.D	58.B	59.D	60.E
61.A	62.A	63.A	64.E	65.A	66.A	67.B	68.D	69.D	70.D
71.B	72.D	73.D	74.D	75.D	76.B	77.C	78.E	79.D	80.E
81.E	82.A	83.B	84.A	85.C	86.B	87.D	88.B	89.E	90.E
91.A	92.A	93.C	94.D	95.B	96.C	97.E	98.D	99.E	100.C
101.D	102.B	103.E	104.B	105.D	106.B				

Solution to Exercise 14

1. (D) $72\% + 20\% + 5\% = 97\%$. Remaining = $(100-97)\% = 3\% = 330$ Tk.
 $\therefore 100\% = \frac{330 \times 100}{3}$ Tk. = 11,000 Tk.
2. (E) $(48/72) \times 100\% = 66.67\%$
3. (B) Total cost = $12 + 30 + 18 = 60$. Donna paid $(18/60) \times 100\% = 30\%$
4. (C) Decline = $20000 - 16000 = 4000$.
 Percent decline = $(4000/20000) \times 100\% = 20\%$
5. (B) Mr X = 25%
 Mr Y = $\frac{2}{3} \times (100 - 25) = 50\%$
 Remaining = $100 - 25 - 50 = 25\%$
 $25\% = 11$
 $100\% = 44$
6. (C) Increase = $75 - 25 = 50$
 Percentage Increase = $\frac{50}{25} \times 100 = 200\%$
7. (C) 10% of $y/3$ means $\frac{10}{100} \times \frac{y}{3} = \frac{y}{30}$
 $\frac{2y}{3} = 10\%$ of 600
 $\frac{2y}{3} = 60$ or, $\frac{y}{3} = 30$ or, $\frac{y}{30} = 3$
8. (A) ধরি, মোট লোক = 100 জন
 \therefore মহিলা = 55 জন অতএব, পুরুষ = $(100 - 55) = 45$ জন
 Ratio of female to male = $55 : 45 = 11 : 9 = \frac{11}{9}$
9. (B) $550 \times \frac{70}{100} = 385$ জন business school employees $(550 - 385)$
 = 165 জন liberal arts employees
 \therefore Difference = $385 - 165 = 220$
10. (A) ধরি yellow মার্বেল = x
 \therefore blue মার্বেল = $3x$ \therefore red মার্বেল = $\frac{x}{2}$
 এবং orange মার্বেল = $\frac{x}{2}$ Total মার্বেল = $x + 3x + \frac{x}{2} + \frac{x}{2} = 5x$
 $5x$ এর মধ্যে orange = $\frac{x}{2}$ টি \therefore 100 এর মধ্যে orange = $\frac{x \times 100}{2 \times 5x} = 10$ টি
11. (E) ধরি book এর cost = x টাকা \therefore pen এর cost = $x + 20\%$ of $x = x + \frac{x}{5} = \frac{6x}{5}$ টাকা
 \therefore CD এর cost = $\frac{6x}{5} \times \frac{3}{4} = \frac{9x}{10}$ টাকা। প্রশ্নমতে, $\frac{6x}{5} - 90 = \frac{9x}{10} \Rightarrow \frac{12x - 9x}{10} = 90 \Rightarrow 3x = 900 \Rightarrow x = 300$ টাকা

12. (C) 15% increase = Tk. 450
 \therefore 10% increase = Tk. $\frac{450 \times 10}{15}$ = Tk. 300
13. (B) 30% পাশ করলে পাশ করেনি = $(100 - 30)\%$ = 70%
 70% = 12 + 30 = 42 জন; অর্থাৎ, 100% = $\frac{42}{70} \times 100$ = 60 জন
14. (D) ধরি box এর quantity = x
 $x \times \frac{2}{100} \times 35 = 700$
 $\Rightarrow x = 1000$
15. (B) If 60% of the socks are given, then red:green = 2:3
 = 24:36
 \therefore Green socks to be removed = 43-36=7
16. (B) 20% opted for product A and 60% for product B.
 Therefore, 20% were uncertain. Percentage difference between those who opted for product B and those who were uncertain were $(60 - 20) = 40\%$ Given that the difference between those who opted for product B and those who were uncertain were 720.
 So, $40\% = 720$
 $100\% = (720/40) \times 100 = 1800$.
17. (B) যেহেতু কোন contestant একটির বেশি পাইজ পায়নি কাজেই 30 prizes পেয়েছে 30 contestants, $5\% = 30$ তাহলে $100\% = 600$.
18. (E) production কমে গেছে = $800 \times 0.5\% = 4$ units. বর্তমান production = $800 - 4 = 796$.
19. (B) income face value অর্থাৎ Tk -25 এর উপরে calculate করতে হবে, buying price 32.5 এর উপরে নয়।
 income = $400 \times 25 \times 4\% = 400$ টাকা।
20. (E) Number of students who passed the final exam = $\frac{2}{3}$ of 90% of 50 = $\frac{2}{3} \times \frac{90}{100} \times 50 = 30$.
21. (B) Say, number of games played in 1st season = x
 \therefore number of games played in 2nd season = 2x
 \therefore total win = (50% of x) + 65% of 2x = $\frac{x}{2} + \frac{65}{100} \times 2x = \frac{x}{2} + \frac{13x}{10} = \frac{5x + 13x}{10} = \frac{18x}{10}$
 \therefore percentage of win = $\frac{\text{win}}{\text{total}} \times 100\% = \frac{\frac{18x}{10}}{x + 2x} \times 100\% = \frac{18x}{10} \times \frac{1}{3x} \times 100\% = 60\%$.
22. (B) profit = 25% of 100,000 = $0.25 \times 100,000 = 25,000$
 \therefore Broker got 50% of 25,000 = 12,500
23. (C) মনে করি, সে x সংখ্যক pen কিনেছিলো।
 $\therefore 8x + (12 - x) 4.5 = 82 \Rightarrow 3.5x = 28 \Rightarrow x = \frac{28}{3.5} = 8$
24. (A) $x = 1.33y$ and $y = 0.75z \therefore x = 1.33(0.75z) = z = 200,000$

25. (B) মনে করি, earnings of last year = x \therefore savings = $0.1x$ এবং earnings of this year = y \therefore savings = $0.12y$ \therefore $0.12y = 126\%$ of $0.1x \Rightarrow 0.12y = 1.26 \times 0.1x \Rightarrow 12y = 126 \times 0.1x \Rightarrow 120y = 126x \Rightarrow \frac{Y}{X} = \frac{126}{120} = \frac{21}{20} \Rightarrow \frac{Y-X}{X} = \frac{21-20}{20} = \frac{1}{20} \times 100\% = 5\%$
26. (C) Not passed = $60\% = 15 + 33 \Rightarrow 48 = \frac{48}{60} = \frac{4}{5}$ Percentage = $100\% = \frac{4}{5} \times 100 = 80$
27. (A) Final exam দিয়েছে 60 এর $90\% = 54$ জন
final exam পাস করেছে = $54 \times \frac{2}{3} = 36$ জন। মোট enrolled students = 60 জন অর্থাৎ পাস করেনি = $60 - 34 = 24$ জন
 \therefore নির্ণেয় percentage = $\frac{24}{60} \times 100 = 40$
28. (A) ধরি, মোট member = 100
 \therefore মহিলা member = 70 এবং পুরুষ member = 30 জন পুরুষদের মধ্যে অবিবাহিত = $30 \times \frac{2}{3} = 20$ জন অর্থাৎ 10 জন বিবাহিত মোট বিবাহিত = 60 জন \therefore মহিলাদের মধ্যে বিবাহিত = $60 - 10 = 50$ জন \therefore নির্ণেয় fraction = $\frac{50}{70} = \frac{5}{7}$
29. (B) ধরি, initial salary = 100 টাকা।
1ম মাস পরে salary = 110 টাকা
2য় মাস পরে salary = $(100 \times \frac{10}{100}) + 110 = 121$ টাকা
3য় মাস পরে salary = $(121 \times \frac{10}{100}) + 121 = 133.1$ টাকা
অর্থাৎ, 3টি বৃদ্ধির পর salary 133.1 টাকা হলে শুরুতে ছিল 100 টাকা
 \therefore 3টি বৃদ্ধির পর 13310 টাকা হলে শুরুতে ছিল $\frac{100 \times 13310}{133.1}$ টাকা = 10,000 টাকা
30. (C) Commission on 6000 = 5% of 6000 = 300
commission on 6000 + = 8% of 4000 = 320
 \therefore Total commission = 620
31. (D) Price = 300 টাকা
tax 5% হলে cost = $300 + (300 \times \frac{5}{100}) = 315$ টাকা
tax 8% হলে cost = $300 + (300 \times \frac{8}{100}) = 324$ টাকা
অর্থাৎ, cost 315 টাকা হতে 324 টাকার মধ্যে থাকবে।
32. (A) 3600 জনের মাঝে $\frac{1}{3}$ যদি clerical হয় তাহলে clerical staff এর সংখ্যা = 1200. এদের মাঝে $\frac{1}{3}$ কে বাকি দিলে, clerical staff এর সংখ্যা হয় $(1200 - 400) = 800$ এবং total staff এর সংখ্যা হয় $(3600 - 400) = 3200$
So, percentage of clerical staff = $(800/3200) \times 100 = 25\%$

33. (A) মনে করি, male students x
female " $(400 - x)$

$$15\% \text{ of } x + 20\% \text{ of } (400 - x) = 72$$

$$\Rightarrow \frac{15x}{100} + \frac{20(400 - x)}{100} = 72$$

$$\Rightarrow 15x - 20x + 8000 = 7200$$

$$\Rightarrow 5x = 800 \therefore x = 160$$

অথবা

elimination মেথডে করা যায়। option A তে,

$$160 \text{ male, A পায় } 160 \times \frac{15}{100} = 24$$

$$240 \text{ female, A পায় } 240 \times \frac{20}{100} = 48$$

$$A \text{ পায় } = 24 + 48 = 72 \text{ জন অর্থাৎ, match করে।}$$

34. (B) মনে করি, Toll pay করে x টাকার উপর (1000 টাকার অতিরিক্ত)

$$x \times 7\% = 87.50 \Rightarrow \frac{7x}{100} = 87.50 \Rightarrow x = \frac{87.50 \times 100}{7}$$

$$\Rightarrow x = \frac{8750}{7} \Rightarrow x = 1250$$

$$\text{Total value of potatoes} = 1000 + 1250 \text{ (প্রথম 1000 টাকা total free)} = 2250$$

35. (B) মোট women = $400 \times \frac{30}{100} = 120$ জন

$$\text{Instructor হয়েছে} = 120 \times \frac{1}{5} = 24 \text{ জন}$$

$$\therefore \text{Men instructors এর সংখ্যা} = 24 \times 2 = 48 \text{ জন}$$

36. (A) প্রথম 100,000 এর জন্য tax = $(100,000 \times \frac{10}{100}) = 10,000$ টাকা

$$\text{পরবর্তী } (275,000 - 100,000) = 175,000 \text{ এর জন্য tax} = (175,000 \times \frac{15}{100}) = 26,250 \text{ টাকা}$$

$$\text{মোট tax} = 10,000 + 26,250 = 36,250 \text{ টাকা।}$$

37. (D) Played = 50, won = 30

$$\text{more to play} = 46, \text{ সুতরাং মোট খেলা হবে} = 50 + 46 = 96.$$

$$75\% \text{ জিতে হবে। } 96 \text{ এর } 75\% = 96 \times \frac{75}{100} = 72$$

$$\text{এখন পর্যন্ত 30 টি জিতেছে। অর্থাৎ আরও } (72 - 30) = 42 \text{ টি জিতে হবে।}$$

38. (C) Team won 40 games out of 60 and remaining games is 32.

$$\text{Total games} = 60 + 32 = 92$$

$$75\% \text{ of } 92 = 69$$

$$\text{Team has to win 69 games in total. Team has already won 40.}$$

$$\therefore \text{Games to win} = 69 - 40 = 29$$

39. (C) পিয়াজের দাম বেড়ে 100 থেকে 125 হলো; \therefore খরচ সমান রাখতে হলে, এখন 125 টাকায় কিনা যায় 1 অংশ;
 \therefore 100 টাকায় কিনা যায় $\frac{1}{125} \times 100$ অংশ = $4/5$ অংশ; \therefore ব্যবহার কমাতে হবে = $1 - \frac{4}{5} = \frac{1}{5}$ অংশ অর্থাৎ, $1/5 \times 100\% = 20\%$ কমাতে হবে।
40. (B) মনে করি, original salary = 100 টাকা; \therefore বৃদ্ধির পর salary = 125 টাকা; \therefore original পরিমাণে নিয়ে আসতে হলে $(125 - 100) = 25$ টাকা কমাতে হবে। \therefore percentage decrease $\frac{\text{change}}{\text{original}} = \frac{25}{125} \times 100\% = 20\%$
41. (B) ধরি, 1993 এর price = 100 টাকা \therefore 1994 এর price = 110 টাকা
 এবং 1995 এর price = $\{110 - (110 \times \frac{5}{100})\}$ টাকা = $110 - 5.5 = 104.5$ টাকা
 অর্থাৎ, 1993 থেকে 1995 এর change 4.5% increase.
42. (C) মনে করি, 1994 এ price = 100 \therefore 1995 এ = 110 \therefore 1996 এ = $110 - 5\%$ of 110 = $110 - 5.5 = 104.5$
 \therefore increase = $104.5 - 100 = 4.5$ \therefore percentage increase = $\frac{\text{increase}}{\text{original}} = \frac{4.5}{100} \times 100\% = 4.5\%$
43. (A) 75% of 35 = $\frac{75}{100} \times 35$. 75% কে লেখা যায় = $\frac{75}{100} = .75 = \frac{3}{4}$.
44. (C) মনে করি, radius = 10; সুতরাং area = $\pi r^2 = 100\pi$
 radius 100% বাড়ল। নতুন radius = 20; area = $\pi r^2 = 400\pi$ area increase বাড়ল 300%. Answer: C
45. (D) New length = $15 - 10\%$ of 15 = 13.5m; New width = $y + 10\%$ of $y = 1.1y$; \therefore New area = $(13.5) \times (1.1y) = 14.85y$; Old area = $15y$; \therefore Change = $15y - 14.85y = 0.15y$; \therefore Percentage change = $\frac{\text{change}}{\text{original}} \times 100\% = \frac{0.15y}{15y} \times 100\% = 1\%$, decrease.
46. (D) ধরি, previous length = 10; previous breadth = 10 \therefore area = $10 \times 10 = 100$
 After the increase, length = $10 \times 20\% = 12$; breadth = $10 \times 25\% = 12.5$ \therefore
 area = $12 \times 12.5 = 150$
 অর্থাৎ 50% increase হয়েছে।
47. (C) মনে করি original width = x ; original length = y ; \therefore area = xy ;
 new width = $1.25x$ and new length = $0.75y$; \therefore new area = $(1.25 \times .75) xy = .9375 xy$
 percentage = $\frac{.9375xy}{xy} \times 100 = 93.75\%$
48. (E) এই ধরনের problem এ original length এবং width 100 ধরে নিলে সমাধান সহজ হবে।
 $160 \times w' = 100 \times 100$ or, $w' = \frac{100 \times 100}{160} = 62.5$
 \therefore width কমাতে হবে $(100 - 62.5)$ বা 37.5%
49. (E) initial area = XY . বর্তমানে length = $X - 12.5\% \times X = 0.875 X$ আর বর্তমান width = $Y - 10\% Y = 0.90 Y$. কাজেই বর্তমান area = $0.875 \times 0.90 XY$. percentage loss = $\frac{xy - 0.7875xy}{xy} \times 100 = 21.25\%$

50. (B) say, original length = l & original breadth b \therefore original area = bl Now, new length = $1.2l$ and new breadth = $0.8b$ \therefore new area = $1.2l \times 0.8b = 0.96bl$ \therefore decrease in area = $bl - 0.96bl = .04bl$ \therefore percentage change = $\frac{\text{change}}{\text{original}} \times 100\% = \frac{.04bl}{bl} \times 100\% = 4\%$

51. (B) $5 = (5 \times 100)\% = 500\%$

52. (A) মনে করি, screwdriver এর দাম = s \therefore hammer এর দাম = $2s$
 After increase price of Hammer = $2s + 5\%$ of $2s = 2s + 0.1s = 2.1s$
 After decrease price of screwdriver = $s - 4\%$ of $s = s - 0.04s = 0.96s$
 Original price of 3 screwdriver and 3 hammers = $3s + 3 \times 2s = 9s$
 New price = $3 \times 0.96s + 3 \times 2.1s = 9.8s$ \therefore Change = $0.18s$

$$\therefore \text{Percentage Change} = \frac{0.18s}{9s} \times 100\% = 2\%$$

53. (A) ধরি, Red socks 30 টি, তাহলে Green socks 20 টি Cotton red socks = 60% of $30 = 18$ টি
 Cotton green socks = 20% of $20 = 4$ টি
 $\%$ of cotton socks = $22 / 50 \times 100 = 44\%$

54. (C) Back solve করলে c ধরে প্রথমেই মিলে যেতো। price of chain x বলে

$$\frac{5x}{100} + \frac{10}{100} (500 - x) = 45 \text{ [loss + gain = net change]}$$

$$\text{or, } 5000 - 5x = 4500 \quad \text{or, } 5x = 500 \quad \text{or, } x = 100$$

55. (C) $100 + 20\%$ increase = 120

$$120 + 20\% \text{ increase} = 120 + \left(120 \times \frac{20}{100}\right) = 144$$

Price in 1995 = Tk. 450,000

1995 - এ 120 হলে 1990 এ = 100

$$1995 \text{ এ } 450,000 \text{ হলে } 1990 \text{ এ} = \frac{100 \times 450,000}{120} = 375,000$$

আবার

1995 এ 120 হলে 2000 - এ = 144

$$1995 - \text{এ } 450,000 \text{ হলে } 2000 \text{ এ} = \frac{144 \times 450,000}{120} = 540,000$$

$$\text{Difference} = 540,000 - 375,000 = 165,000$$

56. (D) গত বছরের বাজেট = 1000,000 টাকা

$$\therefore \text{এই বছরের বাজেট} = \left\{1000,000 + \left(1000,000 \times \frac{15}{100}\right)\right\} \text{ টাকা} = 11,50,000 \text{ টাকা}$$

$$\text{এ বছরে computer center এর জন্য allocation} = 1,150,000 \times \frac{60}{100} = 690,000 \text{ টাকা}$$

এটি গত বছরের চেয়ে 20% বেশি অর্থাৎ, এ বছর 120 টাকা হলে গত বছর ছিল = 100 টাকা

$$\therefore \text{এ বছর } 690,000 \text{ টাকা হলে গত বছর ছিল} = \frac{100 \times 690,000}{120} \text{ টাকা} = 575,000 \text{ টাকা।}$$

57. (D) প্রশ্নমতে, $\frac{x}{5} = \frac{3y}{10} \Rightarrow x = \frac{3y}{2}$ অর্থাৎ, x, y এর 150%
58. (B) ধরি, salary ছিল = x
 $\frac{6x}{100} + 450 = \frac{8x}{100} \Rightarrow \frac{2x}{100} = 450 \Rightarrow x = 22,500.$
59. (D) $1.5 + 8.5\% \times 1.5 = 1.63$
60. (E) If the original population was 100, then after increase, population = 150
 After decrease, population = $150 \times 40\% = 60$
 \therefore Percentage decrease = 40%
61. (A) In january
 No of female were $300 \times \frac{55}{100} = 165$
 In February
 No of female were $440 \times \frac{30}{100} = 132$
 So, % decrease = $\frac{33}{165} \times 100 = 20$ (Ans. A)
62. (A) Suppose there are $2x$ white socks and $3x$ black socks.
 \therefore Cotton socks = 60% of $5x = 3x$
 Cotton white socks = 25% of $2x = 0.5x$
 \therefore cotton black socks = $3x - 0.5x = 2.5x$
 wool black socks = $3x - 2.5x = 0.5x$
 according to question, $0.5x = 20 \Rightarrow x = 40$
 \therefore Cotton black socks = $2.5 \times 40 = 100$
63. (A) 6000 টাকার sales এর জন্য commission = 5% of 6000 = $.05 \times 6000 = 300$
 \therefore বাকি $460 - 300 = 160$ টাকা commission এসেছে 6000 টাকার বেশি sales থেকে। মনে করি, total sales =
 x , 8% of $(x - 6000) = 160 \Rightarrow x - 6000 = \frac{160}{0.08} = 2000 \therefore x = 8000$
64. (E) ধরি, Shaukat এর weight = 100
 \therefore Hasib এর weight = 140
 এবং Misha এর weight = 200
 আবার, Moula এর weight = $200 \times \frac{90}{100} = 180 \therefore$ নির্ণেয় percentage = $\frac{180}{140} \times 100 = 128 \frac{4}{7}$
65. (A) $\frac{1}{8}$ এবং $\frac{5}{6}$ করা যায় এমন একটি সংখ্যা 24.
 let, no. of girls = no of boys = 24
 \therefore no of boys not residing in the hostel = $\frac{1}{6}$ of 24 = 4
 \therefore Fraction of total boys not residing in hostel = $\frac{4}{48} = \frac{1}{12}$

66. (A) ধরি, cost = 100 টাকা, \therefore import duty = 50 টাকা;
 additional supplementary charge = $150 \times \frac{30}{100} = 45$ টাকা।
 \therefore total duty + add. charge = $50 + 45 = 95$ টাকা
 import duty + add. charge 95 টাকা হলে cost = 100 টাকা
 \therefore import duty + add. charge 2,85,000 টাকা হলে cost = $\frac{285,000}{95} = 3,00,000$ টাকা
67. (B) আগের বছরের বাজেট n হলে এবছরের বাজেট = $n + (n \times \frac{15}{100}) = n + \frac{3n}{20} = \frac{23n}{20}$
 \therefore school expenditure এ allocate করা হয়েছে = $\frac{23n}{20} \times \frac{60}{100} = \frac{23n}{20} \times 0.6 = (0.6)(1.15n)$
68. (D) 1995 এ bank এর সংখ্যা ছিল = $60 \times 0.45 = 27$
 1997 এ bank এর সংখ্যা হল = $144 \times 0.25 = 36$
 Therefore, percentage increase = $(9/27) \times 100 = 33.33\%$
69. (D) এই বছরে students আছে 15 percent বেশি। Number of students = $1172 \times 1.15 = 1400$
70. (D) ধরি, Mercedes এর price = 100 ; Mercedes এর tax = 15
 BMW এর price = 120; BMW এর tax = $120 \times 20\% = 120 \times \frac{20}{100} = 24$
 $\frac{\text{BMW এর tax}}{\text{Mercedes এর tax}} \times 100\% = \frac{24}{15} \times 100\% = 160\%$;
71. (B) 8 liter solution এ salt = $8 \times 5\% = 8 \times \frac{5}{100} = 0.4$; 1 liter পানি evaporation এর পর solution = 7 liter
 \therefore percentage = $\frac{0.4}{7} \times 100\% = \frac{4}{70} \times 100\% = 5.7\%$;
72. (D) $x = y + y \times 30\%$
 $= y + \frac{30y}{100} = y + \frac{3y}{10} = y \left(\frac{13}{10} \right)$
 $\therefore \frac{x}{y} \times 100\% = \frac{13}{10} \times 100\% = 130\%$
 অথবা just common sense apply করে করা সম্ভব। x is 30% grater than y মানে,
 x is 130% of y
73. (D) ধরি last week এর total hours = x
 \therefore Current " " " " = $x - x$ এর 10% = $0.9x$
 আগে total weekly wage ছিল Tk. 1370
 \therefore per hour " " $\frac{1370}{x}$ Tk.
 10% বেড়ে গিয়ে এখন per hour wage = $\frac{1370}{x} + \frac{1370}{x}$ এর 10%
 $= \frac{1370}{x} + \frac{1370}{10x}$
 $= \frac{15070}{10x} = \frac{1507}{x}$ Tk.

$$\therefore \text{Total wage} = 0.9x \times \frac{1507}{x} = 1356.3 \text{ Tk.}$$

$$\text{অর্থাৎ Charge} = \text{Tk. } 1370 - \text{Tk. } 1356.3 \text{ Tk.} = \text{Tk. } 13.7$$

Short Cut method: 10% increase - decrease এর final result = 1% decrease

$$\Rightarrow 1370 \text{ এর } 1\% = 13.7 \text{ Tk.}$$

74. (D) ধরি, price of pencil = 100 \therefore price of pen = 200

$$\therefore \text{Original price of 5 pen and 5 pencil} = 1500$$

$$\text{new price of pencil} = 96 \quad \text{new price of pen} = 210$$

$$\therefore \text{new price of 5 pen and 5 pencil} = 1530 \therefore \text{increase in price} = \frac{30 \times 100}{1500} = 2\%$$

75. (D) আগে x টি Tk. 75 এখন $x + 5$ টির price Tk. 75, x টির বর্তমান price calculate করতে পারলে present price বের করা যাবে।

$$\text{Previous price } 100 \text{ হলে current price} = 80$$

$$\text{Previous price } 75 \text{ হলে current price} = \frac{80 \times 75}{100} = 60$$

$$5 \text{ টির current price} = 75 - 60 = \text{Tk. } 15$$

$$\therefore 12 \text{ টির current price} = \frac{15 \times 12}{5} = \text{Tk. } 36$$

76. (B) Total games = 100; Played games = $x \therefore$ won games = $x \times \frac{40}{100} = \frac{2x}{5}$

$$\text{unplayed games} = 100 - x \quad \therefore \text{won games} = (100 - x) \times \frac{30}{100} = \frac{3(100 - x)}{10}$$

$$\text{Total won game} = \frac{2x}{5} + \frac{3(100 - x)}{10} = \frac{4x + 300 - 3x}{10} = \frac{300 + x}{10} = 30 + \frac{x}{10}$$

77. (C) ধরি, rectangle টি $10/10$, length 10% increase এবং width 10% decrease করলে area হবে 99 অর্থাৎ 1% কমে যাচ্ছে।

78. (E) প্রতি y এ defective = x

$$\therefore 100 \text{ এ defective} = \frac{100x}{y}$$

$$\text{প্রশ্নমতে, } 5\% = \frac{100x}{y} \quad \therefore 100\% = \frac{100x \times 100}{5y} = \frac{2000x}{y}$$

79. (D) মোট women = $160 \times \frac{15}{100} = 24$

$$\text{ধরি, } x \text{ জন বেরিয়ে গেলেন।} \quad \therefore \text{women বেরিয়ে গেলেন} = x \times \frac{30}{100} = \frac{3x}{10}$$

$$\text{অর্থাৎ, room এ রয়ে গেলেন} = 160 - x \text{ জন লোক}$$

$$\text{এক room এ women রয়ে গেলেন } 24 - \frac{3x}{10} = \frac{240 - 3x}{10}$$

$$\text{প্রশ্নমতে } \frac{240 - 3x}{10} = \frac{160 - x}{10} \Rightarrow 240 - 3x = 160 - x \Rightarrow x = 40$$

80. (E) $156000 - 150,000 = 6000$. Now that, 15% is paid for additional amount of 1, 50,000.
15 \Rightarrow 100

$$\therefore 6000 \Rightarrow \frac{100 \times 6000}{15} = 40000$$

81. (E) $x = m\%$ of $y = m/100 \times y$
 $y = x \times 100/m$ Percentage = $(x \times 100 / m) / x \times 100 = x \times 100/m\%$
82. (A) $0.04 \times 0.03^2 = 0.04 \times 0.03 \times 0.03 \times 100\% = 0.0036\%$
83. (B) $x \times 7/3 \times 5/8 = x \times 35/24 = x + 11/24x = x + 11/24 \times 100\%$ of $x = x + 45.83\%$ of $x = x + 46\%$ of x
84. (A) Let, Old price = 100 Taka
 So new price = 132 taka
 Old cost = $100 \times 10 = 1000$
 New cost = $1000 \times 10\%$ of $1000 = 1100$ taka
 So, New quantity = $1100/132 = 8.33$ taka
 So, Answer A.
85. (C) The clouds absorb 40% of the reflected light.
 The surface reflects 80% of light and 60% of reflected light passes through the clouds.
 So, the percentage of light passed through is = 60% of 80 = 48%.
 So, Answer C.
86. (B) Juniors = $900 \times 24\% = 216$
 Sophomores = $900 \times (100-72)\% = 900 \times 28\% = 252$
 Seniors = 144
 Freshmen = $900 - (216 + 252 + 144) = 900 - 612 = 288$
 So, freshmen - sophomores = $288 - 252 = 36$
87. (D) 20% reduction (রিডাকশন- হ্রাস) হওয়ার অর্থ হলো, পূর্বের মূল্য 100 হলে বর্তমান মূল্য 80।
 \therefore পূর্ব মূল্য 75 হলে বর্তমান মূল্য $\frac{80}{100} \times 100 = 60$
 \therefore যে কয়টি কলার দাম পূর্বে ছিলো 75, সেই কয়টির বর্তমান দাম 60। \therefore এখন, 5 টি কলা পাওয়া যায় $75 - 60 = 15$ টাকায়।
 \therefore 12টি কলা পাওয়া যায় $\frac{15}{5} \times 12 = 36$ টাকায়।
88. (B) ধরি, 2 বছর আগে Millat এর salary = 200 টাকা
 \therefore 2 বছর আগে Jalal এর salary = 100 টাকা
 1 বছর আগে Jalal এর salary = 105 টাকা এবং Millat এর salary = 220 টাকা
 এখন, Jalal এর salary = $\{ 105 + (105 \times \frac{5}{100}) \}$ টাকা। = 110.25 টাকা
 এবং Millat এর salary = $\{ 220 + (220 \times \frac{10}{100}) \}$ টাকা। = 242 টাকা
 \therefore নির্ণেয় percentage = $\frac{110.25}{242} \times 100 = 45.55\%$ (approx) = 46% (approx)
89. (E) ধরি, গত সপ্তাহে Sohan কাজ করেছে = 10 hours
 এবং গত সপ্তাহে Sohan এর total wage = \$ 137
 \therefore গত সপ্তাহে Sohan এর per hour wage = $\frac{\$137}{10} = \13.7
 প্রশ্নানুসারে, এই সপ্তাহে Sohan কাজ করেছে = $10 - (10 \times \frac{10}{100}) = 9$ hours
 এবং এই সপ্তাহে per hour wage = $13.7 (13.7 \times \frac{10}{100}) = \$ 15.07$
 \therefore এই সপ্তাহে Sohan এর total wage = $\$ (15.07 \times 9) = \$ 135.63$
 অর্থাৎ, change = $\$ (137 - 135.63) = \$ 1.37$ decrease

90. (E) 25% marks পেলে pass mark থেকে 30 কম হয়, আবার, 50% marks পেলে pass mark থেকে 30 বেশি হয়, অর্থাৎ, 25% marks is equivalent to a score of $30 + 30 = 60$. \therefore pass mark = $60 + 30 = 90$; অর্থাৎ, Answer E.
অথবা মনে করি, মোট mark x .
1ম ক্ষেত্রে, pass mark = 25% of $x + 30 = \frac{x}{4} + 30$; 2য় ক্ষেত্রে
pass mark = 50% of $x - 30 = \frac{x}{2} - 30$
এখন, $\frac{x}{2} - 30 = \frac{x}{4} + 30 \Rightarrow \frac{x}{2} - \frac{x}{4} = 60 \Rightarrow x = 240 \therefore$ Pass mark = $\frac{240}{4} + 30 = 60 + 30 = 90$
91. (A) পূর্বের থেকে 20% কম মূল্যে -
0.8y টাকায় পাওয়া যায় 16 টি কলম
1 টাকায় পাওয়া যায় $16/0.8y$ টি কলম
z টাকায় পাওয়া যায় $16z/0.8y$ টি কলম = $20z/y$ টি কলম
92. (A) May তে মূল্য বেড়েছে $60 \times 12/100 = 36/5$ টাকা
July তে গিয়ে মোট বেড়েছে $36/5 + 3 = 51/5$ টাকা
60 টাকায় মূল্য বেড়েছে $51/5$ টাকা, যা 100 টাকার 17%
93. (C) পাবলিশিং কোম্পানি Kalim কে এককালীন 13,375 টাকা দিবে
অথবা, 2000 টাকা এবং বিক্রিত প্রতি বই থেকে 3.25 টাকা দিবে।
পাবলিশিং কোম্পানি থেকে আয় এককালীন 13,375 টাকা।
ধরি, Kalim 'x' টি বই বিক্রি করে যখন দুই পদ্ধতিতেই তার আয় 13,375 টাকা
সুতরাং
 $13375 = 2000 + 3.25x$
Or, $3.25x = 11375$
Or, $x = \frac{11375}{3.25}$
Or, $x = 3500$
94. (D) ধরি, square এর প্রতিটি বাহুর দৈর্ঘ্য x
সুতরাং, square টির area x^2
যদি square টির প্রতিটি বাহুর দৈর্ঘ্য 50% করে বাড়ানো হয় তবে প্রতিটি বাহুর দৈর্ঘ্য হবে $1.5x$, এবং তখন area হবে $(1.5x)^2 = 2.25x^2$
অর্থাৎ area বাড়বে $1.25x^2$, which is 125%
95. (B) Restaurant এ বিল আসলো 35.50 taka
যদি 10% Tax হয় তবে bill amount হবে $(35.50 \times 10\% \text{ of } 35.50)$ taka = 39.05 taka
যদি 15% Tax হয় তবে bill amount হবে $(35.50 \times 15\% \text{ of } 35.50)$ taka = 40.825 taka
সুতরাং যদি 10% থেকে 15% এর মধ্যে Tax হয় তবে bill amount 39.05 taka থেকে 40.825 taka হবে যা 39 এবং 41 এর মধ্যে।
96. (C) 10% বাড়লে acceleration a হয়ে যাবে, $1.1a$
5% কমলে mass m হয়ে যাবে, $0.95m$
So, new force, $1.1a \times 0.95m = 1.045ma$ যা আগের force এর চেয়ে 4.5% বেশি।
97. (E) 30% বেশি দাম এ বিক্রি করে। so if cost price is $100x$, selling price is $130x$. And store cost এর থেকে 10% কম মানে $90x$
Given, $130x = 52$
So, $100x = 40$
So, $90x = 36$

98. (D) Apple juice $(100-20-20) = 60\%$ অর্থাৎ $(750 \times 60\%) = 450$ ml। অতএব Water এবং Apple juice এর ratio = $250:450 = 5:9$ ।

99. (E) Price 10% বৃদ্ধি হলে হয় 110 টাকা এরপর আবার price 10% কমলে দাঁড়ায় $110 - (110 \times 10\%) = 99$ টাকা অতএব শেষ 50 টি share থেকে পেয়েছে $(99 \times 50) = 4950$ টাকা।

100. (C) 11 থেকে 90 এর মধ্যে Unit digit এ 0 or 5 আছে 16 সংখ্যায়। অর্থাৎ শতকরা = $(16/80) \times 100 = 20\%$ ।

101. (D) 120 জন male student এর $25\% = 30$ জন

100 জন female student এর $20\% = 20$ জন

30 জনের $20\% = 6$ জন male student passed

20 জনের $25\% = 5$ জন female student passed

Total engineering students = $30+20=50$ জন

Total number of engineering passed student = $6+5=11$ জন

Percentage of passed student = $(11/50) \times 100$

$$= 22\%$$

সঠিক Answer (D)

102. (B) 60% members are female তাহলে female doctor হলো 30%.

Female doctor এর number twice হওয়ার male non-doctor হলো 15%

তাহলে male doctor হলো $(40-15)\%$

$$= 25\%$$

Total percentage of doctors = $(25+30)\%$

$$= 55\%$$

So, Answer (B)

103. (E) fast food restaurant এ খাওয়ার probability = $1/2$

Restaurant এ গিলে sandwich না নেয়ার probability = $1/2 \times 2/5 = 1/5$

Restaurant এ গিলে sandwich না নিয়ে burger নেয়ার probability = $1/5 \times 1/2 = 1/10 = 10\%$

Correct Answer (E)

104. (B) 800,000

Azmal's shares = $20\% = \text{Tk. } 500,000$

Moinul's and Nuru's total shares = $(100-20)\% = 80\%$

Moinul's share = 40% of Remaining $80\% = 32\% = \text{Tk. } \frac{32 \times 500000}{20} = \text{Tk. } 800,000$.

105. (D) 20%

Tax apply করার আগে কলমটির দাম = Tk 80

Tax apply করার পরে কলমটির দাম = Tk. 96

সুতরাং, Tax = Tk 16

Tax Rate = $\frac{16}{80} \times 100\% = 20\%$.

106. (B) 30

There are three cases when the price of the ticket will increase if it is bought one day later.

Case 1: The ticket was bought 5 days in advance and price would increase if it was bought one day later i.e. 4 days in advance.

This means Tk 252 is the price after 15% discount and Tk 306 is the total price of the ticket. But if we calculate we will find that after applying 15% discount on Tk 306 the amount is not Tk 252. So the ticket was not bought 5 days in advance.

Case 2: The ticket was bought 30 days in advance and price would increase if it was bought one day later i.e. 29 days in advance.

This means Tk 252 is the price after 30% discount and Tk 306 is the price after 15% discount. If we find the total price from both of these amounts then we can see that the total price is same i.e. Tk 360 for both amounts. So the ticket was actually bought 30 days in advance.

Case 3: The ticket was bought 60 days in advance and price would increase if it was bought one day later i.e. 59 days in advance. No need to check, since answer already found.

Concept 15

Profit Loss

Concept 15 (Profit & Loss)

- ⊗ Profit = Selling Price – Cost
Loss = Cost – Selling Price
- ⊗ **Always remember, Profit or loss is always calculated on the cost**
If an item is sold at 20% profit, it is sold at 120% of cost
If an item is sold at 20% loss, it is sold at 80% of cost
- ⊗ **Marking up/down means raising/lowering the selling price. It is always calculated on selling price.**
If an item is marked up by 20%, its selling price is 120% of previous selling price
If an item is marked down by 20%, its selling price is 80% of previous selling price
- ⊗ 100% of cost is cost itself. It's obvious isn't it? But, keeping it in mind makes life easier.
Let me show you how.
Suppose a book was sold at 20% profit and profit was 40 tk.
So, 20% of cost = 40
100% of cost = 200.
The cost of the book was 200.
- ⊗ **Discount is calculated on selling price**
If an item is sold at 20% discount, it is sold at 80% of the previous selling price

Example 1: A bicycle originally cost \$ 100 and was discounted 10%. After three months it was sold after being discounted another 15%. How much was the bicycle sold for?
A) \$76.50 B) \$75.00 C) \$73.50 D) \$71.00 E) \$69.50

Solution:

Original price = \$100

10% discounted price = \$90

The bicycle was sold after another 15% discount. Meaning, the bicycle was sold at 85% of the discounted price. Selling price = $\$90 \times 85\% = \76.50

Answer: (A)

Example 2: A certain radio costs a shopkeeper Tk. 64, At what price must he sell it if he is to make a profit of 20% on the selling price?

A. Tk. 12.80 B. Tk. 76.80 C. Tk. 78,00 D. Tk. 80.00 E. Tk. 84.00

Solution:

Cost = 64; at 20% profit, selling price is 120% of cost.

Selling Price = $64 \times 120\% = 76.80$ taka.

Answer: (B)

Exercise 15

- 1. A certain radio costs a shopkeeper Tk. 64, At what price must he sell it if he is to make a profit of 20% on the selling price? (BBA 94-95)
 (A) Tk. 12.80 (B) Tk. 76.80 (C) Tk. 78.00 (D) Tk. 80.00 (E) Tk. 84.00
- 2. A trader incurs a loss of 10% on cost of an item on selling it. If he could sell it at Tk. 1,500 more, he could make a profit of 20% on cost. What was the cost of the item in thousand Taka? (BBA 94-95)
 (A) 7.5 (B) 6 (C) 5 (D) 4.5 (E) 8
- 3. A bicycle originally cost \$ 100 and was discounted 10%. After three months it was sold after being discounted another 15%. How much was the bicycle sold for? (BBA 94-95)
 (A) \$76.50 (B) \$75.00 (C) \$73.50 (D) \$71.00 (E) \$69.50
- 4. A trader incurs a loss of 10% from selling an item. If the selling price was Tk. 200 more he would have made a profit of 15%. What was the cost of the item? (BBA 02-03)
 (A) 800 (B) 720 (C) 1200 (D) 900 (E) None of these
- 5. A man made a loss of 20% on his cost by selling a pen at taka 200. What should be the selling price in taka if he wants to make a profit of 10% on cost? (BBA 98-99)
 (A) 250 (B) 275 (C) 300 (D) 225 (E) None of these
- 6. Asif purchased a radio from a store and sold it to Rahman and made a profit of 20%. After few months Rahman sold the same radio to Fahad and incurred a loss of 15%. Fahad bought the Radio for Tk. 510 what was the original price of the radio? (BBA 03-04)
 (A) 425 (B) 450 (C) 475 (D) 500 (E) None of these
- 7. A manufacturer of TV wants to make a profit of Tk. 3,00,000 on sale of 200 TV sets. It costs Tk. 10,000 each to make the first 100 TV sets and Tk. 7,500 each to make TV sets after the first 100 sets. What should be the selling price of each TV sets in taka? (BBA 03-04)
 (A) 10,250 (B) 10,350 (C) 10,500 (D) 10,750 (E) None of these
- 8. If the price of a product is increased by 15% then the seller would get Tk 450 more. Instead, the price were increased by 10% then how much more would he get? (BBA 04-05)
 (A) 150 (B) 200 (C) 300 (D) 325 (E) None of these
- 9. An article sells at Tk. 60. This price gives a retailer a profit of 20% on its cost. What would be the new retail price, in tk., if he cuts his profit to 12% of the cost? (MBA 98-99)
 (A) 50 (B) 45 (C) 56 (D) 50.50 (E) 55

- Q10. 5% merchandise of a trader was stolen and another 5% was damaged during transportation. At what profit (in %) should he sell the rest of the goods so that he can make an overall profit of 20%? (MBA 99-00)
 (A) 22.25% (B) 27.5% (C) 30% (D) 33.3% (E) None of these
- Q11. During summer, a store offers 10% discount on some items. But due to a defect, an additional 5% was discounted from the discount price for a particular item. If the list price of the item was Tk. 400, what was the discounted price? (MBA 99-00)
 (A) 338 (B) 340 (C) 342 (D) 345.50 (E) None of these
- Q12. A T-shirt marked Tk. 48 is offered at a discount of 25% during Eid sale. At this reduced price the shopkeeper makes a profit of 20% on the cost. The cost to the shopkeeper is (MBA 00-01)
 (A) Tk. 29 (B) Tk. 30 (C) Tk. 32 (D) Tk. 36 (E) Tk. 40
- Q13. You buy equal number of two types of chocolates at the rate of Tk. $\frac{1}{9}$ and Tk. $\frac{1}{11}$ respectively. If you now sell them at the rate of Tk. $\frac{1}{10}$ what will be your profit/loss? (BBA 96-97)
 (A) 2% loss (B) 2% profit (C) 0 (D) 1% loss (E) 1% Profit *
- Q14. X sells an item to Y at a profit of 28% on his cost and Y sells the same item to Z at a loss of 25% on his cost. If Y has thus sold the item to Z at Tk. 2 less than the cost of the item to X, what is the cost of the item to X in Taka? (BBA 94-95)
 (A) 100 (B) 50 (C) 200 (D) 150 (E) 250
- Q15. In making a Radio set, the cost of labour and materials are in the ratio of 3:2. A manufacturer sells a set for Tk. 150 to make a gain of 25% on the cost. What is the cost of the materials for the set? (BBA 94-95)
 (A) Tk. 72 (B) Tk. 60 (C) Tk. 54 (D) Tk. 48 (E) Tk. 40
- Q16. Mr. Karim bought 20 mangoes for Tk 55. He found that 10% of the mangoes were damaged and sold the rest at the rate of Taka 54 per dozen. How much profit in Taka did he make? (BBA 98-99)
 (A) 28 (B) 26 (C) 24 (D) 20 (E) None of these
- Q17. A trader purchases some pen at the rate of Tk. 10 per dozen. If he sells all the pen at a rate of Tk. 120 per hundred pen. What will be his profit in percent? (BBA 00-01)
 (A) 33.33 (B) 44 (C) 45 (D) 48 (E) None of these
- Q18. The manager of Agora purchased some tomatoes for Tk. 45 per kg. Due to improper handling, 10% of the tomatoes, by weight, were ruined and discarded. At what price per kg should the manager sell the remaining tomatoes if he wishes to make a profit of 12 percent on the cost of the tomatoes? (BBA 04-05)
 (A) 52 (B) 54 (C) 56 (D) 58 (E) None of these

- ⊕19. A merchant was selling an item at a certain price, then marked it down 20% for a spring sale. During the summer, he marked the item down another 20% from the spring price. If the item is sold at the summer price, then what percent of the original price did it sell for? (BBA 06-07)
 (A) 40% (B) 60% (C) 64% (D) 67% (E) None of these
- ⊕20. When the per unit production cost of an item is Tk. 80 and other costs per unit is Tk. 20, the producer makes a profit of 15% on his total cost. If the production cost decreases by 20% and the selling price remains the same, calculate the profit in Tk. (BBA 07-08)
 (A) 31 (B) 34 (C) 35 (D) 43 (E) None of these
- ⊕21. A shopkeeper marks an article at such a price that after allowing a discount of 30% on the tag price (including tax) he makes a profit of 40%. If the tag price of the article including tax is Tk. 460, then the cost price of that article is - (BBA 09-10)
 (A) 232 (B) 260 (C) 230 (D) 330 (E) 322
- ⊕22. The potato traders have increased the original price of potatoes by 20% by creating a false shortage of supply. Govt. intervened into the scene and forced the traders to reduce their price by 20% of new price and stick to that. Currently the traders are selling potatoes with a loss/gain of what percentage over the original price? (BBA 09-10)
 (A) 4% loss (B) 4% gain (C) 5.5% gain (D) 6% loss (E) Neither gain nor loss
- ⊕23. Hasan purchased 3 products: 100 units of product A @ Tk. x per unit; 300 units of product B @ Tk. $2x$ per unit and 600 units of product C @ Tk. $3x$ per unit. If he wants to make a profit of 20%, he should sell these products at an average price of (MBA 96-97)
 (A) $2.4x$ (B) $2x$ (C) $3x$ (D) $2.2x$ (E) None of these
- ⊕24. A pen was sold at 10% loss. If the selling price was Tk. 6 more, then the seller could have made a profit of 5%. What was the purchase price of the pen? (MBA 98-99)
 (A) 45 (B) 40 (C) 30 (D) 25 (E) None of these
- ⊕25. A trader, while selling a pen, was asking for such a price that will enable him to offer a 10% discount and still make a profit of 20% on cost. If the cost of the pen was Tk. 30, what was his asking price? (MBA 98-99)
 (A) 42 (B) 40 (C) 36 (D) 32 (E) None of these
- ⊕26. An item was sold at 6% profit. If the cost was 4% less and the selling price was Tk. 4 more, then the trader would have made a profit of 12.5%. What was the cost of the item? (MBA 99-00)
 (A) 100 (B) 120 (C) 150 (D) 200 (E) None of these
- ⊕27. A trader buys eggs for Tk. M per dozen and sells them for Tk. $M/6$ per piece. What is his profit? (MBA 01-02)
 (A) 20% (B) 50% (C) 60% (D) 100% (E) none of these

- ⊕28. A person bought an article and sold it at a loss of 10%. If he had bought it for 20% less the article taka? (MBA 07-08)
 (A) 350 (B) 300 (C) 250 (D) 150 (E) None of these
- ⊕29. A wholesaler bought 2100 MBA admission guide books for taka 20 each. The wholesaler sold 50 percent of the books for taka 35 each and the rest for taka 18 each. What was the wholesaler's average profit per book? (MBA 09-10)
 (A) taka 6.5 (B) taka13 (C) taka 7 (D) taka 5 (E) taka 3.33
- ∇30. The retail price of a pen is 40 taka. Asif got a discount of 20% over the retail price and he eventually saved taka 240 on his total purchase of the pens. How many pens did he buy? (MBA 09-10)
 (A) 20 (B) 24 (C) 12 (D) 30 (E) None of these
- ∇31. A trader normally makes a profit of 40% on items he sells. If he reduces the price by 10%, his sales increase by 40%. Let x be the total profit when he does not reduce the price, and y the total profit when he reduces the price. What is the ratio of y to x ? (BBA 02-03)
 (A) 1.28 (B) 7.8 (C) 1.11 (D). 91 (E) None of these
- ∇32. The cost of 1 dozen apples and 1 dozen mangoes is Tk. 100 and Tk. 120 respectively. If you spend equal amounts of money to buy apples and mangoes and sell them both at Tk. 110 per dozen, what will be your approximate profit or loss? (BBA 02-03)
 (A) 2% profit (B) 2% loss (C) 0 (D) 1% profit (E) 1% loss
- ∇33. A shirt was sold at 6% profit. If the purchase price were 4% less and the selling price were tk.4 more, the profit would be 12.5%. What was the purchase price of the shirt? (MBA 96-97)
 (A) 240 (B) 220 (C) 200 (D) 180 (E) None of these
- ∇34. If you buy equal amount of two types of chocolates at the rate of tk. $\frac{1}{4}$ and tk. $\frac{1}{6}$ respectively and sell all of them at the rate of tk. $\frac{1}{5}$, what will be your profit/loss? (MBA 96-97)
 (A) 1% loss (B) 2% profit (C) 2% loss (D) 4% profit (E) 4% loss
- ∇35. Two years ago, the cost of pen A was Tk. 70 more than that of pen B. But due to high demand, the cost of pen A has increased by 100% and that of pen B has increased by Tk. 20. If today you need a total of Tk. 250 to buy one pen of each type, what was the price in Taka of pen B two years ago? (MBA 00-01)
 (A) 30 (B) 40 (C) 50 (D) 70 (E) None of these

- ∇36. The price for a TV is 120% of its cost. The TV was sold at a 10% discount on the price. If the profit is Tk. 2,400, what is the cost of the TV in taka? (MBA 02-03)
 (A) 24,000 (B) 27,500 (C) 30,000 (D) 32,000 (E) None of these
- ∇37. A shop sold a pair of shoes for Tk. 1600.00 and a pair of sandals for Tk. 960.00. It made a profit of 20% on shoes and took a 10% loss on sandals. The shop made a (MBA 03-04)
 (A) loss of 17.8% (B) loss of 15.0% (C) gain of 17.8%
 (D) gain of 75.3% (E) None of these
- ∇38. In the official exchange, ratio of French Francs to US Dollars is 350:1 and the free exchange ratio is 400:1 how much profit would a man make if he could convert \$ 70 to francs at the free rate and then convert these back to dollars at the official rate? (MBA 05-06)
 (A) \$ 1 (B) \$ 10 (C) \$ 61.25 (D) \$ 70 (E) \$ 80
- ∇39. A man buys eggs at the rate of Tk 35 per 100 pieces and sells them at Tk 7.20 per dozen. If the profit is Tk 30, how many eggs did he buy? (MBA 08-09)
 (A) 60 (B) 120 (C) 180 (D) 210 (E) none of these
- ∇40. A merchant buys two articles for Taka 1400. He sells one of them at a profit of 20% and the other at a loss of 8%. He makes no profit or loss in the end. What is the selling price of the article that he sold at a loss? (MBA 08-09)
 (A) 1000 (B) 1200 (C) 800 (D) 900 (E) none of these
- ∇41. A trader makes a loss of 10% by selling a chair at a discount of 28% on the listed price. What will be his profit/loss if he sells the chair at 90% of its listed price? (MBA 2013)
 (A) 10% (B) 12.5% (C) 13.6% (D) 15% (E) none of these
- 42. For an item the profit is 40% when the discount is 30%. What is the profit when the discount is 40%? (BBA 14-15)
 (A) 10% (B) 20% (C) 25% (D) 30% (E) none of these
- ⊕43. Bashir bought an ordinary mobile and a cover for Tk, 2000. Malek bought a smart phone and the same cover for Tk. 2000 more than what Bashir had paid. The price of the cover was one tenth of the combined cost of the two mobiles. What was the cost of the ordinary mobile? (BBA 14-15)
 (A) Tk. 1000 (B) Tk. 1200 (C) Tk. 1500 (D) Tk. 1600 (E) none of these
- ∇44. A customer came to a shop and asked the shop manager to give a 20% discount on listed price of a pen. Moreover, for every 10 pens purchased he wanted two pens free of cost. The manager agreed to the customer's demand because he could still make a profit of 20% on cost price. If the cost price of a pen is x, what was the list price of the pen? (BBA 14-15)
 (A) 1.75x (B) 1.8x (C) 1.9x (D) 2x (E) none of these

- Q45. The total income of Mr. Teng in the years 2003, 2004, and 2005 was BDT 36,400. His income had increased by 20% each year. What was his income (BDT) in 2005?
(BBA 15-16)
(A) 5,600 (B) 8,800 (C) 12,000 (D) 14,000 (E) none of these
- Q46. Nipu sold 100 pens, of which 50 are red and 50 are black, at Tk. 48 per pen. He made a profit of 20% on the black pens and made a loss of 20% on the red pens. What was the net gain or net loss on this sale?
(BBA 16-17)
(A) 0 (B) Gain of Tk. 200 (C) Loss of Tk. 200
(D) Gain of Tk. 400 (E) none of these
- Q47. The sale of TV increased by 30% when the price was reduced by 10%. What will be the percentage change in revenue?
(BBA 16-17)
(A) +14% (B) +15% (C) +17% (D) +18% (E) none of these
- Q48. A TV and a computer have the same price. If the price of the TV goes up by 20% and that of the computer goes down by 10%, how much more will it cost to buy 4 TVs and 4 computers?
(BBA 16-17)
(A) 5% (B) 1% (C) 15% (D) 20% (E) none of these
- Q49. Johnny bought a book and sold it at a loss of 10%. If he had bought it for 20% less and sold it for Tk 55 more, he would have made a profit of 40%. What was the cost of the book?
(BBA 17-18)
(A) Tk 150 (B) Tk 250 (C) Tk 350 (D) Tk 450 (E) None of these

Answer Key Exercise 15

1. B	2. C	3. A	4. A	5. B	6. D	7. A	8. C	9. C	10. D	11. C
12. B	13. D	14. B	15. D	16. B	17. B	18. C	19. C	20. A	21. C	22. A
23. C	24. B	25. B	26. D	27. D	28. C	29. A	30. D	31. D	32. D	33. C
34. E	35. A	36. C	37. E	38. B	39. B	40. E	41. B	42. B	43. C	44. B
45. E	46. C	47. C	48. A	49. B						

Solution to Exercise 15

1. (B) Cost = 64; at 20% profit, selling price is 120% of cost.
Selling Price = $64 \times 120\% = 76.80$ taka.
2. (C) ধরি, cost = x টাকা \therefore selling price = $x - \frac{x}{10} = \frac{9x}{10}$ টাকা
20% profit করলে selling price = $x + \frac{x}{5} = \frac{6x}{5}$ টাকা
প্রশ্নমতে, $\frac{9x}{10} + 1500 = \frac{6x}{5} \Rightarrow \frac{6x}{5} - \frac{9x}{10} \Rightarrow 1500 \Rightarrow 12x - 9x = 15000 \Rightarrow x = 5000$
 \therefore Answer C
3. (A) Original price = \$100
10% discounted price = \$90
The bicycle was sold after another 15% discount. Meaning, the bicycle was sold at 85% of the discounted price. Selling price = $\$90 \times 85\% = \76.50
4. (A) ধরি, cost = x টাকা
 \therefore selling price = .9x টাকা (10% loss এ)
যদি selling price (.9x + 200) টাকা হতো, profit হতো .15x
অর্থাৎ, $.9x + 200 = x + .15x \Rightarrow .9x + 200 = 1.15x \Rightarrow .25x = 200 \therefore x = 800$
5. (B) At 20% loss, 80 টাকা বিক্রয় মূল্য হলে cost = 100 Tk.
 \therefore 200 Tk. টাকা বিক্রয় মূল্য হলে cost = $(100 \times 200) / 80 = 250$ Tk
6. (D) ধরি, original price = 100 টাকা
Asif 20% লাভ করলে price = 120 টাকা অর্থাৎ Rahman কিনেছে 120 টাকায়।
Rahman 15% ক্ষতিতে বিক্রি করলে বিক্রয়মূল্য = $120 - (120 \times \frac{15}{100}) = 102$ টাকা।
অর্থাৎ, Fahad কিনেছে 102 টাকায়; এখন, Fahad 102 টাকায় কিনলে original price = 100 টাকা
Fahad 510 টাকায় কিনলে original price = $\frac{100 \times 510}{102}$ টাকা = 500 টাকা।
7. (A) প্রথম 100 TV set এর cost = $(100 \times 10,000)$ টাকা = 1,000,000 টাকা
পরবর্তী 100 TV set এর cost = $(100 \times 7,500)$ টাকা = 750,000 টাকা
 \therefore Total cost = $(1,000,000 + 750,000) = 1,750,000$ টাকা profit = 3,00,000 টাকা
 \therefore মোট বিক্রয়মূল্য = $(1,750,000 + 300,000) = 2,050,000$ টাকা
অর্থাৎ প্রতিটি TV set এর বিক্রয়মূল্য = $\frac{2,050,000}{200}$ টাকা = 10,250 টাকা।
8. (C) 15% increase = Tk. 450
 \therefore 10% increase = Tk. $\frac{450 \times 10}{15} = \text{Tk. } 300$ ।

9. (C) 20% profit হওয়াতে 100 টাকার জিনিস বিক্রি হয় 120 টাকায়। এখন বিক্রয় মূল্য দেয়া আছে 60। এখন প্রথমে cost বের করতে হবে। 120 টাকা বিক্রয়মূল্য হলে ক্রয়মূল্য 100 টাকা।

∴ 1 টাকা বিক্রয় মূল্য হলে ক্রয় মূল্য $\frac{100}{120}$ টাকা: ∴ 60 টাকা বিক্রয় মূল্য হলে ক্রয় মূল্য $\frac{100}{120} \times 60 = 50$ টাকা। এখন, বিক্রয় তার পণ্যও দাম কমাবে যাতে Profit হয় ক্রয় মূল্যের (বা cost-এর) 12% তার মানে profit = 12% of 50 =

$\frac{12}{100} \times 50 = 6$ টাকা, ∴ New retail price = cost + profit = 50 + 6 = 56 টাকা।

10. (D) মনে করি, 100 টাকার পণ্য ছিলো ∴ বিক্রয় যোগ্য পণ্য = 100 - 5 - 5 = 90 টাকার। overall profit 20% হতে হলে 90 টাকার পণ্য বিক্রয় করে 120 টাকা পেতে হবে। অর্থাৎ 120 - 90 = 30 টাকা profit করতে হবে। ∴ % profit =

$$\frac{30}{90} = \frac{1}{3} = 33.3\%$$

11. (C) 400 এর 10% = 40 ∴ 10% discount এর পর দাম = 400 - 40 = 360; এখন, 5% of 360 = 18 টাকা। ∴ final discounted price = 360 - 18 = 342

12. (B) 48 টাকার শার্ট 25% discount এ পাওয়া যায় = $48 - (48 \times \frac{25}{100})$ টাকায়। = 36 টাকায়।

36 টাকায় বিক্রি করলে 20% profit থাকে। অর্থাৎ, বিক্রয়মূল্য 120 টাকা হলে cost = 100 টাকা ∴ বিক্রয়মূল্য 36 টাকা হলে cost = $\frac{100 \times 36}{120}$ টাকা = 30 টাকা।

13. (D) 1ম type এর chocolate = x টি হলে মূল্য = x/9 Tk. দ্বিতীয় type এর x টি chocolate এর মূল্য = x/11 Tk.

$$\therefore \text{total cost} = x/9 + x/11 = \frac{20x}{99} \text{ Tk। মোট } 2x \text{ টার বিক্রয় মূল্য} = \frac{2x \times 1}{10} = \frac{x}{5} \therefore \text{loss} =$$

$$\frac{20x}{99} - \frac{x}{5} = \frac{x}{99 \times 5}; \therefore \% \text{ loss} = \frac{\text{loss}}{\text{cost}} = \frac{99 \times 5}{20x} = 1\% \text{ loss.}$$

14. (B) ধরি, X এর কাছে cost = x টাকা ∴ Y কিনল = $x + \frac{28x}{100} = x + \frac{7x}{25} = \frac{32x}{25}$ টাকায়

$$Y \text{ বিক্রয় করল} = \left(\frac{32x}{25} - \frac{32x}{25 \times 4} \right) \text{ টাকায়} = \frac{128x - 32x}{100} = \frac{96x}{100} \text{ টাকায়} \quad \text{অর্থাৎ, } Z \text{ কিনল } \frac{96x}{100} \text{ টাকায়}$$

$$\text{প্রশ্নমতে, } \frac{96x}{100} + 2 = x \Rightarrow x - \frac{96x}{100} = 2 \Rightarrow x = 50 \text{ টাকা}$$

15. (D) 25% gain (লাভ) হওয়াতে বিক্রয়মূল্য = 125 টাকা। ∴ 125 টাকা বিক্রয়মূল্য হলে cost = 100

$$150 \text{ টাকা বিক্রয়মূল্য হলে cost} = \frac{100 \times 150}{125} = 120, \therefore \text{material cost} = \frac{120}{5} \times 2 = 48 \text{ টাকা।}$$

16. (B) 10% of 20 = 2 mangoes were damaged; ∴ বিক্রি করলো 20 - 2 = 18 = $1\frac{1}{2}$ dozen;

$$\text{বিক্রয় মূল্য} = 54 \times 1\frac{1}{2} = 81. \therefore \text{profit} = 81 - 55 = 26$$

17. (B) Buying price = Tk. 10/dozen = Tk. $\frac{5}{6}$ per pen

Selling price = Tk. 120/hundred pen = Tk. $\frac{6}{5}$ per pen

Profit = Tk. $\frac{6}{5} - \text{Tk. } \frac{5}{6} = \text{Tk. } \frac{11}{30}$

$\frac{5}{6} \text{ — } \frac{11}{30}$

$100 \text{ — } \frac{\frac{11}{30} \times 100}{\frac{5}{6}} = 44\%$

18. (C) ধরি, x Kg টমেটো কেনা হয়েছিল; অর্থাৎ মোট cost = $45x$ 10% নষ্ট হয়েছে; অর্থাৎ $x - \frac{x}{10} = \frac{9x}{10}$ kg টমেটো রবে গেছে।

12% profit করতে চাইলে বিক্রয়মূল্য = $45x + \frac{45x \times 12}{100} = \frac{4500x + 540x}{100} = \frac{5040x}{100} = 50.4x$

\therefore তখন প্রতি kg এর বিক্রয়মূল্য = $50.4x + \frac{9x}{10} = 50.4x \times \frac{10}{9x}$
= 56 টাকা

19. (C) Let, cost = 100

Spring sales price was marked down by 20%, so selling price was 80% of cost.
Spring price = 80.

Summer sales price was marked down by another 20%, so selling price was 80% of spring price.

Summer price = $80 \times 80\% = 64$.

20. (A) Initial total cost = 100

At 15% profit, selling price = 115.

If production cost decreases by 20%, production cost becomes $80\% \times 100 = 80$.

Total cost becomes 84. So, profit = $115 - 84 = 31$ Tk.

21. (C) মনেকরি, cost = 100

actual selling price = 140

এখন actual selling price পাওয়া যায় Tag Price থেকে 30% discount দেবার পরে।

Tagged price 100 হলে selling price হবে 70

অতএব, Tagged price = $100 \times 2 = 200$

যখন, Tag price 200 \Rightarrow cost 100

\therefore Tag price 460 \Rightarrow cost $\frac{100}{200} \times 460 = 230$.

22. (A) Total increase / decrease = $A + B + \frac{AB}{100}$
 $= 20 - 20 + \frac{20 \times (-20)}{100} = -4$

∴ Price 4% কমে যাবে। Ans: (A) 4% loss

23. (C) Total cost = $100 \times x + 300 \times 2x + 600 \times 3x = 2500x$.
 20% profit করলে price = $2500x + 2500x \times 20\% = 3000x$,
 total quantity = $100 + 300 + 600 = 1000$
 average price = $3000x / 1000 = 3x$.

24. (B) মনে করি, ক্রয়মূল্য = 100 টাকা; ∴ 10% loss এ বিক্রয়মূল্য = 90 টাকা এবং 5% profit এ বিক্রয়মূল্য = 105 টাকা
 ∴ বিক্রয়মূল্য (105-90) = 15 টাকা বেশি হলে, 5% profit হতো; এখন ঐকিক নিয়ম ব্যবহার করে, বিক্রয়মূল্য 15 টাকা
 বেশি হলে ক্রয় মূল্য 100 টাকা

∴ বিক্রয়মূল্য 1 টাকা বেশি হলে ক্রয়মূল্য $\frac{100}{15}$ টাকা

∴ বিক্রয় মূল্য 6 টাকা বেশি হলে ক্রয়মূল্য $\frac{100}{15} \times 6 = 40$ টাকা

25. (B) Profit = 20% of cost = $20\% \times 30 = 6$; ∴ selling price = $30 + 6 = 36$ Tk.

Let asking price = x ; ∴ $x - 10\% \text{ of } x = 36 \Rightarrow 36 \Rightarrow x = \frac{36}{9} = 40$ Tk.

26. (D) 6% profit এ 100 টাকার পণ্যের বিক্রয় মূল্য 106 টাকা। এখন, cost 4% less হলে, cost = $100 - 4 = 96$ টাকা। ∴ profit = 12.5% of 96 = $\frac{12.5}{100} \times 96 = 12$ টাকা। ∴ 96 টাকার পণ্যের বিক্রয়মূল্য = $96 + 12 = 108$ টাকা। ∴ বিক্রয় মূল্য $108 - 106 = 2$ টাকা বেশি হলে ক্রয়মূল্য 100 টাকা। ∴ বিক্রয় মূল্য 1 টাকা বেশি হলে ক্রয়মূল্য $\frac{100}{2}$ টাকা। ∴ বিক্রয়মূল্য 4 টাকা বেশি হলে ক্রয়মূল্য $50 \times 4 = 200$ টাকা।

27. (D) Sales price per dozen = $\frac{m}{6} \times 12 = 2m$

profit per dozen = $2m - m = m$ profit percentage = $\frac{m}{m} \times 100 = 100\%$

28. (C) let, cost = 100. ∴ Selling price = 90

If cost was 20% less cost would have been 80.

If selling price was Tk 55 more selling price would have been 145

Profit would have been 65. Given that profit is 40%.

So, 40% of cost = 65

1% = $65/4$

100% = $(65/4) \times 100 = 250$ Tk. So, cost is 250 Tk. (Remember that profit is measured as a percentage of cost and 100% of cost is cost itself)

29. (A) ১ম 50% অর্থাৎ $(2100 \times 50\%)$ বা 1050 টি guide এ profit
 $= 1050 \times 15 = \text{Tk. } 15750$
 বাকি 1050 টি guide এ loss হয় $= 1050 \times 2 = \text{Tk } 2100.$
 Overall profit $= 15750 - 2100 = \text{Tk. } 13,650$
 Average profit per book $= \frac{13650}{2100} \text{ Tk. } 6.5$
30. (D) Retail price 40 taka (per pen). 20% discount $= 40 \times \frac{20}{100} = 8 \text{ taka}$
 অর্থাৎ, প্রতি pen এ save হয় $= 8 \text{ taka}$
 Total savings $= 240 \text{ taka}$
 \therefore Number of pens $= \frac{240}{8} = 30 \text{ pen.}$
31. (D) let, cost price 100
 Selling price $= 140$; unit $= 10$
 After discount,
 Selling price $= 126$; unit $= 14.$
 So, new profit $= (126 \times 14 - 100 \times 14) = 364$
 Old profit $= (140 \times 10 - 100 \times 10) = 400$
 So the ratio of new to old profit is $= 364/400 = 0.91$
 So the answer is D.
32. (D) 1 ডজন আপেলের দাম $= 100$ টাকা। 1 ডজন আমের দাম $= 120$ টাকা
 যদি আপেল ও আমের জন্য একই পরিমাণ টাকা খরচ করতে হয়, তবে খরচকৃত টাকার পরিমাণ 100 ও 120 দ্বারা বিভাজ্য হবে।
 ধরি, টাকার পরিমাণ $= 600$ \therefore মোট খরচ $= 600 + 600 = 1200$ টাকা
 আপেল পাওয়া যাবে $\frac{600}{100} = 6$ ডজন, আম পাওয়া যাবে $\frac{600}{120} = 5$ ডজন
 আপেল থেকে পাওয়া যাবে $= 6 \times 110 = 660$ টাকা; আম থেকে পাওয়া যাবে $= 5 \times 110 = 550$ টাকা
 মোট বিক্রয়মূল্য $= 660 + 550 = 1210$ টাকা 1200 টাকায় লাভ হল $= 10$ টাকা
 100 টাকায় লাভ হল $= \frac{10 \times 100}{1200}$ টাকা $= \frac{10}{12} = \frac{5}{6}$ টাকা অর্থাৎ, প্রায় 1 টাকা বা 1% profit
33. (C) মনে করি, purchase price x তাহলে 6% profit সহ selling price $= 1.06x$. এখন $(1.06x + 4) - 0.96x$
 $= 0.96x \times 0.125 = 0.02x = 4, x = 200$ টাকা।
34. (E) মনে করি, প্রত্যেক ধরনের চকলেট কেনা হল 60 টি করে। তাহলে total cost $= 60 \times \frac{1}{4} + 60 \times \frac{1}{6} =$
 25 । আবার selling price $= 60 \times 2 \times \frac{1}{5} = 24$ । কাজেই percent loss $= \frac{25 - 24}{25} \times 100 = 4\%.$
35. (A) মনে করি, ২ বছর আগে pen B এর price $= x$ টাকা।
 \therefore ২ বছর আগে pen A এর price $= (x + 70)$ টাকা।
 অর্থাৎ, তখন pen A এর price $= 2(x + 70) = 2x + 140$ টাকা। এবং এখন pen B এর price $= x + 20$
 টাকা প্রশ্নমতে, $2x + 140 + x + 20 = 250 \Rightarrow 3x = 90 \therefore x = 30$

36. (C) ধরি, cost = 100;
 \therefore price = 120; selling price = $120 - (120 \times \frac{10}{100}) =$
 $120 - 12 = 108$ টাকা।
 অর্থাৎ, profit = $108 - 100 = 8$ টাকা
 8 টাকা profit হলে cost = 100 টাকা
 \therefore 2400 টাকা profit হলে cost = 30,000 টাকা।

37. (E) 20% profit এ,
 Cost 100 হলে selling price = 120
 বা S.P 120 হলে cost = 100
 \therefore S.P 1600 হলে cost = $\frac{100 \times 1600}{120} = 1333.33$ টাকা
 10% loss এ,
 cost 100 হলে S.P = 90 টাকা
 বা, S.P 90 হলে cost = 100 টাকা
 \therefore S.P 960 হলে cost = $\frac{100 \times 960}{90} = 1066.66$ টাকা
 Total cost = $(1333.33 + 1066.66)$ টাকা = 2400 টাকা
 Total S.P = $(1600 + 960)$ টাকা = 2560 টাকা
 \therefore profit = $\left(\frac{2560 - 2400}{2400} \times 100 \right) \% = \frac{160 \times 100}{2400} \% = 6.67\%$ ।

38. (B) After converting \$70 to francs in free rate, the man will get = $400 \times 70 = 28,000$ francs
 Again, after converting it to dollars in the official rate, he will get = $28,000 \div 350 = \$80$
 Therefore, profit = $\$80 - \$70 = \$10$

39. (B) 1 টি egg এর cost price = $\frac{35}{100} = 0.35$ Tk.
 1 টি egg এর selling price = $\frac{7.20}{12} = 0.60$ Tk.
 1 টি egg এ profit = $0.60 - 0.35 = 0.25$ Tk.
 0.25 Tk profit হয় 1 টি egg এ
 \therefore 1 Tk " " $\frac{1}{0.25}$ টি egg এ
 \therefore 30 Tk " " $\frac{30}{0.25}$ টি egg এ
 $= \frac{30 \times 100}{25}$ টি egg এ
 $= 120$ টি egg।

40. (E) মনেকরি, loss এ sell করা article এর cost x
 profit এ " " " " " (1400 - x)
 এখন, overall কোন profit বা loss নেই, অর্থাৎ দুই article এর profit এক loss equal.

$$\frac{8x}{100} = \frac{20}{100}(1400 - x)$$

$$\Rightarrow 8x = 28000 - 20x$$

$$\Rightarrow 28x = 28000$$

$$\Rightarrow x = 1000$$
 অর্থাৎ, selling price of the article sold at 8% loss = 920 Tk.
41. (B) Let, the listed price was 100 Tk.
 তাহলে 28% discount এ sell করেছে 72 টাকায়।
 এখানে 10% loss হওয়ায় cost price = $72 \times 100/90 = 80$ টাকা।
 আবার listed price এর 90% দামে মানে 90 টাকায় বিক্রি করলে profit হয় $90 - 80 = 10$ টাকা।
 80 টাকায় profit হয় 10 টাকা, যা percentage এ 12.5%
42. (B) Let, the cost price is 100
 So, the selling price is 140.
 Giving 30% discount,
 $x - 30\% \text{ of } x = 140$
 So, $x = 200$.
 Now, giving 40% discount,
 $200 - 40\% \text{ of } 200 = 200 - 80$
 $= 120$.
 So the new selling price is 120 taka.
 So profit = $120 - 100 = 20$
 So the answer is B.
43. (C) BACK CALCULATE করে Tk.1500 ধরে করলে উত্তর সঠিক হয়।
 Thus Answer Option C.
44. (B) ধরি, List price হচ্ছে = a
 12 টা পেন কিনতে Original খরচ 10a (কারণ 12 পেন পাচ্ছে 10 টা পেন এর দাম এ)
 এবং এই price এর উপর পাচ্ছে 20% discount
 তাহলে, কিনতে লাগছে, 8a
 Cost of 12 pens = 8a
 Cost of 1 pen = $2/3 a$
 এখন, $2/3 a = 1.2x$ (কারণ এই দাম এ Seller এর 20% profit হচ্ছে)
 $a = 1.8x$
45. (E) ধরি, 2003 সালে income ছিল x, 2004 সালে $1.2x$ এবং 2005 সালে $1.44x$ টাকা। তাহলে total income ধ
 $(1+1.2+1.44) = 3.64x$ টাকা।
 দেয়া আছে, total income 36400 টাকা। অতএব, 2005 সালে income ছিল = $(1.44x/3.64x) \times 36400 = 14,400$ টাকা।

46. (C) 50 টি black pen এ profit 20%

Black pen এর cost price x হলে $x+20%$ of $x=48$
 $x=40$ টাকা

Profit per pen=8 Taka

Profit for 50 pen =400 Taka

50 টি red pen এ loss 20%

Red pen এর cost price x হলে, $x-x$ এর 20%=48 or, $x=60$

Loss per pen=12

Loss for 50 pen=600 taka

Net loss= 200 taka

Answer (C)

47. (C) ধরি, পূর্বে cost price 100 টাকা
 এবং sale = 10

Cost price 10% reduce করার পর,

Cost price = 90 টাকা

এবং sale =13 টাকা

Revenue = $(13*90-100*10)$
 $= 170$

1000 টাকায় revenue 170 টাকা

100 টাকায় revenue 17 টাকা

সুতরাং percentage increase=17%

সঠিক Answer (C)

48. (A) ধরি, price x টাকা।

TV এর price বাড়ার পর = $x + x$ এর 20%
 $=1.2x$

Computer এর price কমার পর = $x-x$ এর 10%
 $= 0.9x$

পূর্বে 4 টি TV এবং 4 টি computer এর price = $8x$

এখন 4 টি TV এবং 4 টি computer এর price = $4.8x+3.6x$
 $= 8.4x$

So, percentage increase = $.4/8 * 100$
 $=5%$

সঠিক Answer (A)

49. (B) Tk. 250

ধরি নেই, ক্রয় মূল্য = x . তাহলে, বিক্রয় মূল্য = $0.9x$.

যদি সে 20% কম দাম এ ক্রয় করত, i.e. $0.8x$ এবং আরও Tk 55 দাম বাড়িয়ে বিক্রয় করত, then the profit will be

40%. That is, $0.9x + 55 = 140%$ of $0.8x$

$55 = 1.12x - 0.9x$

$x = 250$.

Concept 16

Interest

Concept 16 (Interest)

- ⊗ **Principal** is the money deposited or borrowed.
- ⊗ **Interest** is the extra money paid as cost of the principal. It is expressed in percentage. Interest generally means yearly interest rate. 5% interest rate means 100 Tk principal earns 5 Tk interest every year.
- ⊗ **Total amount = Principal amount + Interest Amount**
- ⊗ In **Simple Interest** the principal amount remains unchanged. So, at 5% interest rate, 100 Tk will earn 5 Tk interest every year.
- ⊗ Formula for Simple Interest is $I = PNR$
Where I = Interest
P = Principal
N = time
R = yearly Interest rate
- ⊗ In **Compound Interest** the interest earned becomes part of principal and the interest rate applies on the principal + interest amount.
- ⊗ Formula for Compound Interest is $I = P(1+r)^n$
Where I = Total Amount = Principal + Interest
P = Principal
N = time
R = yearly Interest rate

Example 1: 21. Mr. X invests Tk. 2,400 in the bank at 5% interest. How much additional money must he invest at 8% interest so that the total annual income will be equal to 6% of his entire investment?

(MBA 98-99)

- (A) 1200 (B) 3000 (C) 2400 (D) 3600 (E) none of these

Solution: Let, the additional amount is x

$$\text{Now, } 2400(0.05) + x(0.08) = (2400 + x)(0.06)$$

$$\Rightarrow 120 + .08x = 144 + .06x; \Rightarrow .02x = 24 \Rightarrow x = 1200$$

Answer: (A)

Exercise 16

- 1. Two banks offered interest rates of 5% and 7 % respectively on savings account. Mr. X deposited a total amount of Tk. 4000 in the banks & in one year his interest income was Tk. 250. Find the investment in the bank with 7% interest. (MBA 96-97)
 (A) 3000 (B) 2000 (C) 3500 (D) 2500 (E) None of these
- 2. Mr. X invests Tk. 2,400 in the bank at 5% interest. How much additional money must he invest at 8% interest so that the total annual income will be equal to 6% of his entire investment? (MBA 98-99)
 (A) 1200 (B) 3000 (C) 2400 (D) 3600 (E) None of these
- 3. Tk. 2000 is deposited in a savings account which pays 6% annual interest compounded semi-annually. To the nearest Taka, how much is in the account at the end of the year? (MBA 05-06)
 (A) Tk 2060 (B) Tk. 2120 (C) Tk. 2122 (D) Tk. 2247 (E) Tk. 2258
- ⊕ 4. Mr. Zaman is planning to buy a television after two years time from now. He expects that after two years he will need Tk. 12,100 to buy the television. How much money does Mr. Zaman need to invest now at 10% interest rate compounded annually? (BBA 09-10)
 (A) Tk. 10,000 (B) Tk. 13,350 (C) Tk. 13,310 (D) Tk. 14,250 (E) Tk. 11,000
- ⊕ 5. Arman wanted to have Tk. 39,200 as interest after 5 years. He has invested an amount in an account for 1 year at 8% interest rate. From the 2nd year, he invested the principal amount in another account offering 10% interest for 3 years. At the beginning of the fifth year he invested the principal amount in another account at the rate of 11%. What was the principal amount? (assume simple interest rate) (BBA 09-10)
 (A) Tk. 50,000 (B) Tk. 80,000 (C) Tk. 90,000 (D) Tk. 70,000 (E) None of these
- ∇ 6. A man deposited Tk. 50,000 at a certain Interest for 1 year. After 1 year, he received Tk. 55,280 as both principal and interest after deduction of Tk. 120 as government levy and 10% on interest as government tax. What was the interest rate in percentage? (MBA 07-08)
 (A) 12 (B) 12.5 (C) 13 (D) 15 (E) None of these
- ∇ 7. Sabbir invested a certain sum of money in a simple interest bond whose value grew to Tk. 300 at the end of 3 years and to Tk. 400 at the end of another 5 years. What was the rate of interest in which he invested his sum? (BBA 10-11)
 (A) 12% (B) 12.5% (C) 6.6% (D) 8.33% (E) None of these

Answer Key Exercise 16

1.E	2.A	3.D	4.A	5.B	6.A	7.D			
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Solution to Exercise 16

1. (E) মনে করি, 7% interest rate এর investment = x টাকা তাহলে 5% interest investment = 4000 - x, তাহলে, $x \times 7\% + (4000 - x) \times 5\% = 250$, $x = 1000$.
2. (A) $2400 \times 0.05 + 0.08x = .06(2400 + x) \Rightarrow 120 + .08x = 144 + .06x; \Rightarrow .02x = 24 \Rightarrow x = 1200$
3. (C) Explanation:
Amount = $P(1+i)^n$
In the question, the annual rate of interest is given. But, the principal is compounded semiannually. Therefore, the semiannual rate of interest should be used to solve the problem.
 \therefore Amount = $2000 \times (1 + .03)^2 = 2121.8 = 2122$ (approx.)
4. (A) Compounded Amount = $P(i+r)^n$
N = 2 years P = ? R = 10% or 0.10
Compounded amount = 12,100
অতএব, $12,100 = P(1+0.10)^2$ $P = \frac{12,100}{1.21} = 10,000$ Ans: (A) Tk. 10,000
5. (B) মনে করি, Principle = P
Now, 8% এ interest = $P \times 1 \times .08 = 0.08P$
10% -এ interest = $P \times 3 \times 0.10 = 0.30P$
11% এ interest = $P \times 1 \times 0.11 = 0.11P$
এখন, $0.08P + 0.30P + 0.11P = 39,200$
 $\Rightarrow P = \frac{39,200}{0.49} = 80,000$ Ans: (B) 80,000
6. (A) এই অঙ্কটি elimination method এ করলে সহজ হয়, Tk. 50,000 এর উপর 1 year এ 12% interest rate এ interest আসে 6000. এখন, Net profit = 6000 - 10% income tax - government levy = $6000 - (6000 \times 10\%) - 120 = 5280$ তাহলে, 1 year পর amount = 55,280 যা question এর সাথে match করে, অর্থাৎ, interest rate = 12% .
7. (D) 5 years interest (400-300) = Tk. 100
 \therefore 1 years interest = $\frac{Tk.100}{5} = Tk. 20$
 \therefore Principal amount = Tk. (300-3 \times 20) = Tk. 240
 \therefore Rate of interest = $\frac{20 \times 100}{240} \% = 8.33\%$

Concept 17

Inequalities

Concept 17 (Inequalities)

- ⊗ In equation there is equal (=) sign between two mathematical statements.
In inequalities there is either greater than (>) or less than (<) sign between two statements. These inequalities are not equations.
- ⊗ There is also 'greater than or equal' (\geq) and 'less than or equal' (\leq) signs.
 $x > 5$ means x is greater than 5. x can be 6,7,8,9... ∞ . (x cannot be 5)
 $x \geq 5$ means x is greater than or equal 5. x can be 5,6,7,8,9... ∞ . (x can be 5)

Example 1: If $4x-7 < 2x+13$, then which of the following must be true?

- (A) $x > 7$ (B) $x > 13$ (C) $x < 10$ (D) $x < 6$ (E) None of these

Solution:

$$4x - 7 < 2x + 13 \quad \Rightarrow 2x < 20 \quad \Rightarrow x < 10$$

Answer: (C)

Exercise 17

- 1. If $-3t + 8 > t - 6$, then
 (A) $t > 1$ (B) $t < 7/2$ (C) $t > 7/2$ (D) $t > -7/2$ (E) $t < -7/2$ (BBA 94)
- 2. If x is greater than y and $x + y = 5$ and $xy = 6$, then what is the value of $(x-y)$?
 (A) 0 (B) 1 (C) 2 (D) 3 (E) -1 (BBA 94-95)
- 3. If $3x - 4y > 2x + 3y$, then which of the following must be true?
 (A) $x > 0$ (B) $y > 0$ (C) $x > y$ (D) $x < y$ (E) None of these (BBA 94-95)
- 4. If $a < b$ and $c < d$, then which of the following must be true?
 (A) $-c - a > -b - d$ (B) $a + b < c + d$ (C) $a = c$ (D) $b = d$ (E) None of these (BBA 96-97)
- 5. If $4x - 7 < 2x + 13$, then which of the following must be true?
 (A) $x > 7$ (B) $x > 13$ (C) $x < 10$ (D) $x < 6$ (E) None of these (BBA 03-04)
- 6. If you buy x apples at a cost of $(y+1.5)$ taka per piece and y oranges at a cost of Tk $(x+1.5)$ per piece, and you spend higher amount of money on buying apples, then which of the following is true?
 (A) $x > y$ (B) $y < x$ (C) $x = y$ (D) $x > y + 3$ (E) Can not be determined (BBA 03-04)
- 7. If $10 > x > 9$ and $x^2 = (10-y)(10+y)$, which of the followings is a possible value of y ?
 (A) -7 (B) -6 (C) 3 (D) 4 (E) None of these (BBA 04-05)
- 8. If $(x^2 - 4x + 10) < 7$, which of the following must be true?
 (A) $x > 3$ (B) $1 > x > 3$ (C) $1 < x < 3$ (D) $x > 1$ (E) None of these (BBA 07-08)
- 9. If $a > b > c$, then which of the following must be true?
 (A) $2a > b + c$ (B) $a - b > a - c$ (C) $a > b + c$ (D) $2a = b + c$ (E) none (MBA 99-00)
- 10. If $ab > 0$ and $a < 0$, which of the following is negative?
 (A) $-a$ (B) b (C) $-b$ (D) $(a-b)$ (E) $-(a + b)$ (MBA 99-00)
- 11. If $0 \leq x \leq 5$ and $y < 10$ which of these can be a value of xy ?
 I. -2 II. 0 III. 50
 (A) I only (B) II only (C) III only (D) I & II only (E) I and III only (MBA 99-00)
- 12. Which of the following inequalities is equivalent to $10 - 2x > 18$?
 (A) $x > -14$ (B) $x > -4$ (C) $x > 4$ (D) $x < 4$ (E) None of these. (MBA 05-06)
- 13. A lift operator is not allowed to carry less than 7 and more than 10 passengers in the lift at one time. If there are 45 people waiting on the ground floor, what is the minimum number of trips that the lift must make in order to transport all the people?
 (A) $4\frac{1}{2}$ (B) 3 (C) 4 (D) 5 (E) 6 (BBA 94)

14. The weight of Kalim is an integer. If he gains 8 kg, he will weigh more than 70 kg. If he gains 6 kg, he will weigh less than 70 kg. What is his weight? (BBA 02-03)
 (A) 61 (B) 62 (C) 63 (D) 65 (E) None of these
15. If $xyz < 0$ and $z < 0$, then which of the following must be true? (BBA 94-95)
 (A) $xy = 1$ (B) $xy < 1$ (C) $xy > z$ (D) $xy < z$ (E) $xy > 0$
16. If $x > 1$ which of the following decreases as x decreases? (BBA 00-01)
 (i) $x - x$ (ii) $2x - x$ (iii) $\frac{1}{x-1}$
 (A) only (i) (B) both (i) and (ii) (C) only (ii) (D) only (iii) (E) none
17. If $0 \leq x \leq 4$ and $y < 12$, which of the following cannot be the value of xy ? (BBA 04-05)
 (A) -2 (B) 48 (C) 6 (D) 24 (E) None
18. If $1 \leq x \leq 3$ and $2 \leq y \leq 4$ then which of the following must be true? (BBA 04-05)
 (A) $xy \geq 5$ (B) $xy \leq 12$ (C) $xy = 12$ (D) $xy > 3$ (E) None of these
19. Jim has 5 pieces of string. He needs to choose the piece that will be able to go around his 36-inch waist as his belt broke. The piece needs to be at least 4 inches longer than his waist so he can tie a knot in it, but it cannot be more than 6 inches longer so that the ends will not show from under his shirt. Which of the following pieces of string will work the best? (BBA 09-10)
 (A) 3 feet (B) $\frac{3}{4}$ feet (C) $3\frac{1}{2}$ feet (D) $3\frac{1}{4}$ feet (E) None of these
20. If x, y and z are consecutive integers and $x < y < z$, which of the following must be true? (MBA 04-05)
 I. xyz is even II. $x + y + z$ is even III. $(x + y)(y + z)$ is odd
 (A) None (B) I only (C) II only (D) I and III only (E) I, II and III
21. Find the range of real values of x satisfying the inequalities $3x - 2 > 7$ and $4x - 13 > 15$. (MBA 08-09)
 (A) $7 > x > 3$ (B) $-3 > x > -7$ (C) $x > 7$ (D) $x > 3$ (E) None of these
22. If $xy > 0$ and $y < 0$, which of the following must be positive? (BBA 01-02)
 (A) $x - y$ (B) $x + y$ (C) $(x + 10)/y$ (D) $(y - 2)/x$ (E) None of these
23. If $a > 0, b < 0, c > 1$ and $d < 1$, which of the following must be true? (BBA 02-03)
 (A) $ab > cd$ (B) $ab < cd$ (C) $ac > bd$ (D) $ac < db$ (E) None of these
24. If $a > 0, b < 0$ and $c > a$, which of the following must be positive? (BBA 02-03)
 (A) $(a/b - b/c)/(c - b)$ (B) $(b/a - c/b)/(a - b)$ (C) $(c/b - a)/(a - c)$
 (D) $abc/(c + b)$ (E) None of these

- ⊕25. If $x \geq 8$ and $y \leq 3$, then which of the following must be true? (BBA 03-04)
 (A) $x/y=5$ (B) $x+y \leq 11$ (C) $x-y \geq 5$ (D) $xy \leq 24$ (E) none of these
- ⊕26. if $x=(0.1)^2$, $y = \frac{1}{5}$ and $z = \sqrt{1/100}$, which of the following is true. (BBA 03-04)
 (A) $x/y > z$ (B) $x/z > y$ (C) $x < y < z$ (D) $xy > z$ (E) None of these
- ⊕27. If x is less than y , which of the following numbers must be greater than x and less than y ? (BBA 03-04)
 (I) $(x+y)/2$ (II) $xy/2$ (III) $x^2 - y^2$
 (A) only I (B) only II (C) I and III (D) I and II (E) None of these
- ∇28. If $8 < \sqrt{(n+6)(n+1)} < 9$, then n would be equal to (BBA 04-05)
 (A) 5 (B) 6 (C) 7 (D) 8 (E) 9
- ∇29. Suppose $z=a \times b \times c \times d \times e$ where $a > b > c > d > e$. A decrease by 1 in which of the factors would result in the greatest decrease in the value of z ? (BBA 04-05)
 (A) a (B) b (C) c (D) d (E) e
- ∇30. If $x = (0.08)^2$, $y = 1/(0.08)^2$ and $z = (1-0.08)^2 - 1$, which of the following is true? (BBA 05-06)
 (A) $x = y = z$ (B) $y < z < x$ (C) $z < x < y$ (D) $y < x$ and $x = z$ (E) None of these
- ∇31. If $(a+b) > 0$ and $\sqrt{a+b} > b$, which of the following must be true? (BBA 08-09)
 (A) $a > 0$ (B) $b > 0$ (C) $a < 0$ (D) $b < 0$ (E) None of these
- ∇32. If $-4 < x < 12$ and $-2 < y < 13$ which of the following numbers represent the maximum value of $(y-x)$? (BBA 09-10)
 (A) 25 (B) 1 (C) 14 (D) 17 (E) -1
- ∇33. If $m > n$, $n < p$ and $n > 0$, which of the following must be true? (MBA 02-03)
 (A) $mn > p^2$ (B) $mp > n^2$ (C) $pn > m^2$ (D) $mn > np$ (E) None of these
- ∇34. If $3 < x < 7$ and $5 > y > 2$, which of the following must be true? (MBA 02-03)
 (A) $x + y > 8$ (B) $x - y > 0$ (C) $x - 2y < 2$ (D) $2x - y > 1$ (E) None of these
- ∇35. If $2x + y = 2$ and $x + 3y > 6$, then (MBA 08-09)
 (A) $y \geq 2$ (B) $y < 2$ (C) $y > 2$ (D) $y \leq 2$ (E) $y = 2$
- ⊕36. If $x/y < (x+1)/(y+1)$, which of the following must be true? (MBA 2013)
 (A) $x < 1$ (B) $x < y$ (C) $y < 1$ (D) $y < x$ (E) none of these
- ⊕37. If $x > 0$ and $y < 0$, which of the following must be true? (MBA 2013)
 (A) $x + y > 0$ (B) $x^2 - y^2 > 0$ (C) $y^2 - x > 0$ (D) $y + x^2 > 0$ (E) none of these

738. If $x < 1/x$, then which of the following must be true?
 I. $x^3 > x^2$ II. $x^2 > x^3$ III. $x > x^2$ (MBA 2013)
 (A) only I (B) only II (C) only III (D) both II and III (E) none of these
39. If $(2 + \sqrt{x}) > 2\sqrt{x}$, which of the following must be true?
 (A) $x < 1$ (B) $x < 2$ (C) $x < 3$ (D) $x < 4$ (E) none of these (MBA 2013)
40. If x and y are integers, $13 < x < 25$ and $-2 < y < -13$, what is the greatest possible value of $(x - y)$?
 (A) 13 (B) 24 (C) 25 (D) 36 (E) none of these (BBA 16-17)

Answer Key Exercise 17

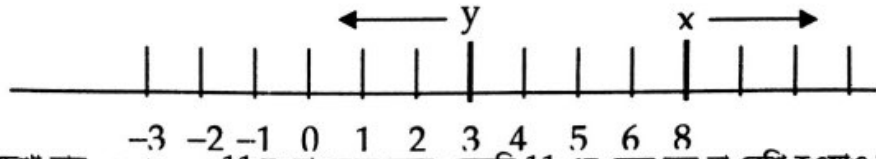
1.B	2.B	3.E	4.A	5.C	6.A	7.C/D	8.C	9.A	10.B
11.D	12.E	13.D	14.C	15.E	16.B	17.B	18.B	19.C	20.D
21.C	22.D	23.E	24.E	25.C	26.E	27.A	28.A	29.E	30.C
31.E	32.C	33.B	34.D	35.C	36. B	37.E	38. B	39.D	40.D

Solution to Exercise 17

1. (B) $-3t + 8 > t - 6 \Rightarrow -4t > -14 \Rightarrow 4t < 14 \Rightarrow t < 7/2$.
2. (B) বলা আছে, $x > y$, $x + y = 5$, $xy = 6$ সমাধান করলে দেখা যায়, $x = 3$, $y = 2 \therefore x - y = 1$
3. (E) $3x - 4y > 2x + 3y \Rightarrow x - 4y > 3y \Rightarrow x > 7y$
অতএব, y এর value positive বা negative হওয়ার উপর x এর value নির্ভর করে।
4. (A) $(a + c) < (b + d) \Rightarrow (-a - c) > (-b - d)$
5. (C) $4x - 7 < 2x + 13 \Rightarrow 2x < 20 \Rightarrow x < 10$
6. (A) Total cost of apples = $x(y + 1.5) = xy + 1.5x$
total cost of oranges = $y(x + 1.5) = xy + 1.5y$
প্রশ্নমতে, $xy + 1.5x > xy + 1.5y \Rightarrow 1.5x > 1.5y \therefore x > y$
7. (C)/ (D) ১ম expression এ x এর value 10 এবং 9 এর মধ্যে; অর্থাৎ x integer নয়। অর্থাৎ x^2 এর value 81 থেকে বড় এবং 100 এর থেকে ছোট যেকোন number.
২য় Expression এ $x^2 = (10 - y)(10 + y) = 100 + 10y - 10y - y^2 = 100 - y^2$
 $\Rightarrow y^2 = 100 - x^2$ (অর্থাৎ, y^2 এর value $100 - 81 = 19$ থেকে ছোট এবং $100 - 100 = 0$ থেকে বড়) অতএব, y এর value 3 বা 4 দুটোই হতে পারে। সুতরাং, এই প্রশ্নের দুটি answer হতে পারে (C) এবং (D) .
8. (B) $x^2 - 4x + 3 < 0 \Rightarrow x^2 - x - 3x + 3 < 0 \Rightarrow (x - 1)(x - 3) < 0 \Rightarrow x < 1$ or $x < 3$
অর্থাৎ, $1 < x < 3$
9. (A) এই ধরনের অঙ্কে solve করতে গেলে answer choice গুলো থেকে আসতে হবে। যেমন, (D) এর $2a = b + c$ equation থেকে $a < b < c$ থেকে নিশ্চিতভাবে বলা যায় না যে true হবে। একইভাবে, (c) এর $a > b + c$ true হতে পারে, কিন্তু must be true বলা যায় না। আবার, (B) এর $a - b > a - c$ থেকে পক্ষান্তর করলে আসে $a + c > a + b \Rightarrow c > b$, যেটি প্রদত্ত $a > b > c$ শর্তটির বিপরীত। এখন, বাকী থাকলো (A)। এখন, $a > b > c$ থেকে পাওয়া যায়, $a > b$ । উভয় পার্শে a যোগ করে পাওয়া যায়, $a + a > b + a \Rightarrow 2a > b + a$ এখন ডান পক্ষের a এর বদলে c লিখতে ডান পক্ষটি আরো ছোট হয়ে যায়। $\therefore 2a$ অবশ্যই $b + c$ এর চেয়ে আরো বড়। \therefore (A) এর $2a > b + c$ must be true.
10. (B) $ab > 0$ এর অর্থ হলো a এবং b উভয়ই একই সাথে positive অথবা উভয়ই একইসাথে negative। তাহলেই, তাদের গুণফল হবে greater than zero অর্থাৎ positive। এখন, দেয়া আছে, $a < 0$ অর্থাৎ a হলো negative। $\therefore b$ কে অবশ্যই negative হতে হবে।
11. (D) $x = 1$ এবং $y = -2$ হলে $xy = -2 \therefore$ I is true, আবার, $x = 0$ হলে $xy = 0 \therefore$ II is true আবার, x এর value খুব বেশী হলে 5 হতে পারে। আবার, $y < 10$ হওয়াতে $xy = 50$ কখনই হবে না। \therefore (D) উত্তর।
12. (E) $10 - 2x > 18$
 $2x < -8$
 $x < -4$
13. (D) যেহেতু minimum number of trips দিতে হবে, \therefore প্রতিবার lift এ maximum সংখ্যক লোক নিতে হবে। \therefore প্রতিবার 10 জন নিলে চার বার এ যাবে চল্লিশ জন। বাকী 5 জনকে নিতে পূর্ণাঙ্গ একটা trip দিতে হবে। \therefore মোট পাঁচটা trip. কিন্তু যেহেতু 7 জনের কম নেয়া যাবে না, \therefore চতুর্থবারে 10 জন না যেয়ে 8 জন যাবে; ফলে পঞ্চমবারে 7 জন যাবে। ঘুরে ফিরে মোট 5 টা trip ই লাগবে।
14. (C) ধরি, Kalim এর weight = x kg. (x পূর্ণসংখ্যা)
 $x + 6 < 70$ এবং $x + 8 > 70$
 $\therefore x + 7 = 70$ (যেহেতু x পূর্ণসংখ্যা)। $x = 63$
15. (E) বলা আছে, $xyz < 0$ এবং $z < 0$ অর্থাৎ, x , y ও z এর গুণফল negative এবং z এর value ঋণাত্মক। এখন, x ও y এর গুণফল অবশ্যই positive হতে হবে।

16. (B) ধরি, $x = 2$, decrease এর পরে $x = 1$
 i) $x + x^2 = 2 + 4 = 6$, decrease এর পরে $x + x^2 = 1 + 1 = 2$
 ii) $2x^2 - x = 8 - 2 = 6$, decrease এর পরে $2x^2 - x = 2 - 1 = 1$
 iii) $\frac{1}{x^2 + 1} = \frac{1}{4 + 1} = \frac{1}{5}$, decrease এর পরে $\frac{1}{x^2 + 1} = \frac{1}{2} = \frac{1}{2}$
 \therefore (i) ও (ii) decrease করে (iii) increase করে।
17. (B) $0 \leq x \leq 4$ এই expression থেকে আমরা বুঝতে পারি x অবশ্যই একটি positive number: $y < 12$ expression থেকে y positive নাকি negative তা বোঝার উপায় নেই। আবার প্রথম expression এ আমরা দেখি x এর সর্বোচ্চ value 4 এবং দ্বিতীয় expression এ y এর সর্বোচ্চ value 12 এর থেকে কম। অতএব, xy এর value অবশ্যই $4 \times 12 = 48$ এর চেয়ে কম হবে। সুতরাং, answer (B)
18. (B) ১ম expression থেকে পাই x এর সর্বনিম্ন value 1 এবং সর্বোচ্চ value 3: ২য় expression থেকে পাই y এর সর্বনিম্ন value 2 এবং সর্বোচ্চ value 4.
 অর্থাৎ x ও y এর গুণফল 12 এর থেকে বড় হতে পারবেনা এবং 2 এর থেকে ছোট হতে পারবেনা।
19. (C) Length of the waist = 36 inch.
 The string should be 4 to 6 inches longer. Therefore, possible length of the string should be between 40 to 42 inch or, $3 \frac{1}{3}$ feet to $3 \frac{1}{2}$ feet.
- Ans: C) $3 \frac{1}{2}$ feet
20. (D) x, y, z ক্রমিক সংখ্যা এবং $x < y < z$ হলে, x ও z even, y odd; অথবা, x ও z odd, y even.
 অর্থাৎ, $xyz = \text{even} \times \text{odd} \times \text{even} = \text{even}$
 অথবা, $\text{odd} + \text{even} + \text{odd} = \text{even}$
 অতএব, I অবশ্যই সত্যি। এখন, $x + y + z = \text{even} + \text{odd} + \text{even} = \text{odd}$ অথবা, $\text{odd} + \text{even} = \text{odd} = \text{even}$ অতএব, II সবসময় সত্যি নয়।
 আবার, $(x + y)(y + z) = (\text{even} + \text{odd})(\text{odd} + \text{even}) = \text{odd} \times \text{odd} = \text{odd}$
 অথবা, $(\text{odd} + \text{even})(\text{even} + \text{odd}) = \text{odd} \times \text{odd} = \text{odd}$
 অতএব, III অবশ্যই সত্যি।
21. (C) $3x - 2 > 7$ আবার, $4x > 28$
 $\Rightarrow 3x > 9$ $\Rightarrow 4x > 28$
 $\Rightarrow x > 3$ $\Rightarrow x > 7$
 এখন, দুটি inequality কে satisfy করে এমন option C. কারণ, $x > 7$ হলে, অবশ্যই $x > 3$ হবে।
22. (D) $xy > 0, y < 0 \therefore x < 0$
 A. could be positive if $x > y, y > x$ হলে negative
 B. always negative
 C. negative if $x + 10$ is positive
 D. $y - 2$ negative, $\text{neg} + \text{neg} = \text{positive}$.
23. (E) $a > 0, b < 0, c > 1, d < 1$
 a একটি ধনাত্মক সংখ্যা b ঋণাত্মক c ধনাত্মক; কিন্তু d ঋণাত্মক কি ধনাত্মক তা স্পষ্ট নয়।
 অতএব, কোনটিই প্রমাণ করা যায় না।
24. (E) $a > 0, b < 0, c > a$
 a ধনাত্মক, b ঋণাত্মক এবং c ধনাত্মক। কিন্তু কোনটির মান দেয়া নেই।

25. (C) $x \geq 8$ এবং $y \leq 3$ হতে আমরা যে number line পাই-



পর্যবেক্ষণ করলে দেখা যায়, $x + y = 11$ হওয়া যেমন সম্ভব, তেমনি 11 এর চেয়ে কম বা বেশি হওয়াও সম্ভব।

$\frac{x}{y} = 5$ কোনভাবেই গ্রহণযোগ্য নয়। xy এর মান 24 হতে পারে, 24 এর কম বা বেশিও হতে পারে। $x - y$ এর মান 5 হতে পারে এবং 5 এর চেয়ে বেশি হতে পারে, কিন্তু $x - y < 5$ হওয়া সম্ভব নয়।

26. (E) $x = (0.1)^2 = 0.01$ $y = \frac{1}{5} = 0.2$

$z = \sqrt{\frac{1}{100}} = \frac{1}{10} = 0.1$ (A) $\frac{x}{y} = \frac{0.01}{0.2} = 0.05$ which is not greater than z

(B) $\frac{x}{z} = \frac{0.01}{0.1} = 0.1$ which is not greater than y

(C) $0.01 < 0.2$ কিন্তু 0.2 is not less than 0.1

(D) $xy = 0.01 \times 0.2 = 0.002$ which is not greater than z .

27. (A) $x < y$

i) $\frac{x+y}{2}$ হচ্ছে x এবং y এর average অর্থাৎ x এর চেয়ে বড় এবং y এর চেয়ে ছোট।

ii) $\frac{xy}{2}$ কোন কোন ক্ষেত্রে y এর চেয়েও বড় হয়ে যায়।

iii) $x^2 - y^2$ কোন ক্ষেত্রে x এর চেয়েও ছোট হয়ে যায়।

28. (A) $8 < \sqrt{(x+6)(x+1)} < 9$

অর্থাৎ, $(x+6)(x+1)$ এর value $8^2 = 64$ এবং $9^2 = 81$ এর মাঝামাঝি হবে। x এর value 5 বসালেই এটি সম্ভব। সুতরাং answer (A).

29. (E) $z = a \times b \times c \times d \times e$ এবং $a > b > c > d > e$; এক্ষেত্রে সর্বনিম্ন value অর্থাৎ e এর value 1 decrease করলে পুরো expression এর decrease greatest হবে।

30. (C) $x = 0.0064$; $y = \frac{1}{0.0064}$; $z = (.92)^2 - 1$ বের করার দরকার নেই; এটি negative হবে সেটা নিশ্চিত)

অর্থাৎ, $z < x < y$

31. (E)

32. (C) Maximum value of $(y-x) =$ Maximum value of y - minimum value of x
 $= 13 - (-4) = 17$ Ans: (D) 17

But the answer should be less than 17. So, (C) is the closest option.

33. (B) $m > n$, $n < p$ এবং $n > 0$

m , n ও p প্রত্যেকে 0 থেকে বড়; m , n এর চাইতে বড়; কিন্তু m ও p এর মধ্যে কোনটি বড় তা নির্ণয়যোগ্য নয়। সুতরাং একমাত্র m ও p এর গুণফল n^2 এর চাইতে বড় হবে, এটাই বলা যায়।

Answer: B

34. (D) $3 < x < 7; 5 > y > 2$
 শুধুমাত্র $2x - y > 1$ equation টি-ই সবসময় সম্ভব।

35. (C) $2x + y = 2 \Rightarrow x = \frac{2-y}{2}$

এখন, $x + 3y > 6 \Rightarrow \frac{2-y}{2} + 3y > 6$

$\Rightarrow \frac{2-y+6y}{2} > 6 \Rightarrow 2+5y > 12 \Rightarrow 5y > 10 \Rightarrow y > 2$

36. (B) $\frac{x}{y} < \frac{x+1}{y+1}$

Or, $xy + x < xy + y$

Or, $x < y$, which is must be true

37. (E) It is given that, $x > 0$ and $y < 0$. অর্থাৎ x এর value positive যেকোন সংখ্যা এবং y এর value negative যেকোন সংখ্যা হতে পারে। কিন্তু x ও y এর specific value না জানলে কোন option কেই must be true বলা যাবে না।

38. (B) $x < 1/x$, অর্থাৎ x এর value হতে পারে negative, যেমন -5 অথবা 1 থেকে ছোট যেকোনো positive fraction যেমন $1/5$. উভয়ক্ষেত্রেই option (ii), $x^2 > x^3$ সত্য হবে। বাকি দুটি option must be true হবে না।

39. (D) $2 + \sqrt{x} > 2\sqrt{x}$

$2 > 2\sqrt{x} - \sqrt{x}$

$2 > \sqrt{x}$

$4 > x;$

or, $x < 4$

40. (D) $(x-y)$ এর greatest possible value পেথে হলে x এর greatest এবং y এর lowest value নিতে হবে।

$13 < x < 25$



$-13 < y < -2$

সুতরাং $x-y = 24 - (-12)$

$= 36$

সঠিক Answer (D)

Concept 18

Ratio & Proportion

Concept 18 (Ratio & Proportion)

- ⊗ Ratio is simply an expression of a fraction.
The ratio of a to b is written as a: b (a is to b) and means a divided by b (a/b)
The ratio of b to a is written as b: a (b is to a) and means b divided by a (b/a)
These two ratios are inverse of one another since a/b and b/a are reciprocals.
- ⊗ If a set of objects is divided into 2 groups in the ratio of a:b then the first group contains $\frac{a}{a+b}$ of the objects and the second group contains $\frac{b}{a+b}$ of the objects. Similar rule is also applicable for groups of 3 or higher.
- ⊗ If two numbers are in the ratio of a:b, then for some number x, the first number is ax and the second number is bx.
- ⊗ The equality of two ratios is called proportions.
a:b = 3:4 or $\frac{a}{b} = \frac{3}{4}$ is a proportion.

Example 1: A football team had a ratio of win to lose of 3:1. After winning 6 games in a row, the team's ratio of win to lose became 5:1. How many games had the team won before it won the six games?

- (A) 24 (B) 12 (C) 9 (D) 6 (E) 3

Solution: মনে করি, 6 games জেতার পর্বে team টা x games খেলেছিলো।

$$\frac{\frac{3x}{4} + 6}{\frac{x}{4}} = \frac{5}{1} \Rightarrow \frac{3x + 24}{4} = \frac{5x}{4} \Rightarrow x = 12; \therefore \text{Answer} = \frac{12 \times 3}{4} = 9$$

Answer: (C)

Exercise 18

- 1. The ratio of $\frac{1}{4}$ to $\frac{3}{5}$ is (BBA 93-94)
 (A) 1 to 3 (B) 3 to 20 (C) 5 to 12 (D) 3 to 4 (E) 5 to 4
- 2. 0.179 written as a ratio of 2 integers is (BBA 94)
 (A) 178/990 (B) 178/999 (C) 17/99 (D) 179/999 (E) 179/990
- 3. If $x : y = y : z = 1.5$ and $z = 2$, what is the value of x ? (BBA 94-95)
 (A) 3 (B) 4 (C) 4.5 (D) 2.5 (E) 5
- 4. A football team had a ratio of win to loss of 3:1. After winning 6 games in a row, the team's ratio of win to loss became 5:1. How many games had the team won before it won the six games? (BBA 96-97)
 (A) 24 (B) 12 (C) 9 (D) 6 (E) 3
- 5. A jar contains 10 pencils. Some sharpened and some unsharpened. Each of the following could be the ratio of sharpened to unsharpened pencils except. (BBA 96-97)
 (A) 9:1 (B) 5:1 (C) 4:1 (D) 3:2 (E) 1:1
- 6. A certain pole casts a shadow 24 ft. long. At the same time another pole which is 3 feet high casts a shadow 4 feet long. How high is the first pole, given that the heights and shadows are in proportion? (BBA 97-98)
 (A) 21 (B) 20 (C) 19 (D) 18 (E) none of these
- 7. Given that $(p + 7q)/4p = 19/20$, what is the ratio $q:p$? (BBA 97-98)
 (A) 2:7 (B) 2:5 (C) 2:4 (D) 1:3 (E) 1:2
- 8. Four children aged 11, 9, 7 and 4 share a sum of money in the ratio of their ages. If the youngest child receives Tk.1,200, what is the sum of money? (BBA 97-98)
 (A) 8,400 (B) 8,600 (C) 9,000 (D) 9,300 (E) 9,600
- 9. A cake weighing 750g has three ingredients: flour, sugar, and fruits. There is twice as much flour as sugar and one and a half times as much sugar as fruits. What is the quantity of sugar (in gram) in the cake? (BBA 97-98)
 (A) 50g (B) 125g (C) 250g (D) 100g (E) none of these
- 10. Taka 1105 was divided between A, B & C. The amounts of money received by A & B were in the ratio 1: 2. Amounts of money received by B & C were in the ratio 3: 4. How much money did A receive? (BBA 98-99)
 (A) Tk 205 (B) Tk 195 (C) Tk 150 (D) Tk 100 (E) None of these
- 11. If $A : B = 1 : 2$, $B : C = 4 : 3$ and $A+B+C = 630$, what is the value of A? (BBA 99-00)
 (A) 70 (B) 80 (C) 100 (D) 120 (E) 140

- Q12. If 55 percent of the people who purchase a certain product is female, what is the ratio of the number of females who purchase the product to the number of males who purchase the product? (BBA 00-01)
 (A) 11/9 (B) 10/9 (C) 9/10 (D) 9/11 (E) 5/9
- Q13. The ratio of green, red and yellow marbles in a box is 3:4:5. If 10 green marbles are removed and 5 red marbles are added, the total number of marbles becomes 103. How many yellow marbles were in the box? (BBA 01-02)
 (A) 32 (B) 45 (C) 48 (D) 50 (E) none of these
- Q14. The ratio of water and salt in a 16 kg of salt-water solution is 3:1. How much water in kg must be added to make the ratio of water to salt 4:1? (BBA 01-02)
 (A) 2 (B) 3 (C) 4 (D) 6 (E) none of these
- Q15. If $a:b=3:4$, $b:c=4:5$, $c:d=5:4$; and $d:e=4:7$ then what is $a:e$? (BBA 04-05)
 (A) 3/7 (B) 4/7 (C) 3/5 (D) 4/5 (E) none of these
- Q16. Halim, Kalim and Salim invest Tk. 5000, Tk. 7000, and Tk. 12000 respectively in a business. If the profits are distributed proportionately, what share of a Tk. 1111 profit should Salim receive? (MBA 00-01)
 (A) Tk. 231.40 (B) Tk. 254.00 (C) Tk. 333.33
 (D) Tk. 370.33 (E) Tk. 555.50
- Q17. The ratio of green marbles to red marbles in a box is 3: 5. If there are 24 marbles in the box, how many additional green marbles will be required to make the ratio of green marbles to red marbles 1:1? (MBA 01-02)
 (A) 12 (B) 9 (C) 6 (D) 3 (E) none of these
- Q18. To mix a certain color of paint, Alana combines 5 liters of red paint, 2 liters of blue paint, and 2 liters of yellow paint. What is the ratio of red paint to the total amount of paint? (MBA 05-06)
 (A) 5 : 2 (B) 9 : 4 (C) 5 : 4 (D) 5 : 9 (E) None of these
- Q19. If $m : n = 2:3$, find the value of $\frac{3m + 5n}{6m - n}$ (MBA 07-08)
 (A) $\frac{3}{7}$ (B) $\frac{7}{3}$ (C) $\frac{5}{3}$ (D) $\frac{4}{7}$ (E) none of these
- Q20. The ratio of x to y is 0.75. If the ratio of $4y + 7$ to $x + 1$ is 5, then what is the value of y ? (BBA 01-02)
 (A) 2 (B) 3 (C) -2 (D) 3 (E) none of these
- Q21. If 25% of x equals 30% of y and 24% of y equals 20% of z , what is the ratio of x to z ? (BBA 01-02)
 (A) 1.2 (B) 1 (C) 0.8 (D) .75 (E) none of these

- ⊕22. During a particular day, x number of applicants came to IBA to submit their applications before lunch. Of them 70% were male applicants. On the same day, y number of applicants came to submit their applications after lunch and all of them were male applicants. On that particular day, the ratio of male applicants to female applicants was 4:1. Calculate y in terms of x . (BBA 03-04)
 (A) $0.28x$ (B) $0.35x$ (C) $0.4x$ (D) $0.5x$ (E) None of these
- ⊕23. Three friends - Anwar, Bobby and Dipu divided Tk. 1105 amongst them in such a way that if Tk. 10, Tk. 20 and Tk. 15 were removed from the amount that Anwar, Bobby and Dipu received respectively, then the share of the amount they got would be in the ratio of 11: 18: 24. How much did Dipu receive? (BBA 08-09)
 (A) 495 (B) 510 (C) 480 (D) 375 (E) none of these
- ⊕24. Polash started a business on the first day of 2008. Qader joined the business of Polash on partnership contract with double investment of Polash on July 1 of 2008. Sohel, on the first day of September 2008, joined the partnership business of Polash and Qader with thrice the investment of Polash. The firm earned a profit of Tk. 72,000 on 31st December, 2008. What will be the share of profit of Sohel? (BBA 09-10)
 (A) Tk. 36,000 (B) Tk. 24,000 (C) Tk. 12,000 (D) Tk. 18,000 (E) none of these
- ⊕25. Mr. Noman is in charge of a special snake farm in Gaibandha. The farm has two types of snakes; Cobras and Pythons. After a recent stock taking he was surprised to find that $\frac{1}{4}$ of the number of cobras in the farm was exactly equal to $\frac{1}{6}$ of the total number of snakes in the farm. What is the ratio of the number of Pythons to the number of Cobras in the farm? (BBA 09-10)
 (A) 1:4 (B) 1:3 (C) 1:2 (D) 2:3 (E) cannot be determined
- ⊕26. Ages of three persons are now in the proportion of 2: 3: 4 and in five years from now, the proportion will be 5: 7: 8. What is the present age of the youngest person? (MBA 96-97)
 (A) 30 (B) 25 (C) 20 (D) 15 (E) none of these
- ⊕27. The ratio of marbles collected by Amir, Babu and Enam is 1:2:5. If Babu gives 3 marbles to Amir and receives 6 marbles from Enam the ratio becomes 3:5:8. How many marbles did Enam have? (MBA 07-08)
 (A) 25 (B) 30 (C) 35 (D) 45 (E) None of these
- ⊕28. $\frac{1}{4}$ of Arif's income and $\frac{1}{3}$ of Babu's income equal Tk. 1,100. If $\frac{1}{8}$ of Arif's income is equal to $\frac{1}{5}$ of Babu's income, what is Babu's income? (MBA 98-99)
 (A) 1500 (B) 1450 (C) 1200 (D) 1100 (E) none of these

- ⊕29. If $A = \frac{2}{3}B$, $B = \frac{2}{3}C$, and $C = \frac{2}{3}D$, what part of D is B? (MBA 00-01)
 (A) $\frac{8}{27}$ (B) $\frac{4}{9}$ (C) $\frac{2}{3}$ (D) 75% (E) $\frac{4}{3}$
- ⊕30. A box contains 24 balls, some red and some black. Each of the following could be the ratio of red to black balls except. (MBA 02-03)
 (A) 1:1 (B) 3:1 (C) 5:3 (D) 4:3 (E) 5:1
- ⊕31. The ratio of girls to boys in a class is 8:7. The number of students in the class could be any of the following except. (MBA 03-04)
 (A) 30 (B) 45 (C) 50 (D) 60 (E) 90
- ∇32. The ratio of incomes of Ali & Baby is 5: 4 and the ratio of their expenditure is 4 : 3. If Ali saves Tk 500 per month, what is the income of Baby? (BBA 98-99)
 (A) Tk 2,500 (B) Tk. 2,000 (C) Tk. 1,500 (D) Tk. 1,000 (E) cannot be determined
- ∇33. If a right angled isosceles triangle is inscribed in a semi circle, what is the ratio of the area of the circle to the area of the triangle? (BBA 98-99)
 (A) $\frac{1}{4}$ (B) $\frac{1}{2}$ (C) $\pi / 2$ (D) 2π (E) π
- ∇34. In a sugar solution the ratio of water to sugar was 4: 1. If the total weight of the solution was 2 kg, how much more sugar should be added so that the ratio becomes 5: 2? (BBA 98-99)
 (A) 0.3 kg (B) 0.2 kg (C) .24 Kg (D) .32 kg (E) none of these
- ∇35. In 24 kg of salt water, 8% is salt; of another mixture, 4% is salt. How many kg of 2nd solution must be added to the first mixture to get a solution that is 5% salt? (BBA 99-00)
 (A) 24 (B) 36 (C) 48 (D) 72 (E) 96
- ∇36. If $yx/z^2 = 27$ and $y^2/zx = 1/(3\sqrt{3})$, what is the ratio of z to y? (BBA 02-03)
 (A) $\sqrt{3}$ (B) $\sqrt{3}/3$ (C) $1/3$ (D) $3\sqrt{3}$ (E) none of these
- ∇37. Two friends, Rajib and Rahat, entered into a partnership investing Tk. 700 and Tk. 600 respectively. After 3 months, Rajib withdrew $\frac{2}{7}$ his investment but after 3 months, he reinvested $\frac{3}{5}$ of what he had withdrawn. The profit at the end of the year was Tk. 726. If the profit was shared according to time weighted investment, then what was the difference between the profits of those two friends? (BBA 09-10)
 (A) Tk. 360 (B) Tk. 183 (C) Tk. 36 (D) Tk. 6 (E) None of these
- ∇38. Arif, Babu and Salam started a business jointly with a total amount of Tk. 280. Arif paid Tk. 45 more than Babu and Babu paid Tk. 70 less than Salam. If the company made a profit of Tk. 56, how much profit should Babu receive? (MBA 98-99)
 (A) 22 (B) 20 (C) 25 (D) 27 (E) none of these

- ∇39. Three workers. X, Y and Z are paid a total of Tk 5,500 for a particular job. X is paid 133.33% of the amount paid to Y and Y is paid 75% of the amount paid to Z. How much is paid to Z? (MBA 02-03)
 (A) 1,750 (B) 1,850 (C) 1,950 (D) 2,000 (E) none of these
- ∇40. The ratio of income of Kamran and Dolon is 3:4. The ratio of their expenditures is 4:5. Find the ratio of their savings if the savings of Kamran is one fourth of his income? (MBA 09-10)
 (A) 5:4 (B) 19:12 (C) 4:6 (D) 12:19 (E) 10:20
- ∇41. Last year, the ratio of salary of X and Y was 1:2 and that of X and Z was 1:3. This year everyone got an increment of Tk. 1000. If Z is now drawing Tk. 25,000, what is the salary in Tk. of Y this year? (MBA 2013)
 (A) 15000 (B) 17000 (C) 17500 (D) 18000 (E) none of these
- ∇42. The cost of 1 kg. of cashew nut is Tk. 500 and the cost of 1 kg. of pistachio nut is Tk. 580. At what proportion should they be mixed so that the resultant mixture costs Tk. 550 per kg.? (MBA 2013)
 (A) 2:3 (B) 3:4 (C) 3:5 (D) 4:5 (E) none of these
- ⊕43. Taka 3660 is divided among X, Y and Z in such a way that if Tk. 10, Tk. 20 and Tk. 30 are removed from the sums that X, Y and Z received respectively, then the share of the sums that they will get will be in the ratio of 3: 4: 5. How much did X receive? (MBA 2013)
 (A) 890 (B) 905 (C) 910 (D) 915 (E) none of these
- ∇44. In a club the ratio of men and women is 16:7. The ratio of married men and married women is 4:3. Find the percentage of married men if 60% of the women are married. (MBA 2013)
 (A) 35% (B) 42% (C) 45% (D) 52.5% (E) none of these
- ∇45. 8 litres are drawn from a container full of mango juice and is then filled with water. This operation is performed three more times. The ratio of the quantity of mango juice now left in container to that of water is 16: 81. How much mango juice did the container hold originally? (BBA 2013-14)
 (A) 24 litres (B) 30 litres (C) 36 litres (D) 42 litres (E) none of these
- 46. A die is rolled randomly on a circular board with a triangle inscribed in the circle. (All three vertices of the triangle are on the circumference of the circle.) What is the probability that the die comes to rest outside the triangular region? (BBA 2013-14)
 Statement 1: The hypotenuse of the triangle is the diameter of the circle.
 Statement 2: The radius of the circle is 2 units, and the area of the triangle is 4 square units.
 A) statement 1 alone is sufficient, but statement 2 alone is not sufficient to answer the question.
 B) statement 2 alone is sufficient, but statement 1 alone is not sufficient to answer the question.

- C) both statements taken together are sufficient to answer the question, but neither statement alone is sufficient
- D) each statement alone is sufficient.
- E) statements 1 and 2 together are not sufficient, and additional data is needed to answer the question.

Q47. A company paid Tk. 500,000 in merit raises to employees whose performance were rated A, B, or C. Each employee rated A received twice the amount of the raise that was paid to each employee rated C, each employee rated B received 1.5 times the amount of the raise that was paid to each employee rated C. If 50 workers were rated A, 100 were rated B, and 150 were rated C, how much was the raise paid to each employee rated A?
 (BBA 2013-14)
 A) Tk. 370 B) Tk. 625 C) Tk. 740 D) Tk. 1250 E) Tk. 2500

Q48. In a certain used-car lot, there are 4 times as many blue cars as green cars and 1/3 as many green cars as red cars. If there are 4q red cars in the lot, how many blue cars are in the lot?
 (BBA 2015-16)
 (A) 12q (B) 3q (C) 4q/3 (D) 16q/3 (E) none of these

Q49. If a and b are integers greater than 100 such that $a + b = 300$, which of the following could be the exact ratio of a to b?
 (BBA 2015-16)
 (A) 9 to 1 (B) 5 to 2 (C) 5 to 3 (D) 4 to 1 (E) 3 to 2

Answer Key Exercise 18

1.C	2.D	3.C	4.C	5.B	6.D	7.B	8.D	9.E	10.B
11.E	12.A	13.B	14.C	15.A	16.E	17.C	18.D	19.B	20.E
21.B	22.D	23.A	24.B	25.C	26.C	27.B	28.A	29.B	30.D
31.C	32.E	33.E	34.C	35.D	36.A	37.D	38.E	39.D	40.D
41.B	42.C	43.C	44.A	45.A	46.C	47.D	48.D	49.E	

Solution to Exercise 18

1. (C) $\frac{1}{4} : \frac{3}{5} = 5 : 12$ (বহুগুণন)

2. (D) $0.179 = 179/1000$. এর সবচে কাছাকাছি হলো (D).

3. (C) $\frac{x}{y} = 1.5 \Rightarrow 1.5y = x \Rightarrow y = \frac{x}{1.5}$ $\frac{y}{z} = 1.5 \Rightarrow 1.5z = y$

অর্থাৎ, $\frac{x}{1.5} = 1.5z \Rightarrow \frac{x}{1.5} = 1.5 \times 2 \Rightarrow \frac{x}{1.5} = 3 \therefore x = 4.5$

4. (C) মনে করি, 6 games জেতার পরে team টা x games খেলেছিলো।

$$\frac{\frac{3x}{4} + 6}{\frac{x}{4}} = \frac{5}{1} \Rightarrow \frac{3x + 24}{4} = \frac{5x}{4} \Rightarrow x = 12; \therefore \text{Answer} = \frac{12 \times 3}{4} = 9$$

5. (B) কোন সংখ্যাকে (একেক্রে) কোন ratio তে ভাগ করতে হলে ratio এর সব অংশের যোগফল দিয়ে সংখ্যাটি বিভাজ্য হতে হবে। একেক্রে,

A. 9 : 1 থেকে $9 + 1 = 10$ দ্বারা 10 বিভাজ্য হচ্ছে; B. 5 : 1 থেকে $5 + 1 = 6$ দ্বারা 10 বিভাজ্য নয়;

C. 4 : 1 থেকে $4 + 1 = 5$ দ্বারা 10 বিভাজ্য হচ্ছে;

D. 3 : 2 থেকে $3 + 2 = 5$ দ্বারা 10 বিভাজ্য হচ্ছে;

E. 1 : 1 থেকে $1 + 1 = 2$ দ্বারা 10 বিভাজ্য হচ্ছে;

6. (D) মনে করি, first pole এর height = x ft.

$$\therefore \frac{x}{24} = \frac{3}{4} \Rightarrow x = 18$$

7. (B) $\frac{p+7q}{4p} = \frac{19}{20} = 20p + 140q = 76p \Rightarrow 140q = 56p \Rightarrow \frac{q}{p} = \frac{56}{140} = \frac{2}{5}$

8. (D) যার যত বয়স, সে তত ভাগ পাবে। \therefore মোট কত ভাগ হবে, তা প্রথমে বের করতে হবে = $11 + 9 + 7 + 4 = 31$; মনে

করি, total = x, $\therefore \frac{x}{31} \times 4 = 1200 \Rightarrow x = 300 \times 31 = 9300$

9. (E) যদি sugar এর পরিমাণ = x gram হয়, তাহলে, flour এর পরিমাণ = 2x gram

এবং fruits এর পরিমাণ = $\frac{2}{3}x$ [যেহেতু sugar = $\frac{3}{2} \times$ fruits]

এখানে, $x + 2x + \frac{2x}{3} = 750 \Rightarrow 3x + 6x + 2x = 2250 \Rightarrow 11x = 2250 \Rightarrow x = 204.5$

10. (B) A:B = 1:2; B:C = 3:4; \therefore A:B = 3:6; B:C = 6:8 \therefore A:B:C = 3:6:8

$$\therefore \text{A received} = \frac{1105}{3+6+8} \times 3 = \frac{1105}{17} \times 3 = 65 \times 3 = 195$$

11. (E) A:B = 1:2 = 2:4

B:C = 4:3

\therefore A:B:C = 2:4:3

$$\therefore A = 630 \times \frac{2}{9} = 140$$

12. (A) ধরি, মোট লোক = 100 জন

$$\therefore \text{মহিলা} = 55 \text{ জন অতএব, পুরুষ} = (100 - 55) = 45 \text{ জন}$$

$$\text{Ratio of female to male} = 55:45 = 11:9 = \frac{11}{9}$$

13. (B) Total no. of marbles = 103 + 10 - 5 \therefore total no. of marbles = 108
 \therefore no. of yellow marbles = $108 \times \frac{5}{12} = 45$

14. (C) salt = $16 \times \frac{1}{4} = 4$ Kg water = $16 - 4 = 12$ Kg

এখন, $\frac{\text{water}}{\text{salt}} = 4 \therefore \text{water} = 4 \times 4 = 16$ Kg

$\therefore (16 - 12) = 4$ Kg water add করতে হবে।

15. (A) a : b = 3 : 4, b : c = 4 : 5, c : d = 5 : 4, d : e = 4 : 7

$$\therefore \frac{a}{e} = \frac{a}{b} \times \frac{b}{c} \times \frac{c}{d} \times \frac{d}{e}$$

$$= \frac{3}{4} \times \frac{4}{5} \times \frac{5}{4} \times \frac{4}{7} = \frac{3}{7}$$

16. (E) Halim: kalim: salim = 5000; 7000; 12000 = 5:7:12

অর্থাৎ, 1111 টাকায় salim পাবে = $(1111 \times \frac{12}{5+7+12})$ টাকা = 555.5 টাকা

17. (C) Green marbles = $24 \times \frac{3}{8} = 9$

Red marbles = $24 \times \frac{5}{8} = 15$

ratio 1 : 1 অর্থাৎ green ও Red marble সমান হবে। অর্থাৎ, $15 - 9 = 6$ টি green marble add করতে হবে।

18. (D) Ratio of red paint to total amount of paint = $5/(5+2+2) = 5:9$

19. (B) $\frac{m}{n} = \frac{2}{3} \therefore 2n = 3m$ এখন, $\frac{3m+5n}{6m-n} = \frac{3m+5n}{2(3m)-n} = \frac{2n+5n}{4n-n} = \frac{7n}{3n} = \frac{7}{3}$;

20. (E) $\frac{x}{y} = 0.75 \dots \dots \dots$ (I) এবং $\frac{4y+7}{x+1} = 5 \dots \dots \dots$ (II)

equation (I) থেকে $x = .75y$ equation (II) তে স্থাপন করি,

$$\frac{4y+7}{.75y+1} = 5 \quad \text{or, } 4y+7 = 3.75y+5 \quad \text{or, } .25y = -2$$

or, $y = -8$

21. (B) $\frac{25}{100}x = \frac{30}{100}y \therefore x = \frac{30}{25}y$

আবার, $\frac{20}{100}z = \frac{24}{100}y \therefore z = \frac{24}{20}y$

$$\therefore \frac{x}{z} = \frac{30y}{25} \div \frac{24y}{20} = \frac{30y}{25} \times \frac{20}{24y} = 1$$

22. (D) \therefore মোট male applicant = $\frac{70x}{100} + y$ এবং মোট female applicant = $\frac{30x}{100} = \frac{3x}{10}$

$$\therefore \text{male: female} = \frac{7x}{10} + y : \frac{3x}{10} = 4:1 \Rightarrow \frac{\frac{7x}{10} + y}{\frac{3x}{10}} = \frac{4}{1}$$

$$\Rightarrow \frac{7x + 10y}{10} \times \frac{10}{3x} = 4$$

$$\Rightarrow 7x + 10y = 12x \Rightarrow 10y = 5x \Rightarrow y = \frac{5x}{10} = \frac{x}{2} = 0.5x$$

23. (A) ধরি, টাকা নিয়ে ফেলার পর Anwar পায় $11x$, Bobby পায় $18x$ এবং Dipu পায় $24x$.
 $11x + 10 + 18x + 20 + 24x + 15 = 1105$

$$\therefore x = 20$$

So, Dipu = $20 \times 24 + 15$
 = 495 (Ans. A)

24. (B) ধরি, Polash এর investment x for 12 months

So, Qader এর investment $2x$ for 6 months

And, Sohel এর investment $3x$ for 4 months

So, তাদের investments আসলে সমান, অতএব Profit সমানভাবে ভাগ হবে।

So, Sohel এর Profit = $\frac{72,000}{3} = 24,000$

25. (C) মনে করি, 'cobra' -র সংখ্যা = C

Python -এর সংখ্যা = P

$$\therefore \frac{1}{4}C = \frac{1}{6}(C + P) \Rightarrow 3C = 2C + 2P \Rightarrow C = 2P \Rightarrow \frac{P}{C} = \frac{1}{2} \quad \text{Ans: (C) 1:2}$$

26. (C) মনে করি, বর্তমানে তাদের বয়স $2x, 3x, 4x, 5$ বছর পরে বয়স হয় $2x+5, 3x+5, 4x+5$. কাজেই লেখা যায়, $2x+5: 3x+5 = 5:7 \Rightarrow x = 10$, present age of the youngest = $2 \times 10 = 20$ years.

27. (B) মনে করি, Amir এর কাছে marbel x টি এবং Babu এর কাছে marbel $2x$ টি তাহলে Enam এর কাছে $5x$ টি marbel আছে।

এখন, marbel exchange এর পর, $\frac{\text{Amir}}{\text{Babu}} = \frac{x+3}{2x-3+6} = \frac{x+3}{2x+3} = \frac{3}{5}$

$$\therefore \frac{x+3}{2x+3} = \frac{3}{5} \Rightarrow 5x + 15 = 6x + 9$$

$$\therefore x = 6 \therefore \text{Enam এর কাছে marbel ছিল } 5x = 5 \times 6 = 30 \text{ টি।}$$

28. (A) $\frac{A}{4} + \frac{B}{3} = 1100 \Rightarrow 3A + 4B = 12 \times 1100$: আবার, $\frac{A}{8} = \frac{B}{5} \Rightarrow A = \frac{8B}{5}$

$$\therefore 3 \times \frac{8B}{5} + 4B = 12 \times 1100 \Rightarrow 44B = 12 \times 1100 \times 5$$

$$\therefore B = \frac{12 \times 1100 \times 5}{44} = \frac{12 \times 100 \times 5}{4} = 1500.$$

29. (B) $\frac{A}{B} = \frac{2}{3}; \frac{B}{C} = \frac{2}{3}; \frac{C}{D} = \frac{2}{3}$

এখন, $\frac{B}{C} \times \frac{C}{D} = \frac{2}{3} \times \frac{2}{3} \Rightarrow \frac{B}{D} = \frac{4}{9}$

30. (D) মোট বলের সংখ্যা = 24; সুতরাং ratio টি এমন হতে হবে যাতে সংখ্যাদ্বয়ের যোগফল 24 এর factor না হয়।
Answer choice (D) তে 4 : 3 অর্থাৎ যোগফল 7.

31. (C) Ratio = 8:7

যোগফল = 8 + 7 = 15

অর্থাৎ, মোট সংখ্যা 15 দ্বারা বিভাজ্য হবে।

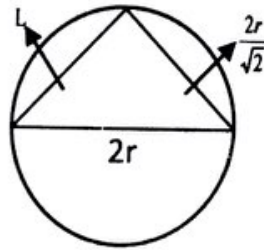
অতএব, মোট ছাত্রসংখ্যা 50 হতে পারবে না।

32. (E) মনে করি, Ali র income = x Tk. ∴ Baby র income = $\frac{4x}{5}$; Ali এর expenditure = x - 500;

so, Baby র expenditure = $\frac{x-500}{54} \times 3$; এর পর আর করা solve যাবে না।

33. (E) $l = \sqrt{(2r)^2 + (r)^2}$

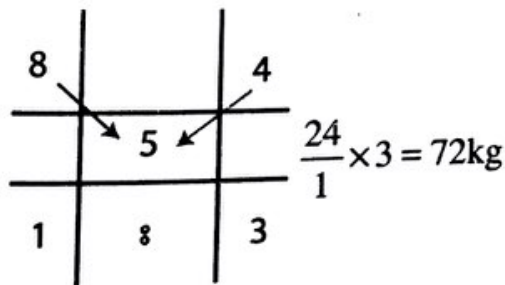
$$\frac{\text{area of circle}}{\text{area of triangle}} = \frac{\pi r^2}{\frac{1}{2} \times \frac{2r}{\sqrt{2}} \times \frac{2r}{\sqrt{2}}} = \pi$$



34. (C) Now amount of Sugar = $(1/5) \times 2 = 0.4$ kg: মনে করি; X পরিমাণ sugar add করতে হবে।

$$\therefore X + 0.4 = \frac{2}{7} \times (2+X) \Rightarrow 7X + 2.8 = 4 + 2X \Rightarrow 5X = 1.2 \Rightarrow X = \frac{1.2}{5} = 0.24$$

35. (D) Applying the spider method



36. (B) $\frac{yx}{z^2} = 27; \frac{y^2}{zx} = \frac{1}{3\sqrt{3}} \Rightarrow \frac{yx}{z^2} = 3^3; \frac{y^2}{zx} = \left(\frac{1}{\sqrt{3}}\right)^3$

এখন, $\frac{yx}{z^2} \times \frac{y^2}{zx} = 3^3 \times \left(\frac{1}{\sqrt{3}}\right)^3 \Rightarrow \frac{y^3}{z^3} = 3^3 \times \left(\frac{1}{\sqrt{3}}\right)^3 = \left(3 \times \frac{1}{\sqrt{3}}\right)^3$

$$\Rightarrow \left(\frac{y}{z}\right)^3 = \left(3 \times \frac{1}{\sqrt{3}}\right)^3 \Rightarrow \frac{y}{z} = \frac{3}{\sqrt{3}} \therefore \frac{z}{y} = \frac{\sqrt{3}}{3}$$

37. (D) Rajib $\frac{2}{7} \times 700 = 200$ Tk. withdraw করে। এরপর reinvest করে $\frac{3}{5} \times 200 = \text{Tk. } 120$

\therefore 6 month পর Rajib এর investment Tk $(700-200 + 120) = \text{Tk. } 620$

\therefore Rajib: Rahat এর investment $= (200 \times 3 + 500 \times 3 + 620 \times 6) : (600 \times 12)$
 $= 7320 : 7200$
 $= 183 : 150$

\therefore Investment difference $= \frac{183-180}{183+180} \times 726 = 6$

38. (E) Partnership business এর ক্ষেত্রে সাধারণত: নিয়ম হলো যে partner যত ভাগ invest করবে, profit এর ঠিক তত ভাগ বা (percent) ঐ partner পাবে। \therefore এই অঙ্কে প্রথমে Arif. Babu এবং Salam এই তিনজনের কে কতটুকু খাটালো, তা বের করতে হবে। $\therefore A + B + S = 280 \dots (I), A = B + 45; B = S - 70: \therefore A = S - 70 + 45 = S - 25$

\therefore (I) থেকে, $S - 25 + S - 70 + S = 280 + 95 \therefore S = \frac{375}{3} = 125$

$\therefore B = 125 - 70 = 55 \therefore$ Babu খাটায় $\frac{55}{280} = \frac{11}{56}$ ভাগ;

\therefore Babu র প্রাপ্য profit $= \frac{11}{56} \times 56$ টাকা $= 11$ টাকা।

39. (D) ধরি, Y পায় = 100 টাকা; সুতরাং; X পায় = 133.33 টাকা
 এবং Z পায় = 133.33 টাকা (কারণ Y, Z এর 75% পায়)
 অর্থাৎ, মোট টাকা = $100 + 133.33 + 133.33 = 366.66$ টাকা

366.66 এ z পায় 133.33 \therefore 5550 এ z পায় $\frac{133.33 \times 5500}{366.66} = 2000$ টাকা

40. (D) মনেকরি, Kamran's income $3x$ & Dolon's income $4x$
 আবার, Kamran's expenditure $4y$ & Dolon's expenditure $5y$

$$3x - 4y = \frac{3x}{4} \Rightarrow 3x - \frac{3x}{4} = 4y \Rightarrow 9x = 16y \Rightarrow x = \frac{16y}{9}$$

$$\text{এখন, Kamran's Savings} = 3x - 4y = 3 \left(\frac{16y}{9} \right) - 4y = \frac{16y}{3} - 4y = \frac{16y - 12y}{3} = \frac{4y}{3}$$

$$\text{Dolon's savings} = 4x - 5y = 4 \left(\frac{16y}{9} \right) - 5y = \frac{64y}{9} - 5y = \frac{64y - 45y}{9} = \frac{19y}{9}$$

$$\therefore \text{Kamran's savings : Dolon's savings} = \frac{4y}{3} : \frac{19y}{9} = \frac{4y}{3} \times \frac{9}{19y} = \frac{12}{19} = 12 : 19$$

অথবা এই অঙ্কটি ratio match করেও করা সম্ভব।

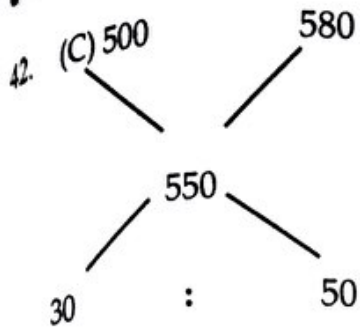
41. (B) Salary of X:Y = 1:2 and salary of X:Z = 1:3

অতএব Salary of X:Y:Z = 1:2:3

1000 টাকা বৃদ্ধির পূর্বে Z পায় = 24000 টাকা

1000 টাকা বৃদ্ধির পূর্বে Y পায় = $24000 \times \frac{2}{3}$ টাকা = 16000 টাকা

Y এখন পায় $16000 + 1000 = 17000$ টাকা



So the ratio will be 30: 50 or 3: 5

43. (C) টাকা 10, 20, 30 remove করা হলে মোট amount দাড়ায় $3660 - 60 = 3600$.
তখন X, Y ও Z এর share এর ratio হয় 3:4:5

তাই X পায় = $3600 \times \frac{3}{12} = 900$ টাকা

সুতরাং X originally পেয়েছে = $900 + 10 = 910$ টাকা

44. (A) Given,

i) Total men: Total women = 16:7

ii) Married men : Married women = 4:3

iii) Married women / total women = 60%

Now, from (ii) Married men = $\frac{4}{3} \times$ married women

from (i) Total men = $\frac{16}{7} \times$ total women

So, Married men / Total men = $(\frac{4}{3} \times \text{married women}) / (\frac{16}{7} \times \text{total women})$

$$= \frac{28}{48} \times (\text{married women} / \text{total women})$$

$$= \frac{28}{48} \times 60\% \text{ (from iii)}$$

$$= 35\%$$

45. (A) Let the quantity of the mango juice in the container originally be x litres. Then,
quantity of mango juice left in the container after 4 operations = $[x(1 - \frac{8}{x})^4]$ litres

$$\therefore [x(1 - \frac{8}{x})^4] = 1681$$

$$\text{Or, } [1 - \frac{8}{x}]^4 = (\frac{23}{x})^4$$

$$\text{Or, } x = 24$$

46. (C) Statement A অনুসারে triangle এর hypotenuse এ diameter. তাহলে triangle তি একটি right angled triangle.

Statement B অনুসারে radius 2 cm এবং area 4 square cm. এই তথ্য থেকে circle এর area বের করা সম্ভব।

Triangle এবং circle উভয়ের area জানা থাকার কারণে dice এর triangle এর বাইরে পড়ার সম্ভাবনা বের করা সম্ভব।

Statement A এবং Statement B উভয় এর সহযোগিতা দ্বারা।

47. (E) Let, The amount of merit raise received by C rated employees be Tk x
So, raise received by A rated employees = Tk $2x$
And, raise received by B rated employees = Tk $1.5x$
Total Tk $(2x \times 50) + (1.5x \times 100) + (x \times 150) = \text{Tk } 500000$
Or, $400x = \text{Tk } 500000$
Or, $2x = \text{Tk } 2500$
48. (D) Blue car: Green Car = 4:3
Green car: Red car = 1:3
So, Blue car: Green car : Red car = 4:1:3
49. (E) For an integers if ratio $\rightarrow a:b$
the integers has to be divisible by $a + b$
so only A, D, E are possible answers
For A and D, if values are found, they will be less than 100.
Therefore, E is the answer

Concept 19

Time & Distance

Concept 19 (Time and Distance)

- ⊗ Speed is the distance traveled per unit of time. (একক সময়ে অতিক্রান্ত দূরত্ব)
- ⊗ The general formula for speed is $Speed = \frac{Total\ distance}{Total\ Time}$
- ⊗ $v = d/t$
 $d = v \times t$
 $t = d/v$ where, $v =$ speed, $d =$ distance, $t =$ time
- ⊗ If the speed of traveling from point A to point B is x km/hr and the speed of returning from point A to point B is y km/hr, then the avg speed is $2xy/(x+y)$
 Because, speed = Total distance/Total Time = $(d+d) / (d/x + d/y) = 2d / d((x+y)/xy) = 2xy/(x+y)$
- ⊗ $1\ km/hr = 5/18\ m/s$
- ⊗ Boat and current related math is a variation of speed related math.
- ⊗ If a boat has a speed of x km/hr and current has a speed of y km/hr,
 When the boat is moving downstream (শ্রোতের অনুকূলে), the speed is $(x + y)$ km/hr
 When the boat is moving upstream (শ্রোতের প্রতিকূলে), the speed is $(x - y)$ km/hr

Example 1: A motorcyclist rode to work at an average speed of 15 miles per hour and returned home along the same route at an average speed of 45 miles per hour. If his entire traveling time was 1 hour, what was the total number of miles in the round trip?
 (IBA BBA 93)

- (A) 15 (B) $22\frac{1}{2}$ (C) 30 (D) $36\frac{1}{2}$ (E) 45

Solution:

Since the same distance is traveled twice, avg speed of the entire journey = $2xy/(x+y) = 2 \times 15 \times 45 / 60 = 45/2$ km/hr
 Total time was 1 hour
 We know, $v = d/t$.
 So, $d = vt = 1 \times 45/2 = 45/2 = 22.5$ miles
 Answer: B

Exercise 19

- 1. A motorcyclist rode to work at an average speed of 15 miles per hour and returned home along the same route at an average speed of 45 miles per hour. If his entire traveling time was 1 hour, what was the total number of miles in the round trip?
(BBA 93)
(A) 15 (B) $22\frac{1}{2}$ (C) 30 (D) $36\frac{1}{2}$ (E) 45
- 2. A plane traveling at 600 miles per hour is heading for Chittagong Airport. At 3:58 pm., it is 30 miles from the airport. At what time will it arrive at the airport?
(BBA 93)
(A) 3:59 pm. (B) 4:00 pm. (C) 4:01 pm. (D) 4:02 pm. (E) 4:03 pm.
- 3. Ali starts from his home at 5 a.m. and travels towards Chittagong at an average speed of 30 km/hr. Belal starts from the same home at 7 a.m. and travels along the same route towards Chittagong, overtaking Ali at exactly 11 a.m. At what speed, in km/hr, was Belal travelling?
(BBA 94-95)
(A) 35 (B) 40 (C) 45 (D) 48 (E) 50
- 4. Hasan can run 10 miles per hour, while Jack can run only 8 miles per hour. If they start at the same time from a point, and run in opposite direction, how far apart (to the nearest mile) will they be after 10 minutes?
(BBA 95-96)
(A) 1 mile (B) 2 miles (C) 3 miles (D) 4 miles (E) 5 miles
- 5. A certain 90-mile trip took 2 hours. Exactly $\frac{1}{3}$ of the distance traveled was by rail, and this part of the trip took $\frac{1}{5}$ of the travel time. What was the average rate, in miles per hour, of the rail portion of the trip?
(BBA 95-96)
(A) 12 mph (B) 30 mph (C) 45 mph (D) 60 mph (E) 75 mph
- 6. Sharif ran a 2 mile race at an average speed of 8 miles per hour. If Arif ran the same race at an average speed of 6 miles per hour, how many minutes longer than Sharif did Arif take to complete the race?
(BBA 96-97)
(A) 20 (B) 15 (C) 12 (D) 9 (E) 5
- 7. Two trains are running on the same route at the rate of 25 and 30 miles per hour. If the first train starts out an hour earlier, how long will it take the second train to catch up with it?
(BBA 97-98)
(A) 5 hrs. (B) 4 hrs. (C) 3 hrs. (D) 2 hrs. (E) none of these
- 8. A man travels a certain distance at a rate of 20 miles an hour and returns at the rate of 30 miles an hour. What is his average speed?
(BBA 97-98)
(A) 26 (B) 25 (C) 25.5 (D) 24 (E) none of these
- 9. A boat sailing against the current takes 8 hours to travel 32 km. If it had been sailing with the current the time taken would have been only 4 hours. What is the speed of current?
(BBA 98-99)
(A) 3 km/hr (B) 2.5 km/hr (C) 2 km/hr (D) 1 km/hr (E) None of these

- 10. Mr. Karim traveled to his office from his home at speed of 3 km/hr. if his total traveling time was 5 hours, what is the distance in kms, of his office from his home?
(BBA 98-99)
(A) 15 (B) 5 (C) 6 (D) 9 (E) None of these.
- 11. Two cars start towards each other from points 200 km apart. One car travels at 40 km/hr and the other travels at 35 km/hr. How far apart will the two cars be after four hours of continuous traveling?
(BBA 98-99)
(A) 100 km (B) 75 km (C) 40 km (D) 20 km (E) 160 km
- 12. A man travels from A to B at 20 km/hr. He makes the return journey at 30 km/hr. What was his avg speed?
(BBA 98-99)
(A) 20 (B) 22 (C) 23 (D) 25 (E) none of these
- 13. Mr. Karim traveled from A to B at a speed of 3 km/hr and returned from B to A at a speed of 5 km/hr. If the round trip required 8 hours what was the distance between A and B in km?
(BBA 99-00)
(A) 9 (B) 12 (C) 15 (D) 18 (E) 20
- 14. Two cars start towards the same destination at the same time. One car is 5 km behind the other. If the speed of the car at the front is 750 m/minute and that of the other car is 1000 m/minute, after how many minutes will the two cars meet?
(BBA 99-00)
(A) 20 (B) 24 (C) 25 (D) 30 (E) none of these
- 15. A motorist travels x miles in y hours and z minutes. What is his average speed in miles per hour?
(BBA 03-04)
(A) $x/(y+60z)$ (B) $(60y+z)/x$ (C) $60x/(y+z)$ (D) $60x/(60y+z)$ (E) none of these
- 16. Sonia travels to IBA from Uttara by car at a speed of 40 km per hour and returns to Uttara at a speed of 30 km per hour by an auto rickshaw. What is her average speed in the entire journey in km/hour?
(BBA 09-10)
(A) 35 (B) 34.3 (C) 37.5 (D) 35.3 (E) 36
- 17. Mr. X starts from his house at 9:10 am towards IBA which is 10 miles away from his house. He must reach IBA by 9:30 am. If he covers half the distance at a speed of 20 miles per hour, his speed for the remainder of the distance must be (in miles per hour) what?
(MBA 96-97)
(A) 50 (B) 60 (C) 45 (D) 55 (E) none of these
- 18. A truck driver must complete a 180-km trip in 4 hours. If he averages 50 km an hour for the first three hours of his trip, how fast must he travel in the final hour?
(MBA 98-99)
(A) 50 km (B) 45 km (C) 40 km (D) 35 km (E) 30 km

- 19. A bus uses one liter of diesel to travel 15 km. After an engine tune-up, the bus travels 15% farther on one liter. How many liters of diesel (to the nearest tenth) will it take for the bus to travel 150 km. after a tune-up? (MBA 00-01)
 (A) 8.5 (B) 8.7 (C) 8.9 (D) 9.0 (E) 10.0
- 20. Arif travels $\frac{1}{3}$ rd of the distance at an average speed of 5 km/hr, $\frac{2}{5}$ th of the distance at an average speed of 4km/hr and the rest 12 miles in 2 hours. What is the total distance traveled by Arif? (MBA 01-02)
 (A) 45 (B) 48 (C) 52 (D) 54 (E) none of these
- 21. A car is traveling on a highway. At 10 A.M., it passes a truck traveling in the same direction. The truck continues on the highway traveling at 50 mph while the car travels at 65 mph. How far apart are the car and the truck at 2 P.M? (MBA 03-04)
 (A) 15 Miles (B) 30 Miles (C) 60 Miles (D) 200 Miles (E) 260 Miles
- 22. If two planes leave the same airport at 1:00 PM. how many miles apart will they be at 3:00 PM if one travels directly north at 150 mph and the other travels directly west at 200 mph? (MBA 10-11)
 (A) 50 miles (B) 100 miles (C) 500 miles (D) 400 miles (E) None of these
- ⊕ 23. A man started at 8 am from his home, walked at the rate of 3 km/hr and reached his office 45 minutes late. The next day, he started at the same time and walked at the rate of 5 km/hr and reached his office 15 minutes earlier than the scheduled time. What was the distance between his office and home? (BBA 99-00)
 (A) 6 km (B) 7.5 km (C) 9 km (D) 12 km (E) none of these
- ⊕ 24. A man traveled one-fourth of the total distance of his trip by car. He traveled the remaining distance on foot. The ratio of his walking time to driving time was 15:1. Calculate the ratio of his driving speed to his walking speed. (BBA 02-03)
 (A) 5:2 (B) 5: 1 (C) 1: 5 (D) 2: 5 (E) 25: 1
- ⊕ 25. A train left Dhaka for Chittagong at 62 km per hour and at the same time another train left Chittagong for Dhaka at 48 km per hour on the same route. How far apart were the two trains one hour before they met? (BBA 02-03)
 (A) 80 (B) 92 (C) 100 (D) 110(E) none of these
- ⊕ 26. Mr. X and Mr. Y started from point A and reached point B in 10 minutes and 9 minutes respectively. If the traveling speed of Mr. X was 2 km/hr less than that of Mr. Y, what was the distance between A and B in kms? (MBA 98-99)
 (A) 6 (B) 4.5 (C) 4 (D) 3 (E) none of these
- ⊕ 27. A train covers the distance x between two cities in y hours, arriving 2 hours late. What rate would permit the train to arrive on schedule? (MBA 01-02)
 (A) $x/y-2$ (B) $x/(y-2)$ (C) $xy-2$ (D) $x/(y+2)$ (E) none of these
- ⊕ 28. Anwar usually walks to his office from his house at a speed of 8 km per hour. It takes him 10 minutes longer to walk the same distance at 6 km per hour. What is the distance (in km) between his house and office? (MBA 02-03)
 (A) 7 (B) 6 (C) 5 (D) 4 (E) none of these

- #29 A train covers a distance of 80 km at a speed of 40km/hr for the first 60 km and the remaining distance at a speed of 20 km/hr. What is the average speed (in km/hr) of the train on the journey? (MBA 08-09)
 (A) 24 (B) 25 (C) 30 (D) 32 (E) none of these
- #30 Two cyclists start hiking from the starting point of a trail 3 hours apart. The second cyclist travels at 10 miles per hour and starts 3 hours after the first cyclist who is traveling at 6 miles per hour. How much time will pass before the second cyclist catches up with the first from the time the second cyclist started hiking? (MBA 10-11)
 (A) 2 hours (B) $4\frac{1}{2}$ (C) $\frac{3}{4}$ (D) 6 hours (E) None of these
- #31. A man had traveled $\frac{1}{3}$ of the total distance of his trip when his car broke down. He finished the journey on foot, spending twenty times as long walking as he had spent driving. How many times faster was his driving speed than his walking speed? (BBA 01-02)
 (A) 10 (B) 12 (C) 15 (D) 20 (E) none of these
- #32. A ferry can travel twice as fast when empty as when it is full. It travels 20 miles with full load, spends 1 hour for unloading and returns to its original port empty. It took 11 hours to complete the journey. What is the speed when the ferry was empty? (MBA 97-98)
 (A) 6 (B) 5.5 (C) 5 (D) 4.5 (E) 4
- #33. A man intends to run a certain distance in $\frac{1}{4}$ less time than he usually takes. By what percent must he increase his running speed to accomplish his goal? (MBA 98-99)
 (A) 25% (B) 27.5% (C) 33.33% (D) 35% (E) none of these
- #34. A father and a son started for a shop at the same time. In one minute, the son moved 20 steps forward and in the same time, the father moved 30 steps forward. In one step the son covered 1 ft. and the father covered 1.5 ft. If the son reached the store 10 minutes after his father, what was the distance of the store in ft.? (MBA 98-99)
 (A) 280 (B) 240 (C) 360 (D) 320 (E) none of these
- #35. A car traveled 75% of the way from town A to town B at an average speed of 50 miles/hour. The car travels at an average speed of S miles/hour for the remaining part of the trip. The average speed for the entire trip was 40 miles/hour. What is S? (MBA 04-05)
 (A) 10 (B) 20 (C) 25 (D) 30 (E) 37.5
- #36. A train normally travels 60 miles at a certain speed. On a day, due to mechanical problem, the train's speed is reduced by 10 mph so that the journey takes 3 hours longer. What is the normal speed of the train? (MBA 07-08)
 (A) 20 (B) 25 (C) 32 (D) 45 (E) none of these

- ∇37. On a certain day X drives his car from his home at the rate of 20 Km/hr and reaches his office 10 minutes late. The next day he drives at 30 Km/hr and reaches his office 5 minutes early. Calculate the distance between X's home and office in Km. (MBA 2013)
 (A) 10 (B) 12 (C) 15 (D) 17.5 (E) none of these
- ⊕38. At 9:00 a.m. train A left the Airport Railway Station and two hours later train B left the same station on a parallel track. If train A averaged 60 kilometers per hour and train B averaged 75 kilometers per hour until B passed A, at what time did B pass A?
 (BBA 13-14)
 (A) 2:00 p.m. (B) 5:00 p.m. (C) 6:00 p.m. (D) 7:00 p.m. (E) 9:00 p.m.
- ∇39. The mile meter of a highway bus misses every 11th mile being travelled. After a certain time, the meter shows that 1,251 miles were travelled. How many miles were actually travelled?
 (BBA 13-14)
 (A) 1360 miles (B) 1460 miles (C) 1386 miles (D) 1376 miles (E) none of these
- ∇40. Two boats on the opposite shores of a river start moving towards each other. When they pass each other they are 750 yards from one shoreline. They each continue to the opposite shore, immediately turn around and start back. When they meet again they are 250 yards from the other shoreline. Each boat maintains a constant speed throughout. How wide is the river?
 (BBA 13-14)
 (A) 2400 yards (B) 3000 yards (C) 2000 yards (D) 4000 yards (E) none of these
- ⊕41. A group of hikers is planning a trip that will take them up a mountain using one route and back down using another route. They plan to travel down the mountain at a rate of one and a half times the rate they will use on the way up, but the time each route will take is the same. If they will go up the mountain at a rate of 4 miles per day and it will take them two days, how many miles long is the route down the mountain?
 (BBA 13-14)
 (A) 8 (B) 6 (C) 12 (D) 16 (E) none of these
- ⊕42. Ajit, Bilash and Chinu start at the same time in the same direction to run around a circular stadium. Ajit completes a round in 252 seconds, Bilash in 308 seconds and Chinu in 198 seconds, all starting at the same point. After what time will they all be again at the starting point?
 (BBA 13-14)
 A) 26 minutes and 18 seconds B) 42 minutes and 36 seconds
 C) 45 minutes and 38 seconds D) 46 minutes and 12 seconds E) none of these
- ∇43. On a 300-mile trip, a car went 30 miles per hour for the first 100 miles, 50 miles per hour for the second 100 miles, and 60 miles per hour for the third 100 miles. For what fractional part of the time taken for the entire 300-mile trip was the car going 30 miles per hour?
 (BBA 13-14)
 A) 1/10 B) 1/3 C) 10/21 D) 11/21 E) 3/14

744. Ishtiaque completes a journey in 10 hours. He travels first half of the journey at the rate of 21 km/hr and second half at the rate of 24 km/hr. Find the total journey in km. (BBA 15-16)
 A. 121 km B. 242 km C. 112 km D. 224 km E. none of these
745. An ambulance travels 10 miles at a speed of 75 miles per hour. How fast must the ambulance travel on the return trip if the round-trip travel time is to be 20 minutes? (BBA 15-16)
 A. 50 mph B. 55 mph C. 60 mph D. 65 mph E. none of these
746. Asif, riding his bike at 24 km/h reaches his office 5 minutes late. If he would have reached the office 4 minutes earlier than the scheduled time by traveling 25% faster, how far is his office from his house in kms? (BBA 16-17)
 (A) 18 (B) 24 (C) 36 (D) 40 (E) none of these
747. An UberX car charges Tk 40 as base fare, Tk 3.6 for each 0.2 of a kilometer and Tk 180/hour as the travelling time charge. What will be the fare for a 6 kilometer trip if the travelling time is 110 minutes?
 A) 230 B) 340 C) 460 D) 478 E) None of these
748. A hiker walked for two days. On the second day the hiker walked four hours longer and his speed was 2 miles per hour faster than that of the first day. If during the two days he walked a total of 104 miles and spent a total of 20 hours, what was his average speed (miles/hour) on the first day?
 A) 2 B) 4 C) 5 D) 8 E) None of these

Answer Key Exercise 19

1.B	2.C	3.C	4.C	5.E	6.E	7.A	8.D	9.C	10.A
11.A	12.E	13.C	14.A	15.D	16.B	17.B	18.E	19.B	20.A
21.C	22.C	23.B	24.B	25.D	26.D	27.B	28.D	29.D	30.B
31.A	32.A	33.C	34.C	35.C	36.A	37.C	38.D	39.D	40.C
41.C	42.D	43.C	44.D	45.A	46.A	47.D	48.B		

Solution to Exercise 19

1. (B) As the distance between motorcyclist's home and work is same, here average speed of the round trip is, $v = \frac{2xy}{x+y}$

$$\text{So, } v = \frac{2 \times 15 \times 45}{15 + 45} = 22.5 \text{ mph}$$

$$\text{Now, } d = v t = 22.5 \times 1 = 22.5$$

2. (C) Plane টি 600 mile যায় 1 hour এ বা 60 minutes এ

$$\therefore 30 \text{ mile যাবে } \frac{60 \times 30}{600} \text{ minutes এ, বা 3 minutes এ } \quad 3:58 \text{ p.m} + 3 \text{ minutes} = 4:01 \text{ p.m.}$$

3. (C) আলী 5 am এ রওনা দিয়েছে এবং তার speed 30 km/hr. অর্থাৎ 11 am (6 ঘন্টায়) এ আলীর মোট দূরত্ব = 6×30 km. = 180 km. বেলাল 7am এ রওনা দিয়ে 11am এ অর্থাৎ 4 ঘন্টায় 180 Km দূরত্ব অতিক্রম করে।

$$\therefore \text{বেলাল এর speed} = \frac{180}{4} \text{ km / hr} = 45 \text{ km/hr.}$$

4. (C) যেহেতু 2 জন opposite দিকে যাচ্ছে, তাই 1hr এ $10 + 8 = 18$ km যায়। তাহলে 10 mins এ $\frac{18}{60} \times 10 = 3$ km যাবে।

5. (E) $d = \frac{1}{3} \times 90 = 30$ mile

$$t = \frac{2}{5} \text{ hr}$$

$$\therefore s = \frac{d}{t} = \frac{30}{\frac{2}{5}} = 75$$

6. (E) Sharif এর time = $\frac{2}{8} \text{ hr} = \frac{1}{4} \times 60 \text{ min} = 15 \text{ min}$

$$\text{Arif এর time} = \frac{2}{6} \text{ hr} = \frac{1}{3} \times 60 \text{ min} = 20 \text{ min}$$

$$\therefore \text{Time difference} = 20 - 15 = 5 \text{ min}$$

7. (A) মনে করি, প্রথম train টা নাগাল পেতে 2nd train এর x ঘন্টা লাগবে।

$$\therefore 25(x + 1) = 30x \Rightarrow x = 5 \text{ hours.}$$

8. (D) মনে করি সে x miles গেল \therefore total time = $\frac{x}{20} + \frac{x}{30} = \frac{5x}{60} = \frac{x}{12}$; total distance = 2x

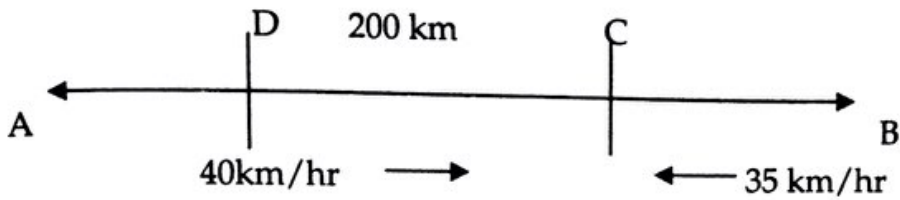
$$\therefore \text{Av. speed} = \frac{\text{distance}}{\text{time}} = \frac{2x}{\frac{x}{12}} = 24$$

$$\text{অথবা, If the distance is same, average speed} = \frac{2xy}{x+y}$$

$$\frac{2xy}{x+y} = \frac{2 \times 20 \times 30}{80} = 24$$

9. (C) speed of boat = b km/hr; speed of current = c km/hr; $\therefore 8 \times (b - c) = 32$ and, $(b + c) \times 4 = 32$; therefore, $b - c = 4$ and $b + c = 8$; $\therefore 2b = 12 \therefore b = 6 \therefore c = 2$
10. (A) Distance = speed \times time = $3 \times 5 = 15$

11. (A)



$$AC = 40 \times 4 = 160 \text{ km}; BD = 35 \times 4 = 140 \text{ km}$$

$$\therefore BC = 200 - 160 = 40; AD = 200 - 140 = 60$$

$$\therefore CD = 200 - BC - AD = 200 - 40 - 60 = 100 \text{ km}$$

12. (E) Average = $\frac{\text{Total Distance}}{\text{Total Time}} = \frac{d + d}{\frac{d}{20} + \frac{d}{30}} = \frac{2}{\frac{1}{20} + \frac{1}{30}} = \frac{2 \times 60}{3 + 2} = 24 \text{ km/hr}$

13. (C) Average speed = $\frac{2S_1 S_2}{S_1 + S_2} = \frac{2 \times 3 \times 5}{3 + 5} = \frac{30}{8}$

$$\text{Total Distance} = \text{Av. Speed} \times \text{Total Time} = \frac{30}{8} \times 8 = 30 \text{ km.}$$

Distance from A to B is 15. Back calculation করলে খুব সহজে solve করা যেত।

14. (A) 2nd car per minute cover করে 250 meters বেশী

$$5 \text{ km cover করে} = \frac{1 \times 5 \times 1000}{250} = 20 \text{ minutes এ}$$

15. (D) মোট দূরত্ব = x miles; মোট সময় = y hr. z min = y hr + $\frac{z}{60}$ hr. = $y + \frac{z}{60}$ hr.

$$\text{অতএব, speed} = \frac{\text{দূরত্ব}}{\text{সময়}} = \frac{x \text{ miles}}{y + \frac{z}{60} \text{ hr}} = \frac{60x}{(60y + z)} \text{ miles/hr.}$$

16. (B) $u = 40$ kmph

$v = 30$ kmph

$$\text{Average speed} = \frac{2uv}{u + v} = \frac{2 \times 40 \times 30}{40 + 30} = 34.3 \text{ kmph} \quad \text{Ans: (B) 34.3}$$

17. (B) He covers 5 miles at 20 mph

$$\text{So here } t = \frac{5}{20} \text{ h} = 15 \text{ mins}$$

So, he'll have to travel the remainder of 5 miles in $(20 - 15) = 5$ mins

$$\text{So, } v = \frac{5}{5} \text{ miles per minute} = 60 \text{ miles per hour}$$

18. (E) distance covered in first 3 hours = speed \times time = $50 \times 3 = 150$ kms
 \therefore বাকি থাকে $180 - 150 = 30$ kms. \therefore শেষ 1 ঘন্টায় তার গতি হতে হবে 30 km/hr.

19. (B) 1 লিটার এ যায় = 15 km; কিন্তু tune - up এর পর 1 লিটার এ যায় = $15 + (15 \times \frac{15}{100})$ km = 17.25 km

$$\therefore \frac{150}{17.25} = 8.7 \text{ (approx.) liter diesel লাগবে।}$$

20. (A) ধরি, total distance = x miles

$$\text{অর্থাৎ, } \frac{x}{3} + \frac{2x}{5} = x - 12 \quad \therefore x = 45$$

এখানে speed বা time কোন কাজে আসবে না।

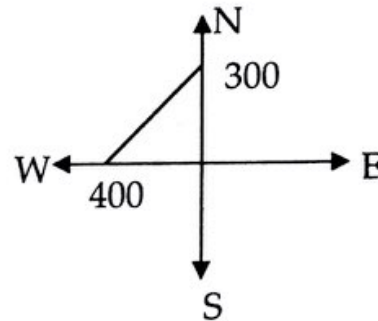
21. (C) গাড়িটি 10 am এ truck কে cross করলো।

2pm এ গাড়ি যাবে (65×4) মাইল = 260 মাইল

2pm এ truck যাবে = (50×4) মাইল = 200 মাইল

\therefore distance = $(260 - 200) = 60$ মাইল।

22. (C)



প্রথমটি 2 hours এ যাবে $150 \times 2 = 300$ miles

দ্বিতীয়টি 2 hours এ যাবে $200 \times 2 = 400$ miles

এখন, মানগুলো সমকোণী ত্রিভুজে প্রতিস্থাপন করে অতিভুজ বের করলে আমরা নির্ণয় দূরত্ব পেয়ে যাই।

3: 4: 5 ratio অনুসারে নির্ণয় দূরত্ব 500 miles।

23. (B) Let, the distance between home and office is d

The total time difference of arriving at office the last two days is, 45 mins + 15 mins = 1 hour

$$\text{So, } t_1 - t_2 = 1$$

$$\text{Or, } \frac{d}{3} - \frac{d}{5} = 1 \quad [d = v t]$$

$$\text{Or, } 5d - 3d = 15 \text{ [multiplying by 15 on both sides]}$$

$$\text{Or, } d = 7.5$$

24. (B) ধরি, total distance = x

$$\text{গাড়িতে গেল} = \frac{x}{4} \text{ এবং হেঁটে গেল} = \frac{3x}{4} \text{ হাঁটার সময়} = 15 \text{ হলে গাড়িতে যাওয়ার সময়} = 1$$

$$\therefore \text{হাঁটার গতি} = \frac{3x}{15} \text{ আর গাড়ির গতি} = \frac{x}{4}$$

$$\text{অনুপাত} = \frac{x}{4} : \frac{3x}{15} = \frac{x/4}{3x/15} = \frac{x}{4} \times \frac{15}{3x} = \frac{5}{4} = 5 : 4$$

25. (D) ঢাকা হতে চট্টগ্রামগামী ট্রেনটি 1 ঘন্টায় 62 km. যায়।

চট্টগ্রাম হতে ঢাকাগামী ট্রেনটি 1 ঘন্টায় 48 যায়

∴ 1 ঘন্টায় দুটি বিপরীতমুখী ট্রেন মোট $(62 + 48) = 110$ km. দরত্ব অতিক্রম করে।
অর্থাৎ মুখোমুখি হবার 1 ঘন্টা আগে তাদের দরত্ব = 110 km।

26. (D) ধরি, Mr. X এর speed = x km/hr. ∴ Mr. Y এর speed = $(x + 2)$ km/hr. অর্থাৎ, Mr. Y point B তে 9 minute এ পৌঁছালে মোট দূরত্ব = $(x + 2) \times \frac{9}{60} = \frac{9x + 18}{60}$ আবার, Mr. X point B তে 10 minute এ

পৌঁছালে মোট দূরত্ব = $x \times \frac{10}{60} = \frac{x}{6}$ ∴ $\frac{9x + 18}{60} = \frac{x}{6} \Rightarrow 54x + 108 = 60x \Rightarrow x = 18$

অর্থাৎ দূরত্ব = $\frac{x}{6} = \frac{18}{6} = 3$ km.

27. (B) time available to cover the distance = $y - 2$ ∴ speed = $\frac{x}{y - 2}$

28. (D) ধরি, distance = x
usual speed = 8 Km/hr.

∴ time taken = $\frac{x}{8}$ hrs.

আবার, speed যদি 6 Km/hr. হয়, তাহলে time = $\frac{x}{6}$ hrs.

প্রশ্নমতে, $\frac{x}{8} = \frac{x}{6} - \frac{10}{60}$ (10 min কে hr. এ convert করে)

$\Rightarrow x = 4$ km.

29. (D) 40 km/hr speed এ 60 km যেতে, time = $\frac{\text{distance}}{\text{speed}} = \frac{60}{40} = \frac{3}{2}$ hr

20km/hr speed এ বাকি 20km যেতে, time = $\frac{20}{20} = 1$ hr

∴ Average speed = $\frac{\text{Total distance}}{\text{Total time}} = \frac{80\text{km}}{\left(\frac{3}{2} + 1\right)\text{hr}}$

= $\frac{80\text{km}}{\frac{5}{2}\text{hr}} = \frac{80 \times 2}{5}\text{hr} = 32$ hour.

30. (B) প্রথম জন 3 hours এ $3 \times 6 = 18$ miles দূরত্ব অতিক্রম করবে।

ধরি, দ্বিতীয়জন x hours এ প্রথমজনকে ধরবে।

সে x hours এ যাবে $x \times 10 = 10x$ miles

এবং প্রথমজন x hours এ যাবে $x \times 6 = 6x$ miles

অর্থাৎ $18 + 6x = 10x \Rightarrow x = 4.5$

31. (A) let, distance = d and driving time = t

$$\therefore \text{driving speed} = \frac{d/3}{t} = \frac{d}{3t} \quad \therefore \text{walking speed} = \frac{2d/3}{20t} = \frac{d}{30t}$$

$$\therefore \frac{\text{driving speed}}{\text{walking speed}} = \frac{d}{3t} + \frac{d}{30t} = 10$$

[যতটুকু driving distance এর 2 গুণ হেঁটে অতিক্রম করতে সময় লেগেছে 20 গুণ, সমান দরত্ব অতিক্রম করতে সময় লাগবে 10 times]

32. (A) মনে করি, full অবস্থায় speed x miles per hour, empty অবস্থায় speed = 2x mph, এখন,

$$\frac{20}{x} + 1 + \frac{20}{2x} = 11 \Rightarrow \frac{30}{x} = 10, \therefore x=3. \text{ empty অবস্থায় speed} = 2x = 2 \times 3 = 6$$

33. (C) মনে করি, বর্তমান speed = s₁, সময় = t₁, এর দূরত্ব = d₁; $\therefore d_1 = s_1 t_1$

নতুন time = t₂ এবং speed = s₂ $\therefore d_1 = s_2 t_2$ [যেহেতু distance same]

এখন, s₁ t₁ = s₂ t₂

$$\Rightarrow \frac{t_1}{t_2} = \frac{s_2}{s_1} \Rightarrow \frac{t_1}{\frac{3}{4}t_1} = \frac{s_2}{s_1} \Rightarrow \frac{s_2}{s_1} = \frac{4}{3} \Rightarrow s_2 = \frac{4}{3}s_1$$

$\therefore \frac{1}{3}$ বেশি speed লাগবে।

$\therefore \frac{1}{3} \times 100\% = 33.33\%$ বেশি speed লাগবে।

34. (C) ধরি, distance of store = x feet; Now, distance covered by son in one minute = 1 × 20 = 20 ft. and distance covered by father = 30 × 1.5 = 45 ft.

$$\therefore \text{Time taken by son} = \frac{x}{20} \text{ minute; Time taken by father} = \frac{x}{45} \text{ minute}$$

$$\therefore \frac{x}{20} = \frac{x}{45} + 10 \Rightarrow \frac{x}{20} - \frac{x}{45} = 10 \Rightarrow \frac{9x - 4x}{180} = 10 \Rightarrow x \frac{5}{180} = 10 \Rightarrow x = \frac{1800}{5} = 360 \text{ ft.}$$

35. (C) 75 miles এর জন্য speed = 50 m/h; total time = $\frac{75}{50}$ hours

আবার, 25 miles এর জন্য speed = S m/h; total time = $\frac{25}{S}$ hours

$$\text{অর্থাৎ, average speed} = \frac{100}{\frac{75}{50} + \frac{25}{S}}$$

$$\text{প্রশ্নমতে, } \frac{100}{\frac{75}{50} + \frac{25}{S}} = 40 \Rightarrow 100 = 40 \left(\frac{75S + 50 \times 25}{50S} \right)$$

$$\Rightarrow 100 \times 50S = 40 \times 75S + 40 \times 50 \times 25 \quad \Rightarrow 5000S - 3000S + 50000$$

$$\Rightarrow 2000S = 50000 \Rightarrow S = 25$$

36. (A) elimination method এ সহজ হয়, option A তে normal speed = 20 mph.

তাহলে, 60 miles যেতে time লাগে = $\frac{\text{distance}}{\text{speed}} = \frac{60}{20} = 3 \text{ hours}$

Speed যদি 20 mph থেকে 10 mph কমে অর্থাৎ 10 mph হয়, তাহলে, time লাগে = $\frac{60}{10} = 6 \text{ hours}$

অর্থাৎ 3 hours বেশি লাগে, যা question এর সাথে match করে,

অথবা মনে করি, normal speed = x.

$$\therefore \frac{60}{x-10} - \frac{60}{x} = 3 \Rightarrow \frac{60x - 60x + 600}{x(x-10)} = 3 \Rightarrow \frac{600}{x^2 - 10x} = 3 \Rightarrow \frac{200}{x^2 - 10x} = 1 \text{ [dividing by 3]}$$

$$\Rightarrow x^2 - 10x - 200 = 0 \Rightarrow (x - 20)(x + 10) = 0 \therefore x = 20 \text{ or, } x = 10 \text{ কিন্তু } x = -10 \text{ সম্ভব নয়,}$$

$$\therefore x = 20$$

37. (C) ধরি, home থেকে office এর distance = x

দুই দিনের office এ পৌঁছানোর সময়ের ব্যবধান = 15 minutes, or (15 / 60) hour

$$\frac{x}{20} - \frac{x}{30} = \frac{15}{60}$$

$$\text{Or, } 3x - 2x = 15$$

$$\text{Or, } x = 15$$

38. (D) Train A সকাল 9 am এ ছেড়ে গেল 60 km/hr গতিতে

Train B সকাল 11 am এ ছেড়ে গেল 75 km/hr গতিতে

Train A এগিলে গেল 2 ঘণ্টায় (60×2) = 120 km

প্রতি ঘণ্টায় Train B দূরত্ব কমিয়ে আনে (75-60) km = 15 km

$$\text{সুতরাং } 120 \text{ km দূরত্ব কমিয়ে আনতে সময় লাগবে } \left(\frac{120}{15}\right) \text{ hr} = 8 \text{ hours}$$

সুতরাং, 11 am এ রওনা দিলে (11+8) pm = 7 pm এ train A কে অতিক্রম করবে Train B

39. (D) Highway Bus এর mile meter প্রতি 11th mile বাদ পড়ে যায়।

অর্থাৎ, প্রতি 10 mile পর পর একটি করে mile কম গণনা করা হয়।

$$\text{সুতরাং, } 1251 \text{ mile এর মধ্যে } 125 \text{ mile বাদ গেছে (কারণ } \frac{1251}{10} \text{ 125.1 mile)}$$

আসলে দূরত্ব অতিক্রম করা হয়েছে (1251+125) miles = 1376 miles

40. (C)

ধরি, একটি জাহাজ A speed- এ যাচ্ছে এবং অপরটি B speed- এ যাচ্ছে।

নদীর প্রস্থ w

At time = t₁

$$A(t_1) = 750$$

$$\& B(t_1) = (w - 750)$$

$$\Rightarrow B/A = (w - 750)/750$$

$$750B = (w - 750)A$$

At time = t₂

$$A(t_2) = w + 250$$

$$B(t_2) = w + (w - 250) = 2w - 250$$

$$\Rightarrow B/A = (2w - 250)/(w + 250)$$

$$(w + 250)B = (2w - 250) A \dots \text{Eq. [1]}$$

$$750B = (w - 750) A$$

$$B = [(w - 750)/750] A$$

Plug into Eq. [1]

$$(w + 250)[(w - 750)/750]A = (2w - 250) A$$

$$(w + 250)(w - 750) = 750(2w - 250)$$

$$W^2 - 500w - 187,500 = 1500w - 187,500$$

$$w^2 - 2000w = 0$$

$$w^2 = 2000w$$

$$w = 2000 \text{ yds.}$$

41. C) আমরা জানি

$$\text{Speed} = \frac{\text{distance}}{\text{time}}$$

সুতরাং, speed distance, when time is constant

উপরে ওঠার speed এর 1.5 গুণ নিচে নামার speed

সুতরাং, একই time লাগবে উপরে ওঠার distance এর 1.5 গুণ নিচে নামার distance.

উপরে উঠতে time লাগে 2 days, 4 mile/day. i.e. total distance (2 × 4) miles = 8 miles

সুতরাং, নিচে নামতে distance (8×1.5) miles = 12 miles

42. (D) তিন জনেরই একই সময়ে আবার starting point এ পৌঁছাবে তখন, তাদের সকলের সময়ের L.C.M. হবে। 252, 300 এবং 198 এর L.C.M. 2772.

অর্থাৎ 2772 seconds = 46 minutes 12 seconds

43. (C) প্রথম 100 mile যেতে সময় লাগে $\frac{100}{30}$ hour, পরের 100 mile যেতে সময় লাগে $\frac{100}{50}$ hour এবং শেষ 100

mile যেতে সময় লাগে $\frac{100}{50}$ hour.

সুতরাং, 30 miles per hour speed এ যায় $\frac{\frac{100}{30}}{\frac{100}{30} + \frac{100}{50} + \frac{100}{60}} = \frac{10}{21}$ fraction time

44. 44. (D) ধরি, Total journey = x km.

$$(1/2)x/21 + (1/2)x/24 = 10$$

$$x = 224$$

45. 45. (A) 75 mph বেগে 10 miles যেতে সময় লাগে $(60/75 \times 10) = 8$ মিনিট। return trip এ বাকি 12 মিনিটে 10 miles যেতে হলে গতিবেগ হবে $= (10/12 \times 60) = 50$ mph।

46. (A) ধরি, house থেকে office এর distance = x km এবং office যেতে t hour সময় লাগে।

$$\text{তাহলে, } \frac{x}{24} = \left(t + \frac{5}{60}\right)$$

$$\text{Or, } t = \frac{x}{24} - \frac{5}{60} \dots (i)$$

$$\text{আবার, } \frac{x}{30} = t - \frac{4}{60}$$

$$\text{Or, } \frac{x}{30} = \frac{x}{24} - \frac{5}{60} - \frac{4}{60}$$

$$\text{Or, } \frac{2x + 5 + 4}{60} = \frac{x}{24}$$

$$\text{Or, } 2(2x + 9) = 5x$$

$$\text{Or, } 4x + 18 = 5x$$

$$\text{Or, } x = 18$$

সঠিক Answer (A)

47. (D) 478

Base fare = Tk 40

Distance charge = Tk 3.6 per 0.2 km = Tk 18 per km

Travelling time charge = Tk 180/hour = Tk 3/minute

Total distance = 6 kms

Total time = 110 mins

Total Charge = Tk 40 + Tk (6 × 18) + Tk (110 × 3) = Tk 478

48. (B) 4

Total distance walked = 104 miles and total time taken = 20 hours.

দ্বিতীয় দিন hiker- টি চার ঘন্টা বেশী হাঁটে এবং তার speed আরও 2 miles per hour বেশী ছিল প্রথম দিন এর

তুলনায়

So the hiker walked for 8 hours on the first day and 12 hours on the second day.

Suppose his average speed on the first day was X miles/hour. So on the second day his

average speed was (X + 2) miles/hour.

$$104 = 8 \times X + 12 \times (X + 2)$$

$$X = 4 \text{ miles/hour}$$

Concept 20

Work Problems

Concept 20 (Work Problems)

- ⊗ We generally use unitary method (একিক নিয়ম) to solve these types of problems.
- ⊗ If A can complete a work in n days, A does $1/n$ work in 1 day. Alternatively if A can do $1/n$ work per day A will complete the work in n days.
For example, if A can do a work in 5 days, in 1 day he does $1/5$ work. If A does $1/5$ work daily, he will complete the work in 5 days.
- ⊗ When more people do the same job, the number of days/hours required for the job declines.

Example 1: Anwar can fill a pool with buckets of water in 30 minutes, Bobby can do the same job in 45 minutes, and Dipu can do the same job in $1\frac{1}{2}$ hours. How quickly can all three fill the pool together (in minutes)?

- (A) 9 (B) 12 (C) 15 (D) 21 (E) none of these

Solution:

Anwar fills the pool in 30 minutes. So, Anwar fills in 1 minute $1/30$ of the pool.

Bobby fills the pool in 45 minutes. So, Bobby fills in 1 minute $1/45$ of the pool.

Dipu fills the pool in 90 minutes. So, Dipu fills in 1 minute $1/90$ of the pool.

When they work together, they fill in 1 minute = $1/30 + 1/45 + 1/90 = 1/15$ of the pool.

$1/15$ pool is filled in 1 minute.

So, 1 pool is filled in 15 minutes.

Answer: (C)

Exercise 20

- 1. A man can work twice as much as a boy can and he can complete a given job in 35 days working alone. In how many days can two men and three boys working together complete the same job? (BBA 94-95)
 (A) 12 (B) 10 (C) 8 (D) 14 (E) 15
- 2. A company employs 15 men working 44 hours a week. If 4 men are ill, how many hours a week would the rest have to work to make up the time lost? (BBA 97-98)
 (A) 45 (B) 48 (C) 50 (D) 55 (E) 60
- 3. If 9 men or 15 women can do a work in 16 days, how long will it take 3 men and 7 women to complete the job? (BBA 99-00)
 (A) 12 (B) 15 (C) 18 (D) 20 (E) none of these
- 4. Karim can do a job in 15 minutes and his brother takes twice as long to do the same job. If they work together, how long will it take to complete the job? (BBA 99-00)
 (A) 5 (B) 7.5 (C) 10 (D) 12.5 (E) none of these
- 5. A father can do a job as fast as two sons working together. If one son does the job alone in 3 hours and the other son does it alone in 6 hours, how many hours does it take the father to do the job alone? (BBA 00-01)
 (A) 1 (B) 1.5 (C) 2 (D) 2.5 (E) none of these
- 6. X, Y and Z were each paid the same hourly rate to paint a building. X worked for a full day, Y worked for half a day and Z worked half as long as Y worked. Together they earned Tk. 560. How much money did Y receive? (BBA 01-02)
 (A) 100 (B) 160 (C) 240 (D) 320 (E) none of these
- 7. Arif can do a particular work in 1 hour while Asif can do the same work in 1.5 hours. On a particular day, they worked together for half an hour, after which Arif left and Asif had to finish the rest of the work alone. How much time in minutes will Asif require to finish the rest of the work? (BBA 02-03)
 (A) 15 (B) 16 (C) 17 (D) 18 (E) none of these
- 8. A worker is paid Tk. 40 per hour for the first 8 hours and then Tk. 52 for each additional hour. If on a certain day, his average pay was Tk. 44 per hour, how many hours did he work on that day? (BBA 02-03)
 (A) 12 (B) 10 (C) 8 (D) 4 (E) none of these
- 9. After working for a total of 4 hours at a temporary job, you were told that you had just completed $\frac{1}{4}$ of the job. How long should it take you to finish the remaining part of the job? (BBA 06-07)
 (A) 1 hour (B) 16 hour (C) 8 hour (D) 12 hour (E) None of these

- 10. Anwar can fill a pool with buckets of water in 30 minutes, Bobby can do the same job in 45 minutes, and Dipu can do the same job in $1\frac{1}{2}$ hours. How quickly can all three fill the pool together (in minutes)? (BBA 08-09)
 (A) 9 (B) 12 (C) 15 (D) 21 (E) none of these
- 11. If one man or two women or three boys can finish a job in 66 days, then find out the number of days in which that work can be done by one man, two women, and three boys. (BBA 09-10)
 (A) 22 (B) 34 (C) 24 (D) 11 (E) 121
- 12. Arif can do a work in 45 minutes, while Babu can do the same work in 30 minutes. How long will it take to complete the job if both of them worked together? (MBA 97-98)
 (A) 21 (B) 18 (C) 15 (D) 12 (E) None
- 13. A certain machine fills a bag with 7 ounces of potato chips in 3.5 seconds. At this rate how many seconds will it take the machine to fill a bag with 15 ounces of potato chips? (MBA 03-04)
 (A) 6.5 (B) 7.0 (C) 7.5 (D) 8.0 (E) 11.5
- 14. Ehsan can fill a pool carrying buckets of water in 30 minutes. Suman can do the same job in 45 minutes. Tonmoy can do the same job in $1\frac{1}{2}$ hours. How quickly can all three fill the pool together? (MBA 10-11)
 (A) 12 minutes (B) 15 minutes (C) 21 minutes (D) 23 min (E) None of these
- 15. An empty water tank can be filled in 40 minutes by opening one pipe and the full tank can be emptied in 120 minutes by opening the other pipe. If both pipes are opened together while the tank is empty, in how many hours will the tank be completely filled? (BBA 94-95)
 (A) 1.5 (B) 1.2 (C) 1.0 (D) 2.0 (E) 1.6
- 16. 2 men and 5 women completed only $\frac{1}{4}$ th portion of a job in $\frac{1}{3}$ days. After 3 days another man was included in the team and in 2 days they completed another $\frac{1}{4}$ th portion of the job. How many men (with no women) can complete the whole job in 4 days? (BBA 96-97)
 (A) 12 (B) 8 (C) 6 (D) 4 (E) none of these
- 17. If a typist can type 125 pages, 36 lines each, 11 words to each line in 5 days, how many pages of 30 lines each and 12 words to each line can he type in 6 days? (BBA 97-98)
 (A) 165 (B) 160 (C) 155 (D) 145 (E) none of these
- 18. Adults can do a job twice as fast as children. If x adults can complete a job in d days, how many children can do the same job in $d + 2$ days? (BBA 01-02)
 (A) $\frac{2dx}{d+2}$ (B) $\frac{(d+2)x}{d}$ (C) $\frac{dx}{2(d+2)}$ (D) $\frac{2x+d}{d-x}$ (E) none of these

- ⊕19. A can complete a project in 20 days and B can complete the same project in 30 days. If A and B start working on the project together and A quits 10 days before the project is completed, in how many days will the project be completed? (BBA 08-09)
 (A) 15 (B) 16 (C) 18 (D) 21 (E) none of these
- ⊕20. If 4 people can pack 20 cartons per hour, how many hours will it take 8 people to pack 40 cartons? (MBA 99-00)
 (A) 1 (B) 2 (C) 4 (D) 8 (E) none of these
- ⊕21. A time-study specialist has set the production rate for each worker on a certain job at 22 units every three hours. At this rate what is the minimum number of workers that should be put on the job if at least 90 units are to be produced per hour? (MBA 04-05)
 (A) 5 (B) 8 (C) 12 (D) 13 (E) 30
- ⊕22. Running at the same constant rate, 6 identical machines can produce a total of 270 bottles per minute. At this rate, how many bottles could 10 such machines produce in 4 minutes? (MBA 05-06)
 (A) 648 (B) 1800 (C) 2700 (D) 10800 (E) 2400
- ⊕23. 55 men can finish a work in 42 days. How many additional men must be engaged to complete the work 9 days earlier? (MBA 07-08)
 (A) 15 (B) 16 (C) 17 (D) 18 (E) none of these
- ⊕24. X alone can do a piece of work in 15 days and Y alone can do it in 10 days. X and Y undertook the work and with the help of Z they finished it in 5 days. How many days will it take Z to finish the work alone? (MBA 08-09)
 (A) 30 (B) 25 (C) 20 (D) 15 (E) none of these
- ⊕25. There are two taps in a water tank. The first tap pumps water in the tank and the second one drains it out. The first tap takes 30 minutes to make the tank full and the second tap needs 40 minutes to drain that water out. If both taps are opened at the same time, how long will it take to make a half-full tank full? (MBA 96-97)
 (A) 30 mins (B) 2 hrs (C) 1 hr (D) 40 mins (E) none of these
- ⊕26. Three workers can do a job in 12 days. Two of the workers work twice as fast as the third. How long would it take one of the faster workers to do the job himself? (BBA 97-98)
 (A) 36 (B) 32 (C) 30 (D) 24 (E) none of these
- ⊕27. Jalil can do a particular job in 4 days. Karim can do the same job in 5 days. They worked together to complete the job and received a total payment of Taka 450. How much payment should Jalil receive? (BBA 98-99)
 (A) 275 (B) 200 (C) 225 (D) 250 (E) None of these

- ⊕28. Three machines individually can do a job in 4, 5, and 6 hours respectively. What is the greatest part of the job that can be done in one hour by two of the machines working together at their respective rates? (BBA 05-06)
 (A) $11/30$ (B) $9/20$ (C) $3/5$ (D) $11/15$ (E) None of these
- ∇29. A team of 2 men and 5 women completed one-fourth of a job in 3 days. After 3 days, another man joined the team and they took 2 days to complete another one-fourth of the job. How many men can complete the whole job in 4 days? (MBA 02-03)
 (A) 4 (B) 6 (C) 8 (D) 9 (E) none of these
- ∇30. X can do a work in 12 days. Y is 60% more efficient than X. How many days will Y require to complete the same work? (MBA 07-08)
 (A) 8 (B) 7.5 (C) 7.2 (D) 6.66 (E) none of these
- ∇31. X can do a work in the same time in which Y and Z together can do it. If X and Y together can do it in 10 days, and Z alone can do it in 50 days, how many days will Y require to do the work alone? (MBA 07-08)
 (A) 25 (B) 30 (C) 45 (D) 55 (E) none of these
- ∇32. A group of workers can do a piece of work in 24 days. However, as 7 of them were absent, it took them 30 days to complete the work. How many people actually worked on the job to complete it? (MBA 08-09)
 (A) 35 (B) 30 (C) 28 (D) 42 (E) none of these
- ∇33. X and Y together can do a piece of work in 18 days. When Y and Z work together, they can do the work in 12 days. But when X and Z work together, they can do the same piece of work in 24 days. How many days will it take to complete the same work if all of them work together? (MBA 2013)
 (A) 6 (B) 7.5 (C) 8 (D) 9 (E) none of these
- ⊕34. Three pipes A, B and C can fill a tank from empty to full in 30 minutes, 20 minutes, and 10 minutes respectively. When the tank is empty, all the three pipes are opened. A, B and C discharge chemical solutions P, Q and R respectively. What is the proportion of the solution R in the liquid in the tank after 3 minutes? (BBA 13-14)
 (A) $5/11$ (B) $6/11$ (C) $7/11$ (D) $8/11$ (E) $9/11$
- ⊕35. 6 men and 8 boys can finish a work in 10 days while 26 men and 48 boys can do the same in 2 days. How many days will 15 men and 20 boys take in completing the same work? (BBA 13-14)
 (A) 4 days (B) 5 days (C) 6 days (D) 7 days (E) none of these
- ⊕36. Arif can do a work in 12 hours. Arif finished two-thirds of the work and the remaining portion of the work was done by Babu, whose rate of working is just 20% of what Arif can do. How long did it take Babu to finish the remaining work in hours? (BBA 14-15)
 (A) 8 (B) 20 (C) 24 (D) 32 (E) none of these

- ⊕37. Kalam takes 2 days more than what Zakir takes to produce x chairs. They work together for 6 days and produce $24x$ chairs. How many days will it take Kalam to produce $2x$ chairs? (BBA 14-15)
 (A) 2 (B) 4 (C) 5 (D) 6 (E) none of these
- ⊕38. Rahat can complete a task in 30 minutes, working together with his brother Mominul, he can complete the same task in 20 minutes. How long would it take for Muminul working along to complete the task? (BBA 15-16)
 (A) 30 minutes (B) 40 minutes (C) 50 minutes (D) 60 minutes (E) none of these
- ⊕39. A teacher has 3 hours to grade all the papers submitted by the 35 students in her class. She gets through the first 5 papers in 30 minutes. How much faster does she have to work to grade the remaining papers in the allotted time? (BBA 15-16)
 A. 10% B. 15% C. 20% D. 25% E. none of these
- 40. A, B and C can complete a job individually in 6, 8 and 12 hours respectively. If all three of them work together to complete a job and earn Tk. 3600, what will be C's share of the earnings? (BBA 16-17)
 (A) 800 (B) 820 (C) 875 (D) 950 (E) none of these
- ⊕41. Alam starts working on a job and works on it for 12 days and completes 40% of the work. Then Babu joins Alam and together they complete the rest of the work in 12 days. How long will it take Babu to complete the job if he works alone? (BBA 16-17)
 (A) 24 days (B) 30 days (C) 45 days (D) 60 days (E) none of these
- ∇42. If 20 men or 24 women or 40 boys can do a job in 12 days, how many men working with 6 women and 2 boys can complete the same work in 32 days? (BBA 16-17)
 (A) 4 (B) 5 (C) 10 (D) 12 (E) none of these

Answer Key Exercise 20

1.B	2.E	3.D	4.C	5.C	6.B	7.A	8.A	9.D	10.C
11.A	12.B	13.C	14.B	15.C	16.C	17.A	18.A	19.C	20.A
21.D	22.B	23.A	24.A	25.C	26.C	27.D	28.B	29.B	30.B
31.A	32.C	33.E	34. B	35.A	36.B	37.E	38.D	39.E	40.A
41.D	42.								

Solution to Exercise 20

1. (B) 1 man = 2 boys \therefore 2 man = 4 boys
 2 boys কাজটি করতে পারে 35 days \therefore 1 boy কাজটি করতে পারে (35×2) days \therefore
 $\therefore (4 + 3) = 7$ boys কাজটি করতে পারে $\frac{35 \times 2}{7}$ days $\therefore = 10$ days \therefore
2. (E) 15 জনে মোট কাজ করে = $15 \times 44 = 660$ hours, $\therefore (15-4) = 11$ জনকে কাজ করতে হবে = $\frac{660}{11} = 60$ hours.
3. (D) $9M = 15W \therefore 3M = 5W \therefore 3M + 7W = 12W$
 15 W can do it in 16 days $\therefore 12W$ can do it in $\frac{16 \times 15}{12} = 20$ days
4. (C) rate of Karim + rate of brother = $\frac{1}{15} + \frac{1}{30} = \frac{3}{30} = \frac{1}{10}$
 Together they do, $1/10$ of the work in 1 day
 \therefore Together they can do the work in $1 \times 10 = 10$ days
5. (C) একজন ছেলে 3 hours এ করে সম্পূর্ণ কাজ \therefore সে 1 hour এ করে $\frac{1}{3}$ অংশ
 অপর ছেলে 6 hours এ করে সম্পূর্ণ কাজ \therefore সে 1 hour এ করে $\frac{1}{6}$ অংশ
 \therefore দুজন একসাথে 1 hour এ করে $\left(\frac{1}{3} + \frac{1}{6}\right)$ অংশ = $\frac{3}{6} = \frac{1}{2}$ অংশ
 অর্থাৎ, বাবা $\frac{1}{2}$ অংশ করে 1 hour এ
 \therefore বাবা 1 অংশ করে 2 hour এ।
6. (B) $\frac{x}{2} = y \therefore x = 2y$ এবং $\frac{y}{2} = z$
 $\therefore 2y + y + \frac{y}{2} = 560$ or, $4y + 2y + y = 560 \times 2$ or, $y = \frac{560 \times 2}{7} = 160$
7. (A) আরিফ 1 ঘণ্টায় করে সম্পূর্ণ কাজ অর্থাৎ 1 অংশ
 আসিফ 1.5 ঘণ্টায় করে সম্পূর্ণ কাজ অর্থাৎ $\frac{1}{1.5}$ অংশ
 \therefore দুজন একসাথে 1 ঘণ্টায় করে $1 + \frac{1}{1.5}$ অংশ = $1 + \frac{1}{\frac{3}{2}}$ অংশ = $\frac{5}{3}$ অংশ
 \therefore দুজন একসাথে $\frac{1}{2}$ ঘণ্টায় করে $\frac{5}{3}$ অংশ = $\frac{5}{6}$ অংশ; বাকী থাকে = $1 - \frac{5}{6}$ অংশ = $\frac{1}{6}$ অংশ (এ অংশটুকু আসিফকে একা করতে হবে)
 আসিফ $\frac{2}{3}$ অংশ করে 1 ঘণ্টায়
 \therefore আসিফ $\frac{1}{6}$ অংশ করে $\frac{3 \times 1}{2 \times 6}$ ঘণ্টায় = $\frac{1}{4}$ ঘণ্টায় = $\frac{1}{4} \times 60$ মিনিটে = 15 মিনিটে.

8. (A) ধরি, সে x ঘন্টা কাজ করেছিল ($x > 8$) প্রথম 8 ঘন্টায় পেল = $(40 \times 8) = 320$ টাকা
 বাকী $(x - 8)$ ঘন্টায় পেল = $52(x - 8) = (52x - 416)$ টাকা
 \therefore মোট পেল = $(320 + 52x - 416)$ টাকা = $(52x - 96)$ টাকা

অর্থাৎ, গড়ে প্রতি ঘন্টায় পেল $\frac{52x - 96}{x}$

টাকা প্রশ্রমতে, $\frac{52x - 96}{x} = 44 \Rightarrow 52x - 96 = 44x \Rightarrow 8x = 96 \therefore x = 12$

9. (D) $1/4$ part the job takes 4 hours
 Therefore 1 part of the job takes $4 \times 4 = 16$ hours. So, remaining time = $16 - 4 = 12$ hours
10. (C) Anwer fills the pool in 30 minutes. So, Anwer fills in 1 minute $1/30$ of the pool.
 Bobby fills the pool in 45 minutes. So, Bobby fills in 1 minute $1/45$ of the pool.
 Dipu fills the pool in 90 minutes. So, Dipu fills in 1 minute $1/90$ of the pool.
 When they work together, they fill in 1 minute = $1/30 + 1/45 + 1/90 = 1/15$ of the pool.

$1/15$ pool is filled in 1 minute.

So, 1 pool is filled in 15 minutes.

Answer: (C)

11. (A) 1 man = 2 women = 3 boys
 \therefore 1 man + 2 women + 3 boys = 1 man + 1man + 1 man = 3 men
 1 man করতে পারে 66 days এ
 \therefore 3 men করতে পারে $\frac{66}{3}$ or 22 days-এ Ans: (A) 22 days.

12. (B) Arif ও Babu একসাথে 1 minute এ করে $\frac{1}{45} + \frac{1}{30} = \frac{5}{90} = \frac{1}{18}$ অংশ।

কাজেই কাজ শেষ করতে তাদের 18 minutes লাগবে।

13. (C) 7 ounce এর জন্য সময় লাগে 3.5 sec $\left(\frac{7}{2} = 3.5\right)$
 \therefore 15 ounce এর জন্য সময় লাগে 7.5 sec $\left(\frac{15}{2} = 7.5\right)$ ।

14. (B) Ehsan 1 minute এ করে $\frac{1}{30}$ অংশ

Suman 1 " " " $\frac{1}{45}$ অংশ

Tonmoy 1 " " " $\frac{1}{90}$ " ($1 \frac{1}{2}$ hr = 90 min)

\therefore তিনজন একসাথে 1 min এ করে = $\frac{1}{30} + \frac{1}{45} + \frac{1}{90} = \frac{6}{90} = \frac{1}{15}$ অংশ

এখন, $\frac{1}{15}$ অংশ করে 1 minute; অর্থাৎ পুরোটা করে 15 minutes এ

15. (C) 1 minute এ filled - up হয় $\frac{1}{40}$ অংশ 1 minute এ empty হয় $\frac{1}{120}$ অংশ
 \therefore দুটি pipe খোলা থাকলে filled up হবে $\frac{1}{40} - \frac{1}{120} = \frac{2}{120} = \frac{1}{60}$ অংশ
 অর্থাৎ, 60 minutes বা 1 hour এ filled -up হয়ে যাবে।

16. (C) 2 men + 5 women 3 দিনে করে $\frac{1}{4}$ অংশ
 " " " " 1 দিনে করে $\frac{1}{12}$ অংশ ----- (1); নতুন লোক আসার পরে
 3 men + 5 women 2 দিনে করে $\frac{1}{4}$ অংশ
 3 men + 5 women 1 দিনে করে $\frac{1}{8}$ অংশ ----- (2), (2) - (1) থেকে পাওয়া যায়,
 1 men 1 দিনে করে = $\frac{1}{8} - \frac{1}{12} = \frac{3-2}{24} = \frac{1}{24}$ অংশ
 \therefore $\frac{1}{24}$ অংশ 1 দিনে করে = 1 men
 \therefore 1 অংশ 1 দিনে করে 24 "
 \therefore 1 " 4 " " $24/4 = 6$ "

17. (A) প্রতি লাইনে 11 word, প্রতি page এ 36 line বিশিষ্ট 125 pages এ
 word আছে $11 \times 36 \times 125$
 5 দিনে $11 \times 36 \times 125$ words হয়
 1 দিনে $\frac{11 \times 36 \times 125}{5}$ words হয়
 \therefore 6 দিনে $\frac{11 \times 36 \times 125 \times 6}{5}$ words = $\frac{11 \times 36 \times 125 \times 6}{6 \times 12}$ lines = $\frac{11 \times 36 \times 125 \times 6}{5 \times 30 \times 12}$ = pages = 165
 page

18. (A) x adults = $2x$ children
 to complete in d days $2x$ children is required.
 \therefore to complete in $d + 2$ days $\frac{2x \times d}{d + 2}$ children is required.
19. (C) B works alone for 10 days to finish $\frac{1}{3}$ of the total work.

For A & B together.

in 1 day, they complete $\frac{1}{20} + \frac{1}{30} = \frac{5}{60} = \frac{1}{12}$ work

Now, $\frac{1}{12}$ work is done in 1 day

1 work is done in 12 days

\therefore $\frac{2}{3}$ work is done in $\frac{2}{3}$ day $\times 12 = 8$ days.

So total time required $(8 + 10) = 18$ (Ans. C)

20. (A) 4 people pack 20 cartons in 1 hour \therefore 1 person packs 20 cartons in 4 hours \therefore 8
 people pack 20 cartons in $\frac{4}{8} = \frac{1}{2}$ hours \therefore 8 people pack 40 cartons in $\frac{1}{2} \times 2 = 1$ hours

21. (D) প্রতি 3 ঘন্টায় 22 units হলে 1 ঘন্টায় = $\frac{22}{3}$ units
 অতএব, 90 units করতে হলে no. of workers = $90 \div \frac{22}{3} = 90 \times \frac{3}{22} = 12.3$ (approx)

অর্থাৎ, কমপক্ষে 13 জন লাগবে।

22. (B) In 1 minute, 6 machines can produce 270 bottles
 So, in 4 minutes, 10 machines can produce = $\frac{270 \times 4 \times 10}{6} = 1800$ Bottles

23. (A) 42 days এ কাজটি complete করতে লাগে 55 men
 1 " " " " " " 55 × 42"
 33 " " " " " " $\frac{55 \times 42}{33}$ men = 70 men

Additional men লাগবে 70 - 55 = 15 men;

24. (A) X 15 days এ করতে পারে 1 কাজ

$$1 \text{ day " " " } \frac{1}{15} \text{ কাজ}$$

$$Y \text{ 1 day তে করতে পারে } \frac{1}{10} \text{ কাজ}$$

$$X, Y, Z, \text{ 1 day তে করতে পারে } \frac{1}{5} \text{ কাজ}$$

$$\therefore Z \text{ 1 day তে করতে পারে } \left(\frac{1}{5} - \frac{1}{15} - \frac{1}{10} \right) \text{ কাজ}$$

$$= \frac{6-2-3}{30} \text{ কাজ} = \frac{1}{30} \text{ কাজ} \therefore Z \text{ এর একা কাজটি করতে লাগবে 30 দিন।}$$

25. (C) 1 minute এ 1st tap pumps $\frac{1}{30}$ tank আর 2nd tap drains out $\frac{1}{40}$ tank, tank -এ
 থাকে $\frac{1}{30} - \frac{1}{40} = \frac{4-3}{120} = \frac{1}{120}$ অংশ। তাহলে $\frac{1}{2}$ অংশ full করতে সময় লাগবে 60 minute বা 1 hour.

26. (C) মনে করি; faster worker দ্বয়ের প্রত্যেক কাজটি করতে পারে x দিনে; \therefore third worker কাজটা করতে পারে 2x দিনে

$$\therefore \text{ তিন জন একত্রে প্রতিদিন করে } \frac{1}{x} + \frac{1}{x} + \frac{1}{2x} = \frac{5}{2x} \text{ অংশ} \therefore 5/2x \text{ অংশ করে 1 দিনে}$$

$$\therefore \frac{1}{2} \text{ অংশ করে } \frac{2x}{5} \text{ দিনে} \therefore 2x/5 = 12 \Rightarrow x = 30 \text{ দিনে}$$

27. (D) $\frac{1}{4} + \frac{1}{5} = \frac{4+5}{20} = \frac{9}{20}$ অংশ $\therefore \frac{9}{20}$ অংশ করে 1 দিনে। \therefore 1 অংশ করে $\frac{20}{9}$ দিনে

$$\therefore \text{ Jalil } \frac{20}{9} \text{ দিনে করে } \frac{1}{4} \times \frac{20}{9} = \frac{5}{9} \text{ অংশ; } \therefore \text{ Jalil পাবে } 450 \times \frac{5}{9} = \text{Tk. 250}$$

28. (B) তিনটি মেশিনের মধ্যে 4 hours এবং 5 hours এ যে দুটি কাজ শেষ করতে পারে তারা বেশি কার্যক্রম।
 প্রথমটি 1 ঘন্টায় করতে পারে $\frac{1}{4}$ দ্বিতীয়টি 1 ঘন্টায় করতে পারে $\frac{1}{5}$
 \therefore একত্রে 1 ঘন্টায় করতে পারে $\frac{1}{4} + \frac{1}{5} = \frac{9}{20}$.

29. (B) 2 জন পুরুষ ও 3 জন মহিলা 3 দিনে করে $\frac{1}{4}$ অংশ

\therefore 2 জন পুরুষ ও 3 জন মহিলা 1 দিনে করে $\frac{1}{12}$ অংশ

1 জন পুরুষ যোগ দেয়ায়,

3 জন পুরুষ ও 3 জন মহিলা 2 দিনে করে $\frac{1}{4}$ অংশ

\therefore 3 জন পুরুষ ও 3 জন মহিলা 1 দিনে করে $\frac{1}{8}$ অংশ

অর্থাৎ 1 জন পুরুষ 1 দিনে করে $\frac{1}{8} - \frac{1}{12} = \frac{1}{24}$ অংশ

\therefore 1 জন পুরুষ 4 দিনে করে $\frac{4}{24} = \frac{1}{6}$ অংশ

অতএব, পুরো কাজ 4 দিনে শেষ করতে 6 জন পুরুষ লাগবে।

30. (B) X এর কাজ করতে Y অপেক্ষা 60% সময় বেশি লাগে, তাহলে, মনেকরি, Y এর কাজটি করতে লাগে y দিন,

$\therefore y + \frac{60y}{100} = 12 \Rightarrow \frac{160y}{100} = 12 \Rightarrow y = \frac{1200}{160} \Rightarrow y = 7.5 \text{ days}$

31. (A) মনে করি, Y কাজটি করে x দিনে; \therefore Y 1 দিনে করে $\frac{1}{x}$ কাজ; এখন, X & Y together 1 দিনে করে $\frac{1}{10}$

কাজ

\therefore X 1 দিনে করে $\left(\frac{1}{10} - \frac{1}{x}\right)$ কাজ = $\frac{x-10}{10x}$ কাজ

আবার, Y 1 দিনে করে $\frac{1}{x}$ কাজ; Z 1 দিনে করে $\frac{1}{50}$ কাজ

\therefore Y & Z together 1 দিনে করে $\frac{1}{x} + \frac{1}{50}$ কাজ = $\frac{50+x}{50x}$ কাজ

এখন, x এর কাজটি করতে আর y ও z এর এক সাথে কাজটি করতে একই সময় লাগে,

$\therefore \frac{x-10}{10x} = \frac{50+x}{50x} \Rightarrow x = 25.$

32. (C) মনেকরি, group এ লোকসংখ্যা x জন
 x জন কাজটি করে 24 days এ
 1 " " " 24x " "

$(x - 7)$ জন কাজটি করে $\frac{24x}{x - 7}$ days এ

এখন, $\frac{24x}{x - 7} = 30$

$\Rightarrow 30x - 210 = 24x \Rightarrow 6x = 210 \Rightarrow x = 35$ জন

Actually কাজ করেছে = $35 - 7 = 28$ জন।

33. (E) $1/x + 1/y = 1/18$

$1/y + 1/z = 1/12$

$1/x + 1/z = 1/24$

$2(1/x + 1/y + 1/z) = 13/72$

$1/x + 1/y + 1/z = 13/144$

সুতরাং x, y, z একত্রে $13/144$ অংশ কাজ করে 1দিনে

তাই x, y, z একত্রে সম্পূর্ণ কাজ করে $144/13$ দিনে = 11.077 দিনে

34. (B) A এর সম্পূর্ণ ট্যাঙ্ক ভরতে সময় লাগে 30 minutes

সুতরাং, 1 minute এ A ভরে $\frac{1}{30}$ অংশ

B এর সম্পূর্ণ ট্যাঙ্ক ভরতে সময় লাগে 20 minutes

সুতরাং, 1 minute এ B ভরে $\frac{1}{20}$ অংশ

C এর সম্পূর্ণ ট্যাঙ্ক ভরতে সময় লাগে 10 minutes

সুতরাং, 1 minute এ C ভরে $\frac{1}{10}$ অংশ

A, B এবং C একসাথে 1 minute এ ভরে $(\frac{1}{30} + \frac{1}{20} + \frac{1}{10}) = \frac{11}{60}$ অংশ

3 minute এ A, B এবং C একসাথে ভরে $\frac{11}{60} \times 3$ অংশ = $\frac{33}{60}$ অংশ = $\frac{11}{20}$ অংশ

C 3 minute এ chemical R দ্বারা পূর্ণ করে $\frac{1}{10} \times 3 = \frac{3}{10}$ অংশ

সুতরাং, chemical এর $\frac{\frac{3}{10}}{\frac{11}{20}}$ অংশ = $\frac{6}{11}$ অংশ Chemical R দ্বারা পূর্ণ

35. (A) 6 man এবং 8 boys কাজটি করতে পারে 10 days এ। সুতরাং 6 times বেশি manpower এ, অর্থাৎ 36 men এবং 48 boys কাজটি করতে পারে $\frac{10}{6}$ days এ।

সুতরাং 36 men এবং 48 boys 1 day এ কাজটি করতে পারে $\frac{10}{6}$ কাজ
আবার 26 men এবং 48 boys কাজটি করতে পারে 2 days এ। সুতরাং 26 men এবং 48 boys 1 day এ কাজটি করতে পারে $\frac{1}{2}$ কাজ

So, $(36-26) = 10$ men 1 day তে করে $(\frac{6}{10} - \frac{1}{2}) = \frac{1}{10}$ কাজ

So, 1 man 1 day তে করে $\frac{1}{100}$ কাজ

আবার, 6 men 10 days এ করে $\frac{60}{100}$ কাজ

so, 8 boys 10 days এ করে $\frac{40}{100}$ কাজ

so, 1 boy 1 day এ করে $\frac{1}{100}$ কাজ

So, 15 men 1 day তে করে $\frac{15}{100}$ কাজ এবং 20 boy 1 day তে করে $\frac{20}{100}$ কাজ। সুতরাং একসাথে করলে তারা এক

দিনে করে $\frac{25}{100}$ কাজ। সুতরাং সম্পূর্ণ কাজ করে 4 দিনে।

36. (B) It takes Arif 12 hours to complete a work.

Work done by Arif = $\frac{2}{3}$

Work left = $\frac{1}{3}$

Time required for Arif to finish $\frac{1}{3}$ rd = $12 \times \frac{1}{3} = 4$

Rate of Babu = $5 \times$ rate of Arif

since rate is $\frac{1}{5}$ th that of Arif

$$= 5 \times 4 = 20 \text{ (B)}$$

37. (E) None of these

They have to work together for 6 days to produce $24x$ chairs

So, they have to work together for 1 day to produce $4x$ chair (unitary method) ... (1)

Kalam take 2 more days to produce x chairs than Zakir

So, if Zakir produces x chair in y days, Kalam produces x chair in $(y+2)$ days

In y days, Zakir produces x chair, so, in 1 day, Zakir produces $\frac{x}{y}$ chair

In $y+2$ days, Kalam produces x chair, so, in 1 day, Zakir produces $\frac{x}{y+2}$ chair

So, together in 1 day they produce $\frac{x}{y} + \frac{x}{y+2}$ chair ... (2)

So, combining (1) and (2),

$$\frac{x}{y} + \frac{x}{y+2} = 4x$$

Solving the equation with quadratic formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$, we get,

$$y = \frac{-3 \pm \sqrt{18}}{4}$$

By taking only the positive values, we get the value of y to be an irrational number. So, the number of days Kalam needs to produce 2x chair is a irrational figure too, which is not in the option. Hence, none of these

38. (D) Rahat এবং Mominul একত্রে 1 মিনিটে করে $1/30$ অংশ কাজ। অর্থাৎ Rahat একা 1 মিনিটে করে $(1/30 - 1/20) = 1/60$ অংশ কাজ। অতএব সম্পূর্ণ কাজ করতে 60 মিনিট।
39. (E) প্রথম 5টি copy এর প্রত্যেকটি দেখতে সময় লাগে $(30/5) = 6$ মিনিট। পরের 30টি copy এর প্রত্যেকটি দেখতে সময় লাগবে $(150/30) = 5$ মিনিট। অতএব, $(1/6 \times 100) = 16.67\%$ faster হতে হবে।
40. (A) তিনজন মিলে 1 hour এ করে $= 1/6 + 1/8 + 1/12$
 $= (4+3+2)/12$
 $= 9/24$ অংশ

$$\begin{aligned} \text{C's share of earning} &= \frac{1/12}{9/14} \times 3600 \\ &= 800 \text{ টাকা} \end{aligned}$$

41. (D) আলম 40% complete করে 12 দিনে
 100% complete করে $\frac{12 \times 100}{40}$ দিনে
 $= 30$ দিনে

সুতরাং একদিনে করে $1/30$ অংশ
 দুইজনে 60% complete করে 12 দিনে
 100% complete করে $\frac{12 \times 100}{60}$ দিনে
 $= 20$ দিনে

সুতরাং একদিনে করে $1/20$ অংশ
 বাবু একদিনে করে $(1/20 - 1/30) = 1/60$ অংশ
 সুতরাং বাবু 60 দিনে কাজ complete করে।

42. (E) $20m = 24w = 40b$
 $1b = 20/40 m = 1/2 m$
 $1w = 20/24 m = 5/6 m$
 12 DAYS = 20 m
 1 day = $20 \times 12 m$
 32 days = $(20 \times 12) / 32 = 7.5 m$
 $X + 6w + 2b = 7.5m$
 $X + 5m + 1m = 7.5m$
 $X = 1.5m$ thus option E

Concept 21

Set

- ⊗ Venn diagram is a graphical representation of sets. Set is a collection of well defined distinct objects.
- ⊗ If two sets are A and B, set $(A \cup B)$ (A union B) represents a set where all elements of set A and set B are present.
If $A = \{1,2,3\}$, $B = \{2,3,4,5,7\}$ then $(A \cup B) = \{1,2,3,4,5,7\}$
- ⊗ If two sets are A and B, set $(A \cap B)$ (A intersection B) represents a set where only the common elements of both A and B are present.
If $A = \{1,2,3\}$, $B = \{2,3,4,5,7\}$ then $(A \cap B) = \{2,3\}$
- ⊗ A very important formula to keep in mind -
 $n(A \cup B) = n(A) + n(B) - n(A \cap B)$
where $n(\text{set}) = \text{number of elements in set}$

Example 1: In a class of 82 students, 46 are taking French, 25 are taking German and 11 students are taking both French and German. How many students are not enrolled in either course?

- (A) 11 (B) 18 (C) 22 (D) 24 (E) none of these

Solution:

Total Students = 82

Number of students taking French $n(F) = 46$

Number of students taking German $n(G) = 25$

Number of students taking both $n(F \cap G) = 11$

Total Number of students enrolled $n(F \cup G) = n(F) + n(G) - n(F \cap G) = 46 + 25 - 11 = 60$

So, number of students not enrolled = $82 - 60 = 22$

Answer: (C)

Exercise 21

- 1. In a survey of the town of Brahmanbaria, it was found that 65% of the people surveyed watched the news on television, 40% read a newspaper, and 25% both read newspaper & watched news on television. What percent surveyed neither watched the news on television nor read a newspaper? (BBA 98-99)
 (A) 80% (B) 20% (C) 10% (D) 15% (E) 5%
- 2. In a class of 82 students, 46 are taking French, 25 are taking German and 11 students are taking both French and German. How many students are not enrolled in either course? (BBA 07-08)
 (A) 11 (B) 18 (C) 22 (D) 24 (E) none of these
- 3. In a class of 24 students, one half of the students liked movie A and one-third liked movie B, and one fourth liked both the movies. How many students liked neither of the movies? (MBA 99-00)
 (A) 6 (B) 8 (C) 9 (D) 10 (E) 11
- 4. In a survey of Chittagong City, it was found that 70% of the people surveyed watched television news, 35% read a newspaper, and 25% read a newspaper and watched television news. What percent of the people surveyed neither watched television news nor read a newspaper? (MBA 00-01)
 (A) 30% (B) 20% (C) 0% (D) 15% (E) 5%
- 5. In a survey of the people in Chittagong, it was found that 65% of the people surveyed watched the news on television, 40% read a newspaper, and 25% read a newspaper and watched the news on television. What percent of the people surveyed neither watched the news on television nor read a newspaper? (MBA 04-05)
 (A) 0% (B) 5% (C) 10% (D) 15% (E) 20%
- 6. Out of 65 cars on a car lot, 45 have air conditioning, 30 have power windows and 12 have both air conditioning and power windows. How many of the cars on the lot have neither air conditioning nor power windows? (MBA 05-06)
 (A) 5 (B) 10 (C) 4 (D) 2 (E) None of these
- 7. In an exam, 90% passed History and 85% passed English. If none of the students failed in both subjects and 225 passed in both subjects, calculate the number of students who have attended the exam. (BBA 99-00)
 (A) 250 (B) 275 (C) 300 (D) 325 (E) none of these
- 8. In a class of 120 students, 60 percent can speak French and the rest can speak only English. If 25 percent of those in the class who can speak French can also speak English, how many of the students in the class can speak English? (BBA 00-01)
 (A) 54 (B) 60 (C) 66 (D) 84 (E) 90

9. Half of the graduates of the MBA program became members of the IBA Alumni association. One-third of the graduates became members of the MBA Club. If $\frac{1}{5}$ th of the graduates were members of both Alumni Association & MBA Club, what fraction of the graduates were members of only the MBA Club? (BBA 01-02)
 (A) $\frac{1}{8}$ (B) $\frac{2}{15}$ (C) $\frac{1}{12}$ (D) $\frac{2}{13}$ (E) none of these
10. Of the 45 families in a locality, 25 families have working mothers and 10 families have retired individuals as members to look after the children at home. Of the families, 8 have both working mothers and retired individuals as members. How many of the families have working mothers but no retired individuals as members? (BBA 06-07)
 (A) 0 (B) 2 (C) 18 (D) 17 (E) None of these
11. Half the graduating class of a college was accepted by a business school. One-third of the class was accepted by a law school. If one-fifth of the class was accepted by both schools, then what fraction of the class was accepted only by the law school? (BBA 06-07)
 (A) $\frac{1}{60}$ (B) $\frac{2}{15}$ (C) $\frac{1}{3}$ (D) $\frac{1}{2}$ (E) None of these
12. Of 48 applicants, 28 had at least 5 years experience, 30 had MBA degree, and 10 had less than 5 years experience and no MBA degree. How many of the applicants had at least 5 years' experience and an MBA degree? (BBA 08-09)
 (A) 8 (B) 10 (C) 20 (D) 24 (E) none of these
13. Club A has 20 members and Club B has 28. If a total of 42 people belong to the two clubs, how many people belong to both clubs? (MBA 01-02)
 (A) 3 (B) 4 (C) 5 (D) 6 (E) none of these
14. 70 students are enrolled in Management, Accounting and- Marketing, 40 students are in Management, 35 arc in Accounting, and 30 are in Marketing. 15 students are enrolled in all three courses. How many of the students are enrolled in exactly two of the courses? (MBA 10-11)
 (A) 8 (B) 5 (C) 6 (D) 9 (E) None of these
15. The probability of rolling any number on a weighted 6-sided die, with faces numbered 1 through 6, is directly proportional to the number rolled. What is the probability of getting 5, if the die is rolled only once? (BBA 15-16)
 (A) $\frac{1}{6}$ (B) $\frac{5}{6}$ (C) $\frac{5}{16}$ (D) $\frac{5}{21}$ (E) none of these
16. There are 4 women and 4 men sitting in a waiting room for a job interview. If two of the applicants are selected at random, what is the probability that both will be women? (21) (BBA 15-16)
 (A) $\frac{1}{2}$ (B) $\frac{3}{7}$ (C) $\frac{3}{4}$ (D) $\frac{3}{14}$ (E) none of these

	Favorable	Unfavorable	Not Sure
Proposal A	40	20	40
Proposal B	30	35	35

- V17. The table above shows the result of a survey of 100 voters who responded 'Favorable' or 'Unfavorable' or 'Not Sure' about their opinions about two proposals A and B, If the number of voters who did not respond 'Favorable' for either proposal was 40, what was the number of voters who responded 'Favorable' for both proposals? (BBA 17-18)
- A) 5 B) 10 C) 15 D) 20 E) None of these

Answer Key Exercise 21

1.B	2.C	3.D	4.B	5.E	6.D	7.C	8.C	9.B	10.D
11.B	12.C	13.D	14.B	15.D	16.D	17.B	-	-	-

Solution to Exercise 21

1. (B) $n(n \cup t) = n(n) + n(t) - n(n \cap t)$

$= .8$

$1 - n(n \cup t) = n(n' \cap t')$

$= .2 = 20\%$

2. (C) Total students = 82

No. of students taking French, $n(F) = 46$

No. of students taking German, $n(G) = 25$

No. of students taking both, $n(F \cap G) = 11$

\therefore Total no. of students enrolled, $n(F \cup G) = n(F) + n(G) - n(F \cap G)$
 $= 46 + 25 - 11 = 60$

\therefore No. of students not enrolled = $82 - 60 = 22$

3. (D) students who liked movie A only = $\frac{24}{2} - \frac{24}{4} = 6$

students who liked movie B only = $\frac{24}{3} - \frac{24}{4} = 2$

\therefore students who liked neither = $24 - (6 + 2 + 6) = 10$

4. (B) ধরি, মোট লোক = 100 জন

টেলিভিশন দেখে = 70 জন

পেপার পড়ে = +35 জন

মোট = 105 জন

\therefore common আছে = 25 জন

অর্থাৎ, যেকোন ১টি / ২টি পড়ে = 80 জন

\therefore কোনটিই পড়ে না = $(100 - 80)$ জন = 20 জন

5. (E) TV news দেখে = 65%

Newspaper পড়ে = 40%

মোট = 105 %

দুটোই করে = 25%

\therefore যেকোন ১ টি বা ২টি করে = 80%

অর্থাৎ, $100 - 80 = 20\%$ কোনটিই করেনা।

6. (D) Number of cars with air conditioning, $n(A) = 45$

Number of cars with power windows, $n(W) = 30$

And, $n(A \cap W) = 12$

Now, $n(A \cup W) = 45 + 30 - 12 = 63$. So, 2 cars have no air conditioning.

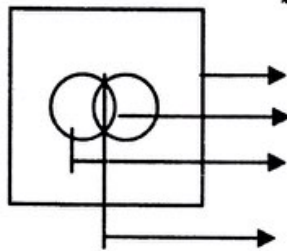
7. (C) Total = A + B - Both + none $\therefore 100 = 90 + 80 - \text{Both} + 0$
 $\therefore \text{Both} = 70$ 70% means 225
 100% means $\frac{225 \times 100}{75} = 300$

8. (C) Total students = 120
 French - speaking = $120 \times \frac{60}{100} = 72$ Rest = $120 - 72 = 48$ people can speak only

English আবার, $72 \times \frac{25}{100} = 18$ জন আছে যারা French ও English দুটোই বলতে পারে।

মোট English - speaking = $48 + 18 = 66$

9. (B) 60 এমন একটি number যাকে $\frac{1}{2}, \frac{1}{3}$ এবং $\frac{1}{5}$ করা যায়, let, no. of graduates = 60,



total (60)
 MBA club (20)
 Alumni (30)
 Both (12)

\therefore only MBA club = 8 $\therefore \frac{8}{60} = \frac{2}{15}$

10. (D)

	Working mother	housewife	total
Retired	8	2	10
Non-retired	17	18	35
	25	20	45

11. (B) Only accepted by law school = $\frac{1}{3} - \frac{1}{5} = \frac{2}{15}$

12. (C)

	MBA	MBA	
At least 5y	20	8	28
Less the 5y	10	10	
	30	18	

13. (D) $T = A + B - \text{Both} + \text{None}$
 none specified না হলে 0 ধরে নিতে হয়।
 $\therefore 42 = 20 + 28 - \text{Both}$
 $\therefore \text{Both} = 6$
14. (B) মোট Student এর সংখ্যা 70
 আবার আলাদা আলাদা enrollment ধরলে $40 + 35 + 30 = 105$ জন পাওয়া যায়। এই 150 সংখ্যাটি এসেছে কারণ বেশ কিছু Student 2 টি এবং কেউ 3 টি course এ enroll করেছে। অর্থাৎ যোগ করার সময় 3 টি course নিয়েছে এমন student এর সংখ্যা 3 বার calculate করা হয়েছে।
 বলা আছে, 15 student 3 টি course এ enroll করেছে।
 $\therefore 15 \times 2 = 30$ students কে বাদ দিলে $150 - 30 = 75$ জন student এর হিসাব পাওয়া যায়।
 অর্থাৎ, $75 - 70 = 5$ জন student 2 টি course এ enroll করেছে।
15. (D) Probability = individual probability / Total probability = $5 / (1+2+3+4+5+6) = 5 / 21$
16. (D) Randomly দুইজনকে select করা হবে দুইজনেই woman হওয়ার probability $4/8 \times 3/7 = 3/14$ ।
17. (B) 10
 Total number of voters = 100.
 Number of voters who did not respond 'Favorable' for either proposal is 40. So number of voters who responded 'Favorable' for either A or B or both is 60. So for voters who responded 'Favorable' $A \cup B = 60$, $A = 40$, $B = 30$.
 So, $A \cap B = A + B - A \cup B = 40 + 30 - 60 = 10$

Concept 22

Mixture Problems

Concept 22 (Mixture Problems)

⊙ Important formula : $C = \frac{C_1 Q_1 + C_2 Q_2}{Q_1 + Q_2}$

Here, C_1 = concentration of the first mixture
 Q_1 = quantity of the first mixture
 C_2 = concentration of the second mixture
 Q_2 = quantity of the second mixture

Example 1: In 24 kg of salt water, 8% is salt; of another mixture, 4% is salt. How many kg of 2nd solution must be added to the first mixture to get a solution that is 5% salt?

- (a) 24 (b) 36 (c) 48 (d) 72 (e) 96

Solution:

Mixture one quantity $Q_1 = 24$ kg

Mixture one concentration $C_1 = 8$

Mixture two concentration $C_2 = 4$

Solution concentration $C = 5$

Mixture two quantity $Q_2 = ?$

$$\frac{C_1 Q_1 + C_2 Q_2}{Q_1 + Q_2} = C \quad \text{or,} \quad \frac{8 \times 24 + 4Q_2}{24 + Q_2} = 5 \quad \text{or,} \quad 192 + 4Q_2 = 120 + 5Q_2 \quad \text{or,} \quad Q_2 = 72$$

Answer: (D)

Exercise 22

- 1. In 24 kg of salt water, 8% is salt; of another mixture, 4% is salt. How many kg of 2nd solution must be added to the first mixture to get a solution that is 5% salt? (BBA 99-00)
 (A) 24 (B) 36 (C) 48 (D) 72 (E) 96
- 2. Ten pints of 15% salt solution are mixed with 15 pints of 10% salt solution. What is the concentration of the resulting solution? (BBA 95-96)
 (A) 10% (B) 12% (C) 12.5% (D) 13% (E) 15%
- 3. 16 ounces of fresh orange juice contains 216 calories and 16 ounces of fresh grapefruit juice contains 174 calories. If an 8 ounce mixture of these two juices contains 94 calories, what fraction of the mixture is orange juice? (BBA 00-01)
 (A) $1/3$ (B) $12/27$ (C) $1/2$ (D) $2/3$ (E) $47/54$
- 4. The ratio of water and salt in a 16 kg of salt-water solution 3:1. How much water in kg must be added to make the ratio of water to salt 4:1? (BBA 01-02)
 (A) 2 (B) 3 (C) 4 (D) 6 (E) None of these
- ⊕ 5. Two varieties of sugar are mixed in a certain ratio. The cost of the mixture per kg is Tk 0.50 less than that of the superior variety and Tk 0.75 more than that of the inferior variety. What was the ratio of superior variety to inferior variety in the mixture? (BBA 04-05)
 (A) 5:2 (B) 3:2 (C) 2:1 (D) 1:1 (E) None of these
- ⊕ 6. Mixture X is 40 percent peanut and 60 percent hazel nut by weight-, mixture Y is 25 percent peanut and 75 percent cashew nut. If a mixture of X and Y contains 30 percent peanut, what percent of the weight of this mixture is X? (BBA 08-09)
 (A) 10% (B) 33.33% (C) 40% (D) 50% (E) 66.66%
- ⊕ 7. A man bought 50 kgs of sugar at the rate of Tk.40/kg. He mixed it with some lower grade sugar, costing Tk.25/kg and sold the entire lot at Tk32 per kg and made a profit of Tk160. How much inferior quality sugar did he mix? (MBA 97-98)
 (A) 100 (B) 90 (C) 80 (D) 70 (E) 60
- ⊕ 8. Coffee A normally costs 100 Taka per pound. It is mixed with coffee B, which normally costs 70 Taka per pound, to form a mixture which costs 88 Taka per pound. If there are 10 pounds of the mix, how many pounds of coffee A was used in the mix? (MBA 01-02)
 (A) 4 (B) 5 (C) 6 (D) 7 (E) None of these
- ▽ 9. In a sugar-water solution, the ratio of water to sugar is 8:3. If you add 2 kgs of sugar, the ratio becomes 2:1. What is the amount of sugar in the original solution in kg? (MBA 02-03)
 (A) 3 (B) 4.5 (C) 6 (D) 8 (E) none of these

710. How many litres of water should be added to a 30 litre mixture of milk and water containing milk and water in the ratio of 7: 3 such that the resultant mixture has 40% water in it? (MBA 08-09)
 (A) 7 (B) 10 (C) 5 (D) 12 (E) None of these
711. A milk vendor has 2 cans of milk. The first can contains 25% water and the rest is milk. The second can contains 50% water. How much milk should he mix from each of the cans respectively so as to get 12 litres of milk such that the ratio of water to milk is 3 : 5 in that mixture? (BBA 13-14)
 A) 4 litres, 8 litres B) 6 litres, 6 litres C) 5 litres, 7 litres
 D) 7 litres, 5 litres E) 8 litres, 9 litres
11. A 60 litre mixture of sugar and water contains sugar and water in the ratio 2:3. How many litres of the mixture should be replaced by sugar so that the ratio of sugar and water becomes 1:1? (BBA 16-17)
 (A) 6 (B) 10 (C) 15 (D) 20 (E) none of these

Answer Key Exercise 22

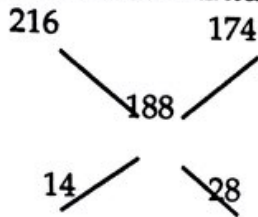
1.D	2.B	3.A	4.C	5.B	6.B	7.C	8.C	9.C	10.C
11.B	12.B								

Solution to Exercise 22

1. (D) $\frac{C_1Q_1 + C_2Q_2}{Q_1 + Q_2} = C$ or, $\frac{8 \times 24 + 4Q_2}{24 + Q_2} = 5$ or, $192 + 4Q_2 = 120 + 5Q_2$ or, $Q_2 = 72$

2. (B) $C = \frac{C_1Q_1 + C_2Q_2}{Q_1 + Q_2} = \frac{15 \times 10 + 10 \times 15}{10 + 15} = \frac{300}{25} = 12$

3. (A) 8 ounce mixture -এ আছে 94 calories
 ∴ 16 ounce mixture -এ আছে 188 calories

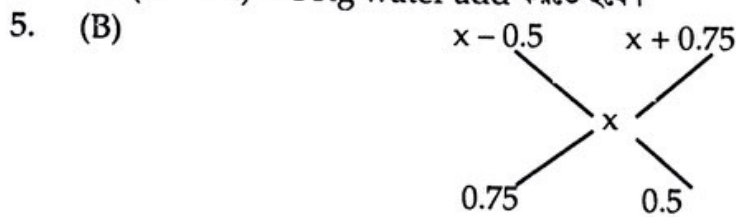


∴ orange juice = $\frac{14}{14 + 28} = \frac{14}{42} = \frac{1}{3}$

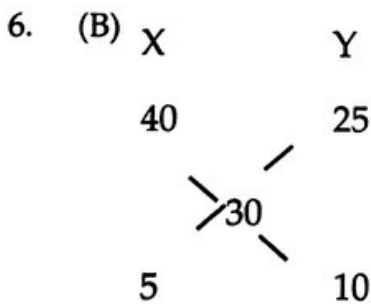
4. (C) salt = $16 \times \frac{1}{4} = 4$ Kg; water = $16 - 4 = 12$ Kg

এখন, $\frac{\text{water}}{\text{salt}} = 4$ ∴ water = $4 \times 4 = 16$ Kg

∴ $(16 - 12) = 4$ Kg water add করতে হবে।



Thus the ratio would be $\frac{0.75}{0.5} = 3:2$



the ratio of the weights of X & Y is 1 : 2 ∴ X is present in $\frac{1}{3}$ of the mixture ∴ X contains 33.33% of the mixture

7. (C) মনে করি, inferior sugar ছিল x kg, তাহলে $50 \times 40 + x \times 25 + 160 = 32 \times (50 + x)$, $7x = 560$, $x = 80$ kg.

8. (C) let, there are x pounds of coffee A.
 \therefore According to the problem,
 $100x + 70(10-x) = 88 \times 10$ or, $30x = 880 - 700$ or, $x = 6$
9. (C) Let amount of water be $8x$. So, the amount of sugar is $3x$.
 According to question,
 $8x/(3x+2) = 2/1$
 Solving this equation, we get, $x = 2$
 Therefore, amount of sugar in the original solution = $3 \times 2 = 6\text{kg}$
10. (C) 30 liter mixture এ milk = $30 \times \frac{7}{10} = 21$ litres

water = 9 litres

এখন, বাকিটা elimination method এ অথবা x ধরে করা যায়।

মনেকরি, x litres water add করতে হবে,

$$\frac{9+x}{30+x} = \frac{40}{100}$$

$$\Rightarrow 100x + 900 = 1200 + 40x \Rightarrow 60x = 300 \Rightarrow x = \frac{300}{60}$$

$$\Rightarrow x = 5 \text{ litres.}$$

11. (B) Water % = $\frac{3}{8} \times 100 = 37.5\%$

Applying the spider method

25		50
37.5		
12.5	:	12.5

Since ratio is 1 : 1, answer B

01. (B) ধরি, mixture এর x পরিমাণকে sugar দ্বারা replace করতে হবে।

$$\text{অর্থাৎ, } \frac{\text{sugar}}{\text{water}} = \frac{\frac{2}{5}(60-x) + x}{\frac{3}{5}(60-x)} = \frac{1}{1}$$

$$\text{Or, } \frac{120 - 2x + 5x}{5} = \frac{180 - 3x}{5}$$

$$\text{Or, } 120 + 3x = 180 - 3x$$

$$\text{Or, } 6x = 60$$

$$\text{Or, } x = 10$$

সঠিক Answer (B)

Concept 23

Permutation & Combination, Probability

Concept 23

Permutation & Combination

Permutation: Permutation relates to the act of arranging all the members of a set into some sequence or order, or if the set is already ordered, rearranging (reordering) its elements, a process called **permuting**. For example, written as tuples, there are six permutations of the set {1,2,3}, namely: (1,2,3), (1,3,2), (2,1,3), (2,3,1), (3,1,2), and (3,2,1). These are all the possible orderings of this three element set.

A formula for the number of possible permutations of k objects from a set of n . This is usually written ${}_n P_k$.

Formula:
$${}_n P_k = \frac{n!}{(n-k)!} = n(n-1)(n-2) \dots (n-k+1)$$

Example: How many ways can 4 students from a group of 15 be lined up for a photograph?

Answer: There are ${}_{15}P_4$ possible permutations of 4 students from a group of 15.

$${}_{15}P_4 = \frac{15!}{11!} = 15 \cdot 14 \cdot 13 \cdot 12 = 32760 \text{ different lineups}$$

Combination: Combination is a way of selecting items from a collection, such that (unlike permutations) the **order of selection does not matter**.

For example, given three fruits, say an apple, an orange and a pear, there are three combinations of two that can be drawn from this set: an apple and a pear; an apple and an orange; or a pear and an orange. Here it doesn't matter if apple stands first or orange does i.e. the order is not important.

A formula for the number of possible combinations of r objects from a set of n objects is

Formula:
$${}_n C_r = \frac{n!}{r!(n-r)!} = \frac{n(n-1)(n-2) \dots (n-r+1)}{r!}$$

Example: How many different committees of 4 students can be chosen from a group of 15?

Answer: There are $\binom{15}{4}$ possible combinations of 4 students from a set of 15.

$$\binom{15}{4} = \frac{15!}{4!11!} = \frac{15 \cdot 14 \cdot 13 \cdot 12}{4 \cdot 3 \cdot 2 \cdot 1} = 1365$$

There are 1365 different committees.

When to choose permutation and when to choose combination: Permutation is used when the order of something matters i.e. each order would yield different, noticeable result. Combination is used when the orders do not really provide affective and noticeable result.

For example, consider the two examples that is used. Both of them asked for number of ways 4 student can be picked from 15. But the one with the permutation asked for lining up for a photograph where it will matter and the result will be noticeable if the 4 students that are chosen interchange each other's position while taking the photo. There will be visible and impactful changes in the outcomes of the photographs.

The second one with the combination asked for the number of ways committees of 4 people can be built out of 15. Here, it really wouldn't matter as to how the 4 members of the committees are placed since a committee works like a group and how the members are ordered within the group doesn't matter at all.

To further explain this, let's look at the following example:

1. There are 5 red flower pots. In how many ways can you pick 3 of them?

$$\text{Answer: } {}^5C_3 = \frac{5!}{(5-3)! \cdot 3!} = \frac{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{2 \cdot 1 \cdot 3 \cdot 2 \cdot 1} = 10 \text{ ways}$$

Here we have to use combination since all the pots are red and it really will not make a difference on how these red pots are arranged amongst themselves.

2. There are 5 different colored flower pots. In how many ways can you pick 3 of them?

$$\text{Answer: } {}^5P_3 = \frac{5!}{(5-3)!} = \frac{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{2 \cdot 1} = 60 \text{ ways.}$$

Here we used permutation because since all the flower pots are differently colored, the 3 which are picked if interchange their position, it will yield a visible result.

Probability

Probability: Probability is the extent to which an event is likely to occur. It is measured by the ratio of the favorable cases to the whole number of cases possible. Probability is quantified as a number between 0 and 1 (where 0 indicates impossibility and 1 indicates certainty). The higher the probability of an event, the more certain that the event will occur.

Probability of an event occurring:
$$\frac{\text{Desired Event}}{\text{Total Events}}$$

Example: A die is rolled, find the probability that an even number is obtained.

Answer:

The total number of sides are 6 {1,2,3,4,5,6}

The desired number is even and there are 3 even numbers {2,4,6}

Hence probability of getting even number = $3 / 6 = 1 / 2$

Probability of an event occurring at least once:

If the question asks to find the probability of an event occurring at least once, first we find out the probability of that event not occurring at all, then we deduct it from 1. This is because 1 is the probability of all the events occurring and if we deduct probability of any event, every other probability will remain except for the one we deducted.

Example: Find the probability of flipping a fair coin thrice and a getting at least a head once.

Answer:

Here we do not want three tails. So first we find out the probability of getting three tails =

$$\frac{1}{2} * \frac{1}{2} * \frac{1}{2} = \frac{1}{8}$$

Now we subtract this from 1. Hence we will have the probability of getting at least one head as the undesired has been subtracted from it.

$1 - \frac{1}{8} = \frac{7}{8}$ is the probability of getting at least one head by tossing the coin thrice.

Exercise 23

- 01. Nine pieces of paper numbered consecutively from 1 to 9 are put into a box. If a piece of paper is drawn at random from the box, what is the probability that it will have a number greater than 6? (MBA 04-05)
 A) $\frac{1}{9}$ B) $\frac{1}{3}$ C) $\frac{2}{9}$ D) $\frac{5}{9}$ E) $\frac{1}{2}$
- ⊕ 02. Coins are to be put into 7 pockets so that each pocket contains at least one coin. At most 3 of the pockets are to contain the same number of coins and no two of the remaining pockets are to contain an equal number of coins. What is the least possible number of coins needed for the pockets? (MBA 05-06)
 (A) 7 (B) 13 (C) 17 (D) 22 (E) None of these
- 03. There are 4 women and 4 men sitting in a waiting room for job. If two of the applicants are selected at random, what is the probability that both will be women? (MBA 10-11)
 A. $\frac{1}{2}$ B. $\frac{3}{7}$ C. $\frac{3}{4}$ D. $\frac{3}{14}$ E. None of these
- ⊕ 04. In a class there are 15 students starting from roll number 1 to 15. If you randomly pick 2 students without replacing, what is the probability that roll number of both students will be odd? (MBA 2015)
 (A) $\frac{8}{15}$ (B) $\frac{3}{5}$ (C) $\frac{4}{15}$ (D) $\frac{2}{5}$ (E) None of these
- 05. There are 10 men and 3 women in room A. One person is picked at random from room A and moved to room B, where there are already 3 women and 5 men. If a single person is then to be picked from room B, what is the probability that a women will be picked? (MBA 2016)
 A. $\frac{13}{21}$ B. $\frac{49}{117}$ C. $\frac{40}{117}$ D. $\frac{15}{52}$ E. None of these
- ⊕ 06. In a nationwide poll, p people were asked 2 questions. If $\frac{2}{5}$ of them answered "yes" to question 1, and of those $\frac{1}{3}$ also answered "yes" to question 2, which of the following represents the number of people polled who did not answer "yes" to both questions? (BBA 10-11)
 (A) $\frac{11}{13}$ (B) $\frac{3}{13}$ (C) $\frac{13}{15}$ (D) $\frac{2}{15}$ (E) none of these
- 07. Event E is defined to be rolling an even number on a 6-sided die and Event F is defined to be rolling a 1, 2 or 3. Calculate the probability of rolling a die such that events E and F occur simultaneously on a single roll of the die. (BBA 13-14)
 A) $\frac{1}{2}$ B) $\frac{1}{6}$ C) 0 D) $\frac{5}{6}$ E) 1
- ▽ 08. There are six different models who are to appear in a fashion show. Two are from Europe, two are from South America, and two are from North America. If all the models from the same continent are to stand next to each other, how many ways can the fashion show organizer arrange the models? (BBA 13-14)
 A) 48 B) 64 C) 24 D) 8 E) 72

9. A jar contains only red, yellow, and orange marbles. If there are 3 red, 5 yellow and 4 orange marbles, and 3 marbles are chosen from the jar at random without replacing any of them, what is the probability that 2 yellow, 1 red and no orange marbles will be chosen?
 A. $1/60$ B. $1/45$ C. $2/45$ D. $3/11$ E. $5/22$ (EMBA 2010)
10. The probability of rolling any number on a weighted 6-sided die, with faces numbered 1 through 6, is directly proportional to the number rolled. What is the probability of getting 5, if the die is rolled only once?
 A. $1/6$ B. $5/6$ C. $5/16$ D. $5/21$ E. None of these (BBA 15-16)
11. There is 50% chance that Rafiq will go to a fast food restaurant for lunch and 50% chance that he will skip lunch. If he goes to a fast food restaurant there is 60% chance that he will take only a sandwich and nothing else. If he decides not to take a sandwich he will take a burger or a chicken pie. What is the probability that he will take a burger?
 (A) 5% (B) 1% (C) 2% (D) 25% (E) none of these (BBA 16-17)
12. A certain bag contains 6 marbles, of which 4 are red and 2 are white in color. If Babu is to pick out 2 marbles from the bag simultaneously and at random, what is the probability that one is red and the other is white?
 (A) $1/5$ (B) $1/3$ (C) $1/15$ (D) $8/15$ (E) none of these (BBA 16-17)
13. A die is rolled randomly on a circular board with a triangle inscribed in the circle. (All three vertices of the triangle are on the circumference of the circle.) What is the probability that the die comes to rest outside the triangular region? (BBA 13-14)
- Statement 1: The hypotenuse of the triangle is the diameter of the circle.
 Statement 2: The radius of the circle is 2 units, and the area of the triangle is 4 square units.
14. A box contains red chips, white chips and blue chips. If a chip is randomly selected from the box, what is the probability that the chip will be either white or blue?
 (MBA 2016)
- Statement 1: The probability that the chip will be blue is $1/5$
 Statement 2: The probability that the chip will be red is $1/3$
15. How many different 3 digit numbers can be formed, such that 1st and 3rd place should be filled up with odd numbers?
 (BBA 17-18)
 A) 400 B) 250 C) 150 D) 120 E) None of these

Answer Key Exercise 23

1.B	2.C	3.D	4.C	5.B	6.C	7.B	8.A	9.D	10.D
11.E	12.E	13.C	14.B	15.B					

Solution to Exercise 22

01. (B) $\frac{\text{possible outcome}}{\text{total outcome}} = \frac{7/8/9}{1 \text{ to } 9} = \frac{3}{9} = \frac{1}{3} \quad \therefore \text{Answer B}$
02. (C) যেহেতু smallest possible number of coins জানতে চাওয়া হয়েছে, কম সংখ্যক coins বেশী pocket এ দিতে হবে। তাই আমরা 3টি pocket এ 1 টি করে coin দিব। বাকিগুলোতে যথাক্রমে 2, 3, 4 এবং 5টি coins থাকবে। So, total number of coins = 1 + 1 + 1 + 2 + 3 + 4 + 5 = 17
03. (D) প্রথমজন woman আসার probability = $\frac{4}{8} = \frac{1}{2}$
 দ্বিতীয়জন woman আসার probability = $\frac{3}{7}$ (একজন woman কমে গেছে)
 অতএব, পরপর 2 জন woman আসার probability = $\frac{1}{2} \times \frac{3}{7} = \frac{3}{14}$
 \therefore Answer D
04. (C) ক্লাসে রোল নম্বর 1 to 15 অর্থাৎ 15 জন আছে।
 এর মধ্যে Odd Roll Number আছে 8 জনের।
 Randomly pick করলে প্রথম জনের জন্যে Number of Favorable Events 8 টি ও Total event 15 টি।
 তাই প্রথম জন Odd Roll Number হবার probability $\frac{8}{15}$
 দ্বিতীয় জনের জন্যে Number of Favorable Events 7 টি ও Total event 14 টি।
 তাই দ্বিতীয় জন Odd Roll Number হবার probability $\frac{7}{14}$
 আর দুই জনেরই Odd Roll Number হবার probability হল $\frac{8}{15} \times \frac{7}{14}$ বা $\frac{4}{15}$
 তাই উত্তর C.
05. (B) If a woman is chosen from Room A, then a person is randomly picked from Room B = $3/13 \times 4/9$
 If a man is chosen from Room A, then a person is randomly picked from Room B = $10/13 \times 3/9$
 Therefore, if a person is chosen at random from Room A and then place at Room B, and then another person is chosen from Room B, the probability that the person is a woman is:
 Answer = $(3/13 \times 4/9) + (10/13 \times 3/9) = 49/117$

06. (C) $P \text{ People} \times \frac{2}{5} = \frac{2P}{5}$ answered yes to q1

$\frac{2P}{5} \times \frac{1}{3} = \frac{2P}{15}$ Answered yes to q1 and q2

$\therefore P - \frac{2P}{15} = \frac{13P}{15}$ did not answer yes to both questions

\therefore Answer C

07. (B) Event E তখনই হবে, যখন একটি dice এ কোন জোড় সংখ্যা পড়বে।
একটি dice এ জোড় সংখ্যা 3 টি। 2, 4 and 6.

Event F তখনই হবে, যখন একটি dice এ 1, 2 বা 3, এই 3 টি সংখ্যার কোন একটি পড়বে।
সুতরাং, Event E এবং Event F 2 টি হবে তখনই, যখন উভয় dice-এই 2 পড়বে।

যেহেতু শুধুমাত্র 2 পড়লেই, উভয় event ই হচ্ছে, উভয় হবার probability $\frac{1}{6}$

08. (A) 8 টি আলাদা model 2 জন Europe, 2 জন North America এবং 2 জন South America থেকে। একই মহাদেশের সবাই সবসময় একসাথে থাকবে।

Europe, North America এবং South America র 2 জন কে নিজেদের মধ্যে সাজানো যায় প্রত্যেক 2! ভাবে।
এক 3 টি মহাদেশ কে নিজেদের মাঝে সাজানো যায় 3! ভাবে।

সুতরাং, 6 জন model কে সাজানো যাবে $2! \times 2! \times 2! \times 3! = 48$ ভাবে।

09. (D) Probability of Yellow Marble = $\frac{5}{12}$

Probability of Red Marble = $\frac{3}{12}$

Probability of 2 Yellow and 1 Red Marbles (Not Replaced) = $(\frac{5}{12} \times \frac{4}{11}) \times \frac{3}{10} \times 3! = \frac{3}{11}$

$\begin{matrix} \uparrow & & \uparrow & & \uparrow \\ \text{Yellow} & & \text{Red} & & \text{No. of ways} \\ & & \text{marbles} & & \text{can be picked} \end{matrix}$

10. (D) Probability = individual probability / Total probability = $\frac{5}{(1+2+3+4+5+6)} = \frac{5}{21}$

11. (E) fast food restaurant এ খাওয়ার probability = $\frac{1}{2}$

Restaurant এ গিয়ে sandwich না নেয়ার probability = $\frac{1}{2} * \frac{2}{5} = \frac{1}{5}$

Restaurant এ গিয়ে sandwich না নিয়ে burger নেয়ার probability = $\frac{1}{5} * \frac{1}{2} = \frac{1}{10} = 10\%$

Correct Answer (E)

12. (E) একটি red এবং একটি white marble পাওয়ার probability = $\frac{4}{6} * \frac{2}{5} = \frac{4}{15}$

Correct Answer (E)

13. (C) Statement A অনুসারে triangle এর hypotenuse এ diameter. তাহলে triangleটি একটি rightangled triangle.

Statement B অনুসারে radius 2 cm এবং area 4 square cm. এই তথ্য থেকে circle এর area বের করা সম্ভব। Triangle এবং circle উভয়ের area জানা থাকার কারণে dice এর triangle এর বাইরে পড়ার সম্ভাবনা বের করা সম্ভব। Statement A এবং Statement B উভয় এর সহযোগিতা দ্বারা।

14. (B) White অথবা blue বল পাওয়ার probability মানে এই দুই color এর যেকোন একটি বল পেলেই চলবে।

তথ্য (I) নং থেকে answer দেওয়া যাবে না। এখান থেকে white বল পাওয়ার probability জানা যায় না।

তথ্য (II) নং থেকে answer দেওয়া যাবে। এখানে red বল পাওয়ার probability দেওয়া আছে $1/3$.

তার মানে white অথবা blue বল পাওয়ার probability = $(1 - 1/3) = 2/3$

15. (B) 250

The 1st and 3rd place of the number should be filled up with any of the five odd numbers - 1, 3, 5, 7 or 9. And the 2nd place can be filled with any of the ten numbers from 0 to 9.

So the number 3 digit numbers which can be formed = $5 \times 10 \times 5 = 250$.

Geometry

Chapter 1

Angles, Triangles

Chapter 1: Angles, Triangles

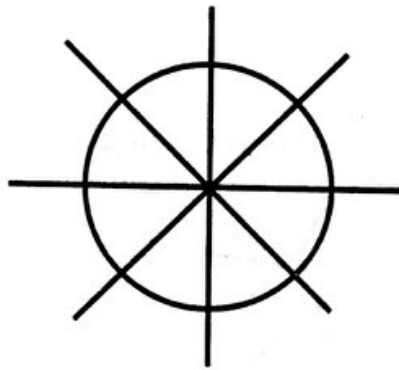
Congruency Similarity

IBA Admission Test-এ Basic Geometric Concepts test করা হয়।

Basic geometric terms, figures এবং কিছু theorem জানলে এবং কিছু short-cut পদ্ধতি আয়ত্ত করতে পারলে problem গুলো allocated time এর চেয়ে কম সময়ে করা সম্ভব।

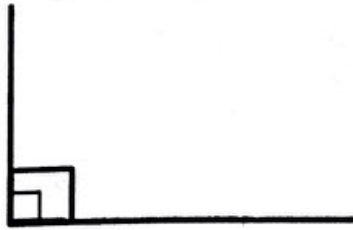
Angles: Angle এর শীর্ষবিন্দুকে vertex এবং দুই বাহুকে leg বলে। \angle sign দিয়ে angle indicate করা হয়। মনে রাখতে হবে,

- Circle তার center-এ 360° angle ধারণ করে।
- দুটি line intersect করলে যে চারটি angle পাওয়া যায় তাদের সমষ্টি 360°
- একটি বিন্দুর চারদিকে সৃষ্ট সব angle গুলোর যোগফল 360°



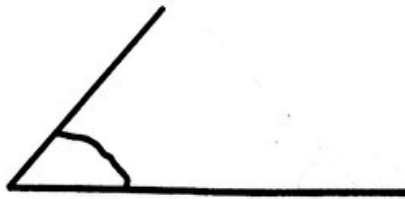
360 degree/360°

Right Angle: 90° angle কে right angle (সমকোণ) বলা হয় এবং vertex এ একটি ছোট box দিয়ে right angle indicate করা হয়।

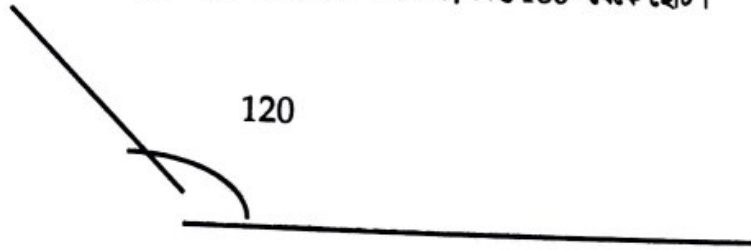


দুটি line point of intersection-এ 90° angle সৃষ্টি করলে তাদের পরস্পরকে পরস্পরের উপর perpendicular বা লম্ব বলা হয় এবং \perp sign ব্যবহার করে তাদের চিহ্নিত করা হয়। একটি angle দৃশ্যত 90° হলে তাকে right angle ধরে problem solve করা চলবে না। \perp sign অথবা 90° বা right angle উল্লেখ থাকতে হবে।

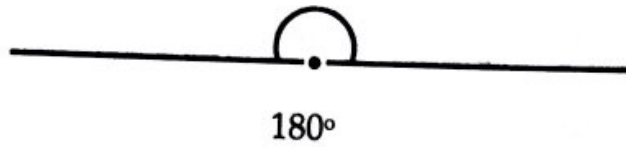
Acute Angle : Acute angle (সূক্ষ্ম কোণ) 0° থেকে বড় কিন্তু 90° থেকে ছোট একটি angle.



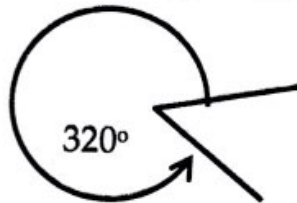
Obtuse Angle : Obtuse angle (স্থূল কোণ) 90° থেকে বড় কিন্তু 180° থেকে ছোট।



Straight angle: সকল কোণ বা straight angle হচ্ছে 180° বা একটি line এর উপরের angle.



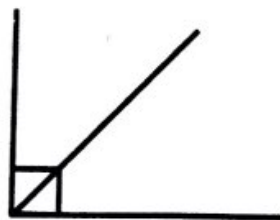
Reflex angle: 180° থেকে বড় কিন্তু 360° থেকে ছোট angle কে reflex angle বা শব্দ কোণ বলা হয়।



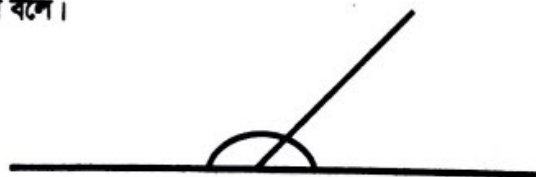
Adjacent Angles: Adjacent angle বা সন্নিহিত কোণ হচ্ছে common vertex এবং একটি common leg বিশিষ্ট দুটি angle.



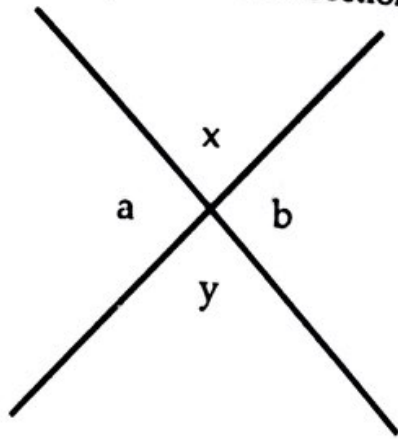
Complementary Angles: দুটি angle এর যোগফল 90° হলে তারা পরস্পরের complementary angle (complements) বা পূরক কোণ।



Supplementary Angles: দুটি angle এর সমষ্টি 180° হলে তাদের পরস্পরকে পরস্পরের supplementary angle (supplements) বা সম্পূরক কোণ বলে।

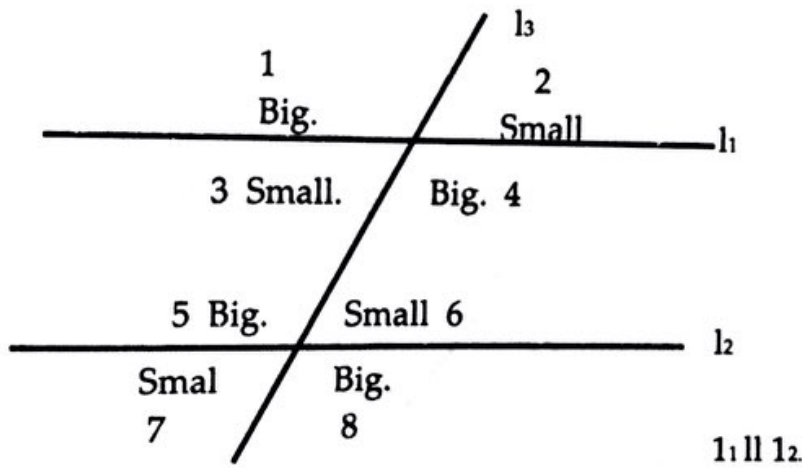


Vertical Angle: দুটি line এর point of intersection-এ দুই pair vertical angle (বিকর্ষিত কোণ) পাওয়া যায়।



$x = y$
 $a = b$
 $a + b + x + y = 360^\circ$

Fred's Theorem : l_1 এবং l_2 Parallel হলে ($l_1 \parallel l_2$) এবং l_3 (transversal বা ছেদক) তাদের intersect করলে যে 8 টি angle সৃষ্টি হয় তাদের relation খুব সহজে express করা যায়।

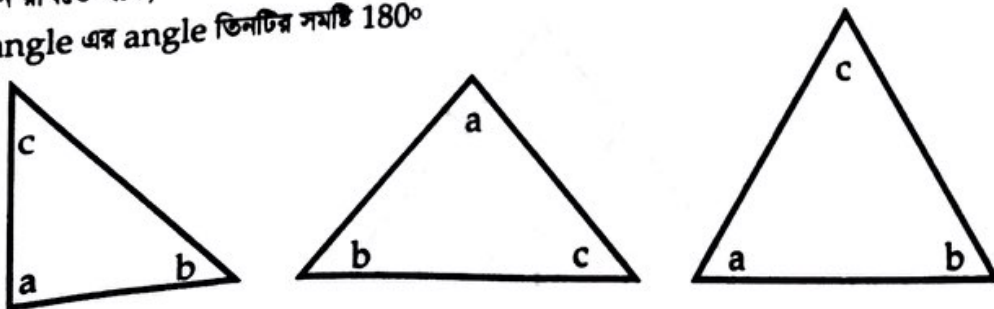


এখানে, সবগুলো Big angle সমান এবং সবগুলো Small angle সমান।

- $1=4, 2=3, 5=8, 6=7$ (vertical angles)
- $1=5, 2=6, 3=7, 4=8$ (corresponding angles)
- $3=6, 4=5$ (alternate angles)

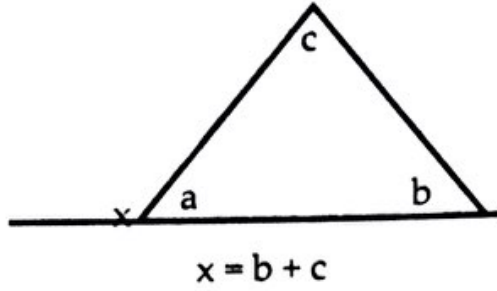
Triangles: মনে রাখতে হবে,

i. Triangle এর angle তিনটির সমষ্টি 180°

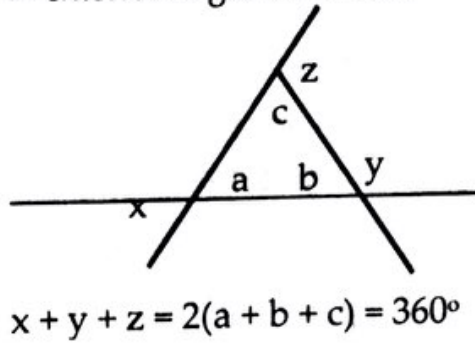


ii. Triangle এর যে কোন দুটি side এর সমষ্টি 3rd side এর চেয়ে বড় (side length limitation)

iii. Exterior angle দ্বিবর্তী interior angle দুটির সমষ্টির সমান।



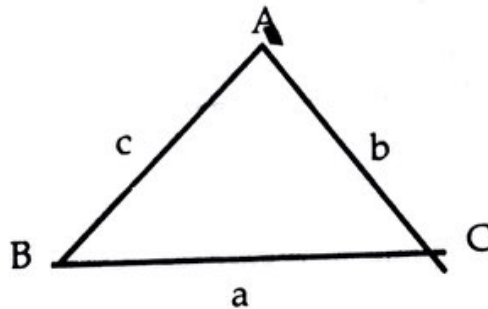
iv. তিনটি vertex-এ তিনটি exterior angle এর সমষ্টি 360°



v. Δ -sign দ্বারা triangle indicate করা হয়।

Angle-Side relationship :

i. Triangle এর angle গুলোকে capital letter এ এবং angle গুলোর বিপরীত বাহু গুলোকে তার small letter এ লেখা হয়।



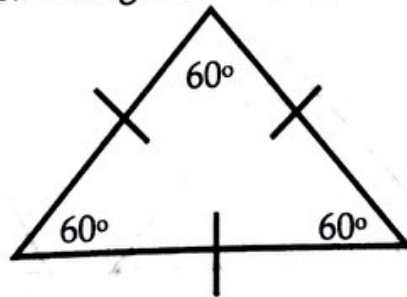
ii. বৃহত্তর কোণের বিপরীত বাহু ক্ষুদ্রতর কোণের বিপরীত বাহু অপেক্ষা বৃহত্তর।

if $\angle A > \angle B, a > b$

iii. বৃহত্তর বাহুর বিপরীত কোণ ক্ষুদ্রতর বাহুর বিপরীত কোণ অপেক্ষা বৃহত্তর, if $a > b$

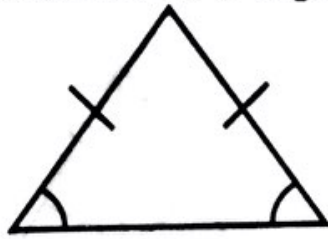
$\angle A > \angle B.$

Equilateral Triangles: Equilateral triangle বা সমবাহু ত্রিভুজের side এবং angle তিনটি সমান



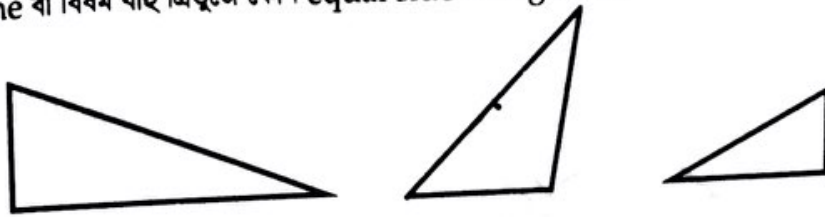
N.B. angle তিনটি বা side তিনটি সমান হলে triangle টি equilateral.

Isosceles: Isosceles বা সমদ্বিবাহু ত্রিভুজের দুটি side এবং দুটি angle সমান।



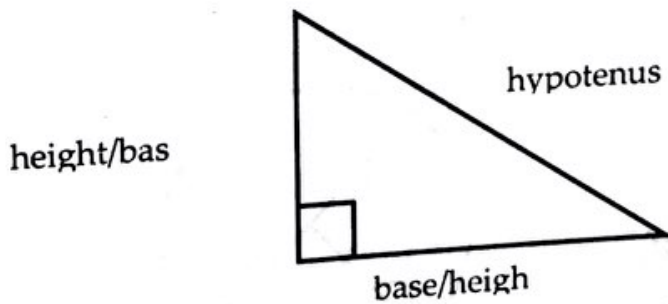
N.B. Triangle এর equal দুটি side এর opposite angle দুটি সমান এবং equal দুটি angle এর opposite side দুটি সমান।

Scalene: Scalene বা বিষম বাহু ত্রিভুজে কোন equal side বা angle নেই।



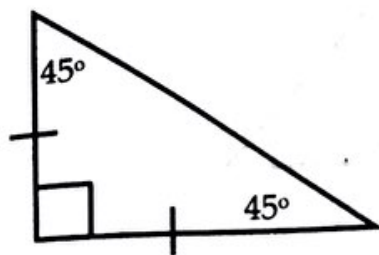
N.B. In a scalene (or in any triangle) largest angle is opposite the longest side.

Right Triangle: 90° angle বিশিষ্ট triangle হচ্ছে right triangle বা সমকোণী ত্রিভুজ।



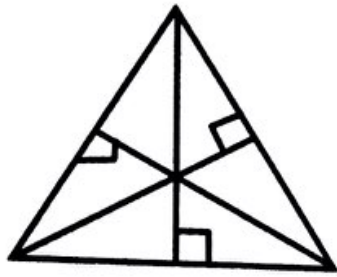
N.B. i. Hypotenuse বা অতিভুজ right triangle এর বৃহত্তম side.
 ii. একটি triangle-এ একাধিক right angle বা obtuse angle থাকা সম্ভব নয়।

Isosceles Right Triangle: এই right triangle-এ base এবং side সমান।

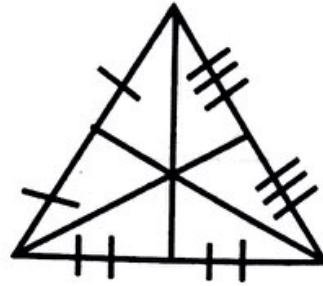


N.B. একটি angle 90° এবং Isosceles triangle বলে অন্য কোণ দুটি সমান।

Height and Median: Height হচ্ছে vertex থেকে opposite side এর উপর লম্ব এবং median হচ্ছে vertex এর opposite side এর mid-point সংযোগকারী রেখা।

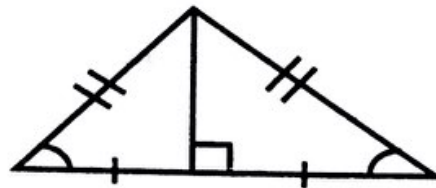


Heigh



Media

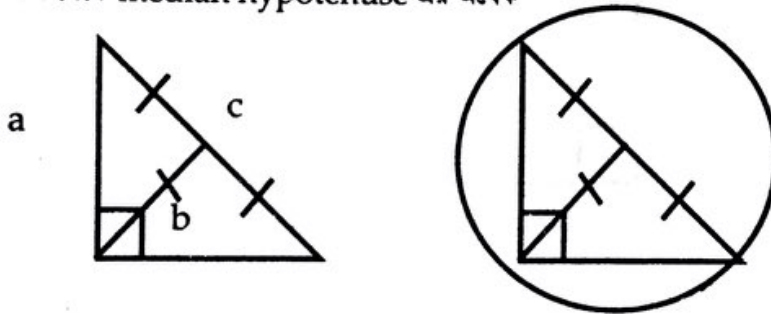
N.B. i. Isosceles এবং equilateral triangle-এ height এবং median একই line (Isosceles এ base-এর উপর)



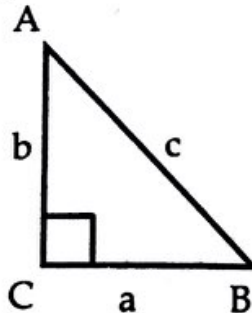
Isosceles.

ii. Median triangle কে সমান দুটি ক্ষেত্রে বিভক্ত করে।

iii. সমকোণী শীর্ষ থেকে median hypotenuse এর অর্ধেক



Pythagorean Theorem: পিথাগোরাসের উপপাদ্য অনুযায়ী right triangle ABC-এ hypotenuse হলে, $c^2 = a^2 + b^2$.



এই equation ব্যবহার করে দুটি side এর মান জানা থাকলে 3rd side বের করা যায়।

Example: Right triangle ABC-এ c hypotenuse,

$$a = 10, b = 10\sqrt{3} \text{ হলে } c = ?$$

$$c^2 = a^2 + b^2$$

$$= 10^2 + (10\sqrt{3})^2$$

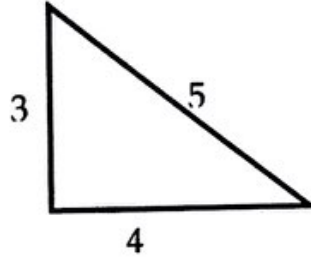
$$= 100 + 100 \times 3$$

$$= 400$$

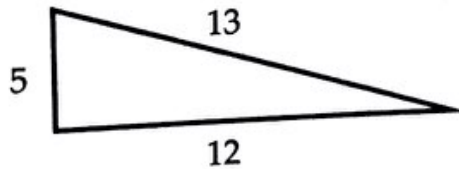
$$\therefore c = 20$$

Pythagorean Triples : Right triangle-এ side গুলোর length $c^2 = a^2 + b^2$ শর্ত পূরণ করে যে কোন রকম হতে পারে তবে কিছু ratio আছে যেগুলো মনে রাখতে পারলে কম সময়ে 3rd side নির্ণয় করা যায়।

i. 3 : 4 : 5, এই অনুপাতে একটি side 3, আরেকটি side 4 এবং hypotenuse 5 হবে।



N. B. যেহেতু এটি একটি ratio, side গুলো 3 : 4 : 5 যে কোন multiple হতে পারে (6 : 8 : 10 বা 30 : 40 : 50 ইত্যাদি)
ii. 5 : 12 : 13 এই অনুপাত অনুযায়ী একটি side 5, আরেকটি side 12 এবং hypotenuse 13 কিংবা side গুলো 5 : 12 : 13 এর যে কোন multiple.



একইভাবে আরো কিছু অনুপাত পাওয়া যায় :

$$7n : 24n : 25n$$

$$9n : 40n : 41n$$

$$11n : 60n : 61n$$

তবে এগুলো সাধারণত ব্যবহার করার প্রয়োজন হয় না।

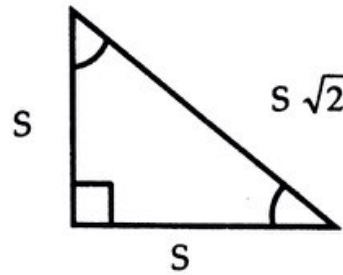
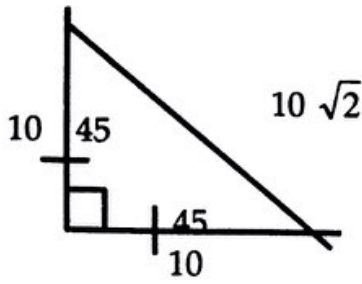
iii) 8 : 15 : 17: উপরের relation গুলোর বাইরে $8n : 15n : 17n$ আরেকটি common ratio.

Example : Right triangle-এ hypotenuse 51 এবং একটি side 24 হলে অপর side কত?

এক্ষেত্রে $n = 3 \therefore$ অপর side 45

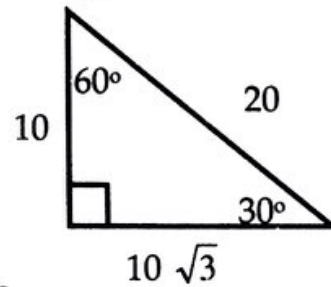
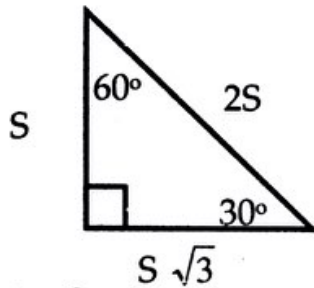
iv. S : S : $S\sqrt{2}$; যেখানে S একটি side এর মান। এই ratio টি মূলত Isosceles right triangle-এর জন্য

ব্যবোজ্য। অর্থাৎ angle গুলো $90^\circ, 45^\circ, 45^\circ$ হলে hypotenuse সমান side গুলোর $\sqrt{2}$ গুণ হবে।



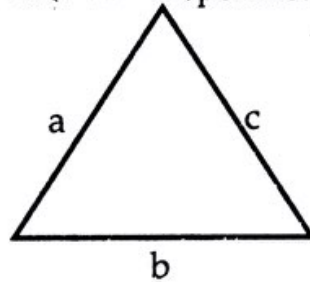
v. $S : S\sqrt{3} : 2S$; S যেখানে 30° এর opposite side.

Right triangle-এ অন্য angle দুটি $30^\circ / 60^\circ$ হলে এই ratio apply করা যায়। এক্ষেত্রে 60° এর opposite side 30° এর opposite side এর $\sqrt{3}$ গুণ এবং hypotenuse 30° এর opposite side-এর 2- গুণ।



N.B. iv এবং v এই ratio দুটি খুবই important কেননা এই ratio দুটি মনে থাকলে Trigonometric relation avoid করা যাবে।

Perimeter of a Triangle: ত্রিভুজের তিন বাহুর সমষ্টি হচ্ছে perimeter বা পরিসীমা।

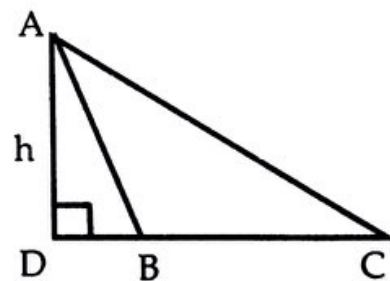
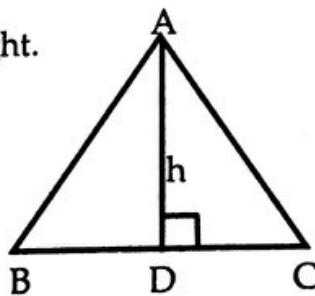


Equilateral triangle এর একটি side x হলে, $P = 3x$.

Area of a triangle:

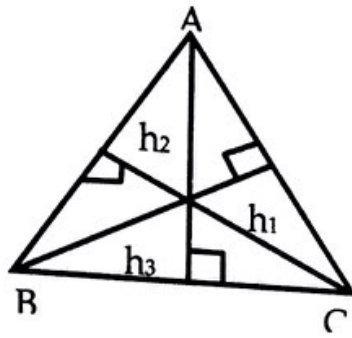
i) Triangle এর একটি side কে base ধরে, বিপরীত vertex -থেকে তার উপর লম্ব h হলে,

$$\text{Area} = \frac{1}{2} \times \text{base} \times \text{height.}$$



$$\text{Area of } \Delta ABC = \frac{1}{2} BC \times h$$

ABC এ B হতে AC এর উপর লম্ব h_1 এবং C হতে AB এর উপর h_2 এবং A থেকে BC-এর উপর লম্ব h_3 হলে



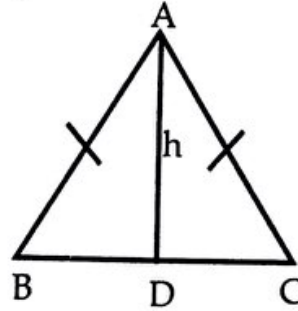
$$\text{Area of } \Delta ABC = \frac{1}{2} AC \times h_1 = \frac{1}{2} AB \times h_2 = \frac{1}{2} BC \times h_3$$

ii) ABC-এ $AB = BC$ হলে, অর্থাৎ ΔABC - isosceles হলে

D, BC-এর মধ্যবিন্দু হবে।

$$\text{Area of } \Delta ABC = \frac{1}{2} BC \times AD = BD \times AD$$

AB (বা AC), AD ও BD (বা BC) এ তিনটির দুটির মান জানা থাকলে Area নির্ণয় করা যাবে।



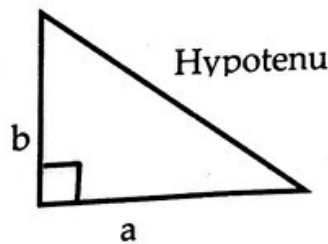
iii) equilateral triangle-এর একটি side x হলে

$$h = \frac{\sqrt{3}}{2} x \text{ হবে এবং Area} = \frac{\sqrt{3}}{4} x^2 \text{ হবে।}$$

Example: Equilateral triangle ABC- এর এক বাহু 2c.m হলে area = ?

$$\text{Area} = \frac{\sqrt{3}}{4} 2^2 \text{cm}^2 = \sqrt{3} \text{ cm}^2$$

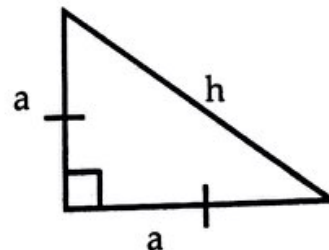
iv) Right angle-এর ক্ষেত্রে Perpendicular side দুটি থেকে Area নির্ণয় করতে হবে।



$$\text{Area} = \frac{1}{2} a \times b$$

v) Isosceles right triangle- এর ক্ষেত্রে

$$\text{Area} = \frac{1}{2} a^2 = \frac{h^2}{4} [2a^2 = h^2]$$



Example : Isosceles right triangle- এর hypotenuse

2 c.m হলে, Area = $\frac{2^2}{4} \text{ cm}^2 = 1 \text{ cm}^2$

vi) ΔABC এর তিনটি বাহু a, b ও c হলে,

Area = $\sqrt{s(s-a)(s-b)(s-c)}$ যখন $s = \frac{a+b+c}{2}$

N.B. i) Median একটি triangle কে সমান area বিশিষ্ট দুটি triangle-এ বিভক্ত করে।

Congruency of Triangles:

দুটি triangle congruent হলে, এদের একটির Side গুলো অপরটির side এবং angle গুলো অপরটির একই রকম angle গুলোর সমান। এদের area সমান, একই রকম height গুলো সমান। \perp Sign দিয়ে দুটি triangle congruent বোঝানো হয়। দুটি triangle সর্বসম বা congruent হবে যদি :

- i) একটির তিনটি side অপরটির তিনটি side এর সমান হয়।
- ii) একটির যে কোন দুটি বাহু এবং অন্তর্ভুক্ত কোণ অপরটির দুটি বাহু এবং অন্তর্ভুক্ত কোণের সমান হয়।
- iii) একটির দুটি কোণ এবং একটি বাহু অপরটির দুটি কোণ এবং অনুরূপ বাহু (একই রকম কোণ সংলগ্ন) সমান হয়।
- iv) দুটি right triangle এর hypotenuse দুটি এবং অপর একটি বাহু সমান হয়।

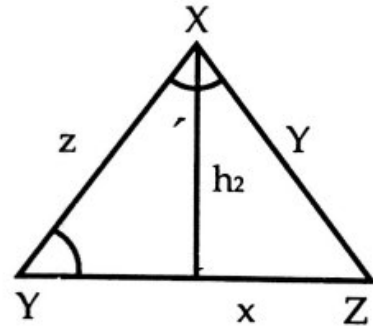
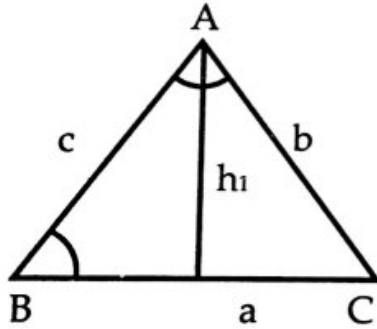
N.B. i) একটির তিনটি angle অপরটির তিনটি angle এর সমান হলে triangle দুটি similar, congruent নয়।

ii) একটি triangle এর দুটি angle অপরটির দুটি angle এর সমান হলে, স্বাভাবিকভাবেই 3rd angle দুটিও সমান।

iii) দুটি right triangle এর hypotenuse সমান এবং একটি side সমান হলে 3rd side সমান হবে।

Similar Triangles :

একটি triangle এর দুটি angle অন্য একটি triangle এর দুটি angle এর সমান হলে, triangle দুটি similar.

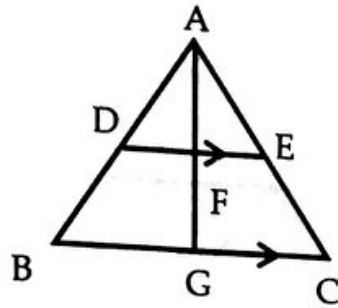


$\angle A = \angle X, \angle B = \angle Y$ হলে (স্বাভাবিকভাবেই $\angle C = \angle Z$)

i) $\frac{AB}{XY} = \frac{BC}{YZ} = \frac{CA}{ZX} = \frac{h_1}{h_2}$ ii) $\frac{AB}{BC} = \frac{XY}{YZ}$

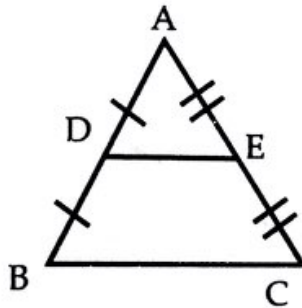
iii) $\frac{Area\Delta ABC}{Area\Delta XYZ} = \frac{AB^2}{XY^2} = \frac{BC^2}{YZ^2} = \frac{CA^2}{ZA^2}$

iv) Triangle এর একটি -side এর parallel কোন line দুটি similar figure তৈরী করে।



DE || BC হলে, $\triangle ADE$ এবং $\triangle ABC$ similar আবার $AF \perp DE$ হলে $AG \perp BC$ এবং $\triangle AFE$ ও $\triangle AGC$ similar হবে।

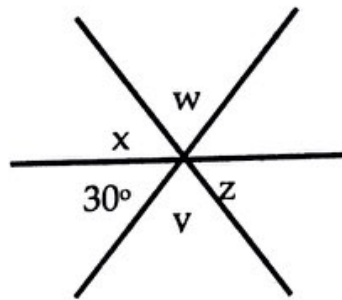
v) Triangle এর দুই বাহুর mid-points যোগ করলে তা 3rd side এর parallel এবং অর্ধেক হবে।



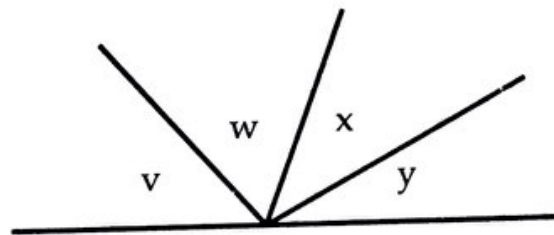
$DE = \frac{1}{2} BC$ এবং $DE \parallel BC$ এবং $\triangle ADE$ ও $\triangle ABC$ similar. এই hypothesis এর Opposite hypothesis ও সঠিক।

vi) AB এর মধ্যবিন্দু থেকে BC এবং parallel অংকন করলে, E, AC এর মধ্যবিন্দু।

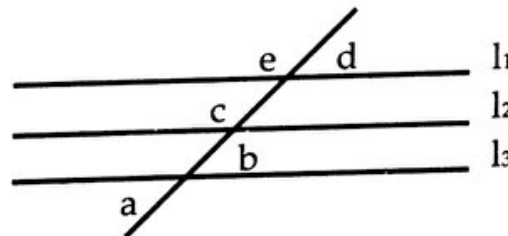
Exercise 1.1: Angles, Triangles



1. In the figure above, $w + x + y + z =$
 (A) 330° (B) 300° (C) 270° (D) 240° (E) 210°

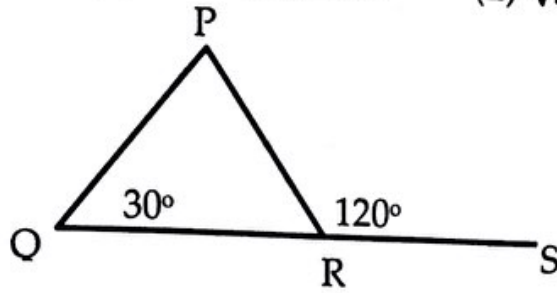


2. In the figure above, $v = 2w$, $w = 2x$ and $x = \frac{y}{3}$. What is the value of y ?
 (A) 18 (B) 36 (C) 45 (D) 54 (E) 60

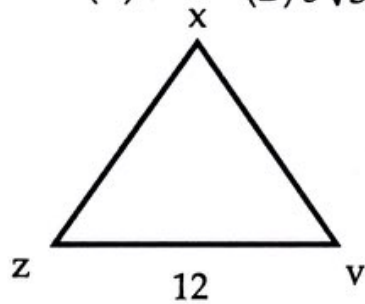


3. In the figure above, $l_1 \parallel l_2$ and $l_2 \parallel l_3$. What is the value of $a + b + c + d + e$?
 (A) 180 (B) 270 (C) 360 (D) 450 (E) cannot be determined.
4. The angles of a triangle are in the ratio of 2:3:4. What is the degree measure of the largest angle?
 (A) 40 (B) 80 (C) 90 (D) 120 (E) 130
5. What is the angle that is half of its own complement?
 (A) 30 (B) 45 (C) 60 (D) 90 (E) 120

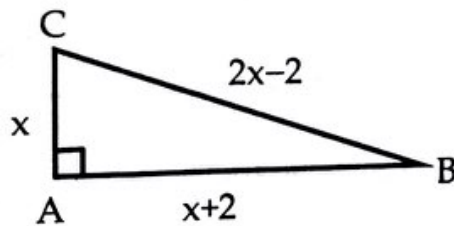
What is the length of the hypotenuse of an isosceles right triangle with an area of 32?
 (A) 4 (B) $4\sqrt{2}$ (C) 8 (D) $8\sqrt{2}$ (E) $\sqrt{3}$



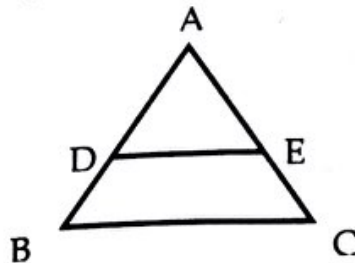
7. In ΔPQR shown above, if $QR = 6$, $PR =$
 (A) 12 (B) $6\sqrt{3}$ (C) 6 (D) $3\sqrt{3}$ (E) 3



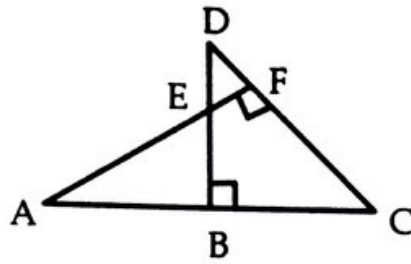
8. If $\angle xyz = \angle xzy$ and area of Δxyz is 48. What is the perimeter of the figure above?
 (A) 32 (B) 36 (C) 40 (D) 44 (E) 48



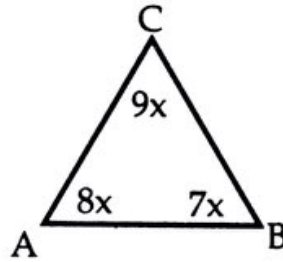
9. In the right triangle ABC above, $x = ?$
 (A) 6 (B) 8 (C) $6\sqrt{2}$ (D) 10 (E) 13



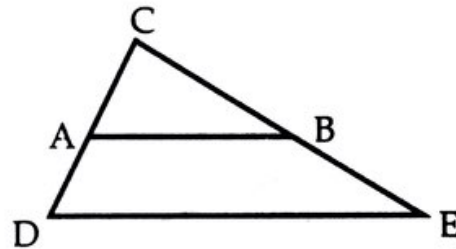
10. In the figure shown above DE is parallel to BC. If the area of triangle ADE is half that of trapezoid DECB, what is the ratio of AE to AC?
 (A) 1:2 (B) $1:\sqrt{2}$ (C) 1:3 (D) $1:\sqrt{3}$ (E) $1:\sqrt{5}$



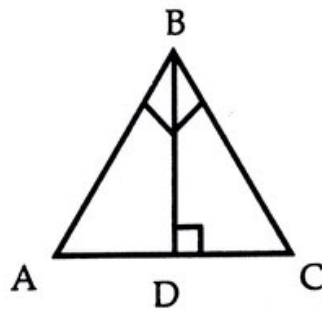
11. In the figure above, if $AC = 12$, $DC = 18$, and $DB = 15$, what is the length of AF ?
 (A) 8 (B) 9 (C) 10 (D) 12 (E) 18



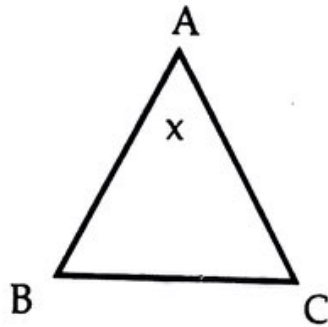
12. In the figure above, what is the measure of $\angle A$?
 (A) 45 (B) 60
 (C) 70 (D) 75 (E) 90



13. In the triangle CDE above, $AD = BE$ and $CD < CE$. Which of the following is true?
 (A) $CA > CB$ (B) $CA < CB$ (C) $CB > CE$ (D) $CD < CA$ (E) $AB \parallel DE$

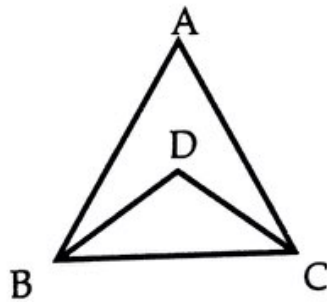


14. In triangle ABC above, $\angle B$ is a right angle, $AB = BC$ and $BD \perp AC$. Which of the following, if any, is not a 45-degree angle?
 (A) $\angle BAD$ (B) $\angle BCD$ (C) $\angle CBD$ (D) $\angle ABD$ (E) none of these.



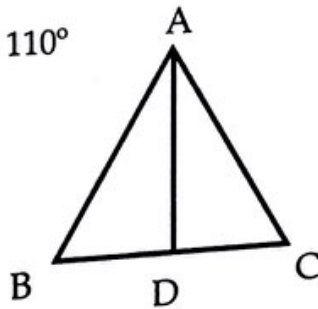
15. $AB = AC$, measure of $\angle A = x^\circ$. Measure of $\angle B =$

- (A) $x - 180$ (B) $x - 90$ (C) $180 - 2x$ (D) $180 - x$ (E) $90 - \frac{x}{2}$



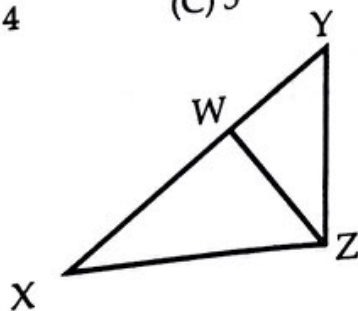
16. BD and CD are the bisectors of the angle B and angle C in isosceles triangle ABC . Angle $A = 70^\circ$. Angle $BDC =$

- (A) 55° (B) 70° (C) 110°
(D) 125° (E) 140°



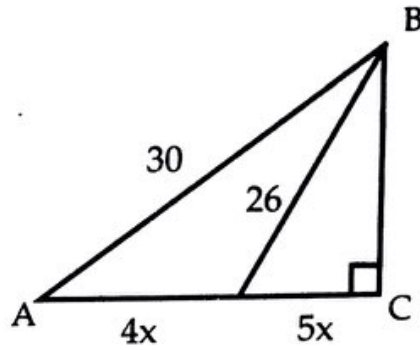
17. $AB = AC = 5$. $BC = 6$. Altitude $AD =$

- (A) 3 (B) 4 (C) 5 (D) $5\sqrt{2}$ (E) $5\sqrt{3}$

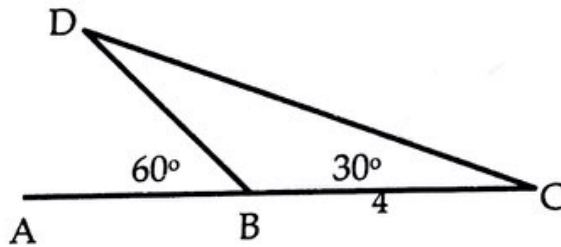


18. In the figure above, the ratio of the area of $\triangle WXZ$ to the area of $\triangle WYZ$ is $7 : 2$. If $XY = 21$, $WY =$

- (A) 7 (B) $\frac{14}{3}$ (C) 14 (D) $\frac{21}{2}$ (E) $\frac{21}{4}$



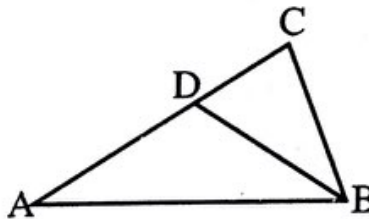
19. What is the length of BC in the figure above?
 (A) 10 (B) 16 (C) 18 (D) 20 (E) 24



20. In the figure above, what is the length of BD?
 (A) $\sqrt{2}$ (B) 4 (C) $4\sqrt{2}$ (D) $4\sqrt{3}$ (E) 8

21. In the triangle, $AC = AB$, $BC = BD = AD$. Find the value of $\angle DBA$. (MBA 2013)

- (A) 32°
 (B) 36°
 (C) 37.5°
 (D) 39°
 (E) None of these

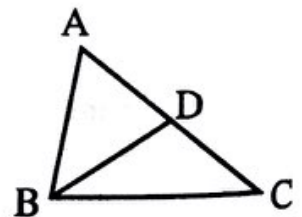


22. In the triangle ABC, $\angle BAC = 60^\circ$ and $\angle DCB = 50^\circ$. Which of the following is true for the triangle?

(MBA 2013)

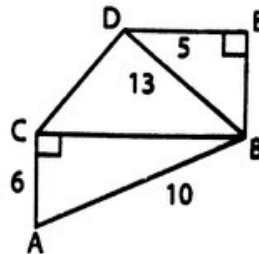
- I. $\angle ADB - \angle DBC = 50^\circ$
 II. $\angle BDC = \angle BDA - 60^\circ$
 III. $\angle ADB + \angle DBC = 100^\circ$

- (A) Only I (B) only II (C) only III
 (D) both I and II (E) None of these



23. A certain straight corridor has four doors, A, B, C and D (in that order) leading off from the same side. How far apart are doors B and C?
 Statement 1: The distance between doors B and D is 10 meters.
 Statement 2: The distance between A and C is 12 meters.
 (A) 13 metres (B) 11 metres (C) 10 Metres (D) 7 Metres (E) Not Enough Data

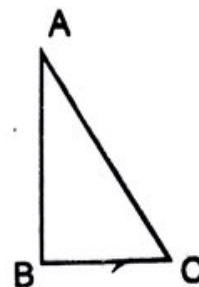
24. What is the area of the triangle BCD?
 (A) 40 (B) 42
 (C) 44 (D) 46 (E) 48



(BBA 13-14)

25. An equilateral triangle is inscribed in a circle. If the radius of the circle is 2, what is the area of the triangle?
 (A) $\sqrt{2}/2$ (B) $\sqrt{2}$ (C) $\sqrt{3}$ (D) $3\sqrt{3}$ (E) none of these (BBA 15-16)
26. If the isosceles triangle ABC has two sides with lengths 3 cm and 9 cm, then what is the possible length of the third side? (Geometry 1)
 (A) 3 cm (B) 6 cm (C) 9 cm (D) 12 cm (E) none of these (BBA 15-16)

27. In the figure, BC equals one half of AB. The area of the right angle triangle ABC equals 125 square meters. Find the hypotenuse AC in Meters.
 (A) 225 (B) 25 (C) 30
 (D) 32.5 (E) none of these (BBA 16-17)



28. The length of each side of a triangle is an even number. If no two of the sides are equal, what is the smallest perimeter the triangle could have?
 (A) 18 (B) 16 (C) 14 (D) 12 (E) None of these (BBA 17-18)

Answer keys:

1.B	2.D	3.E	4.B	5.A	6.D	7.E	8.A	9.A	10.D
11.C	12.B	13.B	14.E	15.E	16.D	17.B	18.B	19.E	20.B
21.B	22.A	23.E	24.E	25.D	26.C	27.B	28.A		

Solution to exercise 1.1

1. (B) The vertically opposite angle of 30° is also 30°
 $w + x + y + z + 30^\circ + 30^\circ = 360^\circ$
 $\therefore w + x + y + z = 300^\circ$
2. (D) $v + w + x + y = 180^\circ$
 $\Rightarrow 2w + w + x + y = 180^\circ$
 $\Rightarrow 3w + x + y = 180^\circ$
 $\Rightarrow 6x + x + y = 180^\circ$
 $\Rightarrow 7x + y = 180^\circ$
 $\Rightarrow 7y/3 + y = 180^\circ$
 $\Rightarrow 10y = 3 \times 180^\circ$
 $\Rightarrow y = 54^\circ$
3. (E) In this figure,
 a and d are Small angles, $a = d$
 b, c and e are Big angles, $b = c = e$
 $\therefore a + b + c + d + e = 2(d + e) + e = 2(180^\circ) + e = 360^\circ + e$
 We cannot determine the value of e, so this is undetermined.
4. (B) Let, the angles are $2x$, $3x$ and $4x$
 $2x + 3x + 4x = 180^\circ$
 $9x = 180^\circ$
 $x = 20^\circ$
 \therefore Largest angle $4x = 80^\circ$
5. (A) Let, the angle is x
 \therefore Its complement is $2x$
 Now, $x + 2x = 90^\circ$
 $\Rightarrow 3x = 90^\circ$
 $\Rightarrow x = 30^\circ$
6. (D) Let, the equal sides of the isosceles triangle is x
 Area = 32
 $\Rightarrow \frac{1}{2} \times \text{base} \times \text{height} = 32$
 $\Rightarrow \text{base} \times \text{height} = 64$
 $\Rightarrow x \cdot x = 64$
 $\Rightarrow x^2 = 64$
 $\Rightarrow x = 8$
 now, $(\text{hypotenuse})^2 = 8^2 + 8^2 = 128$
 $\therefore \text{hypotenuse} = \sqrt{128} = \sqrt{(64 \times 2)} = 8\sqrt{2}$

(E) We know, $\angle PRQ + \angle PRS = 180^\circ$

$$\Rightarrow \angle PRQ + 120^\circ = 180^\circ$$

$$\Rightarrow \angle PRQ = 60^\circ$$

Again, $\angle PRQ + \angle PQR + \angle QPR = 180^\circ$

$$\Rightarrow \angle QPR + 60^\circ + 30^\circ = 180^\circ$$

$$\Rightarrow \angle QPR = 90^\circ$$

So, ΔPQR is a $30^\circ-60^\circ-90^\circ$ right triangle with hypotenuse $QR = 6$

We know, in $30^\circ-60^\circ-90^\circ$ right triangle, the ratio of sides (opposite of angles) are $x, x\sqrt{3}$ and $2x$

$$\text{So, } 2x = 6 \therefore x = 3$$

$$\therefore PR = x = 3 \text{ (PR is opposite of the } 30^\circ \text{ angle)}$$

8. (A) Given, $\angle XYZ = \angle XZY$

So, this is an isosceles triangle as $XZ = XY$

$$\text{Area} = 48$$

$$\Rightarrow \frac{1}{2} \times \text{base} \times \text{height} = 48$$

$$\Rightarrow \text{base} \times \text{height} = 96$$

$$\Rightarrow 12 \times \text{height} = 96$$

$$\Rightarrow \text{Height} = 8$$

So, If we draw a perpendicular line from point X to line YZ it will have a length of 8.

Let us draw a perpendicular line XD

$$\text{Now, } XZ^2 = ZD^2 + XD^2$$

$$\Rightarrow XZ^2 = 6^2 + 8^2 = 100$$

$$\Rightarrow XZ = 10$$

Since this is isosceles triangle, $XY = 10$

$$\therefore 10 + 10 + 12 = 32$$

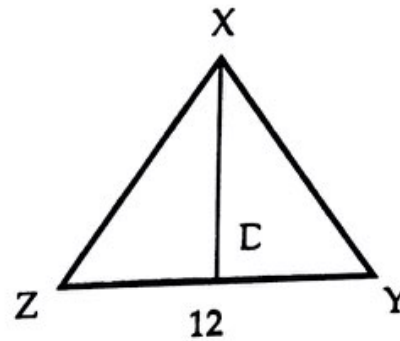
9. (A) $BC^2 = AB^2 + AC^2$

$$(2x-2)^2 = x^2 + (x+2)^2$$

$$\text{Or, } 2x^2 = 12x$$

$$\text{Or, } x = 6$$

Answer A.



10. (D) area of $\triangle ABC = \text{area of } \triangle ADE + \text{area of DEBC}$
 given, area of DEBC = 2 (area of $\triangle ADE$)
 $\therefore \text{area of } \triangle ABC = \text{area of } \triangle ADE + 2 (\text{area of } \triangle ADE)$
 $= 3(\text{area of } \triangle ADE)$

$$\therefore \frac{\text{area of } \triangle ABC}{\text{area of } \triangle ADE} = \frac{3}{1}$$

$$\therefore AC^2 : AE^2 = 3 : 1$$

$$\therefore AC : AE = \sqrt{3} : 1$$

Similar triangle. So the ratio is $1:\sqrt{3}$

Answer D

11. (C) Between $\triangle ACF$ and $\triangle BDC$,
 $\angle AFC = \angle DBC = 90^\circ$ and $\angle DCB$ is common
 So, $\triangle ACF$ and $\triangle BDC$ are similar

$$\therefore \frac{AC}{DC} = \frac{AF}{15}$$

$$\therefore AF = \frac{12 \times 15}{18} = 10$$

12. (B) $9x + 8x + 7x = 180$

$$\Rightarrow 24x = 180$$

$$\Rightarrow x = 7.5$$

$$\therefore \angle A = 8x = 8(7.5) = 60^\circ$$

13. (B)

14. (E) Since ABC is a right angle, and $AB = BC$, this is a isosceles triangle.

$$\text{So, } \angle BAC = \angle BCA = 45^\circ$$

$$\text{Since } BD \perp AC, \angle ABD = \angle CBD = 45^\circ$$

15. (E) Since $AB = AC$, $\angle B = \angle C$

$$\text{Now, } \angle A + \angle B + \angle C = 180$$

$$\Rightarrow \angle A + 2\angle B = 180$$

$$\Rightarrow 2\angle B = 180 - x$$

$$\Rightarrow \angle B = (180 - x)/2 = 90 - x/2$$

16. (D) $\angle A + \angle B + \angle C = 180$

$$\Rightarrow \angle B + \angle C = 180 - \angle A$$

$$\Rightarrow \angle B + \angle C = 180 - 70$$

$$\Rightarrow \angle B + \angle C = 110$$

$$\Rightarrow \frac{1}{2} (\angle B + \angle C) = 55$$

$$\Rightarrow \angle DBC + \angle DCB = 55$$

$$\text{Again, } \angle BDC + \angle DBC + \angle DCB = 180$$

$$\Rightarrow \angle BDC = 180 - 55 = 125^\circ$$

17. (B) $\triangle ADC$ is a right triangle
 $BC = 6$. Since $AB = AC$ and $AD \perp BC$, D is the midpoint of BC .

$$BD = DC = 3$$

Applying Pythagorean theorem,

$$AC^2 = AD^2 + DC^2$$

$$AD^2 = AC^2 - DC^2 = 5^2 - 3^2 = 16$$

$$\therefore AD = 4$$

18. (B) Given, $\triangle WXZ : \triangle WYZ = 7:2$

$$\therefore \frac{1}{2} \times WX \times WZ : \frac{1}{2} \times WY \times WZ = 7:2$$

$$\therefore WX : WY = 7:2$$

Let, $WX = 7x$ and $WY = 2x$

Now, $WX + WY = XY = 7x + 2x = 9x$

Given, $9x = 21$, $\therefore x = 21/9 = 7/3$

$$\therefore WY = 2(7/3) = 14/3$$

19. (E) Applying Pythagorean theorem, $(5x)^2 + BC^2 = 26^2$

$$BC^2 = 26^2 - 25x^2 = 676 - 25x^2$$

Again, $AB^2 = AC^2 + BC^2$

$$BC^2 = 30^2 - (9x)^2 = 900 - 81x^2$$

$$\therefore 676 - 25x^2 = 900 - 81x^2$$

$$\Rightarrow 56x^2 = 224$$

$$\Rightarrow x^2 = 4$$

$$\therefore BC^2 = 676 - 100 = 576 \therefore BC = 24$$

20. (B) $\angle DBA = 60^\circ$

$$\therefore \angle DBC = 120^\circ$$

$$\therefore \angle BDC = 180 - 120 - 30 = 30^\circ$$

$$\therefore \angle DBC = \angle BDC$$

So, $DB = BD = 4$

21. (B) যেহেতু $AC = AB$, তাই $\angle ACB = \angle ABC$

আবার $BD = AD$, তাই $\angle DBA = \angle DAB$

আবার $BC = BD$, তাই $\angle BDC = \angle BCD$

বহিঃস্থ $\angle BDC =$ বিপরীতে অন্তঃস্থ $\angle DAB + \angle DBA$

$$\text{এখন } 2x + 2x + x = 180^\circ$$

$$\text{বা } 5x = 180^\circ$$

$$\text{বা } x = 36^\circ$$

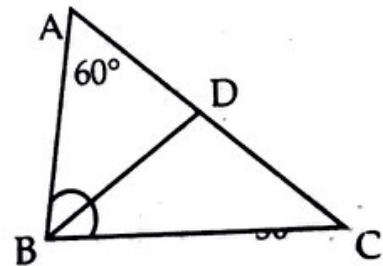
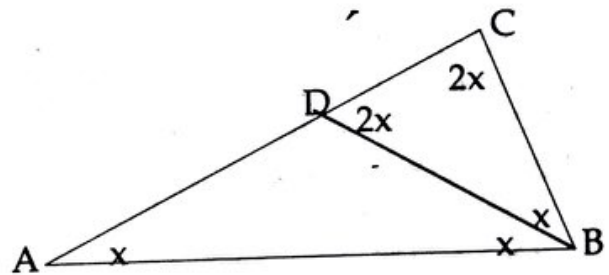
22. (A) i) true, কারণ triangle BDCএ বহিঃস্থ $\angle ADB =$ বিপরীত অন্তঃস্থ

$$\angle DBC + \angle DCB$$

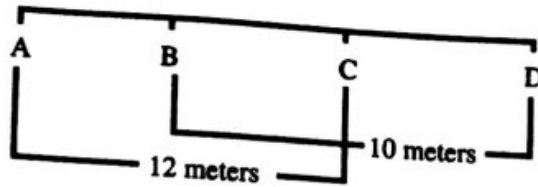
$$\text{বা, } \angle ADB - \angle DBC = \angle DCB = 50^\circ$$

ii) কখনোই সম্ভব নয়।

iii) হতেও পারে, আবার নাও হতে পারে। so must be true বলা যাবে না।



23. (E)



সুতরাং, statement A বা statement B কোনটাই যথেষ্ট নয় B এবং C এর দূরত্ব বের করার জন্য।
 24. (E) Triangle BAC তে Angle BCA একটি সমকোণ। CA = 6 এবং BA = 10
 Pythagoras এর উপপাদ্য অনুযায়ী, $AC^2 + BC^2 = AB^2$
 so, $6^2 + BC^2 = 10^2$
 so, = 8

Again, Triangle DEB তে Angle DEB একটি সমকোণ। DE = 6 এবং DB = 10
 Pythagoras এর উপপাদ্য অনুযায়ী, $DE^2 + EB^2 = DB^2$
 so, $6^2 + EB^2 = 10^2$
 so, = EB = 8

Trapezium DEBC তে BC এবং DE parallel এবং তাদের মধ্যে লম্ব দূরত্ব EB

$$\text{Area of trapezium DEBC} = \frac{1}{2} \times (BC+ED) \times EB = \frac{1}{2} \times (8+5) \times 12 = 78$$

$$\text{Area of triangle DEB} = \frac{1}{2} \times (12) \times 6 = 36$$

$$\text{so, area of triangle DCB} = 78 - 36 = 42$$

25. (D) Here, ABC is an equilateral triangle inscribed in the circle where O is the center of the circle.

$$\text{Now, } OA=OC=2$$

AB, BC and AC are all equal that's why these chords are creating equal Angles in the center which is 120 degree

Now, in triangle AOC angle = 120, OA=OC, So their opposite Angles are equal as well which would be 30 degree

If we draw a perpendicular line OD on AC, in right triangle ODC

$$ODC=90, OCD=30, COD=60 \text{ so if } OC=2 \text{ then } CD=\sqrt{3}$$

$$\text{So, } AC=2\sqrt{3} \text{ SO area of } ABC = \frac{\sqrt{3}}{4} \times (2\sqrt{3})^2 = 3\sqrt{3}$$

26. (C) Isosceles বলে triangle টির third side এর দৈর্ঘ্য 3 বা 9 হবে। যেহেতু triangle এর দুটি বাহুর সমষ্টি তৃতীয় বাহুর অপেক্ষা বৃহত্তর হতে হয় তাই third side টি হবে 9 (because $3+9 > 9$)।

27. (B) ধরি, $BC=x$ so, $AB=2x$

$$\text{তাহলে, } 0.5 \times 2x^2 = 125$$

$$\text{Or, } x^2 = 125$$

$$\text{Or, } x = 5\sqrt{5}$$

$$BC = 5\sqrt{5} \quad AB = 10\sqrt{5}$$

$$\text{So, } AC^2 = 125 + 500$$

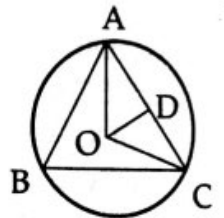
$$AC = 25$$

28.

(A)

18

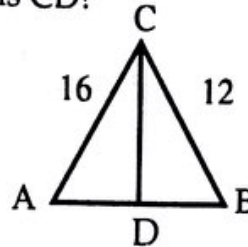
If we take the first three even integers - 2, 4, 6, we can't form a triangle, since $6 = 2 + 4$. But if we take 4, 6, 8, a proper triangle can be formed. So the smallest perimeter of the triangle = $4 + 6 + 8 = 18$



Exercise 1. 2: Angles, Triangles

1. One angle of a triangle is four times the second angle and the third angle is 6 degrees more than the second angle. The second angle, in degrees, is
 A. 29 B. 30 C. 35 D. 40 E. 41
 (BBA 93-94)
2. ABC is a right triangle. Angle $ACB = 90^\circ$, $AC = 16$, $BC = 12$. CD is perpendicular to AB. How long is CD?
 (BBA 94)

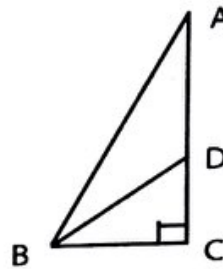
- (A) 9.0 (B) 20.0 (C) 9.6
 (D) 10.58 (E) cannot be determined



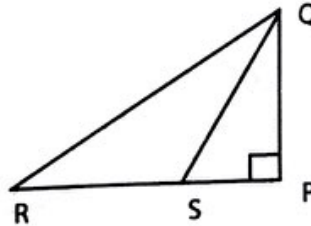
3. Consider two similar right triangles. The first with sides of length 3, 4, 5 and the second with a hypotenuse of length 7.5. The lengths of the remaining two sides of the second triangle are
 (BBA 94)
 (A) 4.5 & 5.5 (B) 5.5 & 6.0 (C) 4.5 & 6.0 (D) 3.5 & 4.5 (E) Cannot be determined

4. In the figure below, $BD = 2DC$ and $AD = BD$. What is the value of AB?
 (BBA 94-95)

- (A) $BC + DC$ (B) $2BD$ (C) $2BC$
 (D) $(BD^2 + DC^2)$ (E) None of these.



5. The area of the following right angle triangle PQR is 36 units. If $PQ = 4$ and $SQ = 5$. what is the area of the triangle SQR?
 (BBA 96-97)



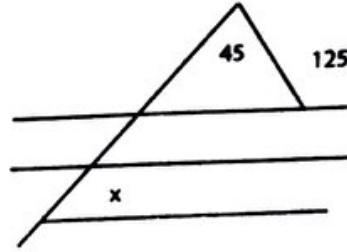
- (A) 30 (B) 24 (C) 20 (D) 18 (E) 16

6. The sides of a triangle are 6 cm, 7 cm and 8 cm. The shortest side of a similar triangle is 2 cm. What would be the length of the other two sides?
 (BBA 96-97)
 (A) 3, 4 (B) $5/3, 7/3$ (C) $7/3, 8/3$ (D) $9/3, 11/3$ (E) none of these

7. If each angle of a regular polygon is 162° . how many sides does it have?
 (BBA 96-97)
 (A) 20 (B) 16 (C) $(1-a)/b$ (D) 10 (E) none of these

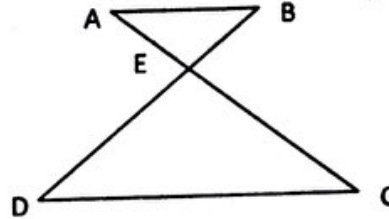
8. In the following diagram. All the angles are expressed in degrees. What is the value of x ? (BBA 96-97)

- (A) 55 (B) 45 (C) 80
(D) 100 (E) 125



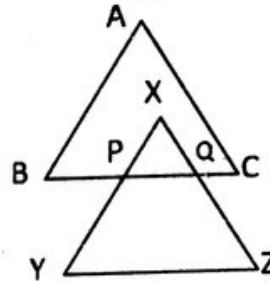
9. In the figure $CD = 2AB$ and AB is parallel to CD . If the area of ABE is 3, what is the area of CED ? (BBA 97-98)

- (A) 12 (B) 9 (C) 6
(D) 2 (E) none of these



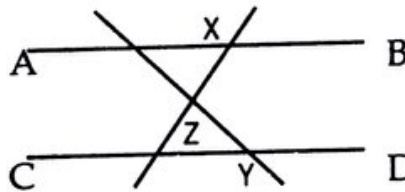
10. In the figure below, triangle ABC and XYZ are equilateral triangles. YZ is parallel to BC . $BC=4$. $QC = 1$ and $BP = 2$ unit. The perimeter of the triangle XPQ is: (BBA 97-98)

- (A) 5 (B) 4 (C) 3
(D) 2 (E) none of these.



11. In the figure, AB is parallel to CD . $\angle X$ is 130° and $\angle Y$ is 150° . What is the value of $\angle Z$? (BBA 97-98)

- (A) 110 (B) 100 (C) 90
(D) 60 (E) none of these

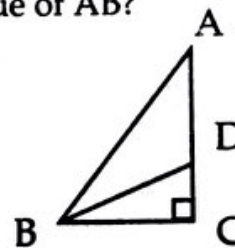


12. A certain triangle has sides that are respectively 6, 8 and 10 inches long. A rectangle equal in area to that of the triangle has a width of 3 inches. What is the perimeter of the rectangle? (BBA 97-98)

- (A) 24 (B) 22 (C) 16 (D) 11 (E) none of these

13. In the figure. $BD = 2DC$ and $AD = DB$. What is the value of AB ? (BBA 97-98)

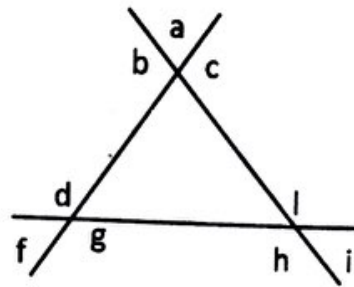
- (A) $\sqrt{BD^2 + DC^2}$ (B) $\sqrt{3} BD$ (C) $BC + DC$
(D) $2BC$ (E) None of these



14. In the figure below, what is the sum of the nine angles labeled with letters?

(IBA BBA 97-98)

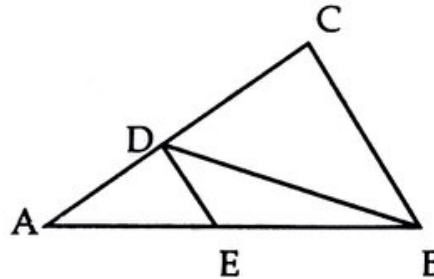
- (A) 990° (B) 900° (C) 840°
 (D) 720° (E) indeterminate



15. In the figure below, triangle ADE is an equilateral triangle, If $DC = AB + BE$ and $AC = 3$ inches, what is the value of AB?

(BBA 97-98)

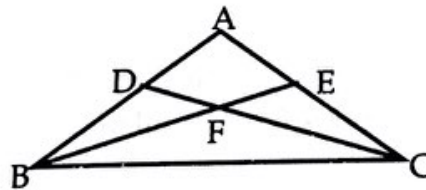
- (A) 2.5 (B) 2 (C) 1.5
 (D) 1 (E) None of these



16. In the figure below, D is the mid point of AB and E is the mid point of AC. What is the relation between the area of BFC and the area of ADFE?

(BBA 98-99)

- (A) Area BFC > Area ADFE
 (B) Area BFC = Area ADFE
 (C) Area ADFE > Area BFC
 (D) Area ADFE = 1.5 times Area BFC
 (E) Either (A) or (C)



17. In the figure, $AD \parallel BC$, $AB = 5$ cm and $AD = 7$ cm. If $\angle BCD = \frac{1}{2} \angle BAD$, what is the length of BC in cm?

(BBA 99-00)

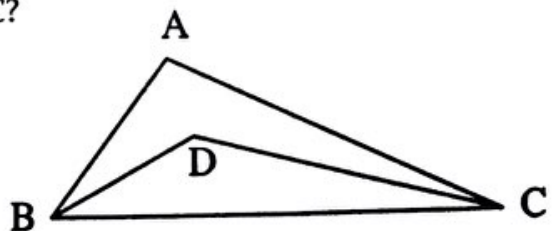


- (a) 10 (b) 12 (c) 17 (d) 19 (e) can't be determined

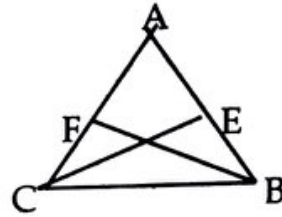
18. In the figure below, angle ABD = angle DBC and angle ACD = angle DCB. If angle BAC = 70° , what is the value of angle BDC?

(BBA 99-00)

- (a) 55° (b) 70° (c) 90°
 (d) 125° (e) can't be determined



19. In triangle ABC, angle AFB = angle AEC = 90°. If BF = CE, which of the following must be true? (BBA 99-00)



- (a) $AB = AC$ (b) $AE = CE$ (c) $BF = AF$
 (d) $AB = BC$ (e) none of these

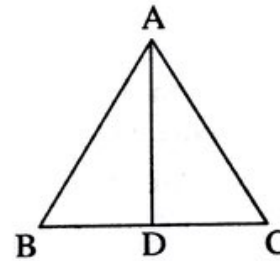
20. Which of the following could be the area of an isosceles triangle with perimeter 18 and one side of length 8? (BBA 00-01)

- A. 6 B. 12 C. $6\sqrt{3}$ D. 16 E. 18

21. X lives 4 kilometers west of Y's house, Z lives 6 kilometers north of Y's house and 4 kilometers west of T's house. What is the straight line distance in kilometers from X's house to T's house? (BBA 00-01)

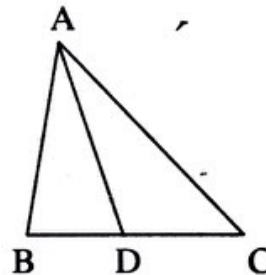
- A. 4 B. 5 C. 8 D. 10 E. 12

22. In the figure below $AB = AC$ and D is the mid point of BC. Which of the following can be a possible value of $\angle ABD$? (BBA 99-00)



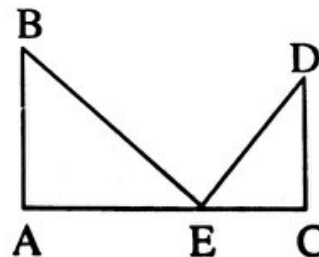
- (i) 70° (ii) 90° (iii) 120°
 A. Only (i) B. only (ii) C. only (iii)
 D. both (ii) and (iii) E. all of these

23. In the figure below. AB is perpendicular to BC and $DB = DC$. If $AD = \sqrt{10}$ and $AC = 4$ cm. what is the value of BC? (BBA 00-01)



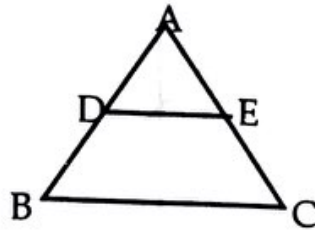
- A. $2\sqrt{2}$ B. 3 C. $3\sqrt{2}$
 D. 4 E. none of these

24. In the figure below AB and CD are perpendiculars on AC. If $\angle BED$ is 100 and $EC = CD$. What is the value of $\angle ABE$? (BBA 00-01)



- A. 45° B. 50° C. 55°
 D. 60° E. none of these

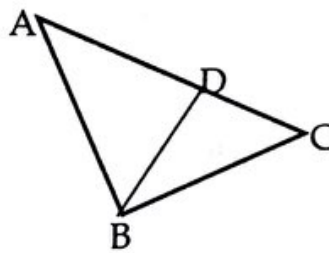
25.



The area of the ABC triangle is 40 sq. cm. D is the midpoint of AB and E is the mid point of AC. What is the area of the triangle ADE? (BBA 01-02)

- A. 20 B. 12 C. 10 D. 8 E. none of these

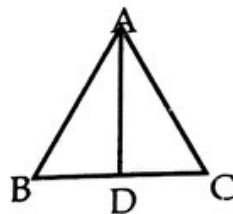
26.



In the triangle, $\angle ABC = 90^\circ$ and $AD = DC$. If $BD = 2$ cm. calculate the length of AC. (BBA 01-02)

- A. $4\sqrt{2}$ B. 8 C. $2\sqrt{2}$ D. 4 E. none of these

27.

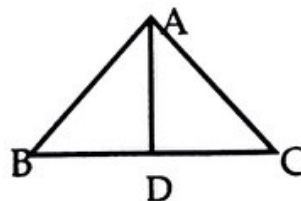


ABC is an equilateral triangle. D is the mid point of BC. $AD = 9$ cm. Calculate the area of ΔABC in sq. cm. (BBA 01-02)

- A. 24 B. $27\sqrt{3}$ C. $18\sqrt{3}$ D. $24\sqrt{3}$ E. none of these

28. $\angle BCA = 30^\circ$; $\angle BAC = 110^\circ$ and $AD = BD$. What is the value of $\angle DAC$? (BBA 02-03)

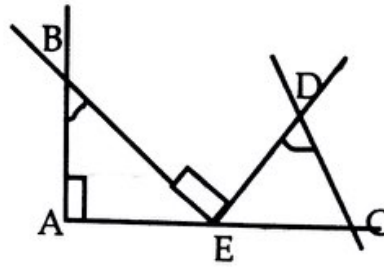
- A. 75° B. 85° C. 70°
D. 80° E. none of these



29. $\angle ABE = 25^\circ$ and $\angle EDC = 100^\circ$. What is the value of $\angle DCE$?

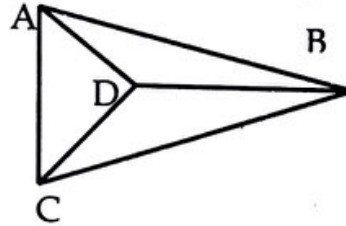
(BBA 02-03)

- A. 25° B. 30° C. 45°
 D. 65° E. none of these



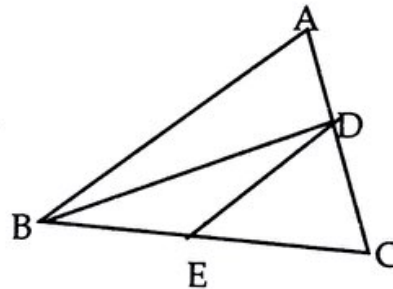
30. In the figure, $AD = DB = CD$. If $\angle DCB = 30^\circ$ and $\angle ABD = 50^\circ$ calculate $\angle DCA$. (BBA 03-04)

- (A) 10° (B) 20°
 (C) 45° (D) 60°
 (E) None of these



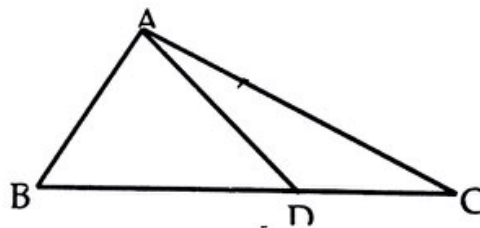
31. In the figure, DE is parallel to AB. $\angle BAC = 50^\circ$, $\angle BDE = 25^\circ$ and $\angle DBE = 35^\circ$. Calculate $\angle DCE$. (BBA 03-04)

- (A) 45° (B) 55° (C) 60°
 (D) 70° (E) none of these



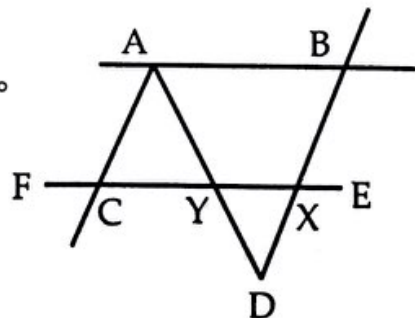
32. In the figure $AB = AD = CD$. $\angle BAD = 70^\circ$ Which of the following must be true? (BBA 03-04)

- I. $AB + AD > AC$
 II. $BD > DC$
 III. $BD < DC$
 (A) Only I (B) only III (C) I and II
 (D) I and III (E) II and III



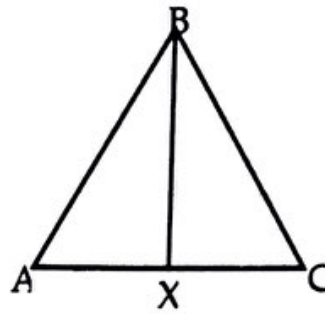
33. In the figure, AC is parallel to BD and AB is parallel to FE. If $\angle BXE = 50^\circ$ and AD bisects $\angle FAB$, find $\angle ADB$. (BBA 03-04)

- (A) 50° (B) 60° (C) 65°
 (D) 70° (E) none of these



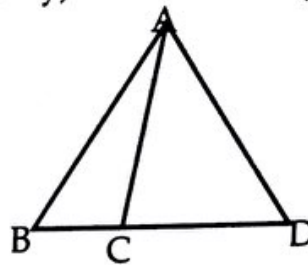
34. In the figure, $AB=5$ cm, $BC=4$ cm and $AC=7$ cm. If BX bisects $\angle ABC$, calculate the length of AX . (BBA 04-05)

- (A) $35/9$ (B) $7/9$ (C) $2/7$
 (D) 4 (E) none of these



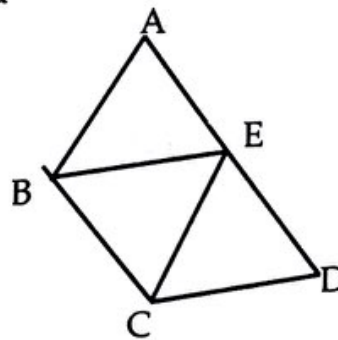
35. In the figure, $\angle ABC = x^\circ$, $\angle ADC = (y-30)^\circ$ and $\angle CAD = (3x-2y)^\circ$. Given that $AC=BC$, calculate $(5x-y)$ (BBA 04-05)

- (A) 210 (B) 220 (C) 240
 (D) 360 (E) none of these



36. ABE is an equilateral triangle, $\angle BEC=48^\circ$ and $BE=EC=ED$. Calculate the size of $\angle BCD$. (BBA 04-05)

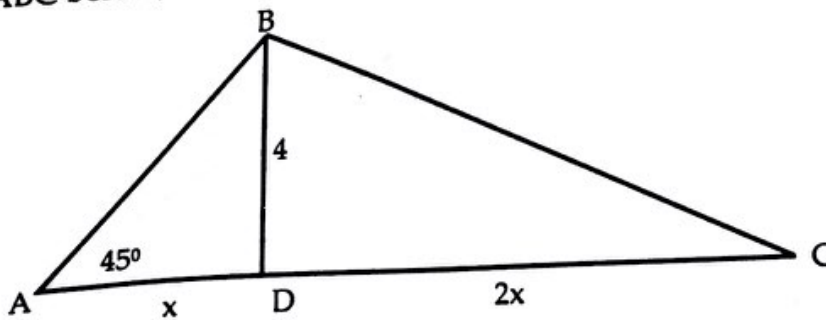
- (A) 120 (B) 135 (C) 140
 (D) 60 (E) none of these



37. A house is 40 ft high. A ladder is inclined on the house keeping its foot 30ft away from the house and its top touches the roof of the house. What is the length of the ladder? (BBA 05-06)

- (A) 70 ft (B) 1200 ft (C) 50 ft (D) 35 ft (E) None of these

38. In triangle ABC below, what is the length of the side AC? (BBA 05-06)



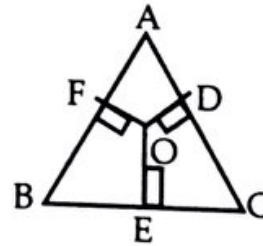
- (A) 24 (B) 18 (C) 12 (D) 10 (E) None of these

39. ABC is a triangle where $\angle ABC = 100^\circ$ and $AB = BC$, find the measure of $\angle BAC$. (BBA 05-06)
- (A) 80° (B) 60° (C) 40° (D) 20° (E) None of these

40. If the degree measures of the angles of a triangle are in the ratio of 3:4:5, what is the measure of the smallest angle in degrees? (BBA 05-06)
- (A) 15° (B) 30° (C) 45° (D) 60° (E) None of these

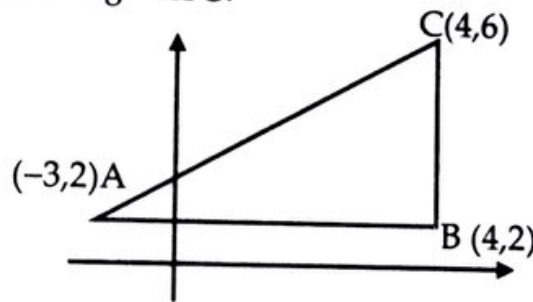
41. ABC is an equilateral triangle. O is any point inside the triangle. If $OD = 3$ cm, $OE = 7$ cm and $OF = 5$ cm, calculate the area of the triangle. (BBA 08-09)

- (A) $75\sqrt{3}$ (B) $225/2$ (C) $30\sqrt{3}$
 (D) $225\sqrt{3}$ (E) none of these



42. In the figure, what is the area of the triangle ABC? (BBA 08-09)

- (A) 14 (B) 16 (C) 24
 (D) 28 (E) none of these



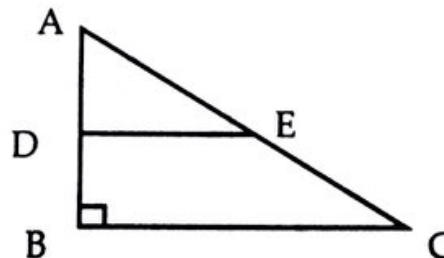
43. The longest side of an isosceles right triangle measures 16 m. What is the perimeter of the triangle? (BBA 09-10)

- A) $32 + 2\sqrt{2}$ m (B) $32 + 16\sqrt{2}$ m (C) $16 + 16\sqrt{2}$ m (D) $32 + \sqrt{2}$ m (E) $48\sqrt{2}$

44. Find out the perimeter of an equilateral triangle if its area is $64\sqrt{3}$ m². (BBA 09-10)

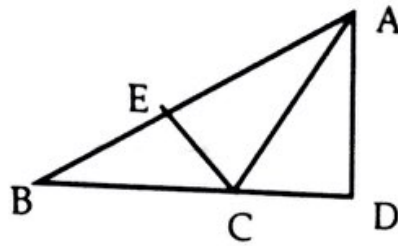
- A) $32\sqrt{3}$ m (B) 48 m (C) 36 m (D) 32 m (E) none of these

45. In the figure below, DE is parallel to BC. $AD = DB = 3$ and $DE = 4$. What is the area of the quadrilateral DBCE? (MBA 96-97)



- (A) 18 (B) 12 (C) 20 (D) 16 (E) none of these

In the figure below, $BC = 4$, $AB = 6$ and $AD = 3$ units & $\angle AEC = 90^\circ$. What is the value of EC ? (MBA 96-97)



- (A) 2.4 (B) 2 (C) 1.5 (D) 1 (E) none of these

The angles of a triangle are in the proportion of 1:2:3 and the length of the smallest side is 1. What is the length of the longest side of the triangle? (MBA 96-97)

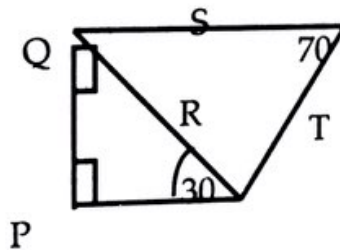
- (A) 4 (B) 5 (C) 2 (D) 3 (E) none of these

Which three lines could not construct a triangle? (MBA 97-98)

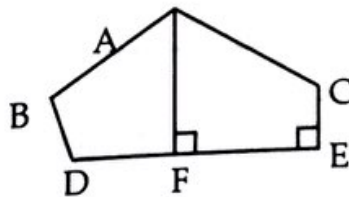
- a. 45cm, 46cm, 44cm b. 24cm, 27cm, 23cm c. 25cm, 13cm, 12cm
 d. 15cm, 16 cm, 17cm e. 33cm, 39cm, 37cm

In the figure below, which is the longest arm? (MBA 97-98)

- a. T
 b. S
 c. R
 d. Q
 e. P

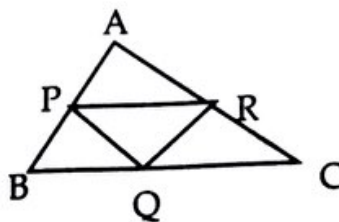


In the figure, $AB = AC$ and $\angle A$ is 60° . AF bisects $\angle A$. If $\angle D$ is 100° , what is the value of $\angle B$? (MBA 97-98)



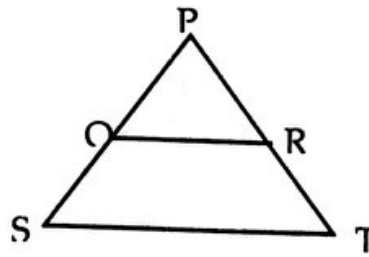
- a. 140
 b. 130
 c. 120
 d. 100
 e. None

In ΔABC , point P, Q & R are midpoints. If $AB = 10$, $AC = 15$ & $BC = 17$, What is the perimeter of the ΔPQR ? (MBA 97-98)



- a. 21
 b. 16
 c. 14
 d. 10
 e. Can't be determined

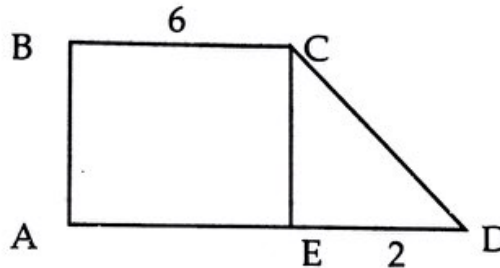
52. In the figure, QR is parallel to ST and $PQ > PR$. If $\angle T$ is 35° , which of the following can be a value of $\angle PQR$? (MBA 97-98)



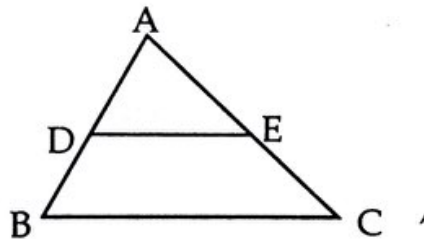
- I. 25
- II. 30
- III. 35

- a. only I b. only II c. only III d. both I & II e. both II & III

53. ABCD has an area equal to 28 sq. cm. BC is parallel to AD, BA is perpendicular to AD. If BC is 6 cm. and AD is 8 cm., what is the length of CD? (MBA 98-99)



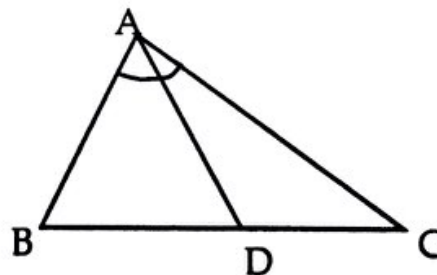
- (A) $2\sqrt{5}$
- (B) $2\sqrt{2}$
- (C) 2
- (D) 6
- (E) none of these



54. In the figure $AB = AC$ and DE is parallel to BC. If $\angle ABC = 70^\circ$, what is the value of $\angle DEC$? (MBA 98-99)
- (A) 140°
 - (B) 120°
 - (C) 110°
 - (D) 80°
 - (E) none of these

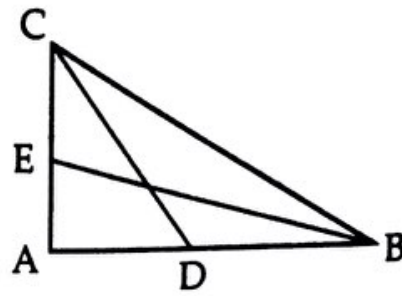
55. In the figure, if $AD = BD = DC$, what is the value of $\angle BAC$? (MBA 98-99)

- (A) 70°
- (B) 80°
- (C) 90°
- (D) 100°
- (E) none of these

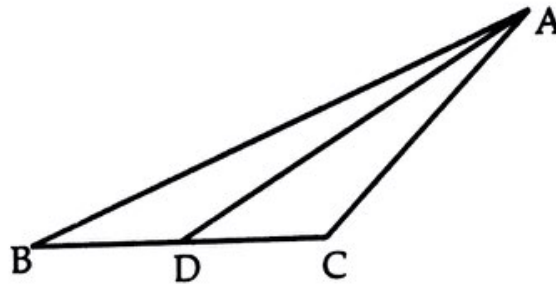


56. In the figure, E is the mid point of AC. AC is perpendicular to AB & AD = DB. If BC = 4 cm, what is the value of $BE^2 + CD^2$? (MBA 98-99)

- (A) 25
- (B) 24
- (C) 20
- (D) 16
- (E) none of these



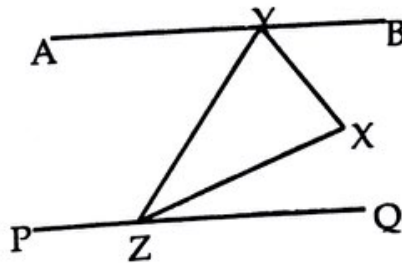
57. In the figure, $BD = AD$, $DC = AC$ and $\angle ACB = 120^\circ$. What is the value of $\angle ABC$? (MBA 99-00)



- A. 15°
- B. 20°
- C. 25°
- D. 30°
- E. none

58. In the figure, $AB \parallel PQ$. $\angle XYB = 40^\circ$ and $\angle XZO = 35^\circ$. What is the value of $\angle YXZ$? (MBA 99-00)

- A. 60°
- B. 75°
- C. 85°
- D. 90°
- E. none of these

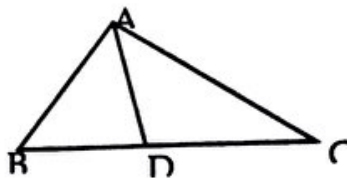


59. In triangle ABC, $AB = AC$. All of the following statements are true except. (MBA 00-01)

- A. $AB < AC + BC$
- B. $AC < AB + BC$
- C. $BC < AB + AC$
- D. $AC + BC = AB + BC$
- E. $BC + AC > AB + BC$

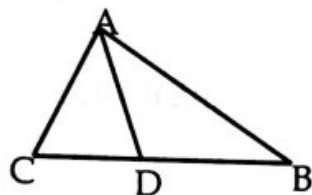
60. Referring to the figure below, $\angle BAC = 90^\circ$ and D is the midpoint of BC. If $BC = 10$ cm, what is the value of AD in cm? (MBA 00-01)

- A. 3
- B. 4
- C. 5
- D. $5\sqrt{2}$
- E. None of these



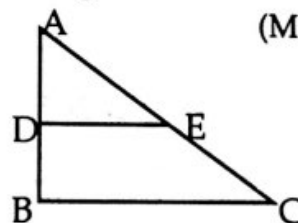
61. A triangular plot with sides 28 meters, 35 meters, & 56 meters is to be surrounded by a fence built on posts set 7 meters apart. After posts are placed at each corner, how many more additional posts will be needed?
 A. 14 B. 15 C. 16 D. 17 E. 20
 (MBA 00-01)

62. In the figure, $AD = DB = CD$. If $\angle ABD = 25^\circ$, $\angle ACD = ?$
 (MBA 00-01)



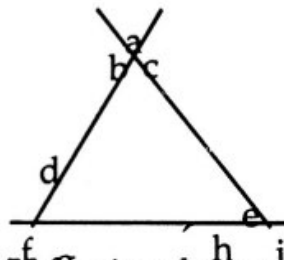
- A. 50° B. 65° C. 70° D. 75° E. none of these

63. In the figure on the right, ABC is a right angled, isosceles triangle. If $BC = x$ and $DE = y$, what is the area of the plot DBCE?
 (MBA 01-02)



- A. $(x^2 - y^2)/2$ B. $(x^2 + y^2)/2$ C. $(x^2 + xy)/2$
 D. $(x^2 - y^2)/4$ E. none of these

64. In the figure below, what is the sum of the angles labeled g, h and c?
 (MBA 01-02)

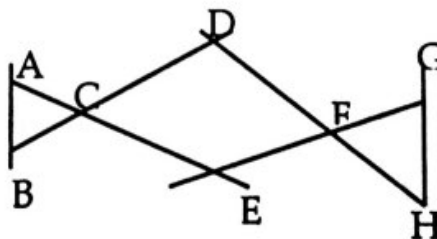


- A. 180° B. 240° C. 360°
 D. 900° E. indeterminate

65. A triangular plot with sides of 25 feet, 40 feet, and 55 feet is to be surrounded by a fence built on pillars set 5 feet apart. How many pillars will be required to surround the plot?
 (MBA 02-03)

- A. 21 B. 22 C. 23 D. 24 E. none of these

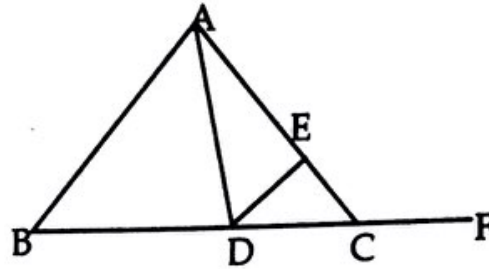
66. ABC is an equilateral triangle. If $\angle FGH = 50^\circ$. $FG = FH$, $BD = AE$ and $DH = EG$, what is the value of $\angle CDF$?
 (MBA 02-03)



- A. 80° B. 90° C. 100°
 D. 110° E. none of these

67. The area of the triangle ABC is 40sq. cm. D is the mid point of BC and E is the mid point of AC. If $AD = 4\sqrt{2}$ cm, what is the area of the triangle ADE in sq. cm? (MBA 02-03)

- A. 10 B. $10\sqrt{2}$ C. 12
 D. $12\sqrt{2}$ E. none of these

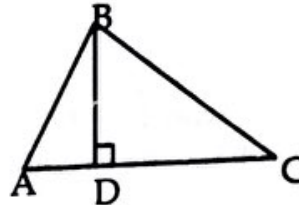


68. B and C are points on a straight line AD, where $AB = BC = CD$. What percent of AC is AD? (MBA 02-03)

- A. 1.5% B. 50% C. 66.67% D. 133.33% E. 150%

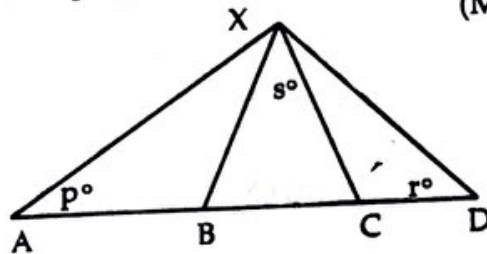
69. In the figure, $\angle BAC = 45^\circ$, $BD = 4$ cm and $DC = 2AD$. What is the length of the side AC? (MBA 02-03)

- A. 24 B. 18 C. 12
 D. 8 E. none of these



70. Streets L, M, and N are straight and level, and they intersect to form a triangle. If streets L and M intersect at a 40° angle and if street N is perpendicular to street M, at what acute angle do streets L and N intersect? (MBA 03-04)

- (A) 30° (B) 35° (C) 40°
 (D) 45° (E) 50°

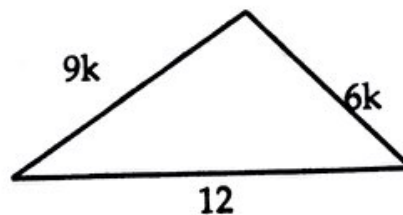


71. If $AB = BX$ and $XC = CD$ in the figure above, what is s in terms of p and r ? (MBA 03-04)

- (A) $180 - 2(p + r)$ (B) $p + r - 90$ (C) $2(p + r)$ (D) $p + r$ (E) none of these

72. If the length of the longest side of the triangle shown below is 36, what is the perimeter of the triangle? (MBA 03-04)

- (A) 51 (B) 63 (C) 81
 (D) 108 (E) 162

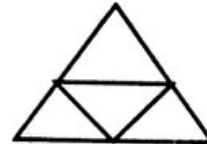


73. City B is 5 miles east of City A. City C is 10 miles southeast of City B. Which of the following is the closest distance from City A to City C? (MBA 03-04)

- (A) 15 miles (B) 12 miles (C) 13 miles (D) 14 miles (E) none of these

74. The figure below is an equilateral triangle divided into four congruent, small, equilateral triangles. If the perimeter of a smaller triangle is 1, what is the perimeter of the larger triangle? (MBA 03-04)

- (A) 2 (B) 4 (C) 6
(D) 8 (E) 16



75. Rini lives 4 kilometers due west of Panna's house. Anni lives 6 kilometers due north of Panna's house and 4 kilometers due west of David's house. What is the straight line distance, in kilometers, from Rini's house to David's house? (MBA 04-05)

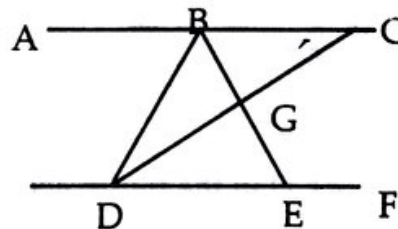
- A) 4 B) 5 C) 8 D) 10 E) 12

76. Danesh and Sham, who live 10 miles apart, meet at a café that is directly north of Danesh's house and directly east of Sham's house. If the café is 2 miles closer to Danesh's house than to Sham's house, how many miles is the café from Sham's house? (MBA 05-06)

- (A) 6 (B) 7 (C) 8 (D) 9 (E) 10

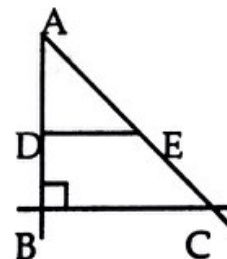
77. The straight lines ABC and DEF are parallel, with $DB = BE$. $\angle ABD = 70^\circ$ and $\angle BDG = 25^\circ$. What is the value of $\angle BGC$? (MBA 07-08)

- A) 60 (B) 65 (C) 66
(D) 72° (E) None of these



78. In the triangle ABC, $\angle ABC = 90^\circ$ and DE is parallel to BC. $AD = DB = 3$ cm, $DE = 4$ cm; what is the area of BCDE in sq. cm.? (MBA 08-09)

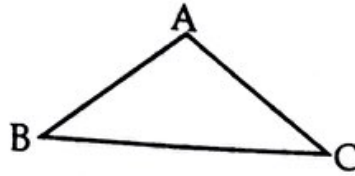
- (A) 18 (B) 24 (C) 27.5
(D) 32 (E) none of these



79. In the figure $AB = AC = 4$ cm and $\angle BAC = 120^\circ$. Find the area of the triangle.

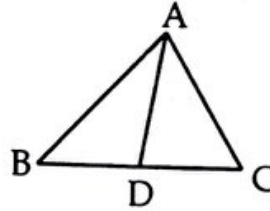
(MBA 08-09)

- (A) $8\sqrt{12}$ (B) $4\sqrt{12}$ (C) $2\sqrt{12}$
 (D) 16 (E) none of these



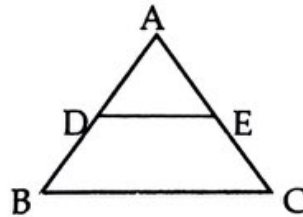
80. In the figure, AD is the bisector of $\angle BAC$. If $AB = 8$ cm, $BD = 5$ cm and $DC = 4$ cm, what is the length of AC in cm?
 (MBA 08-09)

- (A) 6 (B) 7.2 (C) 10
 (D) 12 (E) none of these



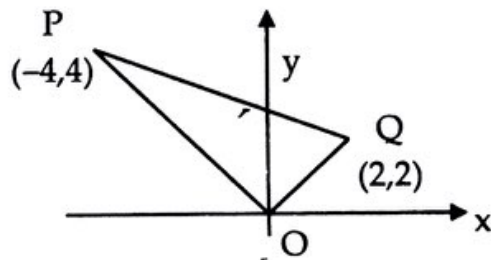
81. In the figure DE is parallel to BC. If $DE = 4$ cm, and $BC = 8$ cm, and triangle ADE = 25 sq.cm. Find the area of ABC in sq.cm.
 (MBA 08-09)

- (A) 100 (B) 50 (C) 200
 (D) 136 (E) none of these



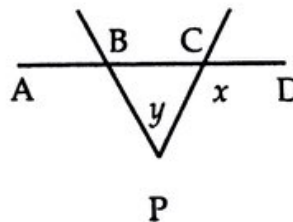
82. In the figure below, the angle POQ is 90 degrees. What is the perimeter of the triangle OPQ?
 (MBA 10-11)

- A. $4\sqrt{2}$ B. $8\sqrt{2}$ C. $6+2\sqrt{5}$
 D. $2\sqrt{10}$ E. None of these



83. In the figure right, if $CP = BP$ and $x = 120^\circ$, then $y = ?$
 (MBA 10-11)

- A. 30° B. 45° C. 60°
 D. 75° E. None of these



Answer Key Exercise 1.2

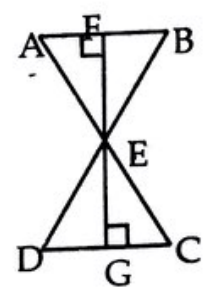
1.A	2.C	3.C	4.C	5.A	6.C	7.A	8.	9.A	10.C
11.B	12.B	13.B	14.B	15.C	16.B	17.B	18.D	19.A	20.B
21.D	22.A	23.A	24.C	25.C	26.D	27.B	28.C	29.E	30.A
31.D	32.C	33.C	34.A	35.A	36.A	37.C	38.C	39.C	40.C
41.A	42.A	43.C	44.B	45.A	46.B	47.C	48.C	49.B	50.A
51.A	52.D	53.A	54.C	55.C	56.C	57.A	58.B	59.E	60.C
61.A	62.B	63.A	64.C	65.D	66.D	67.A	68.E	69.C	70.A
71.A	72.C	73.D	74.A	75.D	76.C	77.B	78.A	79.C	80.E
81.A	82.E	83.C		-	-	-	-	-	-

Solution to Exercise 1.2 Angles, Triangles

1. (A) Second angle = $(x)^\circ$ First angle = $(4x)^\circ$ Third angle = $(x + 6)^\circ$
 এখন, $(x + 4x + x + 6)^\circ = 180^\circ$ [Δ এর 3 কোণের সমষ্টি 180°]
 $\Rightarrow 6x = 174 \Rightarrow x = \frac{174}{6} \Rightarrow x = 29^\circ$
2. (C) $AC : CB = 16 : 12 = 4 \times 4 : 4 \times 3 = 4:3$; \therefore সমকোণী ত্রিভুজে দু'বাহু 4:3 হওয়াতে অতিভুজ 5 হবে। $\therefore AB = 5 \times 20$ ত্রিভুজের ক্ষেত্রফল বের করার formula থেকে পাওয়া যায়, $(1/2) \times AC \times CB = (1/2) \times CD \times AB$; $\Rightarrow 16 \times 12 = CD \times 20$; $\Rightarrow CD = 9.6$.
3. (C) similar triangles (সদৃশ ত্রিভুজ) হওয়াতে তাদের বাহুগুলির অনুপাত সমান হবে। অর্থাৎ $\frac{3}{x} = \frac{4}{y} = \frac{6}{7.5}$ [x, y হলো অজানা বাহু দুটি] $\therefore x = 4.5, y = 6$
4. (C) ধরি, $DC = 1$, অতএব, $BD = AD = 2 \therefore BC = \sqrt{3}$
 অর্থাৎ, $AB^2 = AC^2 + BC^2 = (AD + DC)^2 + BC^2 = (2+1)^2 + (\sqrt{3})^2 \Rightarrow AB^2 = 12$
 $\Rightarrow AB = \sqrt{12} = 2\sqrt{3} = 2BC$
5. (A) ΔPQS - এ $PQ = 4$ এবং $SQ = 5$ হওয়াতে $PS = 3$, $\frac{1}{2} PQ \cdot PR = 36 \Rightarrow \frac{1}{2} 4 \cdot (PS + RS) = 36 \Rightarrow 3 + RS = 18 \Rightarrow RS = 15$. So, $\Delta QRS = \frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times RS \times PQ = \frac{1}{2} \times 15 \times 4 = 30$
6. (C) $2/6 = y/7 = z/8 \therefore y = 7/3, z = 8/3$
7. (A) Formula for total of interior angles of polygon = $180(n-2) \therefore 162 \times n = 180(n-2) \Rightarrow 180n - 162n = 180 \times 2 \Rightarrow 18n = 180 \times 2 \therefore n = 20$

8. Question এ ভুল হলো যে, ছবিতে যদিও তিনটা রেখাকে parallel দেখা যাচ্ছে, আসলেই ওগুলো parallel নাকি, question এ সে ব্যাপারে কিছুই বলা হয়নি। So, the value cannot be determined.

9. (A) ছবিটা আঁকা যাক, সেখানে GF হলো AB এবং CD এর উপর লম্ব;
 এখন ΔABF ও ΔEGC এর মধ্যে $\angle AFE = \angle EGC = 90^\circ$; $\angle FAE = \angle GCE =$ একান্তর \therefore ত্রিভুজদ্বয় সদৃশ। $\therefore \frac{EG}{EF} = \frac{EC}{EA} = \frac{EC}{EA}$ ----- (1)

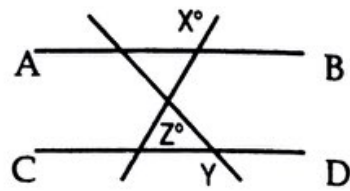


একইভাবে দেখানো যাবে, ΔABE এবং ΔECD সদৃশ। $\therefore \frac{CD}{AB} = \frac{EC}{EA}$ ----- (2)

আবার, দেয়া আছে; $\frac{CD}{AB} = 2$ ----- (3) \therefore (1), (2) ও (3) থেকে $\frac{EG}{EF} = 2 \Rightarrow \frac{EG}{2} = EF$,

আবার, সহজেই বোঝা যায়, AEB এ EF হলো EC থেকে ভূমি AB এর উপর আঁকা উচ্চতা এবং তদ্রূপ, EG হলো ΔDCE এর ভূমি DC এর উপর উচ্চতা। এখন, দেয়া আছে, $\frac{1}{2} \times AB \times EF = 3 \Rightarrow EF \times AB = 6$ এখন, ΔCED এর area = $\frac{1}{2} \times EG \times CD = (EG/2) \times 2AB = 2 \times EF \times AB = 2 \times 6 = 12$.

10. (C) $PQ = BC - BP - QC = 4 - 2 - 1 = 1$. আবার, $\angle YXZ = 60^\circ$; $BC \parallel YZ$ হওয়াতে $\angle XPQ = \angle PYZ = 60^\circ$ এবং $\angle XCP = \angle XZY = 60^\circ$. [কোণগুলি অনুরূপ কোণ] $\therefore \Delta XPQ$ একটি সমবাহু ত্রিভুজ। ΔXPQ এর perimeter = $PQ + QX + XP = 1 + 1 + 1 = 3$



11. (B) ছবি এঁকে নিনঃ

$$y = p = 150^\circ$$

$$\text{Now, } x + p + q = 360^\circ \Rightarrow 130 + 150 + q = 360^\circ \Rightarrow q = 80^\circ$$

$$\text{Now, } q + z = 180 \Rightarrow 80 + z = 180 \Rightarrow z = 100$$

12. (B) $6 : 8 : 10 = 3 : 4 : 5$ হওয়াতে triangle টা একটা right (সমকোণী) triangle. $\therefore \text{area} = \frac{1}{2} \times 6 \times 8 = 24$. $\therefore \text{length of rectangle} = 24/3 = 8$, $\therefore \text{perimeter of rectangle} = 2(8 + 3) = 22$

13. (B) $BD = 2DC$ হওয়াতে ΔBCD একটি $30^\circ - 60^\circ - 90^\circ$ ত্রিভুজ, যার $\angle CBD = 30^\circ$; $\angle BDC = 60^\circ$ এবং $BC = \sqrt{3}DC$. $\therefore \angle BDA = 180^\circ - 60^\circ = 120^\circ$; $\therefore \angle DBA = \angle DAB = \frac{180^\circ - 120^\circ}{2} = 30^\circ$; $\angle CBA = \angle CBD + \angle DBA = 30^\circ + 30^\circ = 60^\circ$. $\therefore \Delta ACB$ হলো একটা $30^\circ - 60^\circ - 90^\circ$ ত্রিভুজ। এখন, $AB^2 = BC^2 + AC^2 = BC^2 + (CD + AD)^2 = BD^2 + BD^2 + BD$. $BD = 3 \cdot BD^2$. $\therefore AB = \sqrt{3}BD$

14. (B) ছবি আঁকা যাকঃ

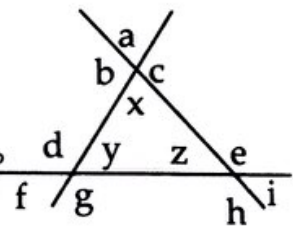
$$a + b + x + c = 360^\circ; d + f + g + y = 360^\circ$$

$$z + h + i + c = 360^\circ;$$

$$\therefore (a + b + c + d + e + f + g + h + i) + (x + y + z) = 360^\circ \times 3 = 1080^\circ$$

$$\therefore (a + b + c + d + e + f + g + h + i) = 1080^\circ - ((x + y + z))$$

$$= 1080^\circ - 180^\circ = 900^\circ$$



15. (C) $DE = AB + BE \Rightarrow AB = DC - BE = (AC - AD) - (AB - AE) = AC - AD - AB + AE \Rightarrow AB = 3 - AB \Rightarrow 2AB = 3$. $\therefore AB = 3/2$

16. (B) Area of $\Delta ADC = \frac{1}{2}$ of Area of ΔABC , and area of $\Delta BEC = \frac{1}{2}$ Area of ΔABC . \therefore Area of $\Delta ADC = \text{Area of } \Delta BEC$

$$ADFE + \Delta EFC = \Delta BFC + \Delta EFC$$

$$ADFE = \Delta BFC$$

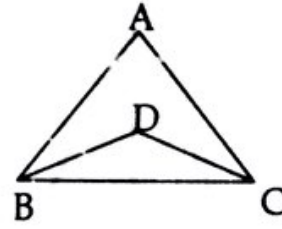
17. (B) Let, $\angle BCD = x$. Then, $\angle BAD = 2x$. The bisector of $\angle BAD$, AE is drawn. Then, $\angle BCD = \angle BAD = x$. So, AECD is a parallelogram. So, $EC = 7$. Again, $\angle BEA = \angle EAD$ [alternate angles]. So, $\angle BAE = \angle BEA = x$. So, $BA = EC = 5$. So, $BC = BA + EC = 5 + 7 = 12$

(D) $\angle B + \angle C = 180^\circ - \angle A = 110^\circ$

$\frac{1}{2} (\angle B + \angle C) = 55^\circ$

আবার, $\angle D = 180^\circ - \angle DBC - \angle DCB$

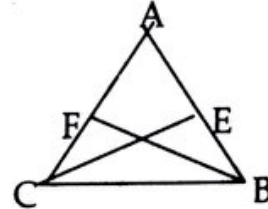
$= 180^\circ - \frac{1}{2} (\angle B + \angle C) = 125^\circ$



(A) $\triangle ABF$ এবং $\triangle ACE$ এ

$\angle F = \angle E = 90^\circ$, $\angle A = \text{common} \therefore$ triangle দুটি similar

$\therefore \frac{AB}{AC} = \frac{BF}{CE} = 1 \therefore AB = AC$

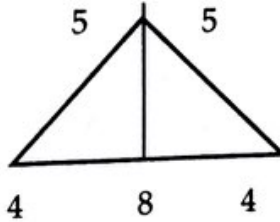
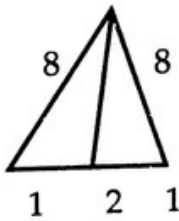


(B) Perimeter of the isosceles triangle = 18

One side of length = 8

এখন, তিনটি বাহু হতে পারে 8, 8, 2

অথবা 8, 5, 5

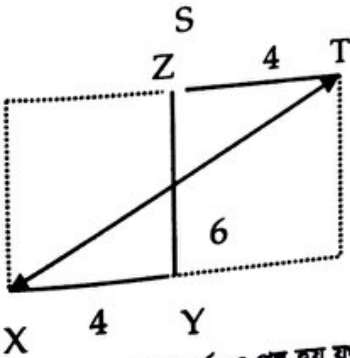


১ম ক্ষেত্রে, ক্ষেত্রফল = $\frac{1}{2} \times 2 \times \sqrt{63} = \sqrt{63}$ (Answer choice এ নেই)

২য় ক্ষেত্রে, ক্ষেত্রফল = $\frac{1}{2} \times 8 \times 3 = 12$

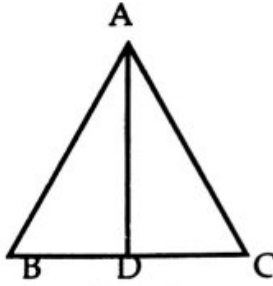
N

21. (D)



আয়তক্ষেত্রটির দৈর্ঘ্য ও প্রস্থ হয় যথাক্রমে 6 ও 8
অর্থাৎ, কর্ণ হবে 10 (3: 4: 5)

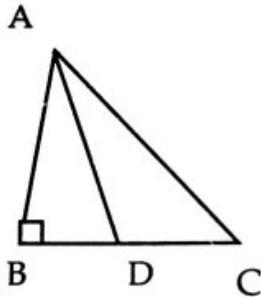
22. (A)



সমদ্বিবাহু ত্রিভুজের ভূমির সমদ্বিখণ্ডক অবশ্যই ভূমির উপর লম্ব।

অর্থাৎ, $\angle ADB = 90^\circ \therefore \angle ABD \neq 90^\circ$ and $\angle ABD \neq 120^\circ$

23. (A)



$$BD^2 + AB^2 = AD^2$$

$$BD^2 + AB^2 = 10$$

আবার, $BC^2 + AB^2 = AC^2$

$$BC^2 + AB^2 = 16$$

$$(BD + DC)^2 + AB^2 = 16$$

$$BD^2 + DC^2 + 2BD \cdot DC + AB^2 = 16$$

$$DC^2 + 2BD \cdot DC = 6 (\because BD^2 + AB^2 = 10)$$

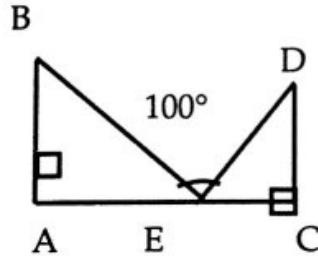
$$3DC^2 = 6 (\because BD = DC)$$

$$DC^2 = 2$$

$$DC = \sqrt{2}$$

অতএব, $BC = 2\sqrt{2}$

24. (C)



দেওয়া আছে, $EC = CD$

$$\therefore \angle CED = \angle EDC = 45^\circ$$

$$\therefore \angle AEB = 180^\circ - (100^\circ + 45^\circ) = 35^\circ$$

অর্থাৎ, $\angle ABE = 180^\circ - (90^\circ + 35^\circ) = 55^\circ$

25. (C) D, AB এর এবং E, AC এর midpoint

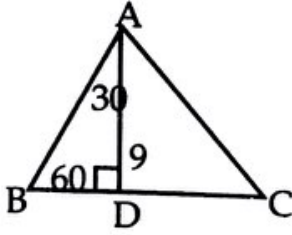
$$\therefore DE = \frac{1}{2} BC \text{ এবং } DE \parallel BC \quad DE \parallel BC \text{ বলে } \Delta ADE \text{ is similar to } \Delta ABC$$

$$\therefore \frac{\text{Area of } \Delta ADE}{\text{Area of } \Delta ABC} = \left(\frac{DE}{BC}\right)^2 \quad \text{or, } \frac{\text{Area of } \Delta ADE}{40} = \frac{1}{4}$$

or, Area of $\Delta ADE = 10$

26. (D) D, অভিক্ষেপ AC এর মধ্য বিন্দু $\therefore AD = DC = BD$ [D কে কেন্দ্র করে ABC বৃত্ত অঙ্কন করা যায়]
 $\therefore AC = 2BD = 4$

27. (B)

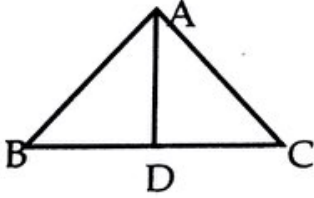


remember 30:60:90 triangle

$$BD = \frac{9}{\sqrt{3}} = 3\sqrt{3}$$

$$\text{Area} = 3\sqrt{3} \times 9 \left[BD = \frac{1}{2} BC \right] = 27\sqrt{3}$$

28. (C)



$\angle BCA = 30^\circ$ ও $\angle BAC = 110^\circ$ হলে

ΔABC এ $\angle ABC = 40^\circ$

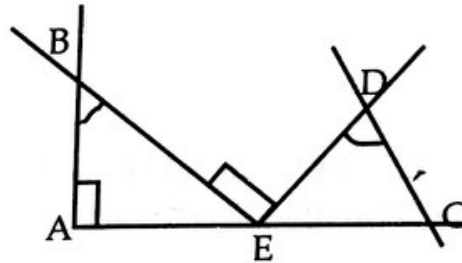
ΔABD এ $AD = BD$ হলে,

$\angle BAD = \angle ABD = 40^\circ$

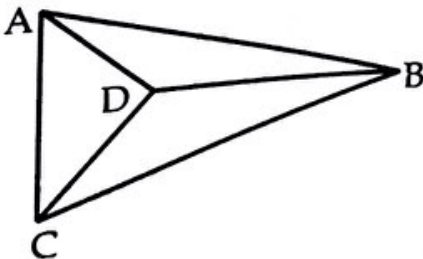
$\angle BAC = 110^\circ$ এবং $\angle BAD = 40^\circ$ হলে,

$\angle DAC = 110^\circ - 40^\circ = 70^\circ$

29. (E) $\angle ABE = 25^\circ$ এবং $\angle EDC = 100^\circ$
 $\angle BAE = 90^\circ$;
 অতএব $\angle AEB = 180^\circ - (90^\circ + 25^\circ) = 65^\circ$
 আবার, $\angle BED = 90^\circ$;
 অতএব, $\angle DEC = 180^\circ - (90^\circ + 65^\circ) = 25^\circ$
 ΔDEC -এ $\angle DEC = 25^\circ$; $\angle EDC = 100^\circ$
 $\therefore \angle DCE = 180^\circ - (100^\circ + 25^\circ) = 55^\circ$



30. (A)



দেয়া আছে, $AD = DB = CD$

$\angle DCB = 30^\circ$ হলে $\angle DBC = 30^\circ$

$\angle ABD = 50^\circ$ হলে $\angle DAB = 50^\circ$

আবার, $\angle DAC = \angle DCA$

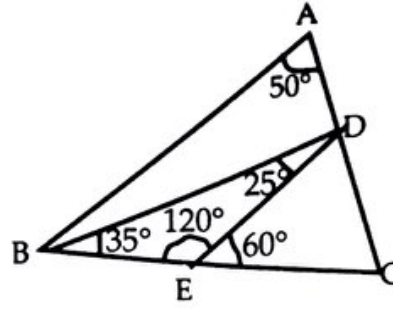
$\angle ABC + \angle BAC + \angle ACB = 180^\circ$

$$\Rightarrow (\angle ABD + \angle DBC) + (\angle BAD + \angle DAC) + (\angle DCB + \angle DCA) = 180^\circ$$

$$\Rightarrow (50^\circ + 30^\circ) + (50^\circ + \angle DCA) + (30^\circ + \angle DCA) = 180^\circ$$

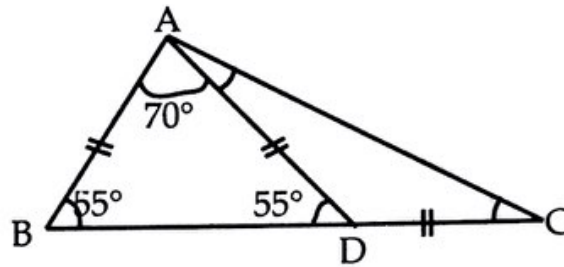
$$\Rightarrow 160^\circ + 2\angle DCA = 180^\circ \Rightarrow \angle DCA = 10^\circ$$

31. (D)



চিত্রানুসারে, $\angle DEB = 180^\circ - (35 + 25)^\circ = 120^\circ \quad \therefore \angle DEC = 180^\circ - 120^\circ = 60^\circ$
 যেহেতু, $DE \parallel AB$, অতএব, $\angle DEC = \angle ABC = 60^\circ$
 অর্থাৎ ΔABC - এ, $\angle ABC = 60^\circ$, $\angle BAC = 50^\circ$
 $\therefore \angle ACB$ or $\angle DCE = 180^\circ - (60 + 50)^\circ = 70^\circ$.

32. (C)



$AB = AD$ হলে $\angle ABD = \angle ADB = \left(\frac{180 - 70}{2}\right)^\circ = 55^\circ \quad \therefore \angle ADC = 180^\circ - 55^\circ = 125^\circ$

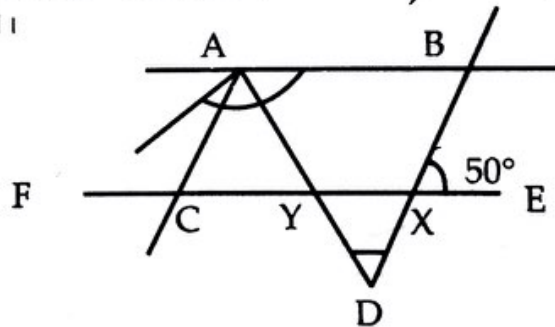
অর্থাৎ, $\angle ACD = \angle CAD = \left(\frac{180 - 125}{2}\right)^\circ = 27.5^\circ$

(i) $AB + AD > AC \Rightarrow DC + AD > AC$ অবশ্যই true কারণ ত্রিভুজের যে কোন দুই বাহুর সমষ্টি তৃতীয় বাহু অপেক্ষা বড়।

(ii) $BD > DC \Rightarrow BD > AB$ or $BD > AD$ অবশ্যই true (বিপরীত কোণের মান দেখে)

(iii) ii true হলে iii true হতে পারে না।

33. (C)



$AD, \angle FAB$ কে সমদ্বিখন্ডিত করে, অর্থাৎ, $\angle FAD = \angle DAB$. আবার, $AC \parallel BD$ এবং AD ছেদক হলে,
 $\angle ADB = \angle FAD = \angle DAB$ আবার, $AB \parallel FE$ এবং AD ছেদক হলে,
 $\angle BXE = \angle ABD = 50^\circ$ এখন, ΔABD এ $\angle ABD = 50^\circ$ এবং $\angle ADB = \angle DAB$

অর্থাৎ $\angle ADB = \left(\frac{180 - 50}{2}\right)^\circ = 65^\circ$ ।

34. (A) ধরি, $AX = x$; অর্থাৎ $CX = 7-x$

অতএব, $\frac{5}{4} = \frac{x}{7-x} \Rightarrow 35 - 5x = 4x \Rightarrow 35 = 9x \Rightarrow x = \frac{35}{9}$

35. (A) যেহেতু $AC = BC$; অতএব, $\angle ABC = \angle BAC = x$
 অতএব, ত্রিভুজটিতে $x + y - 30 + 3x - 2y + x = 180$
 $\Rightarrow 5x - y = 180 + 30 = 210$.

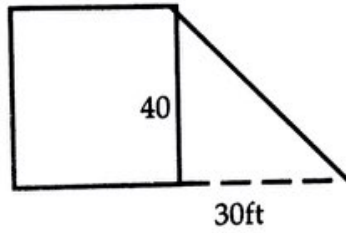
36. (A) যেহেতু $BE = EC$; অতএব, $\angle BCE = \angle CBE$ অর্থাৎ, $\angle BCE = \frac{180 - 48}{2} = 66^\circ$

আবার, $\triangle ABE$ সমবাহু অর্থাৎ, $\angle AEB = 60^\circ \therefore \angle CED = 180 - (60 + 48) = 72^\circ$

যেহেতু, $EC = ED$, অতএব, $\angle EDC = \angle ECD$ অর্থাৎ, $\angle ECD = \frac{180 - 72}{2} = 54^\circ$

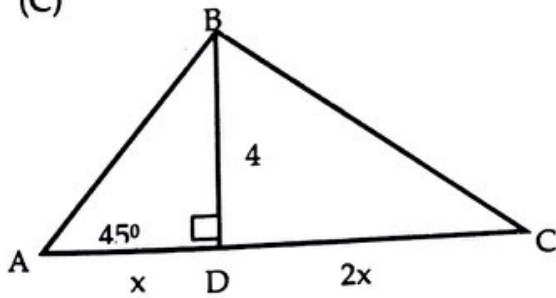
অতএব, $\angle BCD = 66 + 54 = 120^\circ \therefore$ answer (A)

37. (C) এই problem টি solve করার জন্য ছবি ঠেকে নিলে সুবিধা হবে।



এবার বুঝতে হবে এটি একটি সহজ পীথাগোরাস, পীথাগোরিয়ান অনুপাত অনুসারে ladder তার দৈর্ঘ্য 50ft. (3:4:5)

38. (C)



$\triangle ABD$ তে $\angle BDA = 90^\circ$, $\angle BAD = 45^\circ$

সুতরাং $\angle ABD = 45^\circ$

সুতরাং $AD = BD = 4$

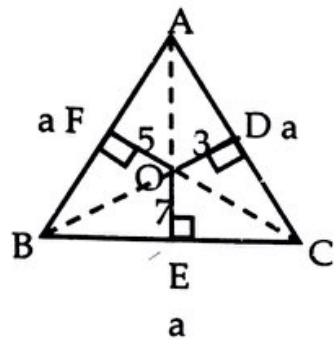
$AC = x + 2x = 3x = 3(4) = 12$

39. (C) যদি $\angle ABC = 100^\circ$ এবং $AB = BC$ হয়,

সেক্ষেত্রে, $\angle BAC = \angle BCA = \frac{180^\circ - 100^\circ}{2} = \frac{80^\circ}{2} = 40^\circ \therefore$ answer C.

40. (C) Degree measure of the smallest angle = $\frac{3}{3+4+5} \times 180 = \frac{3}{12} \times 180 = 45^\circ$

41. (A)



$$\frac{1}{2} \times a \times 7 + \frac{1}{2} \times a \times 3 + \frac{1}{2} \times a \times 5 = \frac{\sqrt{3}}{4} a^2$$

$$\Rightarrow 15a = \frac{\sqrt{3}}{2} a^2$$

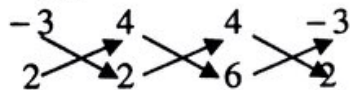
$$\Rightarrow a = \frac{3 \times 10}{\sqrt{3}}$$

$$\therefore a = 10\sqrt{3}$$

$$\text{area} = \frac{\sqrt{3}}{4} \times (10\sqrt{3})^2$$

$$= 75\sqrt{3}$$

42. (A)



$$= \frac{1}{2} \{(-6 + 24 + 8) - (8 + 8 - 18)\}$$

$$= \frac{1}{2} \times 28$$

$$= 14 \text{ (Ans. A)}$$

43. (C) We know

সমান বাহু a হলে, সমকোণী সমদ্বিবাহু ত্রিভুজের অতিভুজ = $a\sqrt{2}$

$$\text{Now, } a\sqrt{2} = 16m$$

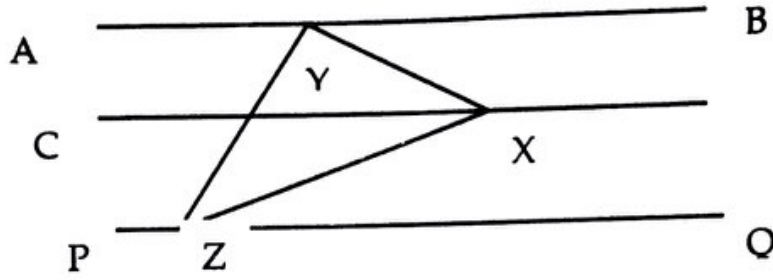
$$a = \frac{16}{\sqrt{2}} m \text{ or, } 8\sqrt{2} m$$

$$\therefore \text{Perimeter} = a\sqrt{2} + a + a$$

$$= 16 + 8\sqrt{2} + 8\sqrt{2} = 16 + 16\sqrt{2} m \quad \text{Ans: (C) } 16 + 16\sqrt{2} m$$

44. (B) আমরা জানি,
সমবাহু ত্রিভুজের প্রত্যেক বাহু a হলে ক্ষেত্রফল হয় $\frac{\sqrt{3}}{4a^2}$
- Now, $\frac{\sqrt{3}}{4a^2} = 64\sqrt{3} \Rightarrow a^2 = 256 \Rightarrow a = 16$
 \therefore Perimeter = $3a = 3 \times 16 = 48$ Ans: (B) 48m
45. (A) D, AB এর মধ্যবিন্দু এবং $DE \parallel BC$. কাজেই অনুসিদ্ধান্ত অনুযায়ী $DE = \frac{1}{2} BC \Rightarrow BC = 2DE \Rightarrow BC = 8$.
এখন area of DBCE = $\frac{1}{2} \times$ sum of parallel side \times height = $\frac{1}{2} (4 + 8) \times 3 = 18$.
46. (B) We do not know whether $\angle D$ is a right angle. So, the value cannot be determined.
47. (C) angle এর proportion 1: 2: 3. অর্থাৎ angle গুলো হলো $30^\circ, 60^\circ, 90^\circ$, এর ধরণের বাহুর ratio = 1: 2: $\sqrt{3}$
যেখানে মধ্যবর্তী বাহুটি অতিভুজ এবং সবচেয়ে বড়। কাজেই smallest side 1 হলে highest side 2.
48. (C) সূত্র আছে, ত্রিভুজের যে কোন দুই বাহুর সমষ্টি তৃতীয় বাহু থেকে বড়।
 $13 + 12 = 25$ কাজেই রেখা তিনটি একটি সরলরেখায় অবস্থিত ও ত্রিভুজ গঠন করবে না।
49. (B) সমকোণী ত্রিভুজটির অন্য কোণটি হবে 60° । কাজেই এর পাশের কোণ 30° । অতএব অন্য ত্রিভুজটির শেষ কোণের মান 80°
সর্বোচ্চ কোণ বলে এর বিপরীত বাহু S হবে সর্বোচ্চ।
50. (A) $\angle BAF = \frac{1}{2} \times 60^\circ = 30^\circ$. $\angle AFD = 90^\circ$. $\angle BDF = \angle D = 100^\circ$ কাজেই $\angle B$
 $= 360^\circ - (30^\circ + 90^\circ + 100^\circ) = 140^\circ$.
51. (A) perimeter of PQR = $PR + PQ + QR = \frac{1}{2} (AB + AC + BC) = \frac{1}{2} (10 + 15 + 17) = 21$.
52. (D) (D) $QR \parallel ST$ কাজেই $\angle PRQ = \angle T = 35^\circ$ আবার $PQ > PR$ কাজেই $\angle PRQ > \angle PQR$, $35^\circ > \angle PQR$ তাহলে $\angle PQR = 35^\circ$ এর চেয়ে ছোট কোন কোণ।
53. (A) C থেকে AD এর উপর লম্ব CE আঁকা হলো: $\therefore AE = 6, ED = 2$; মনে করি $CE = x$; $\therefore 6x + \frac{1}{2} \times 2 \times x = 28 \Rightarrow 7x = 28 \Rightarrow x = 4$; $\therefore CE = 4$ $\therefore \Delta CDE$ এ $CD^2 = CE^2 + DE^2 = 4^2 + 2^2 = 20$; $\therefore CD = \sqrt{20} = 2\sqrt{5}$
54. (C) $AB = AC$ হওয়াতে $\angle B = \angle C = 70^\circ$; আবার, $\angle DEA = \angle C = 70^\circ$; $\therefore \angle DEC = 180^\circ - 70^\circ = 110^\circ$
55. (C) D হলে একটা circle এর center, ও AD, BD ও CD হলে বৃত্তটির ব্যাসার্ধ। $\therefore \angle BAC = 90$
56. (C) $BE^2 + CD^2 = AE^2 + AB^2 + AC^2 + AD^2 = \left(\frac{AC}{2}\right)^2 + BC^2 + \left(\frac{AB}{2}\right)^2 = \frac{1}{4} (AC^2 + AB^2) + 4^2$
 $= \frac{1}{4} BC^2 + 16 = \frac{16}{4} + 4 = 20$.
57. (A) $BD = DA$ হওয়াতে $\angle DBA = \angle DAB = \angle x$ (মনে করি) আবার, ΔABD এর জন্য $\angle ADC$ হলো বহিঃস্থ কোণ। আমরা জানি, ত্রিভুজের বহিঃস্থ কোণ হলো অন্তঃস্থ দূরবর্তী কোণদ্বয়ের সমান। $\therefore \angle ADC = \angle DBA + \angle DAB = x + x = 2x$, আবার, ΔADC তে $DC = AC$; $\therefore \angle CAD = \angle ADC = 2x$; এখন, ΔADC এ $\angle ACD + \angle ADC + \angle DAC = 180^\circ \Rightarrow 120^\circ + 2x + 2x = 180^\circ \Rightarrow 4x = 60^\circ \therefore x = 15^\circ$; $\therefore \angle ABC = x = 15^\circ$.

58. (B) এটি solve করতে হলে প্রথমে X-এর ভিতর দিয়ে AB এবং PQ এর parallel একটি রেখা CX আঁকি। $\therefore \angle BYX = \angle YXC$ (একান্তর কোণ) \therefore আবার, $\angle CXZ = \angle XZQ$ (একান্তর কোণ)। $\therefore \angle YXZ = \angle YXC + \angle CXZ = \angle BYX + \angle XZQ = 40^\circ + 35^\circ = 75^\circ$.



59. (E) choice A, B, C তিনটিই true; কারণ ত্রিভুজের যেকোন দুই বাহুর সমষ্টি তৃতীয় বাহু অপেক্ষা বড়। choice D true কারণ $AB = AC$. Choice E true নয়; কারণ $AB = AC$ হলে BC দুইপক্ষে common থাকায় L,H,S ও R, H, S সমান হবে।
60. (C) $BD = DC = 5\text{cm}$ এখন, D যদি একটি বৃত্তের কেন্দ্র হয় তাহলে $\angle A$ হচ্ছে সেই বৃত্তের পরিধিষ্ কোণ। অতএব, AD ও ঐ বৃত্তের ব্যাসার্ধ। অর্থাৎ, $AD = 5\text{ cm}$
61. (A) একটি 28 meter এর side এ মোট post লাগবে $= \frac{28}{7} + 1 = 5$ টি

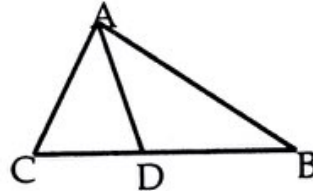
$$35\text{ meter এর side এ মোট post লাগবে} = \frac{35}{7} + 1 = 6\text{ টি}$$

$$56\text{ meter এর side এ মোট post লাগবে} = \frac{56}{7} + 1 = 9\text{ টি}$$

যেহেতু এটি একটি ত্রিভুজ তাই আমরা 3 টি post বাদ দিব। কারণ, এগুলো ২ বার consider করা হয়েছে।

\therefore মোট post এর সংখ্যা $= (5 + 6 + 9) - 3 = 17$ টি; already 3 টি post লাগানো থাকায় additional post $= 17 - 3 = 14$ টি।

62. (B)



ΔABD -এ $AD = BD \therefore \angle DAB = \angle ABD = 25^\circ$ এখানে, $\angle ADC = \angle DAB + \angle DBA = 50^\circ$ কেননা বহিঃস্থ কোণ, অন্তঃস্থ দরবর্তী কোণদ্বয়ের সমষ্টির সমান। আবার, ΔACD -এ $AD = CD \therefore \angle ACD = \angle CAD$ হল। $\therefore \angle ACD + \angle CAD = 180^\circ - \angle ADC$ বা, $2\angle ACD = 130^\circ \therefore \angle ACD = 65^\circ$

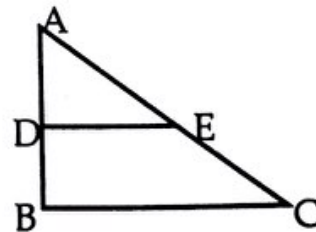
63. (A) $BD = AB - AD = BC - DE = x - y$ এখানে, ABC isosceles হবে।

$\therefore \Delta ADE$ isosceles

$\therefore AD = DE$, এবং $AB = BC$

\therefore Area of trapezoid $DBCE$

$$= \frac{x+y}{2} \times (x-y) = \frac{x^2 - y^2}{2}$$



(C) চিত্র অনুযায়ী $b = c; e = h; d = g$ (বিপ্রতীপ কোণ)

ধরে নিই, ত্রিভুজের ভিতরের কোণগুলো হচ্ছে x, y ও z (d এর পাশে x, e এর পাশে y এবং উপরে z)

অতএব, $x + y + z = 180^\circ$

আবার, $c = x + y; g = y + z; h = x + z$ (ত্রিভুজের বহিঃস্থ কোণ অন্তঃস্থ বিপরীত কোণদ্বয়ের সমষ্টির সমান)।

$$\therefore c + y + h = x + y + y + z + x + z$$

$$= 2x + 2y + 2z = 2(x + y + z)$$

$$= 2 \times 180^\circ = 360^\circ$$

(D) ত্রিভুজটির পরিসীমা = $25 + 40 + 55 = 120$ feet; প্রতিটি পিলার 5 feet দরত্বে থাকলে মোট $\frac{120}{5} = 24$ টি পিলার

লাগবে।

(D) ABC সমবাহু ত্রিভুজ, সুতরাং $\angle ACB = 60^\circ$; বিপ্রতীপ কোণ $\angle DCE = 60^\circ$

আবার; $FG = FH$ এবং $\angle FGH = 50^\circ$ হলে $\angle FHG = 50^\circ$; অর্থাৎ $\angle GFH = 80^\circ$, বিপ্রতীপ কোণ $\angle DFE = 80^\circ$

D, E যোগ করলে যেহেতু $DF = EF$ ($FG = FH$ এবং $DH = EG$ হতে), সেহেতু $\angle FDE = 50^\circ$ ।

আবার, $CD = DE$ হলে ($AC = BC$ এবং $BD = AE$ হতে) $\angle CDE = 60^\circ$ ।

অতএব $\angle CDF = 50^\circ + 60^\circ = 110^\circ$ ।

67. (A) যেহেতু ত্রিভুজ $\triangle ABD$ ও $\triangle ACD$ এর ভূমিদ্বয় BD ও CD পরস্পর সমান (D, BC এর মধ্যবিন্দু) এবং AP (A হতে BC এর উপর লম্ব)

উভয় ত্রিভুজেরই উচ্চতা, অতএব $\triangle ABD$ ও $\triangle ACD$ এর area সমান।

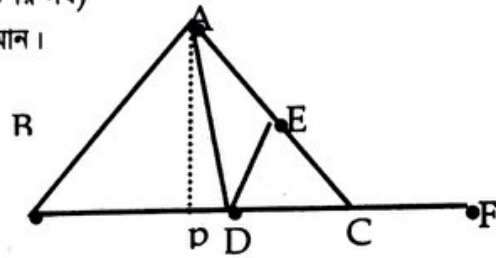
অর্থাৎ $\triangle ACD$ এর area = 20 sq. cm.

একইভাবে E, AC এর মধ্যবিন্দু হওয়ায় $\triangle ADE$ ও $\triangle CED$

এর area ও সমান হবে।

অর্থাৎ, $\triangle ADE$ এর area = 10 sq. cm.

(এখানে, AD বাহুর দৈর্ঘ্য কোন কাজে আসেনা)

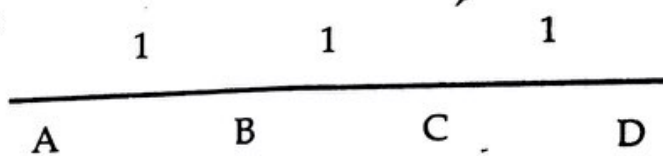


68. (E) $AD = AB + BC + CD = 1 + 1 + 1 = 3$

$$AC = AB + BC = 1 + 1 = 2$$

অর্থাৎ, $AC = 2$ হলে $AD = 3$

$$\therefore AC = 100 \text{ হলে } AD = \frac{3 \times 100}{2} = 150$$



69. (C) As $\angle A = 45^\circ$

So, $\angle ABD = 45^\circ$

So $BD = AD$

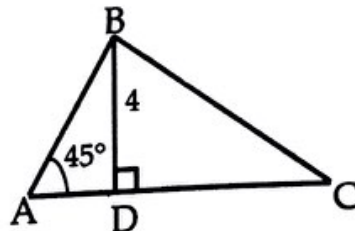
$$= 4$$

As $DC = 2AD$

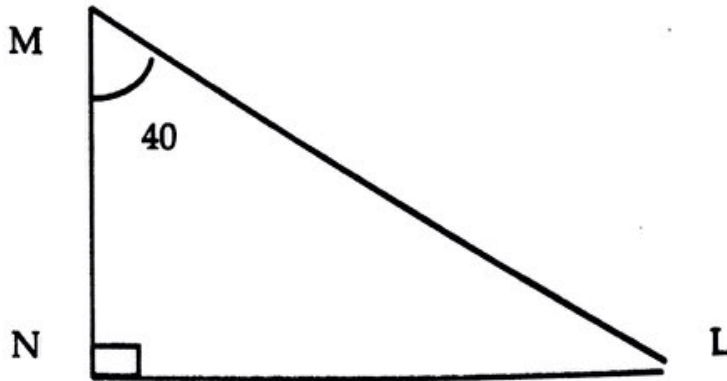
So $DC = 8$

and $AC = 8 + 4$

$$= 12$$

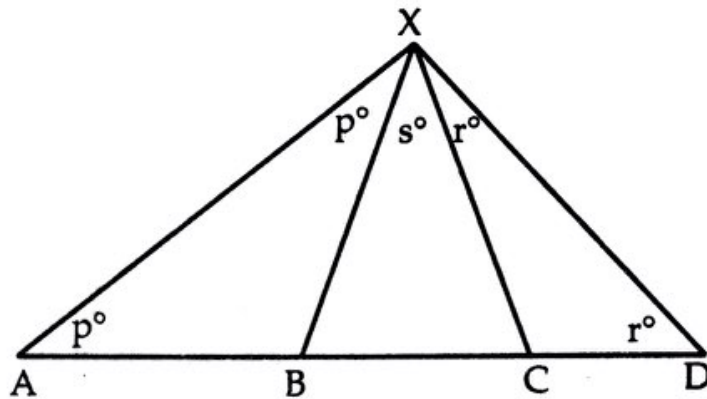


70. (E) ছবি ঠেকে নিলে সুবিধা হবে।



Since $\angle N = 90^\circ$, $\angle M = 40^\circ$ so, $\angle L = 180^\circ - (90^\circ + 40^\circ) = 50^\circ$

71. (A)



$AB = BX$; অর্থাৎ, $\angle p = \angle AXB$

$XC = CD$; অর্থাৎ $\angle r = \angle CXD$

অতএব, ΔAXD এ $p + r + (p + s + r) = 180^\circ$

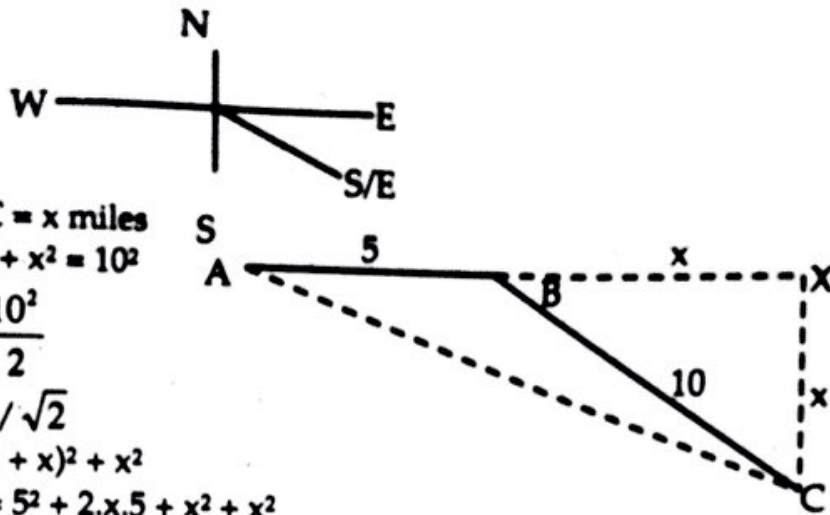
$$\Rightarrow 2p + 2r + s = 180^\circ \Rightarrow s = 180^\circ - 2p - 2r$$

$$\Rightarrow s = 180^\circ - 2(p + r)$$

72. (C) $12K = 36$ হলে $K = 3$

$$\text{perimeter} = 12K + 9K + 6K = 27K = 27 \times 3 = 81$$

1 (D)



$BX = XC = x$ miles

সূত্রমাং: $x^2 + x^2 = 10^2$

$\Rightarrow x^2 = \frac{10^2}{2}$

$\Rightarrow x = 10/\sqrt{2}$

$AC^2 = (5 + x)^2 + x^2$

$\Rightarrow AC^2 = 5^2 + 2 \cdot x \cdot 5 + x^2 + x^2$

$= 25 + 10x + 2x^2$

$= 25 + 100/\sqrt{2} + 100$

$= 125 + 100\sqrt{2}$

$= 125 + 100/1.414$ ($\sqrt{2} = 1.414$)

$= 125 + 70.7$

$= 195.7$

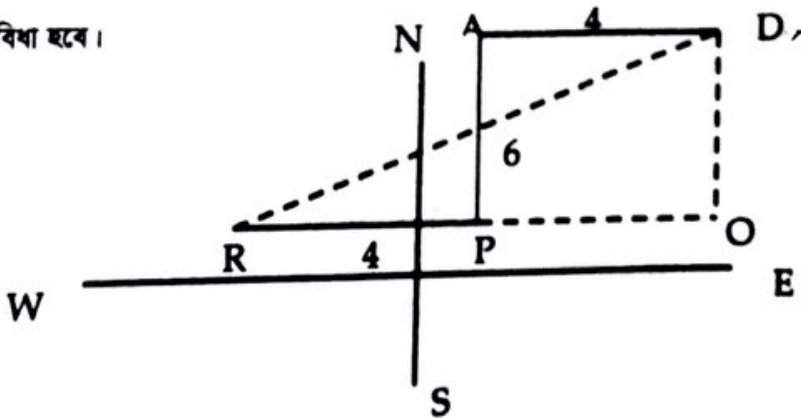
যেহেতু closest answer টি choose করতে বলা হয়েছে, এবং যেহেতু সূত্রমাং $14^2 = 196$

$\therefore AC = \sqrt{195.7} = 14$ (Approximate)

74. (A) সবগুলো যদি সমবাহু (equilateral) ত্রিভুজ হয় তাহলে প্রত্যেকটি বাহুর দৈর্ঘ্য সমান। একেকটি বাহুর দৈর্ঘ্য $\frac{1}{3}$; অতএব

বড় ত্রিভুজটির পরিসীমা = $\left(\frac{1}{3} + \frac{1}{3}\right) + \left(\frac{1}{3} + \frac{1}{3}\right) + \left(\frac{1}{3} + \frac{1}{3}\right) = \left(\frac{6}{3}\right) = 2$

75. (D) ছবি ঠিকে নিলে সুবিধা হবে।



RD বের করতে হবে। D হতে RP এর বহিরাপত লম্বা DQ আঁকলাম।

$DQ = 6$ যেহেতু $AP = 6$; $RQ = 4 + 4 = 8$

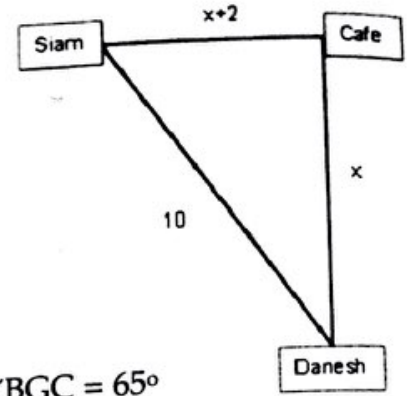
$\therefore RD^2 = 6^2 + 8^2 = 100 \Rightarrow RD = 10$

76. (C) From the diagram, we can see that

$$10^2 = x^2 + (x+2)^2$$

$$\Rightarrow x = 6$$

$$\Rightarrow x+2 = 8$$



77. (B) $ABC \parallel DEF$; এবং BD ছেদক, $\therefore \angle ABD = \angle BDE = 70^\circ$ (একান্তর কোণ বা alternate angle)

যেহেতু, $\angle BDG = 25^\circ$; $\therefore \angle GDE = 70^\circ - 25^\circ = 45^\circ$ আবার, $DN = BE$; $\therefore \angle GED = 70^\circ$

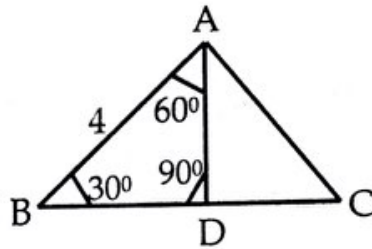
ΔDGE তে, $\angle DGE = 180^\circ - 45^\circ - 70^\circ = 65^\circ$ (বিশ্রুত কোণ); অর্থাৎ, $\angle BGC = 65^\circ$

78. (A) $BC = 2DE = 2 \times 4 = 8$ cm. কারণ,

ত্রিভুজের দুই বাহুর মধ্যবিন্দুর সংযোজক রেখাংশ তৃতীয় বাহুর সমান্তরাল এবং দৈর্ঘ্যে তার অর্ধেক। এখানে, D ও E যথাক্রমে AB ও AC এর মধ্যবিন্দু।

$$\begin{aligned} \text{ট্রাপিজিয়াম } BCED \text{ এর area} &= \frac{1}{2} \times (DE + BC) \times DB \\ &= \frac{1}{2} \times (4 + 8) \times 3 = \frac{1}{2} \times 12 \times 3 = 18 \end{aligned}$$

79. (C)



$AD \perp BC$ আঁকি, তাহলে একটি $(30^\circ, 60^\circ, 90^\circ)$ right angle triangle পাওয়া যায় যেখানে বাহুর ratio

$1: \sqrt{3}: 2$ এখানে, অতিভুজ 4 (2 এর দ্বিগুণ) $\therefore AD = 1 \times 2 = 2$ এবং $BD = \sqrt{3} \times 2 = 2\sqrt{3}$

$$\therefore BC = 2 \times BD = 4\sqrt{3}$$

$$\therefore \text{Area} = \frac{1}{2} \times BC \times AD = \frac{1}{2} \times 4\sqrt{3} \times 2 = 4\sqrt{3} = 2 \times 2\sqrt{3} = 2 \times \sqrt{(4 \times 3)} = 2\sqrt{12}$$

80. (E) ত্রিভুজের শীর্ষকোণের সমদ্বিখন্ডক ভূমিকে অপর দুই বাহুর সমানুপাতে অন্তর্বিভক্ত করে।

$$\therefore AB : AC = BD : DC$$

$$\Rightarrow 8 : AC = 5 : 4$$

$$\Rightarrow \frac{8}{AC} = \frac{5}{4} \Rightarrow AC = \frac{32}{5}$$

$\therefore AC = 6.4$ cm যা option এ নেই।

81. (A) এখানে, $\triangle ADE$ ও $\triangle ABC$ সদৃশকোণী ত্রিভুজ বা similar triangle, সদৃশকোণী ত্রিভুজের area এর অনুপাত তাদের অনুরূপ বাহুরূপের অনুপাতের বর্গের সমান।

$$\therefore \frac{\triangle ADE \text{ এর area}}{\triangle ABC \text{ এর area}} = \left(\frac{DE}{BC}\right)^2$$

$$\Rightarrow \frac{25}{\triangle ABC \text{ এর area}} = \left(\frac{4}{8}\right)^2 = \frac{1}{4}$$

$$\Rightarrow \triangle ABC \text{ এর area} = 100 \text{ sq.cm.}$$

82. (E) $OP = 4\sqrt{2}$ এবং $OQ = 2\sqrt{2}$

$$\therefore PQ = \sqrt{(4\sqrt{2})^2 + (2\sqrt{2})^2} = \sqrt{32+8} = \sqrt{40} = \sqrt{4 \times 10} = 2\sqrt{10}$$

$$\text{অর্থাৎ, perimeter} = 4\sqrt{2} + 2\sqrt{2} + 2\sqrt{10}$$

83. (C) $X = 120^\circ$ হলে $\angle BCP = 60^\circ$ এবং $\angle CPB = 60^\circ$ (যেহেতু $CP = BP$)

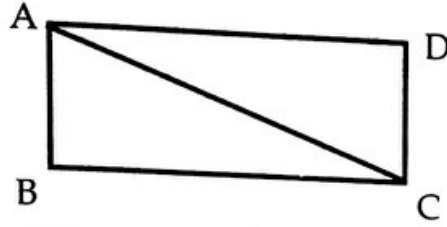
$$\text{অর্থাৎ } \angle y = 180^\circ - (60^\circ + 60^\circ) = 60^\circ$$

Chapter 2

Quadrilaterals, Polygon

Chapter 2: Quadrilaterals, Polygon

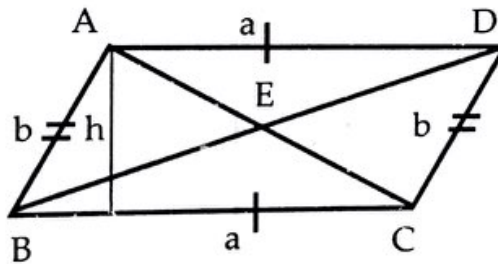
Quadrilaterals: Quadrilaterals বা চতুর্ভুজ চারটি side বিশিষ্ট ক্ষেত্র। Quadrilateral এ চারটি interior angle এর সমষ্টি 360° । বিপরীত দুইটি vertex যোগ করলে (diagonal বা কর্ণ) Quadrilateral দুটি triangle-এ বিভক্ত হয়।



এখানে $\angle A + \angle B + \angle C + \angle D = 360^\circ$ । AC একটি diagonal, Quadrilateral ABCD এর Area $\triangle ABC$ এবং $\triangle ACD$ এর area-র যোগফল, Perimeter side চারটির যোগফল।

Parallelogram:

- i) Quadrilateral এর Opposite বাহুগুলো সমান হলে, বা
 - ii) Opposite side গুলো সমান্তরাল হলে, বা
 - iii) দুটি opposite side সমান ও সমান্তরাল হলে Quadrilateral টি একটি parallelogram বা সামান্তরিক।
- Parallelogram ABCD-এ



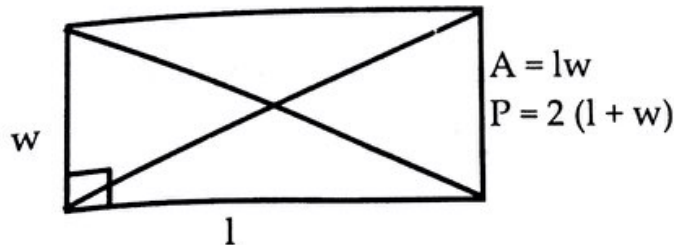
$AB = CD, AB \parallel CD, AD = BC, AD \parallel BC, \angle A = \angle C, \angle B = \angle D$

$\triangle AED \cong \triangle BCE, \triangle AEB \cong \triangle DEC$ এবং $\triangle ABE, \triangle BCE, \triangle CDE$ এবং $\triangle ADE$ -এর area সমান। AC ও BD diagonal দুটি E বিন্দুতে সমদ্বিখন্ডিত হয়েছে।

Perimeter = $2(a + b)$

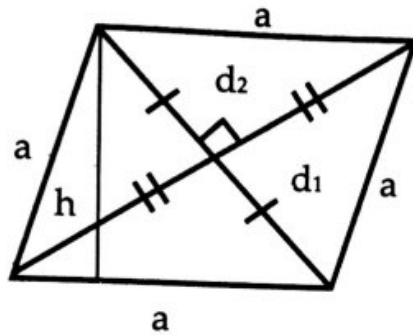
Area = $BC \times h$

Rectangle: কোন Parallelogram এর angle গুলো 90° হলে বা diagonal দুটি সমান হলে সেটি একটি rectangle বা আয়তক্ষেত্র।



N.B. সব rectangle-ই parallelogram কিন্তু সব parallelogram-ই rectangle নয়।

Rhombus: Rhombus অনেকটা Parallelogram এর মত। তবে rhombus-এর চারটি বাহু সমান। Rhombus এর diagonal দুটি পরস্পরকে সমকোণে সম্বিখন্ডিত করে,



$$P = 4a$$

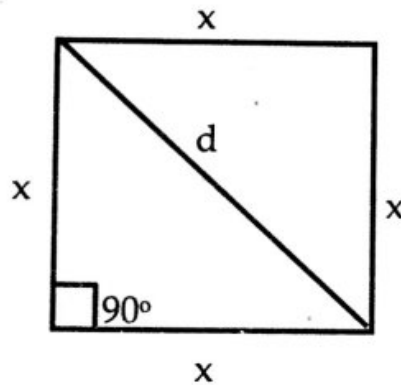
$$A = a \times h$$

$$= \frac{1}{2} d_1 \times d_2$$

N. B. d_1 and d_2 not necessary equal.

সব rhombus-ই Parallelogram কিন্তু কোন Quadrilateral Parallelogram হলেই তা rhombus হবে না। Rhombus এর angle গুলো not necessarily equal to 90° .

Square: Rhombus এর angle গুলো 90° হলে বা diagonal গুলো সমান হলে rhombus টি একটি square. Rectangle-এর বাহুগুলো সমান হলে বা diagonal দুটি লম্বভাবে ছেদ করলে rectangle টি একটি square বা বর্গক্ষেত্র।



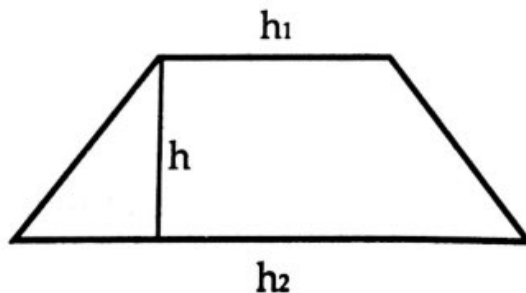
$$A = x^2 = \frac{1}{2} d^2$$

$$P = 4x$$

N. B. সব square-ই rhombus এবং rectangle এবং parallelogram কিন্তু কথাটি বিপরীতক্রমে not necessarily true.

$$x^2 = \frac{1}{2} d^2 \text{ অর্থাৎ square এর area, diagonal এর উপর অংকিত square এর area-র অর্ধেক।}$$

Trapezoid: Trapezoid-এর দুটি Side parallel এবং অপরদুটি Side nonparallel.



$$A = \frac{1}{2} (h_1 + h_2) \times h$$

Polygons: Triangle হচ্ছে সবচেয়ে কমবাহ বিশিষ্ট Polygon. Triangle থেকে শুরু করে আরো বেশি সংখ্যক বাহুবিশিষ্ট যে কোন ক্ষেত্রকেই একনামে polygon বলা হয়। কোন Polygon এর side এর সংখ্যা n হলে, total interior angle = $(n-2) \cdot 180^\circ$

Some polygons

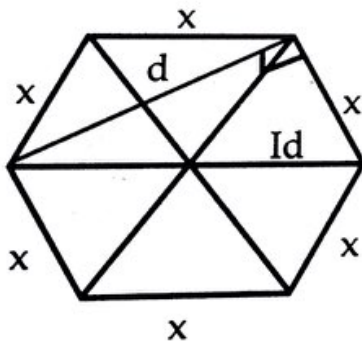
No. of sides	Name	Total interior angle = $(n - 2) 180^\circ$
3	Triangle	180°
4	Quadrilateral	360°
5	Pentagon	540°
6	Hexagon	720°
7	Heptagon	900°
8	Octagon	1080°
9	Nonagon	1260°
10	Decagon	1440°

Regular Polygon: Polygon-এর side গুলো সমান হলে তাকে regular Polygon বলে। Regular Polygon-এর interior angle গুলো সমান। এক্ষেত্রে একটি angle = $\frac{(n-2)180^\circ}{n}$

Example : regular decagon এর একটি angle = $\frac{1440^\circ}{10} = 144^\circ$

Hexagon: Hexagon এর 6 টি side। এর sum of the interior angles = 720°

Regular Hexagon এর একটি interior angle = 120°



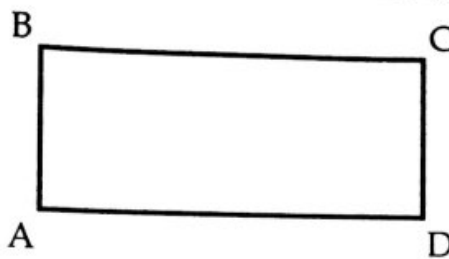
d = diagonal
ld = longest

Hexagon এর 9 টি diagonal, Regular Hexagon এর L.D = 2x Regular hexagon-এর তিনটি L.D.

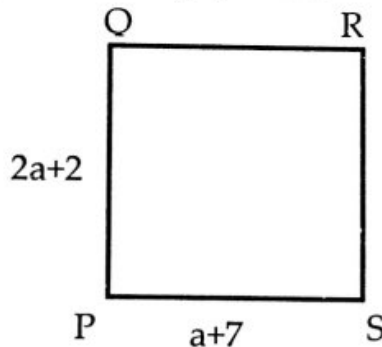
Hexagon-কে 6 টি equilateral triangle -এ বিভক্ত করে।

Area of a regular hexagon = $6 \times \frac{\sqrt{3}}{4} x^2 = \frac{3\sqrt{3}}{2} x^2$

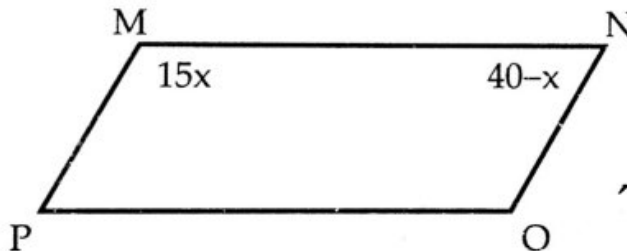
Exercise 2.1 : Quadrilaterals, Polygons



1. In the figure above, if the perimeter of rectangle ABCD is 56, and if the length of AD = 16, what is the area of ABCD?
 (A) 64 (B) 90 (C) 106 (D) 180 (E) 192



2. In the figure above, if PQRS is a square. What is the value of a?
 (A) $\frac{9}{5}$ (B) $\frac{9}{2}$ (C) 5 (D) 7 (E) 9



3. In the figure above, MNOP is a parallelogram. What is the value of x?
 (A) 20 (B) 10 (C) 5 (D) $\frac{25}{7}$ (E) $\frac{5}{2}$
4. If the length of rectangle A is one-half the length of rectangle B, and the width of rectangle A is one-half the width of rectangle B, what is the ratio of the area of rectangle A to the area of rectangle B?
 (A) 1 (B) $\frac{1}{2}$ (C) $\frac{1}{3}$ (D) $\frac{1}{4}$ (E) $\frac{1}{8}$
5. In quadrilateral DEFG, the degree measures of its four angles are in the ratio of 2:3:5:6. What is the difference in the degree measures between the largest and smallest angles?
 (A) 135 (B) 112.5 (C) 90 (D) 67.5 (E) 45

In quadrilateral ABCD, $\angle A + \angle B + \angle C = 2 \angle D$. What is the degree measure of $\angle D$?

- (A) 135 (B) 120° (C) 90 (D) 67.5 (E) 45

The length of each side of square A is increased by 100 percent to make square B. Then each side of square B is increased by 50 percent to make square C. By what percent is the area of square C greater than the sum of the areas of square A and B.

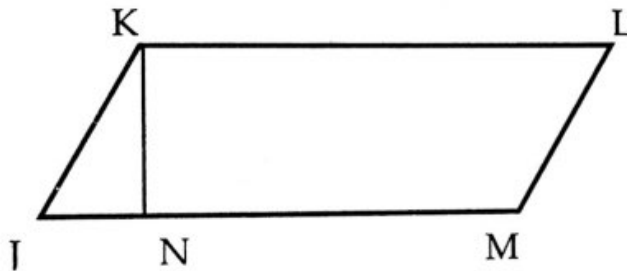
- (A) 50% (B) 75% (C) 80% (D) 100 (E) 120%

What is the greatest number of rectangles with integer side lengths and perimeter 10 that can be cut from a piece of paper with width 24 and length 60?

- (A) 144 (B) 180 (C) 240 (D) 360 (E) 480

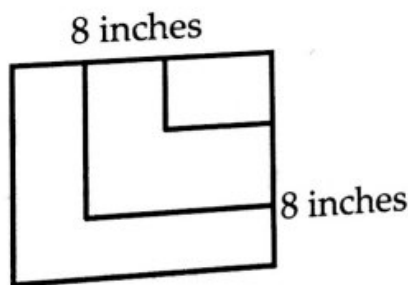
The perimeter of a rectangle is $6w$. If one side has length $w/2$, what is the area of the rectangle?

- (A) $\frac{w^2}{4}$ (B) $\frac{5w^2}{4}$ (C) $\frac{5w^2}{2}$ (D) $\frac{11w^2}{4}$ (E) $\frac{11w^2}{2}$



In the figure above, if the area of parallelogram JKLM is n , and if the length of KN is $n + 1/n$, then the length of JM is

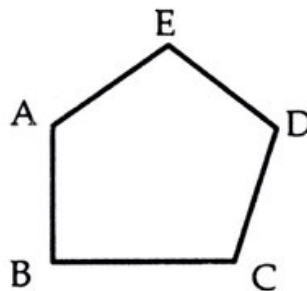
- (A) $\frac{1}{n}$ (B) $\frac{1}{n+1}$ (C) $n+1$ (D) $\frac{n^2}{n+1}$ (E) $\frac{n^2}{n^2+1}$



The figure above shows a large square formed by fitting 2 L-shaped tiles and one square tile together. If a rectangular floor 10 feet by 12 feet is to be tiled in large square of this design, how many L-shaped tiles will be needed?

- (A) 34 (B) 135 (C) 270 (D) 540 (E) 810

12. What is the perimeter, in meters, of a rectangular play ground 24 meters wide that has a same area as a rectangular play ground 64 meters long and 48 meters wide?
 (A) 112 (B) 128 (C) 224 (D) 256 (E) 304
13. If the diagonal of a square is 16 inches long, what is the area of the square?
 (A) 64 sq. inches (B) $64\sqrt{2}$ sq. inches (C) 128 sq. inches
 (D) 128 inches (E) 256 sq. inches
14. Square tiles with each side measuring 8 inches, cost 0.09 taka a piece. At this rate, what will be the cost to cover a floor measuring 10 feet by 16 feet?
 (A) Tk. 22.50 (B) Tk. 25.00 (C) Tk. 28.00
 (D) Tk. 32.40 (E) Tk. 36.00
15. The area of a square is $144s^2$. What is the squares diagonal?
 (A) $12s$ (B) $12s\sqrt{2}$ (C) $24s$ (D) $144s$ (E) $144s^2$
16. The area of a square will be doubled if :
 (A) the length of the diagonal is divided by 2.
 (B) the length of the diagonal is divided by $\sqrt{2}$.
 (C) the length of the diagonal is multiplied by 2.
 (D) the length of the diagonal is multiplied by $\sqrt{2}$.
 (E) none of these.



17. In pentagon ABCDE, $AB \perp BC$. What is the sum of the measures of angles C,D,E and A?
 (A) 450 (B) 540 (C) 630 (D) 720 (E) 810
18. If the side of a square is increased by 150 percent, by what percent does the area increase?
 (A) 125% (B) 225% (C) 300% (D) 525% (E) 625%
19. What is the degree measure of an interior angle of a regular nonagon?
 (A) 90° (B) 100° (C) 120° (D) 140° (E) 150°

17. What is the area of a regular hexagon with sides equal to 6?

- (A) $\frac{3\sqrt{3}}{4}$ (B) $\frac{3\sqrt{3}}{2}$ (C) $3\sqrt{3}$ (D) $9\sqrt{3}$ (E) $54\sqrt{3}$

18. One of the sides of a square measures 20 cm in length. If we increase the length of two opposite sides by 4 centimeters and decrease the length of the remaining two opposite sides by the same measure, then what will be the area of the resulting figure in sq.cm? (MBA 2013)

- (A) 324 (B) 360 (C) 384 (D) 400 (E) none of these

19. A total of x feet of fencing is to form three sides of a rectangular yard. What is the maximum possible area of the yard in terms of x?

- (A) $x^2/9$ (B) $x^2/8$ (C) $x^2/4$ (D) x^2 (E) none of these

20. A rectangular field is to be fenced on three sides leaving a side of 10 feet uncovered. If the area of the field is 240 square feet, how many feet of fencing will be required? (BBA 17-18)

- A) 48 B) 58 C) 68 D) 78 E) None of these

Answer Key Exercise 2.1

1. E	5. C	9. B	13. C	17. A	21. C
2. C	6. B	10. E	14. D	18. D	22. A
3. B	7. C	11. D	15. B	19. D	23. B
4. D	8. D	12. E	16. D	20. E	

Answer 2.1: Quadrilaterals & Polygons

1. (E) Given that, $AD = BC = 16$
 Let, $AB = CD = x$
 \therefore Perimeter $= 2(16 + x)$
 Now, $2(16 + x) = 56$
 $32 + 2x = 56$
 $2x = 24$
 $x = 12$
 \therefore area $= 16 \times 12 = 192$.

2. (C) since PQRS is a square,
 $PQ = QS$
 $\Rightarrow 2a + 2 = a + 7$
 $\Rightarrow a = 5$

3. (B) We know, the opposite angles of parallelogram are equal and sum of all four angle is 360°
 So, $2(15x) + 2(40 - 2x) = 360$
 $\Rightarrow 30x + 80 - 4x = 360$
 $\Rightarrow 28x = 280$
 $\Rightarrow x = 10$

4. (D) Let, the length of rectangle A is x
 And the width of rectangle A is y
 \therefore The length of rectangle B is $2x$
 And the width of rectangle B is $2y$

 So, rectangle A area is xy and rectangle B area is $4xy$
 $\therefore \frac{\text{area of rectangle A}}{\text{area of rectangle B}} = \frac{1}{4}$

5. (C) Let the angles are $2x, 3x, 5x$ and $6x$
 So, $2x + 3x + 5x + 6x = 360$
 $\Rightarrow 16x = 360$
 $\Rightarrow x = 22.50$
 difference between largest and smallest angles is $(6x - 2x) = 4x = 4 \times 22.5 = 90^\circ$

6. (B) Given, $\angle A + \angle B + \angle C = 2\angle D$
 Now, $\angle A + \angle B + \angle C + \angle D = 360$
 $\Rightarrow 2\angle D + \angle D = 360$
 $\Rightarrow 3\angle D = 360$
 $\Rightarrow \angle D = 120^\circ$

(C) Let, length of sides of square A is = x

\therefore Length of sides of square B is = 200% of $x = 2x$

Length of sides of square C is = 150% of $2x = 3x$

Now, area of square A = x^2

Area of square B = $(2x)^2 = 4x^2$

Area of square C = $(3x)^2 = 9x^2$

\therefore Area of A + Area of B = $5x^2$

\therefore Area of C is greater by $9x^2 - 5x^2 = 4x^2$

$4x^2$ is $(4/5 \times 100)$ or 80% of $5x^2$

(D) Let, smaller side of the rectangle is x

Bigger side of the rectangle is y

Given, parameter is 10

$\therefore 2(x + y) = 10 \Rightarrow x + y = 5$

So, (x, y) can be either $(1, 4)$ or $(2, 3)$

When (x, y) is $(1, 4)$, $xy = 4$

When (x, y) is $(2, 3)$, $xy = 6$

Greatest number of rectangles can be cut when the area of the rectangle or xy is lowest.

So, we take $xy = 4$.

Area of paper = $24 \times 60 = 1440$

$\therefore 1440/4 = 360$ rectangles can be cut.

9. (B) Given, perimeter of the rectangle is $6w$

One side is $w/2$

Let other side is x

So, $2(x + w/2) = 6w$

$\Rightarrow 2x + w = 6w$

$\Rightarrow 2x = 5w$

$\Rightarrow x = 5w/2$

area of rectangle = $(5w/2 \times w/2)$
 $= 5w^2/4$

10. (E) Given, area of parallelogram is n

So, base \times height = n

$\Rightarrow JM \times KN = n$

$\Rightarrow JM(n + 1/n) = n$

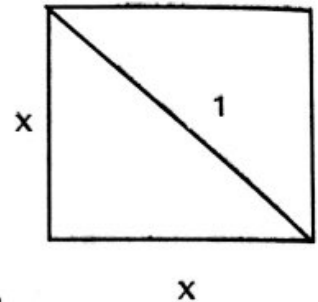
$\Rightarrow JM = \frac{n}{n^2 + 2}$

$\Rightarrow JM = n^2/(n^2 + 1)$

11. (D) Floor area = $10 \times 12 = 120$ sq.ft = $120 \times 12 \times 12$ sq.inch
 Tile are = $8 \times 8 = 64$ sq.inch
 Large square needed = $\frac{120 \times 12 \times 12}{64} = 270$
 \therefore L shaped tiles needed = $270 \times 2 = 540$

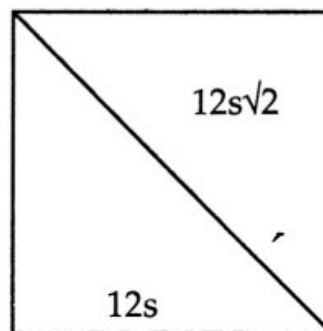
12. (E) Area = $64 \times 48 = 3072$ sqft.
 Given, width = 24m
 \therefore length = $3072/24 = 128$ m
 \therefore perimeter = $2(24 + 128) = 2 \times 152 = 304$ m

13. (C) Let the sides of the square is x
 Now, $x^2 + x^2 = 16^2$
 $\Rightarrow 2x^2 = 256$
 $\Rightarrow x^2 = 128$

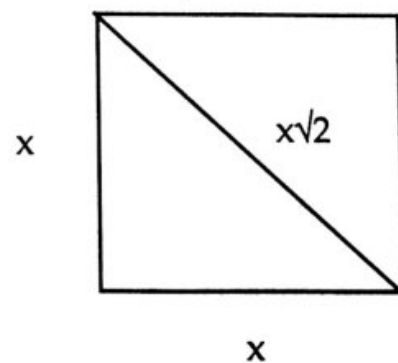


14. (D) Floor area = $10 \times 16 = 160$ sqft. = $(160 \times 12 \times 12)$ square inch
 Tile area = $8 \times 8 = 64$ square inch
 So, tiles required = $\frac{160 \times 12 \times 12}{64} = 360$
 \therefore cost = $360 \times 0.09 = 32.40$

15. (B) area of square = $144s^2$
 \therefore side of square = $\sqrt{144s^2} = 12s$
 Let, diagonal = x
 Applying Pythagorean Theorem,
 $(12s)^2 + (12s)^2 = x^2$
 $288s^2 = x^2$
 $x = 12s\sqrt{2}$



16. (D) If the length of square is x ,
 diagonal is $x\sqrt{2}$ and area is x^2



So, when diagonal is $x\sqrt{2}$, area is x^2

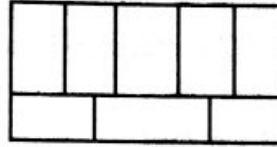
In option D, when diagonal becomes $(x\sqrt{2})\sqrt{2}$,
 Area becomes $(x\sqrt{2})^2 = 2x^2$

17. (A) For polygon, $\angle A + \angle B + \angle C + \angle D + \angle E = (5-2) \times 180 = 540^\circ$
 Given, $\angle B = 90^\circ$
 $\therefore \angle C + \angle D + \angle E + \angle A = 450^\circ$
18. (D) When side is x area is x^2
 If side increases by 150%, increase is $(x \times 150\%) = 1.5x$
 \therefore new side = $x + 1.5x = 2.5x$
 \therefore new area = $(2.5x)^2 = 6.25x^2$
 \therefore Area increase = $6.25x^2 - x^2 = 5.25x^2$
 \therefore Area increase = 525%
19. (D) let, the angle is A
 Since this is a regular nonagon,
 $9\angle A = (9-2) \times 180$
 $\Rightarrow 9\angle A = 7 \times 180$
 $\Rightarrow \angle A = 140^\circ$
20. (E) given, length of a side of regular hexagon = 6
 We know, in regular hexagon, area = $6 \times \frac{\sqrt{3}}{4} \times (\text{side})^2 = 6 \times \frac{\sqrt{3}}{4} \times (6)^2 = 54\sqrt{3}$
21. (C) যেকোনো opposite two sides কে 4cm বাড়ালে length হবে $20 + 4 = 24$ cm
 আবার opposite two sides কে 4cm কমালে length হবে $20 - 4 = 16$ cm
 তাই resultant figure এর area হবে $24 \times 16 = 384$ sq. cm.
22. (A) rectangle এর maximum possible area পেতে হলে square হতে হয়।
 এখানে square এর sides $x/3$
 So, the area is = $(x/3)^2 = x^2/9$
 সঠিক Answer (A)
23. (B) 58
 Area of the rectangular field is 240 sq. ft. One side of 10 feet is to be left uncovered. So the field has a side equal to $240/10 = 24$ ft.
 Required feet of fencing = $24 + 10 + 24 = 58$.

Exercise 2.2: Quadrilaterals & Polygon

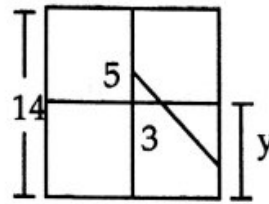
1. Eight identical cards are placed as shown in the figure below to form a large rectangle of area 120 sq. in. How many inches are there in the perimeter of this rectangle? (BBA 93)

- A. 32 B. 34 C. 46
D. 64 E. 90



2. In the figure below, the side of the large square is 14. The four smaller squares are formed by joining the midpoints of opposite sides, Find the value of Y. (BBA 93)

- A. 5 B. $6\frac{2}{3}$ C. $6\frac{5}{8}$
D. 6 E. 8.8

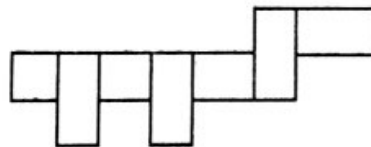


3. The length of a diagonal of a square is 5 inches. What is the area of the square in sq. inches? (BBA 94)
(A) 10 (B) 50 (C) 12.5 (D) 25 (E) Cannot be determined

4. The length and width of a rectangle are 15 meters and y meters respectively. If the length is reduced by 10% and the width increased by 10%, what is the change in area of the rectangle? (BBA 94)

- (A) increase by 1% (B) remains the same (C) decrease by 10%
(D) decrease by 1% (E) Cannot be determined

5. Seven rectangular blocks, each 4ft long and 2 ft wide, are arranged as shown in the figure below. What is the perimeter of the figure? (BBA 94-95)

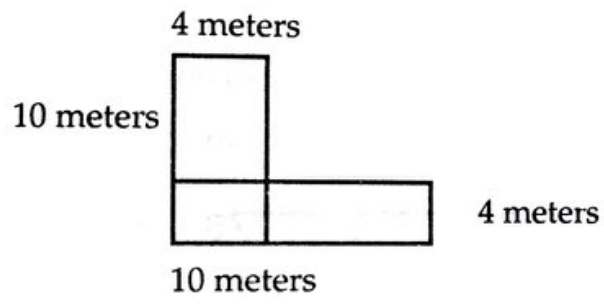


- (A) 42 (B) 56 (C) 60
(D) 68 (E) 72

6. You need to plant trees along the perimeter of a rectangle whose width is 20ft. and length 60ft. The distance between each plant should be 5 ft. How many trees will you need? (BBA 94-95)

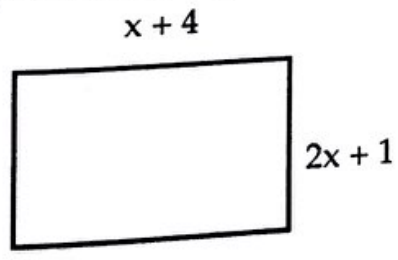
- (A) 31 (B) 32 (C) 33 (D) 34 (E) 35

7. The length and breadth of a room are increased by 20 percent and 25 percent respectively. What is the corresponding percentage increase in the floor area of the room?
 (A) 20 (B) 25 (C) 45 (D) 50 (E) 60 (BBA 94-95)
8. Each side of a rhombus has length equal to 1 and one of its angles is 45 degrees. What is the area of the rhombus?
 (A) 1 (B) $1/\sqrt{2}$ (C) $2/3$ (D) 2 (E) 2 (BBA 94-95)
9. If three angles of a quadrilateral are x , y and z , express the fourth angle in terms of x , y and z .
 (A) $360^\circ - (x + y + z)$ (B) $360^\circ - x - y - z$ (C) $180^\circ - (x + y + z)$ (D) $180^\circ - x - y - z$ (E) none of these (BBA 96-97)
10. The following figure shows the floor dimensions of an L shaped room. All angles are right angles. If carpeting costs Tk. 20 per square meter, what will be the cost in Tk. of carpeting for the entire floor of the room? (BBA 00-01)



- A. 800 B. 1280 C. 1600 D. 1680 E. None of these

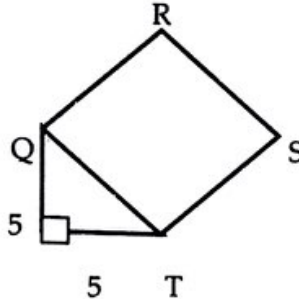
11. If the length of every side of three square garden plots is increased by 50 percent, by what percent is the sum of the areas of the three plots increased? (BBA 00-01)
 A. 675% B. 375% C. 225% D. 125% E. 50%
12. A square floor with side of 3 meters is to be covered with square tiles. If each tile has a perimeter of 1 meter, what is the minimum number of tiles needed to cover the floor? (IBA BBA 01-02)
 A. 4 B. 9 C. 144 D. 256 E. none of these
13. If the figure is a square, what is the perimeter of the figure? (BBA 04-05)



- (A) 9 (B) 12 (C) 16 (D) 28 (E) 49

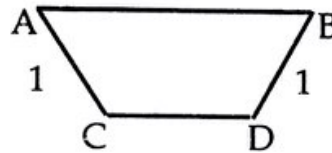
14. A square paper has its each side d cm. How much paper will be wasted (in terms of d) if the largest possible circle is cut of the square?
 (A) $(4d^2 - \pi d^2) / 4$ (B) $(\pi d^2 - 4d^2) / 4$ (C) πd^2 (BBA 56-06)
 (D) $16d^2 - \pi d^2$ (E) None of these

15. In the following figure, what is the area of square QRST? (BBA 05-06)



- (A) 25 (B) $20\sqrt{2}$ (C) $25\sqrt{2}$ (D) 50 (E) None of these
16. The sides of a rectangular floor are 16 feet by 24 feet. When a rectangular carpet is placed on the floor, a 4 feet wide strip of floor is exposed on all sides. What is the area of the carpet in sq. ft.? (BBA 08-09)
 (A) 320 (B) 288 (C) 352 (D) 240 (E) none of these
17. In the trapezoid, $\angle CAB = \angle DBA = 60^\circ$ and $AC = DB = 10$ cm. Find the area of the trapezoid. (BBA 08-09)

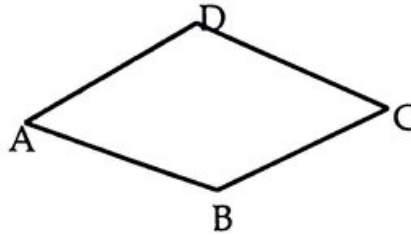
- (A) $250\sqrt{3}$ (B) 150 (C) 250
 (D) $125\sqrt{3}$ (E) none of these



18. The length of a rectangle is 10 cm more than its breadth; the area of the rectangle is 56 cm. What is the breadth of the rectangle? (MBA 96-97)
 (A) 8 (B) 10 (C) 4 (D) 14 (E) 12
19. A square room has a square carpet symmetrically placed in it. This leaves an uncovered area of 9 m^2 . The area of the whole room is 25 m^2 . What is the length of one side of the carpet? (MBA 96-97)
 (A) 10 (B) 8 (C) 6 (D) 4 (E) 2
20. A rectangular area of 16 meters by 12 meters is surrounded by a road 3 meters wide. The area of the road is: (MBA 01-02)
 A. 78 B. 132 C. 204 D. 216 E. none of these
21. The area of a square plot is twice that of another square plot. If the diagonal of the bigger plot is x , what is the diagonal of the smaller plot? (MBA 01-02)
 A. $x/2$ B. $x/4$ C. $2x/3$ D. $\sqrt{2}x/2$ E. none of these

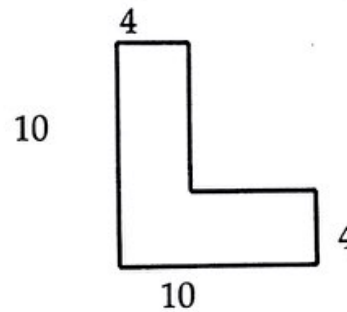
22. A square floor with side of 5 meters is to be covered with square tiles. If each tile has a perimeter of 0.8 meter, what is the minimum number of tiles needed to cover the floor?
 A. 144 B. 425 C. 500 D. 625 E. none of these
 (MBA 02-03)

23. If $\angle ADC = 150^\circ$, $AB = y$ cm and $BC = x$ cm, find the area of parallelogram ABCD.
 A. $\sqrt{3}xy/4$ B. $xy/\sqrt{2}$ C. $2xy/\sqrt{3}$
 D. $3xy/\sqrt{2}$ E. none of these
 (MBA 02-03)



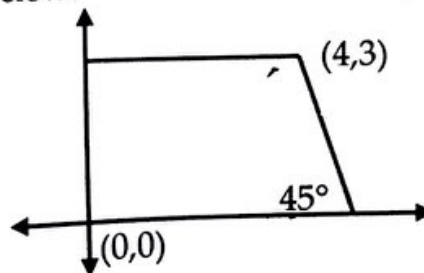
24. The figure below shows the floor dimensions of an L-shaped room. All angles shown are right angles. If carpeting costs Taka 1200 per square meter, what will carpeting for the entire floor of the room cost?
 (MBA 03-04)

- (A) Taka 48,000 (B) Taka 76,800
 (C) Taka 96,000 (D) Taka 100,800
 (E) Taka 139,200

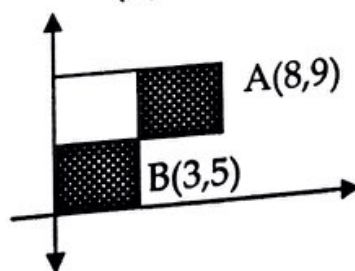


25. If the area of a square increases by 69%, then the side of the square increases by
 (MBA 03-04)
 (A) 13% (B) 30% (C) 39% (D) 69% (E) 130%

26. What is the area of the trapezium in the figure below?
 (MBA 03-04)
 (A) 10.5 (B) 14.5 (C) 16.5
 (D) 21 (E) cannot be determined

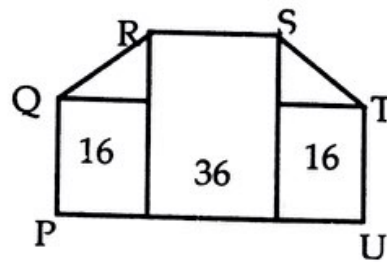


27. Points A and B have coordinates as shown in the figure. Find the combined area of the two shaded rectangles.
 (MBA 03-04)
 (A) 20 (B) 26 (C) 32 (D) 35 (E) 87



28. The following region PQRSTU consists of three square regions and two triangular regions. If the square regions have areas 16, 36 and 16, what is the perimeter of PQRSTU? (MBA 04-05)

- A) $22 + \sqrt{5}$ B) $28 + 2\sqrt{5}$ C) $28 + 4\sqrt{5}$
 D) $34 + 2\sqrt{5}$ E) $34 + 4\sqrt{5}$

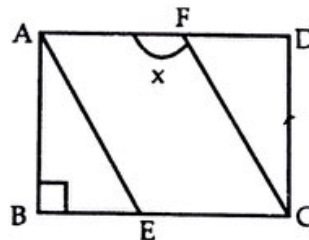


29. If the area of a rectangle is equal to the area of a square, then the perimeter of the rectangular must be (MBA 04-05)
- A) $\frac{1}{2}$ the perimeter of the square
 B) equal to the perimeter of the square
 C) equal to twice the perimeter of the square
 D) equal to the square root the perimeter of the square
 E) none of the above

30. The length of a rectangular field X is 2 kilometers greater than the side of a square field Y, and the width of the field X is 2 Kilometers less than the side of field Y. if y^2 is the area of Y in square kilometers, which of the following gives the area, in square kilometers, of field X? (MBA 04-05)
- A) $y^2 - 4$ B) $y^2 - 2$ C) y^2 D) $y^2 + 2$ E) $y^2 + 4$

31. In the following figure $AB = BE$, $AB \parallel CD$ and $AE \parallel FC$. What is the value of x [in degree]? (MBA 05-06)

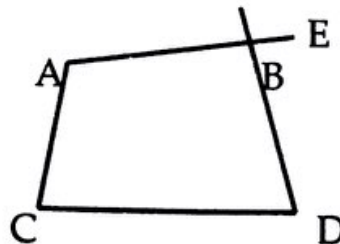
- (A) 45 (B) 135 (C) 75
 (D) 125 (E) 115



32. What is the ratio of the length of a side of a square to its perimeter? (MBA 05-06)
- (A) 1:1 (B) 1:2 (C) 1:3 (D) 1:4 (E) None of these

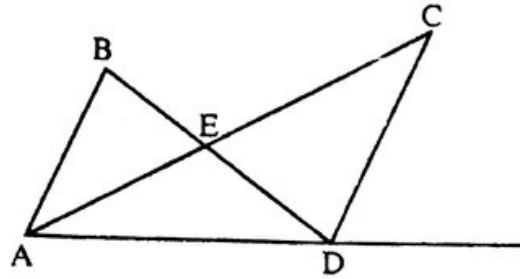
33. In the figure, $\angle CAB = 2 \angle CDB$, $\angle ABD = 3 \angle ACD$ and $\angle CDB = 2 \angle ACD$. Calculate $\angle ABD$. (MBA 07-08)

- (A) 90° (B) 60° (C) 88°
 (D) 72° (E) none of these



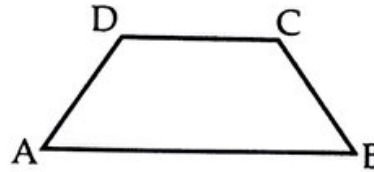
34. In the diagram, AB is parallel to DC. If $AE = ED$, $\angle EAB = 34^\circ$ and $\angle EAD = 42^\circ$, $\angle CDE = ?$ (MBA 07-08)

- (A) 55° (B) 60° (C) 64°
 (D) 72° (E) none of these



35. The parallel sides of a trapezium are 10 cm and 20 cm respectively. $AD = 6$ cm and $CB = 8$ cm. Find the area of the trapezium. (MBA 08-09)

- (A) 120 (B) 96 (C) 72
 (D) 48 (E) none of these

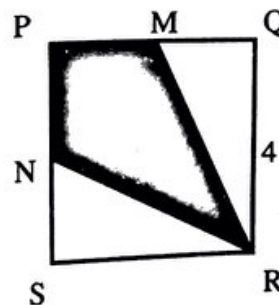


36. Mr. Rashid is a vegetable farmer. His neighbor's goat regularly enters his vegetable garden and destroys his vegetables. To protect his vegetables Mr. Rashid wants to put up fencing around three sides of his rectangular yard and leave a side of 20 feet unfenced as that side is facing the canal and needs no fence. If the garden has an area of 680 square feet, how many feet of fencing does he need? (MBA 09-10)

- A) 34 B) 40 C) 68 D) 88 E) None of these

37. In the figure below, PQRS is a square and M and N are midpoints of their respective sides. Each side of the square has a length of 4 inches. What is the area of quadrilateral PMRN? (figure not drawn to scale) (MBA 09-10)

- A) 8 sq inches B) 10 sq inches C) 12 sq inches
 D) 14 sq inches E) None on these



38. The length of a rectangular field X is 2 kilometers greater than the side of a square field Y and the width of the field X is 2 kilometers less than the side of field Y. If y^2 is the area of Y in square kilometers, which of the following gives the area, in square kilometers, of field X? (MBA 10-11)

- A. $y^2 - 4$ B. $y^2 - 2$ C. y^2 D. $y^2 + 2$ E. None of these

39. If the area of a rectangular is equal to the area of a square, then the perimeter of the rectangular must be – (MBA 10-11)

- A. half the perimeter of the square
- B. equal to the perimeter of the square
- C. equal to twice the perimeter of the square
- D. equal to the square root of the perimeter of the square
- E. None of these

Answer Key Exercise 2.2

1.C	2.B	3.C	4.D	5.C	6.B	7.D	8.B	9.B	10.B
11.D	12.C	13.B	14.A	15.D	16.E	17.E	18.C	19.D	20.C
21.D	22.D	23.E	24.B	25.B	26.C	27.D	28.C	29.E	30.A
31.B	32.D	33.D	34.E	35.C	36.D	37.A	38.A	39.E	-

Solution to Geometry Exercise 2.2

(C) আটটা সমান Card আছে। মোট area = 120 sq. inch, অতএব, 1 টি Card এর area = $\frac{120}{8} = 15$ sq. inch.

ধরি, Card এর দৈর্ঘ্য = x, প্রস্থ = y; অর্থাৎ xy = 15

ছবি হতে পাই, $y + y + y + y + y = x + x + x, \Rightarrow 5y = 3x; y = \frac{3x}{5}$

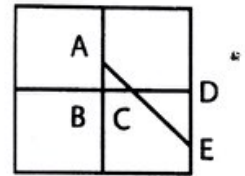
$\therefore xy = 15 \Rightarrow x \times \frac{3x}{5} = 15 \Rightarrow 3x^2 = 75 \Rightarrow x^2 = 25 \Rightarrow x = 5$

x = 5 হলে, $y = \frac{3 \times 5}{5} = 3$

অর্থাৎ, rectangle টির perimeter = $(y + y + y + y + y) + (x + x + x) + 2(y + x)$
 $= 5x + 3x + 2y + 2x = 7y + 5x = 7 \times 3 + 5 \times 5 = 21 + 25 = 46$

2. (B) এখানে, ΔABC এবং ΔCDE সদৃশকোণী। কারণ $\angle ABC = \angle CDE = 90^\circ$;
 $\angle ACB = \angle DCE$ (বিশ্রুতীপ কোণ) এবং $\angle BCA = \angle CED$ (একান্তর কোণ)।

$CD = 4$ ($BD = 7, BC = 3$); সুতরাং $\frac{y}{4} = \frac{5}{3} \Rightarrow 3y = 20; y = \frac{20}{3} = 6\frac{2}{3}$.

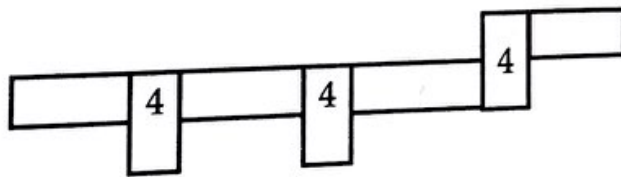


3. (C) Length of diagonal = 5 \therefore sides = $5/\sqrt{2}$; \therefore area = $(\frac{5}{\sqrt{2}})^2 = \frac{25}{2} = 12.5$

4. (D) New length = $15 - 10\%$ of 15 = 13.5m; New width = $y + 10\%$ of $y = 1.1y$; \therefore New area = $(13.5) \times (1.1y) = 14.85y$; Old area = $15y$; \therefore Change = $15y - 14.85y = 0.15y$; \therefore Percentage

change = $\frac{\text{change}}{\text{original}} \times 100\% = \frac{0.15y}{15y} \times 100\% = 1\%$ decrease.

5. (C)



পরিসীমা = 60

6. (B) Rectangle টির perimeter = $2(20 + 60) = 160$ feet. 5 feet অঙ্কব গাছ লাগালে মোট গাছ = $\frac{160}{5} = 32$

টি।

7. (D) ধরি, previous length = 10; previous breadth = 10 \therefore area = $10 \times 10 = 100$

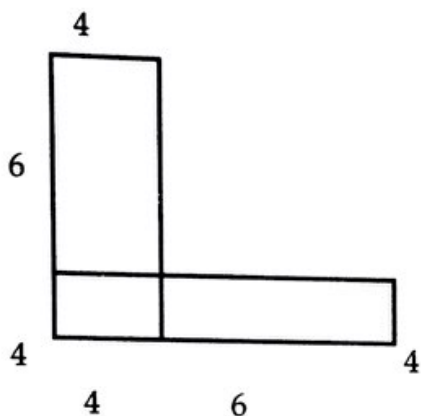
after the increase, length = 12; breadth = 12.5 \therefore area = $12 \times 12.5 = 150$

অর্থাৎ 50% increase হয়েছে।

8. (B) Rhombus এর area = side \times height; এখানে side = 1; একটি angle 45° হলে height = $\frac{1}{\sqrt{2}}$
 \therefore area = $1 \times \frac{1}{\sqrt{2}} = \frac{1}{\sqrt{2}}$

9. (B) $x + y + z + \text{fourth angle} = 360^\circ$; \therefore fourth angle = $360^\circ - x - y - z$

10. (B)



Total area = $(10 \times 4) + (4 \times 6) = 40 + 24 = 64$

Total cost = $64 \times 20 = 1280$ Taka.

11. (D)



Total area = $10^2 + 10^2 + 10^2 = 300$

After 50% increase, area = $15^2 + 15^2 + 15^2 = 225 + 225 + 225 = 675$

300 এ increase করে = 375

\therefore 100 এ increase করে = $\frac{375 \times 100}{300} = 125$

12. (C) no. of tiles = $\frac{\text{area of floor}}{\text{area of tiles}}$

= $\frac{3^2}{\left(\frac{1}{4}\right)^2}$ [perimeter/4 = side of a square] = $\frac{9}{\frac{1}{16}} = 9 \times 16 = 144$

13. (B) figure টি square হলে, $x + 4 = 2x + 1$, অর্থাৎ $x = 3$
 অতএব, perimeter = $3 \times 4 = 12$.

4. (A) paper এর area = d^2

circle এর diameter = d ; radius = $\frac{d}{2}$; area = $\pi \left(\frac{d}{2}\right)^2 = \frac{d^2}{4} \pi$

অর্থাৎ, নষ্ট হবে = $d^2 - \frac{d^2}{4} \pi = \frac{4d^2 - \pi d^2}{4}$

5. (D) পিথাগোরাসের উপপাদ্য অনুসারে,

$$QT = \sqrt{5^2 + 5^2} = 5\sqrt{2} \therefore \text{area of QRST} = (5\sqrt{2})^2 = 50$$

16. (E) $(16 - 4 \times 2)(24 - 4 \times 2)$

$$= 8 \times 16$$

$$= 128$$

17. (E) Cannot be determined

18. (C) মনে করি, breadth x cm, তাহলে length = $x+10$ cm. So, $x(x+10) = 56 \Rightarrow x^2 + 10x - 56 \Rightarrow$

$$(x+14)(x-4) = 0$$

কাজেই breadth, $x = 4$ cm.

19. (D) area of whole room = $25m^2$ আবার uncovered area হলো $9m^2$. কাজেই covered area = $25-9=16m^2$. carpet square আকারের ছিল বলে এর one side এর length = $\sqrt{16} = 4$ cm.

20. (C) Area of a rectangle = length \times width

$$\therefore \text{Area of the path} = 22 \times 18 - 16 \times 12 = 204$$

21. (D) Area of a square = $\frac{\text{diagonal}^2}{2}$

let, diagonal of the smaller square = d

$$\therefore \frac{d^2}{2} = \frac{1}{2} \times \frac{x^2}{2} \therefore d^2 = \frac{x^2}{2} \therefore d = \frac{x}{\sqrt{2}} = \frac{\sqrt{2}x}{2}$$

OR

Diagonal of the bigger square = x

$$\therefore \text{side of the bigger square} = \frac{x}{\sqrt{2}} \therefore \text{area of the bigger square} = \frac{x^2}{2}$$

$$\therefore \text{area of the smaller square} = \frac{x^2}{4} \therefore \text{side of the smaller square} = \frac{x}{2}$$

$$\therefore \text{Diagonal of the smaller square} = \frac{\sqrt{2}x}{2}$$

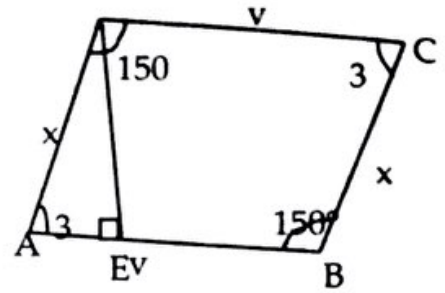
22. (D) মেঝের ক্ষেত্রফল = (5×5) sq. meter = 25 s.m

একটি tile এর perimeter 0.8 meter হলে বাহুর দৈর্ঘ্য = $\frac{0.8}{4} = 0.2$ meter

\therefore tile এর ক্ষেত্রফল = (0.2×0.2) sq. meter = 0.04 s.m

অতএব, মোট tile এর সংখ্যা = $\frac{25}{0.04}$ টি = 625 টি।

23. (E) Parallelogram বা সামান্তরিকে বিপরীত বাহু ও বিপরীত কোণগুলো পরস্পর সমান। অর্থাৎ $\angle B = 150^\circ$, $\angle C = \angle A = 30^\circ$ (দেয়া আছে, এবং $AB = DC = y$ cm; $BC = AD = x$ cm. $\angle D = 150^\circ$)
 D হতে AB এর উপর DE লম্ব টানি।
 $\triangle AED$ - তে $\angle AED = 90^\circ$ এবং $\angle DAE = 30^\circ$;
 অর্থাৎ $\angle ADE = 60^\circ \therefore AD = x$ cm. হলে $ED = \frac{x}{2}$ cm.
 $[30^\circ : 60^\circ : 90^\circ$ এর ratio $1 : \sqrt{3} : 2]$

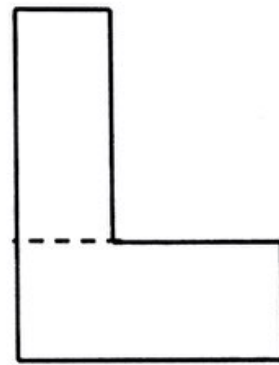


অতএব, area = $AB \times DE = y \times \frac{x}{2} = \frac{xy}{2}$

24. (B)

10

4 meters



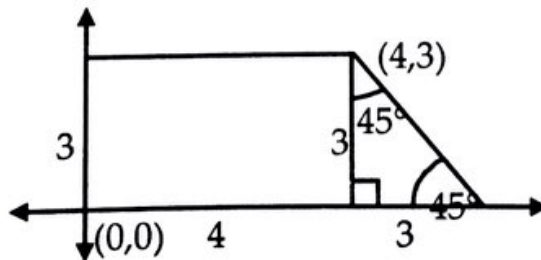
4 meters

10

উপরের অংশের area = $6 \times 4 = 24$ sq.m
 নিচের অংশের area = $4 \times 10 = 40$ sq.m
 \therefore মোট area = $40 + 24 = 64$ sq. m.
 \therefore total cost = (64×1200) টাকা = 76,800 টাকা।

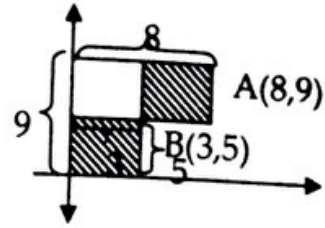
25. (B) ধরি, area ছিল 100
 অর্থাৎ, $a^2 = 100 = 10^2 \Rightarrow a = 10$
 এখন, area = 169
 অর্থাৎ, $a^2 = 169 = 13^2 \Rightarrow a = 13$
 অর্থাৎ, increase in side = $\frac{13-10}{10} \times 100 = 30\%$.

26. (C)



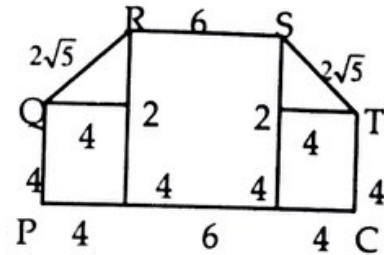
Trapezium এর area = $\frac{1}{2} \times$ সমান্তরাল বাহুদ্বয়ের সমষ্টি \times উচ্চতা = $\frac{1}{2} \times (4+7) \times 3 = 16.5$

(D) পার্শ্বের shaded rectangle এর area = $5 \times 4 = 20$
 দিগের shaded rectangle এর area = $3 \times 5 = 15$
 \therefore মোট area = $20 + 15 = 35$.



(C) Area of the squares are 16, 36, 16
 So length's are 4, 6, 4 (diagram)

the hypotenuse of the triangles = $\sqrt{4^2 + 2^2} = \sqrt{20} = 2\sqrt{5}$
 So, perimeter = $4 + 2\sqrt{5} + 6 + 2\sqrt{5} + 4 + 4 + 6 + 4$
 $= 28 + 4\sqrt{5}$



(E) কোনটিই হবেনা। একটি example দেখুন:

ধরি, rectangle এবং square এর area = 100

\therefore square এর একটি বাহু = $\sqrt{100} = 10$ rectangle এর length ও width = 20,5 or 50,2 or 25,4

অর্থাৎ, square এর perimeter = $10 \times 4 = 40$

rectangle এর perimeter = $2(20 + 5)$ or $2(50 + 2)$ or $2(25 + 4)$
 $= 50$ or 104 or 58

(A) Square এর area y^2 , so length = y

Rectangle এর length = $y+2$

width = $y-2$

So rectangle field এর area = $(y+2)(y-2)$
 $= y^2 - 4$

(B) যেহেতু $AB = BE$, $\angle AEB = 45^\circ$. Now, $\angle AEC = 135^\circ$. Therefore, $x = \angle AFC = 135^\circ$.

(D) Square এর side 'a' হলে perimeter হয় 4a. So, Side: Perimeter = 1:4

(D) $\angle ACD + \angle CDB + \angle ABD + \angle CAB = 360^\circ$

$$\Rightarrow \angle ACD + 2\angle ACD + 3\angle ACD + 2\angle CDB = 360^\circ$$

$$\Rightarrow \angle ACD + 2\angle ACD + 3\angle ACD + 4\angle ACD = 360^\circ$$

$$\Rightarrow 10\angle ACD = 360^\circ \Rightarrow \angle ACD = 36^\circ \therefore \angle ABD = 3 \times \angle ACD = 3 \times 36^\circ = 108^\circ$$

$$\therefore \angle DBE = 180^\circ - \angle ABD = 180^\circ - 108^\circ = 72^\circ$$

(E) $AB \parallel DC \therefore \angle BAC = \angle ACD = 34^\circ$; (alternate angle), $AE = ED$

$$\therefore \angle ADE = \angle EAD = 42^\circ$$

$$\Delta AED \text{ এ, } \angle AED = 180^\circ - 42^\circ - 42^\circ = 96^\circ \therefore \angle DEC = 180^\circ - 96^\circ = 84^\circ$$

$$\Delta CED \text{ এ, } \angle CDE = 180^\circ - 84^\circ - 34^\circ = 62^\circ \text{ যা option এ নেই।}$$

35. (C) পীথাগোরাস অনুসারে,

$$h^2 = 6^2 - a^2 \dots\dots\dots(i)$$

$$h^2 = 8^2 - b^2 \dots\dots\dots(ii)$$

(ii) ও (i) হতে পাই, $8^2 - b^2 = 6^2 - a^2$

$$\Rightarrow b^2 - a^2 = 8^2 - 6^2 = 64 - 36$$

$$\Rightarrow b^2 - a^2 = 28$$

$$\Rightarrow (b + a)(b - a) = 28$$

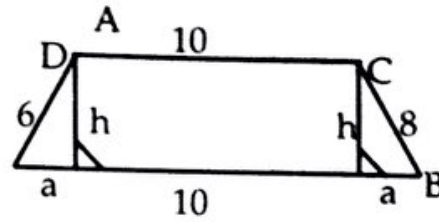
$$\Rightarrow 10(b - a) = 28 \text{ [diagram হতে দেখা যায়, } a + b = 10]$$

$$\Rightarrow b - a = 28 \dots\dots\dots(iii)$$

এখন, $b + a = 10 \dots\dots\dots(iv)$

$$(iv) - (iii) \Rightarrow 2a = 7.2 \quad \therefore a = 3.6 \quad h = \sqrt{6^2 - (3.6)^2} = \sqrt{23.04} \quad \therefore h = 4.8$$

$$\therefore \text{Area} = \frac{1}{2} \times (10 + 20) \times 4.8 = 15 \times 4.8 = 72$$

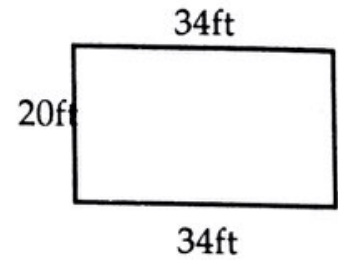


36. (D) Rectangular garden এর Area = 680 sq. feet একটি side = 20 feet

অপর side টি = $\frac{680}{20} = 34$ feet

Mr. Rashid 20 feet unfenced রাখে।

Total fencing needed = $34 + 34 + 20 = 88$ feet.



37. (A) এখানে, P, R যোগ করি, তাহলে ΔPRS এ RN একটি মধ্যমা। ΔNRS এর area = $\frac{1}{2} \times 4 \times 2 = 4$ sq.

inches এখন মধ্যমা ত্রিভুজকে সমান ক্ষেত্রফলের দুই ত্রিভুজে বিভক্ত করে।

ΔPRN এর Area = 4 sq. inches আবার একইভাবে ΔPRM এর Area = 4 sq. inches

Quadrilateral PMRN এর Area = 8 sq.

38. (A) Square field y এর area y^2 হলে প্রতিটি side = y

অর্থাৎ, Rectangular field x এর length = $y + 2$ এবং width = $y - 2$

$$\therefore \text{area} = (y+2)(y-2) = y^2 - 4$$

39. (E) একটি rectangle এবং একটি square এর area সমান হলেও তাদের perimeter এর মধ্যে প্রব কোন সম্পর্ক বের করা সম্ভব নয়।

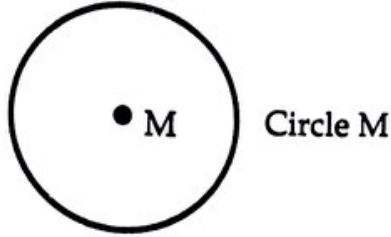
Chapter 3

Circles

Chapter 3: Circles

Some Important Definitions:

i) Center বা mid-point অনুসারে circle-এর নামকরণ করা হয় :

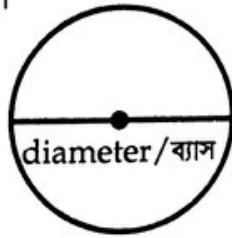


ii) Circumference (C) হচ্ছে circle-এর একটি বৃত্তাকার রেখার দৈর্ঘ্য- অর্থাৎ circle এর perimeter হচ্ছে circumference বা পরিধি।

iii) Radius হচ্ছে Center ও Circumference-এর যে কোন বিন্দু সংযোগকারী রেখা। (S. radius → Pl. radii).



iv) Circumference এর দুটি বিন্দু যোগ করলে তা কেন্দ্র গামী হলে তাকে diameter বা ব্যাস বলে। diameter এর length দুটি radius এর যোগফলের সমান।



v) π (পাই) হচ্ছে একটি constant. যে কোন circle-এর circumference এবং diameter এর ratio একটি constant (π)। এটি আসলে একটি irrational number। তবে এর আসন্ন মান 3.14 বা $\frac{22}{7}$ ।

vi) r, d, c, A (Area) এর যে কোন একটি জানা থাকলে সহজেই অপর তিনটি নির্ণয় করা যায়। কোন Circle এর radius r হলে, $d = 2r$

$$c = 2 \times \pi \times r = \pi d$$

$$A = \pi r^2 = \frac{\pi d^2}{4}$$

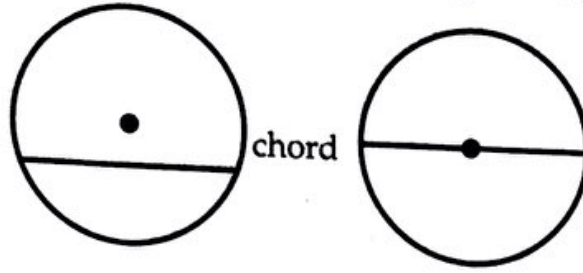
Example : r = 2m হলে

$$d = 2 \times 2 = 4m$$

$$c = 4\pi m$$

$$A = 4\pi m^2$$

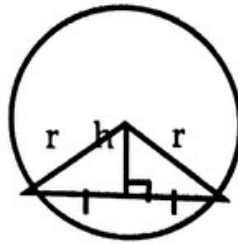
vii) Chord বা জ্যা circumference এর যে কোন দুটি বিন্দু সংযোগকারী রেখা



N. B. a. Diameter circle-এর বৃহত্তম chord

b. center এবং chord-এর মধ্যবিন্দু সংযোগকারী রেখা chord এর উপর Perpendicular.

c. Center থেকে chord-এর উপর লম্ব, chord কে সমদ্বিখন্ডিত করে।



d. সমান সমান chord কেন্দ্র থেকে সমান দূরবর্তী।

e. Center থেকে সমদূরবর্তী chord পরস্পর সমান।

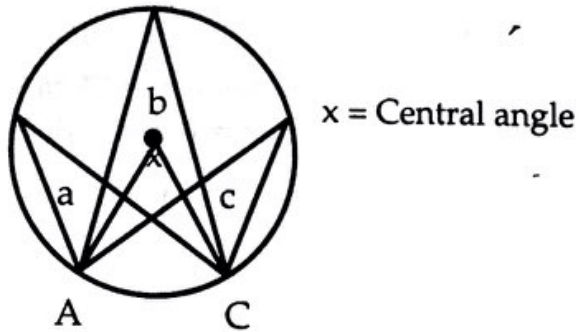
f. বৃহত্তর chord, center এর নিকটতর।

g. center এর নিকটতর chord বৃহত্তর।

viii) Arc বা চাপ হচ্ছে Circumference এর অংশ।

ix) **Central and Inscribed Angles :**

Arc center-এ Central এবং circumference এর উপরে inscribed angle ধারণ করে।



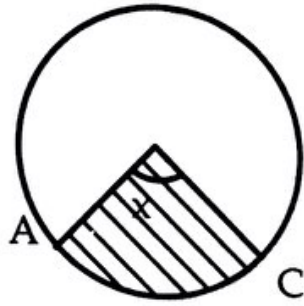
এখানে,

a. $a = b = c$ অর্থাৎ একই চাপ AC-এর উপরে সব inscribed angle সমান।

b. $a = b = c = \frac{x}{2}$ অর্থাৎ inscribed angle, central angle-এর অর্ধেক।

c. সমান সমান chord সমান সমান arc ছিন্ন করে।

Area of Pie : Central angle এর মান অনুযায়ী Pie এর area নির্ণয় করা যায়।

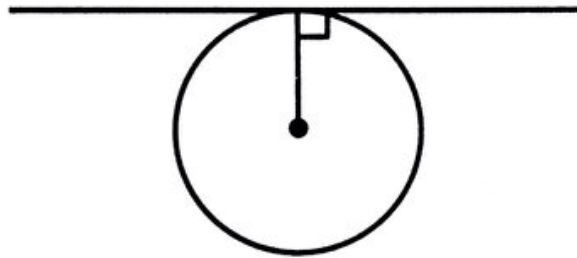


$AC = x^\circ$ হলে, area (shaded) = $A \times \frac{x^\circ}{360^\circ}$

Example : $r = 3m$ এবং $AC = 60^\circ$ হলে,

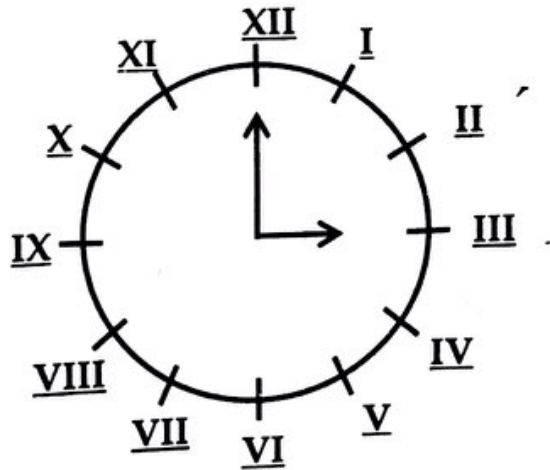
Shaded area = $\pi \times 9m^2 \times \frac{60}{360} = \frac{3}{2} \pi m^2$

Tangent: Tangent circle এর একটি external line যা circumference কে একটিমাত্র point এ touch করে।



Center এবং point of tangency সংযোগ করলে তা tangent এর উপর perpendicular হবে।

Angle between the Hands (Clock Problem):



1. Clock এর Center চারিদিকে total angle 360°
2. Minute এর hand 60 m অর্থাৎ 360° ঘুরলে 1 hour হয় বা hour hand 30° ঘুরলে।
3. x minute-এ hour hand $\frac{x}{2}$ degree ঘুরে। অর্থাৎ প্রতি minute-এ hour hand $\frac{1}{2}$ ঘুরে।
4. প্রতি minute-এ minute hand 6° ঘুরে।

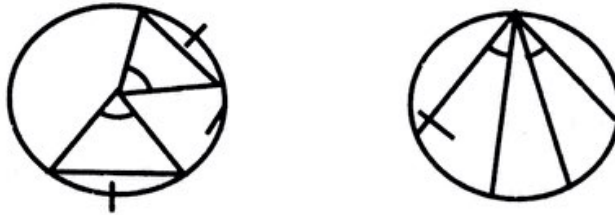
Example: What is the degree measure of the acute angle between the hands of minute and hour at 7 : 45

Solution: 7:00 থেকে minute hand 45 minute ঘুরলে hour hand ছিন্ন থাকলে angle টি হতো 60° (vii থেকে ix এর মাঝে $30^\circ + 30^\circ = 60^\circ$)

কিন্তু 45 minute এ hour hand $\frac{45^\circ}{2}$ ঘুরবে

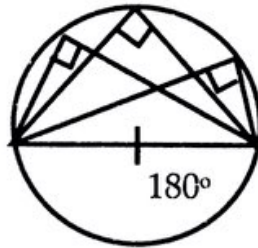
$$\therefore \text{Acute angle} = 60^\circ - 22.5^\circ = 37.5^\circ$$

d. সমান সমান chord বা arc এর central এবং inscribed angleগুলো সমান।



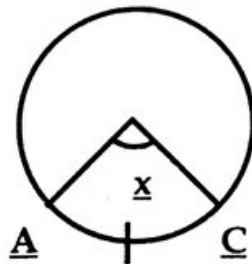
e. circle এর degree measure 360°

f. Semi-circle এ অর্থাৎ diameter এর উপর যে কোন angle 90°



Length of an Arc:

Central angle এর মান অনুযায়ী arc এর length নির্ণয় করা হয়।



$$AC = x^\circ \text{ হলে, } AC = \text{Circumference} \times \frac{x}{360^\circ}$$

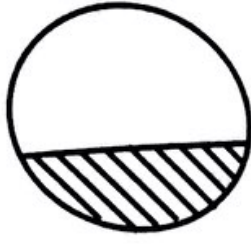
example $r = 3\text{m}$ এবং $AC = 60^\circ$ হলে,

$$AC = 2 \times \pi \times 3 \times \frac{60^\circ}{360^\circ} \text{ m.}$$

$$= \pi \text{m.}$$

Segment and Pie:

Segment এবং pie Circle এর surface-এর part :



Segment



Pie

$$\text{Area of a pie} = \pi r^2 \times \frac{x}{360^\circ}$$

Some Important Formulae:

বর্গক্ষেত্রের কর্ণের উপর অঙ্কিত বর্গের অর্ধেকই হচ্ছে উক্ত বর্গক্ষেত্রের ক্ষেত্রফল।

সমকোণী ত্রিভুজের সমকৌণিক শীর্ষ হতে অঙ্কিত লম্বের দৈর্ঘ্য =

ভূমি \times লম্ব

অতিভুজ

$$\text{সমবাহু ত্রিভুজের বাহু } a \text{ দেয়া থাকলে উক্ত ত্রিভুজের ক্ষেত্রফল} = \frac{\sqrt{3}}{4} a^2$$

সমকোণী ত্রিভুজের অতিভুজ ভূমির দ্বিগুন হলে, লম্ব হবে ভূমির $\sqrt{3}$ গুণ বেশি।

$$\text{সুষম ষড়ভুজের ক্ষেত্রফল} = \frac{3\sqrt{3}}{2} a^2$$

বর্গক্ষেত্রের কর্ণদ্বয় বর্গক্ষেত্রকে চারটি সমান সমদ্বিবাহু সমকোণী ত্রিভুজে বিভক্ত করে।

বর্গক্ষেত্রের কর্ণ এক বাহুর $\sqrt{2}$ গুণ।

$$\text{সুষম বহুভুজের একটি কোণ} = \frac{(n-2)180^\circ}{n}$$

সমবাহু ত্রিভুজের ভেতর অঙ্কিত কোন বৃত্তের ক্ষেত্রফল πa^2 হলে, উক্ত ত্রিভুজের ক্ষেত্রফল $= 3\sqrt{3}a^2$ ।

স্থলকোণী সমদ্বিবাহু ত্রিভুজের স্থলকোণ 120° হলে, স্থলকোণের বিপরীত বাহুর মান হবে সমান সমান বাহুর $\sqrt{3}$ গুণ বেশী।

সমকোণী ত্রিভুজের অপর কোণদ্বয় 30° ও 60° হলে, 30° কোণের বিপরীত বাহু অতিভুজের অর্ধেক এবং 60° কোণের বিপরীত

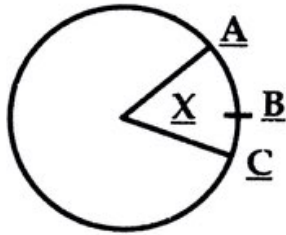
বাহু 30° কোণের বিপরীত বাহুর $\sqrt{3}$ গুণ বেশী।

শীর্ষ কোণের অন্তর্দিকখণ্ডক ভূমিকে কোণ সংলগ্ন বাহুদ্বয়ের অনুপাতে ভাগ করে।

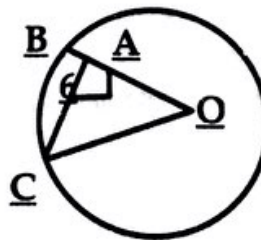
শীর্ষ কোণের বহির্দিকখণ্ডক ভূমিকে কোণ সংলগ্ন বাহুদ্বয়ের অনুপাতে বিভক্ত করে (বহিষ্কৃত একটি বিন্দুতে)

Exercise 3.1:

1. If the area of a circle is 64π , then the circumference of the circle is
 (A) 8π (B) 16π (C) 32π (D) 64π (E) 128π
2. The ratio of the area of a circle to the radius of the circle is
 (A) π (B) 2π (C) π^2 (D) $2\pi^2$ (E) none of these
3. If the circumference and the area of a circle are numerically equal, what is the numerical value of the diameter?
 (A) $\frac{22}{7}$ (B) 4 (C) $2 \times \frac{22}{7}$ (D) 2 (E) 1
4. What is the area of a semicircle with a diameter of 16 inches?
 (A) 32π sq. feet (B) 64π sq. feet (C) 128π sq. feet
 (D) 256π sq. feet (E) 512π sq. feet.
5. If d is the diameter of a circle, then πd^2 represents
 (A) area of the circle
 (B) half the area of the circle
 (C) twice the area of the circle
 (D) One-fourth the area of the circle
 (E) four times the area of the circle.



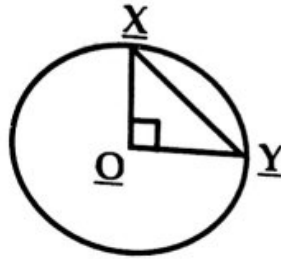
6. In the figure above, the ratio of the circumference of the circle B to the length of arc ABC is 8:1 what is the value of x ?
 (A) 30° (B) 45° (C) 60° (D) 75° (E) 90°



7. In the figure above, if the area of the circle with center O is 100π and CA has a length of 6, what is the length of AB?
 (A) 2 (B) 3 (C) 4 (D) 5 (E) 6

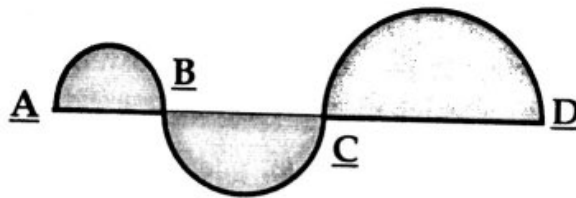
If the minute hand of a clock moves 45 degrees, how many minutes of time have passed?

- (A) 6 (B) 7.5 (C) 15 (D) 5 (E) 6

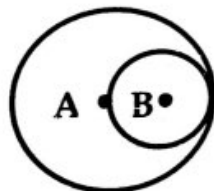


In the figure above, O is the center of the circle. If the area of triangle XOY is 25, what is the area of the circle?

- (A) 25π (B) $25\pi\sqrt{2}$ (C) 50π (D) $50\pi\sqrt{3}$ (E) 625π



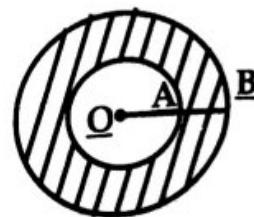
10. Each of the three shaded regions above is a semicircle. If $AB=4$, $CD = 2BC$ and $BC = 2AB$, then the area of the entire figure is
 (A) 28π (B) 42π (C) 84π (D) 96π (E) 168π
11. If the diameter of a circle increases by 50 percent; by what percent will the area of the circle increase?
 (A) 25% (B) 50% (C) 100% (D) 125% (E) 225%



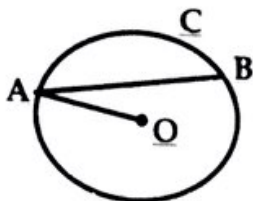
12. In the diagram above, if the circle with center A has an area of 72π , what is the area of the circle with center B?
 (A) 18π (B) 24π (C) 30π (D) 36π (E) 48π

13. A circular garden twenty feet in diameter is surrounded by a path three feet wide. What is the area of the path?

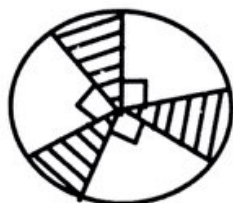
- (A) 9π sq. feet (B) 51π sq. feet
 (C) 60π sq. feet (D) 69π sq. feet
 (E) 90π sq. feet



14. In circle O, $OB = 6$ and $AB = 2$. The ratio of the shaded portion to the small circle =
 (A) 1:9 (B) 1:3 (C) 5:4 (D) 3:5 (E) 3:4
15. If the radius of a circle is increased by 50 percent, the circumference is increased by
 (A) 25% (B) 50% (C) 100% (D) 125% (E) 250%



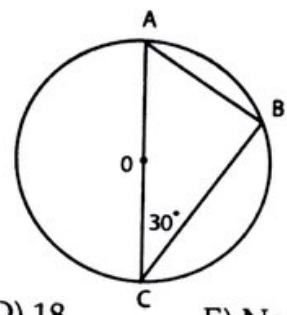
16. Arc $ACB = 60^\circ$. Angle $BAO =$
 (A) 12° (B) 30° (C) 45° (D) 60° (E) 120°
17. What is the acute angle between the hands of hour and minute at 6:35?
 (A) 5° (B) $12\frac{1}{2}^\circ$ (C) 15° (D) $17\frac{1}{2}^\circ$ (E) 30°
18. What is the acute angle between the hands of hour and minute at 6:25?
 (A) $12\frac{1}{2}^\circ$ (B) 15° (C) 30° (D) $42\frac{1}{2}^\circ$ (E) 45°



19. In the circle above, three right angles have vertices at the center of the circle. If the radius of the circle is 8, what is the combined area of the shaded region?
 (A) 8π (B) 9π (C) 12π (D) 13π (E) 16π
20. If an arc with length of 12π is $\frac{3}{4}$ the circumference of a circle, what is the shortest distance between the end points of the arc?
 (A) 4 (B) $4\sqrt{2}$ (C) 8 (D) $8\sqrt{2}$ (E) 16
21. In the figure, O is the center of the circle, $AB = AC$ and $\angle ACB = 62^\circ$. (MBA 2013)
 Find $\angle ABD$.
 (A) 28° (B) 30°
 (C) 32° (D) 35°
 (E) none of these



2. A certain recipe makes enough batter (a semi-liquid mixture of one or more grains used to prepare various foods) for exactly 8 circular pancakes that are each 10 inches in diameter. How many circular pancakes, each 5 inches in diameter and of the same thickness as the 10-inch pancakes, should the recipe make? (BBA 14-15)
 (A) 4 (B) 15 (C) 24 (D) 32 (E) 40
3. The circle with center O has a circumference of $12\pi\sqrt{3}$. If AC is a diameter of the circle, what is the length of line segment AB? (BBA 17-18)



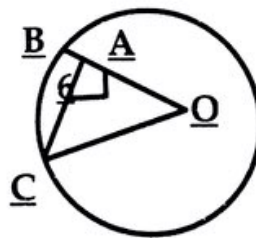
- A) $3\sqrt{2}$ B) 6 C) $6\sqrt{3}$ D) 18 E) None of these

Answer Key Exercise 3.1

1. B	5. E	9. C	13. D	17. B
2. E	6. B	10. B	14. C	18. D
3. B	7. A	11. D	15. B	19. E
4. A	8. B	12. A	16. D	20. D
21. A	22. D	23. C		

Answer 3.1: Circles

1. (B) Let, radius is r
 $\therefore \text{area} = \pi r^2$
 Given, $\pi r^2 = 64\pi$
 $\Rightarrow r^2 = 64$
 $\Rightarrow r = 8$
 $\therefore \text{circumference} = 2\pi r = 16\pi$
2. (E) Area and radius have different units. So, their ratio is not possible.
3. (B) let, radius = r
 $\therefore \text{diameter} = 2r$
 Given $2\pi r = \pi r^2$
 $\Rightarrow 2\pi r - \pi r^2 = 0$
 $\Rightarrow \pi r(2 - r) = 0$
 $\therefore r = 0$ or $r = 2$; $r = 0$ is not acceptable
 $\therefore 2r = 4$
4. (A) diameter = 16 inch \therefore radius = 8 inch
 New area of circle = $\pi r^2 = \pi 8^2 = 64\pi$
 \therefore area of semicircle = 32π
 [The options are for sq. feet, and the answer is in sq. inches. And none of these isn't an option]
5. (E) if radius is r , diameter is $2r$
 $\therefore \pi d^2 = \pi (2r)^2 = 4\pi r^2 = 4$ times the area of the circle.
6. (B) Given, circumference: arc = 8:1
 We know, circumference holds 360° in the center.
 \therefore arc holds $360/8 = 45^\circ$
7. (A) Let, radius = r
 Given, $\pi r^2 = 100\pi$
 $\Rightarrow r^2 = 100$
 $\Rightarrow r = 10$
 $\therefore OC = 10$, given, $AC = 6$
 Applying Pythagorean theorem,
 $OC^2 = AC^2 + AO^2$
 $\Rightarrow 10^2 = 6^2 + AO^2$
 $\Rightarrow AO^2 = 64$
 $\Rightarrow AO = 8$
 Since $OB = r = 10$, $AB = BO - AO = 10 - 8 = 2$
8. (B) If minute hand moves 360° time passed = 60 min
 \therefore If minute hand moves 1° time passed = $60/360$ min
 If minute hand moves 45° time passed = $60 \times 45/360$ min = 7.5 min



9. (C) Let, radius is r
 Area of $\Delta XOY = 25$

$$\therefore \frac{1}{2} OY \cdot OX = 25$$

$$\Rightarrow OY \cdot OX = 50$$

$$\Rightarrow r^2 = 50$$

$$\Rightarrow \pi r^2 = 50\pi$$

10. (B) $AB = 4$. $\therefore r_{AB} = 2$

$$BC = 2AB = 8. \therefore r_{BC} = 4$$

$$CD = 2BC = 16 \therefore r_{CD} = 8$$

$$\therefore \text{Total area} = \frac{\pi 2^2}{2} + \frac{\pi 4^2}{2} + \frac{\pi 8^2}{2} + \frac{4\pi}{2} + \frac{16\pi}{2} + \frac{64\pi}{2} = 2\pi + 8\pi + 32\pi = 42\pi$$

11. (D) Let, radius = r

$$\therefore \text{diameter} = 2r$$

If diameter increases by 50%, increase = $(2r \times 50\%) = r$

$$\therefore \text{New diameter} = 2r + r = 3r$$

$$\therefore \text{New radius} = \frac{3}{2} r$$

$$\text{Previous area} = \pi r^2$$

$$\text{New area} = \frac{9}{4} r^2$$

$$\therefore \text{Increase} = \frac{5}{4} = 1.25 = 125\%$$

12. (A) Let, radius of circle with center A = r

$$\therefore \text{area} = \pi r^2$$

$$\text{Given, } \pi r^2 = 72\pi$$

$$\Rightarrow r^2 = 72$$

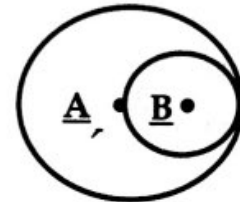
$$\Rightarrow r = 3\sqrt{8}$$

In the figure, radius of bigger circle = diameter of smaller circle

$$\therefore \text{diameter of circle with center B} = 3\sqrt{8}$$

$$\text{Radius of circle with center B} = \frac{3\sqrt{8}}{2}$$

$$\therefore \text{area} = \pi \left(\frac{3\sqrt{8}}{2} \right)^2 = \frac{72}{4} \pi = 18\pi$$



13. (D) Diameter of garden without path = 20 ft

$$\therefore \text{radius of garden without path} = 10 \text{ ft}$$

$$\therefore \text{radius of garden with path} = (10 + 3) \text{ ft} = 13 \text{ ft}$$

$$\text{Now, area of path} = \text{area of garden with path} - \text{area of garden without path}$$

$$= \pi 13^2 - \pi 10^2 = 69\pi$$

14. (C) Given, $OB = 6$, $AB = 2$

$$\therefore OA = 6 - 2 = 4$$

$$\begin{aligned} \text{Shaded portion area} &= \text{area of bigger circle} - \text{area of smaller circle} \\ &= \pi 6^2 - \pi 4^2 = 20\pi \end{aligned}$$

$$\text{Smaller Circle area} = 16\pi$$

$$\therefore \text{shaded portion area} : \text{small circle area} = 20\pi : 16\pi = 5:4$$



15. (B) Let, radius = r

If increased by 50%, radius becomes $1.5r$

$$\text{Previous circumference} = 2\pi r$$

$$\text{New circumference} = 2\pi (1.5r) = 3\pi r$$

$$\text{Increase in area} = \pi r$$

So, in $2\pi r$ increase is πr . \therefore increase is 50%

16. (D) Given, Arc $ACB = 60^\circ$, $\therefore \angle AOB = 60^\circ$

$$\text{Again, } AO = BO = r$$

$$\therefore \angle ABO = \angle BAO$$

$$\text{Now, } \angle AOB + \angle ABO + \angle BAO = 180^\circ$$

$$\Rightarrow 2\angle BAO = 180^\circ - \angle AOB$$

$$\Rightarrow 2\angle BAO = 180^\circ - 60^\circ$$

$$\Rightarrow 2\angle BAO = 120^\circ$$

$$\Rightarrow \angle BAO = 60^\circ$$

17. (B) We know

$$\text{angle between the hands of a clock} = \left| 30h - \frac{11}{2}m \right|$$

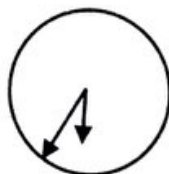
$$= \left| 30 \times 6 - \frac{11}{2} \times 35 \right|$$

$$= \left| 180 - \frac{385}{2} \right|$$

$$= \left| 180 - 192.5 \right|$$

$$= \left| -12.5 \right|$$

$$= 12 \frac{1}{2}$$



18. (D) We know

$$\text{angle between the hands of a clock} = \left| 30h - \frac{11}{2}m \right|$$

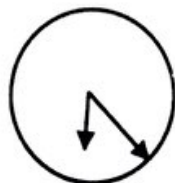
$$= \left| 30 \times 6 - \frac{11}{2} \times 25 \right|$$

$$= \left| 180 - \frac{275}{2} \right|$$

$$= \left| 180 - 137.5 \right|$$

$$= \left| 42.5 \right|$$

$$= 42 \frac{1}{2}$$



(E) The circumference holds in the center 360°

Each non-shaded angle holds 90° in the center.

Combined, the three non-shaded angle holds $3(90^\circ) = 270^\circ$

\therefore Shaded portion holds $360^\circ - 270^\circ = 90^\circ$

Now, area of the circle = $\pi r^2 = 64\pi$

So, 360° holds area of 64π

1° holds area of $\frac{64\pi}{360}$

90° holds area of $\frac{64\pi \times 90}{360} = 16\pi$



(D) Given, $\frac{3}{4}$ of the circumference = 12π

\therefore Circumference = 16π and Radius = 8

The central angle of the shortest distance = 90°

Therefore, shortest distance = $r\sqrt{2} = 8\sqrt{2}$

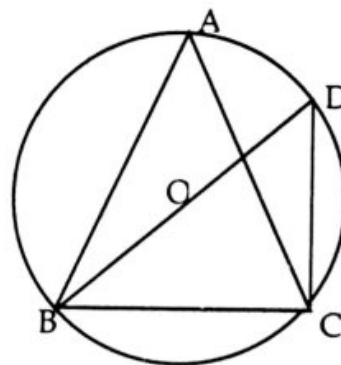
(A) $AB = AC$, so $\angle ABC = \angle ACB = 62^\circ$

তাই $\angle BAC = 56^\circ$. আবার same arc BC থেকে $\angle BAC$ এবং $\angle BDC$ বৃত্তস্থ কোণ, তাই $\angle BDC = 56^\circ$

আবার $\angle BDC$ হচ্ছে অর্ধবৃত্তস্থ কোণ। তাই $\angle BCD = 90^\circ$

সুতরাং $\angle DBC = 180^\circ - 90^\circ - 56^\circ = 34^\circ$

তাহলে $\angle ABD = \angle ABC - \angle DBC = 62^\circ - 34^\circ = 28^\circ$



(D) প্রথম pancake এর diameter = 10, so radius = 5. এবং area $A = \pi r^2 = 25\pi$ এ So, for 8 pancakes the area is $25\pi \times 8 = 200\pi$

দ্বিতীয় pancake এর diameter = 5, so radius = 2.5. এবং area $A = \pi r^2 = 6.25\pi$

সুতরাং, 200π pancake এর material দিয়ে diameter 5 এর $\frac{200\pi}{6.25\pi} = 32$ pancakes বানানো সম্ভব।

(C) $6\sqrt{3}$

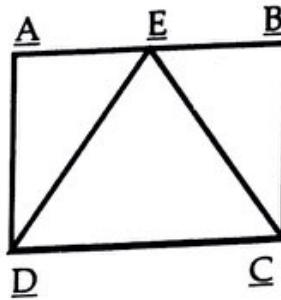
দেওয়া আছে, বৃত্তের পরিধি হয় $12\pi\sqrt{3} = 2\pi r$, so $r = 6\sqrt{3}$. Since AC is the diameter, $AC = 2 \times 6\sqrt{3} = 12\sqrt{3}$. Triangle ABC is a right angled triangle whose angles are 30, 60 and 90. So the ratio of the sides opposite to the angles will be,

$AB : BC : AC = 1 : \sqrt{3} : 2$

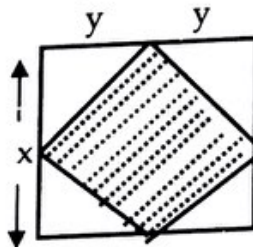
$AC = 12\sqrt{3}$

So, $AB = 6\sqrt{3}$

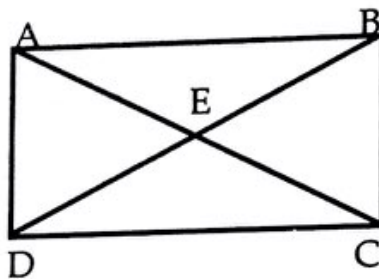
Exercise 3.2:



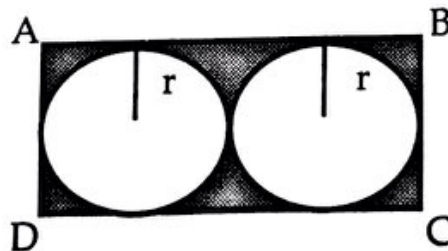
1. What is the ratio of $\triangle DEC$ to the area of square ABCD in the figure above?
 (A) $\frac{1}{4}$ (B) $\frac{1}{3}$ (C) $\frac{1}{2}$ (D) $\frac{2}{1}$ (E) cannot be determined



2. In the square above, what is the area of the dotted region? ($x = 2y$)
 (A) $x^2 - y^2$ (B) $x^2 - 2y^2$ (C) $x^2 - 4y^2$ (D) $(x - y)(x - y)$ (E) $y^2 - x^2$

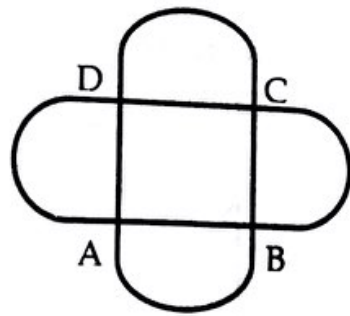


3. In the figure above, ABCD is a rectangle. If area of $\triangle AEB$ is 8, what is the area of $\triangle ACD$?
 (A) 8 (B) 12 (C) 16 (D) 20 (E) 24

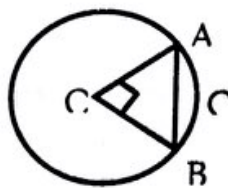


4. In the figure above, the area of the shaded portion is
 (A) $2r^2(4 - \pi)$ (B) $2r^2(2 - 2\pi)$ (C) $2r^2(\pi - 4)$ (D) $2r^2(\pi - 2)$ (E) $r^2(2 - \pi)$
5. The area of a circle with radius r is equal to the area of a rectangle with base b . What is the height of the rectangle in terms of π , r and b ?

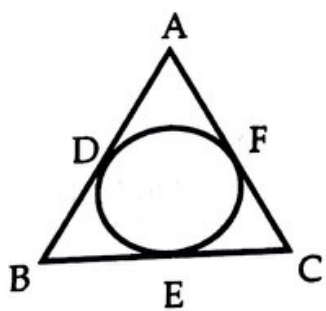
- (A) $\sqrt{\pi r}$ (B) $\frac{2\pi r}{b}$ (C) $\pi r^2 b$
 (D) $\frac{\pi r^2}{b}$ (E) $\frac{\pi r^2}{b^2}$



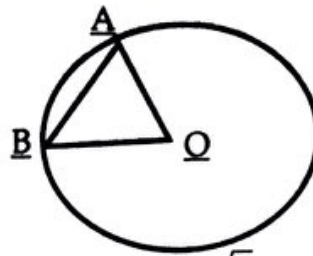
6. In the figure above, ABCD is a square and four semicircles are constructed on each side of the square. If $AB = 2$, what is the area of the entire figure?
 (A) $2 + 4\pi$ (B) $2 - 4\pi$
 (C) $4 + 8\pi$ (D) $4 - 2\pi$ (E) $4 + 2\pi$



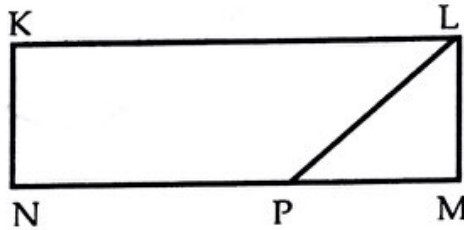
7. In circle O, $OA = 6$. $AO \perp BO$. The area of segment ACB is
 (A) 2π (B) $\pi - 2$ (C) $6\pi - 9\sqrt{3}$ (D) $9\pi - 18$ (E) $36\pi - 9\sqrt{3}$



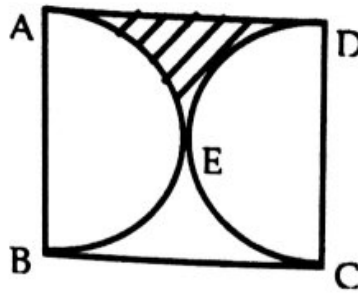
8. Circle O is inscribed in triangle ABC. $BD = 4$, $AF = 3$, $EC = 5$. The perimeter of triangle ABC is
 (A) 12 (B) 15 (C) 17 (D) 24 (E) none of these



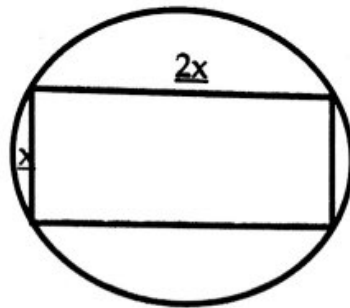
9. $AB = \text{radius } OA$; area of triangle $AOB = 4\sqrt{3}$. Area of circle $O =$
 (A) 4π (B) 8π (C) 16π (D) $24\sqrt{3}$ (E) $24\pi\sqrt{3}$



10. $MP = \frac{1}{3}$ of MN , the base of rectangle $KNML$. Area of triangle $LMP = 8$. Area of $KNML = ?$
 (A) 24 (B) 32 (C) 48 (D) 72 (E) 96
11. Which of the following figures has the smallest perimeter or circumference?
 (A) a circle with diameter of 2 feet
 (B) a square with a diagonal of 2 feet
 (C) a rectangle with sides of 6 inches and 4 feet
 (D) a pentagon with each side equal to 16 inches
 (E) a hexagon with each side equal to 14 inches.
12. Which of the following figures has largest area?
 (A) a 3 : 4 : 5 triangle with a hypotenuse of 25 inches.
 (B) a circle with a diameter of 20 inches.
 (C) a square with a 20 inch diagonal.
 (D) a regular hexagon with a side equal to 10 inches.
 (E) a rectangle with sides of 10 inches and 30 inches.
13. Which of the following has the largest perimeter?
 (A) a square with a diagonal of 10 inches.
 (B) a 3 : 4 : 5 triangle with a hypotenuse of 15 inches.
 (C) a pentagon, each of whose sides is 5 inches.
 (D) a right isosceles triangle with an area of 72 square inches.
 (E) a regular hexagon with a radius of 5 inches.



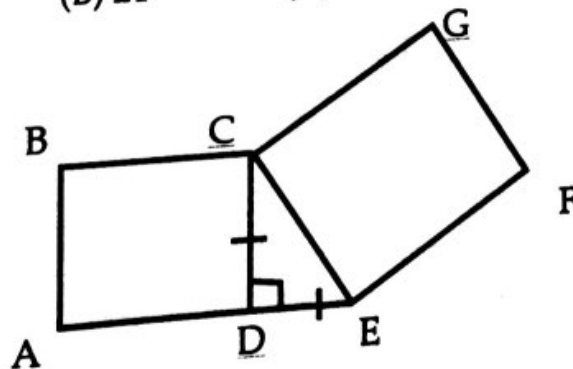
14. If ABCD is a square with side $AB = 4$ and AEB and CED are semicircles, what is the area of the shaded portion in the diagram below?
 (A) $8 - \pi$ (B) $8 - 2\pi$ (C) $16 - 2\pi$ (D) $16 - 4\pi$ (E) $16 - 18\pi$



15. In the figure above area of the inscribed rectangle is 32. The circumference of the circle =
 (A) 20π (B) $4\pi\sqrt{5}$ (C) $4\pi\sqrt{3}$ (D) $2\pi\sqrt{5}$ (E) $2\pi\sqrt{3}$

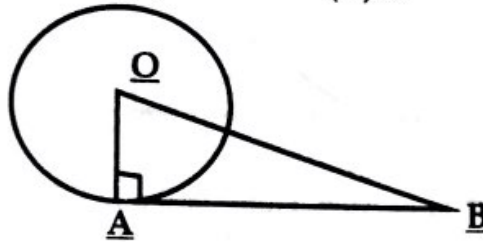


16. What is the perimeter of the quadrilateral shown above?
 (A) 21 (B) 24 (C) $24 + \sqrt{2}$ (D) $18 + 6\sqrt{2}$ (E) $24\sqrt{2}$



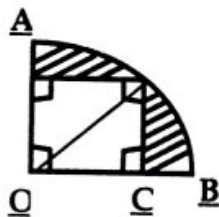
17. In the figure above, ABCD and CEFG are squares. If the area CEFG is 36, what is the area of ABCD?

(A) 6 (B) $6\sqrt{2}$ (C) 9 (D) 18 (E) 24



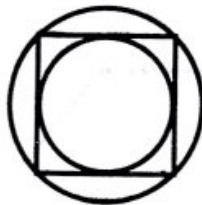
18. In the figure above, if radius OA is 8 and the area of right triangle OAB is 32, what is the area of the entire figure?

(A) $64\pi+32$ (B) $60\pi+32$ (C) $56\pi+32$ (D) $32\pi+32$ (E) $16\pi+32$



19. In the figure above, AB is an arc of a circle with centre O. If the length of arc AB is 5π and the length of CB is 4, what is the sum of the area of the shaded region?

(A) $25\pi-60$ (B) $25\pi-48$ (C) $25\pi-36$ (D) $100\pi-48$ (E) $100\pi-36$



20. In the figure above, if the length of each side of the square is 8, what is the ratio of the area of the larger circle to the area of the smaller circle.

(A) $2\sqrt{2}$ (B) 2 (C) $\sqrt{2}$ (D) 25 (E) $5\sqrt{2}$

Answer Key Exercise 3.2

1. C	5. D	9. C	13. D	17. D
2. B	6. E	10. C	14. B	18. C
3. C	7. D	11. B	15. B	19. C
4. A	8. D	12. B	16. D	20. B

Solution to Exercise 3.2

1. (C) area of ABCD = DC²

$$\text{area of } \triangle DEC = \frac{1}{2} \cdot DC \cdot DC = \frac{1}{2} \cdot DC \cdot DC = \frac{1}{2} DC^2$$

$$\therefore \triangle DEC : ABCD = \frac{1}{2} : 1 = \frac{1}{2}$$

2. (B) Area of each unshaded triangle = $\frac{1}{2} \cdot y \cdot y = \frac{y^2}{2}$

$$\therefore \text{Area of shaded region} = x^2 - 4 \cdot \frac{y^2}{2} = x^2 - 2y^2$$

3. (C) Given,

$$\text{Area of } \triangle AEB = 8$$

$$\Rightarrow \frac{1}{2} \cdot AB \cdot h = 8$$

$$\Rightarrow AB \cdot h = 16$$

$$\text{Now, area of } \triangle ACD = \frac{1}{2} \cdot AD \cdot DC = \frac{1}{2} \cdot 2h \cdot AB = h \cdot AB = 16$$

4. (A) Area of each circle = πr^2

$$\therefore \text{Combined area of both circles} = 2 \pi r^2$$

Now, diameter of each circle = $2r$

$$\therefore \text{Combined diameter of both circles} = 4r$$

$$\therefore AB = 4r, AD = 2r$$

$$\therefore \text{Area of rectangle} = 4r \times 2r = 8r^2$$

$$\therefore \text{Area of shaded portion} = 8r^2 - 2 \pi r^2 = 2r^2(4 - \pi)$$

5. (D) Area of circle = πr^2

Given, base of rectangle is b , let, height of rectangle is h

$$\text{Given, } bh = \pi r^2 \Rightarrow h = \pi r^2 / b$$

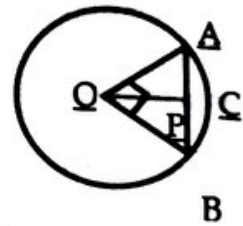
6. (E) $AB = 2, \therefore r = 1$

$$\therefore \text{Area of each semicircle} = \frac{\pi 1^2}{2} = \frac{\pi}{2}$$

$$\therefore \text{Area of four semicircles} = 4 \cdot \frac{\pi}{2} = 2\pi$$

$$\therefore \text{Entire figure area} = 2^2 + 2\pi = 4 + 2\pi$$

7. (D) Given, $OA = r = 6$
 \therefore Area of the circle $= \pi 6^2 = 36\pi$
 $\angle AOB = 90^\circ$



\therefore Area held in the center by arc AOB $= 36\pi \times \frac{90}{360} = 9\pi$

Applying Pythagorean theorem, $AB^2 = OA^2 + OB^2 = 6^2 + 6^2 = 72$

$\therefore AB = 6\sqrt{2}$

If we draw a perpendicular line OP on AB,

$AO^2 = OP^2 + AP^2$

$\Rightarrow 6^2 = OP^2 + \left(\frac{6\sqrt{2}}{2}\right)^2$

$\Rightarrow OP^2 = 36 - 72/4 = \frac{144 - 72}{4} = 72/4 = 18$

$\Rightarrow OP = \sqrt{18} = 3\sqrt{2}$

\therefore Area of $\Delta OAB = \frac{1}{2} \times AB \times OP = \frac{1}{2} \times 6\sqrt{2} \times 3\sqrt{2} = 18$

\therefore Area of Segment ACB $= 9\pi - 18$

8. (D) Since the circle is inscribed in the triangle, all the sides are tangents to the circle. Also, the centre is the intersecting points of all the bisectors of the angles at the vertex. Let O be the centre of the circle. Then, $OE \perp BC$, and $OF \perp AC$. Then in ΔOCF and ΔOCE , $\angle OEC = \angle OFC = 90^\circ$ and $\angle OCE = \angle OCF$, and OC is common. Therefore, they are congruent. Thus, $EC = EF = 5$

Similarly, $AD = AF = 3$ and $BE = BD = 4$

Therefore, perimeter $= 3 + 3 + 4 + 4 + 5 + 5 = 24$

9. (C) $OA = OB = r$
 Given, $AB = OA$
 $\therefore AB = OA = OB$
 $\therefore \Delta AOB$ is equilateral triangle

Area of $\Delta AOB = \frac{\sqrt{3}}{4} r^2$

Given, $\frac{\sqrt{3}}{4} r^2 = 4\sqrt{3}$

$\Rightarrow r^2 = 16$

$\Rightarrow r = 4$

Area of circle $= \pi r^2 = 16\pi$

10. (C) Let, $MP = x \therefore MN = 3x$

$$\Delta LMP = \frac{1}{2} \times MP \times LM = \frac{x}{2} (LM)$$

Given, $\frac{x}{2} (LM) = 8$

$$\therefore LM = \frac{16}{x}$$

$$\therefore \text{Area of KLMN} = LM \times MN = \frac{16}{x} (3x) = 48$$

11. (B)

(A) $r = 1$, circumference = $2\pi \times 1 = 2\pi = 2(3.1416) = 6.28$ ft

(B) let, side of square is x , \therefore diagonal = $x\sqrt{2}$

given, $x\sqrt{2} = 2$, $\therefore x = 2/\sqrt{2} = \sqrt{2}$

$$\therefore \text{perimeter} = 4\sqrt{2} = 4(1.414) = 5.656 \text{ ft}$$

(C) perimeter = $2(4) + 2(.5) = 8 + 1 = 9$ ft

(D) perimeter = $5 \times 16 = 80$ inches = 6.66 ft

(E) perimeter = $6 \times 14 = 86$ inches = 7.16 ft

So, (B) has the smallest perimeter.

12. (B)

(A) Let, sides are $3x$, $4x$ and $5x$.

Now, $5x = 25 \therefore x = 5 \therefore 4x = 20$ and $3x = 15$

$$\text{Area} = \frac{1}{2} \times 15 \times 20 = 150 \text{sq.inch}$$

(B) Diameter = 20, $\therefore r = 10$

$$\therefore \text{Area} = \pi 10^2 = 100\pi = 100(3.1416) = 314.16 \text{sq.inch}$$

(C) $x\sqrt{2} = 20$, $\therefore x = 10\sqrt{2}$, \therefore area, $x^2 = 200 \text{sq.inch}$

(D) In regular hexagon, diagonal = 20, \therefore arm = 10

$$\therefore \text{area} = \frac{3\sqrt{3}}{2} (10)^2 = 150\sqrt{3} = 150(1.73) = 259.5 \text{sq.inch}$$

(E) Area = $10 \times 30 = 300 \text{sq.inch}$

So, (B) has the largest area.

13. (D)

(A) $x\sqrt{2} = 10, \therefore x = 5\sqrt{2}, \therefore \text{perimeter } 4x = 20\sqrt{2} = 20(1.414) = 28.28\text{inch}$

(B) Let sides are $3x, 4x$ and $5x$.

Given, $5x = 15, \therefore x = 3, 3x = 9, 4x = 12$.

$\therefore \text{Perimeter} = 9 + 12 + 15 = 36\text{inch}$

(C) $\text{Perimeter} = 5 \times 5 = 25\text{inch}$

(D) Given, $\frac{1}{2} x \cdot x = 72 \Rightarrow x^2 = 144 \Rightarrow x = 12$

$\therefore (\text{Hypotenuse})^2 = x^2 + x^2 = 288$

$\therefore \text{Hypotenuse} = \sqrt{288} = 12\sqrt{2}$

$\therefore \text{Perimeter} = 12 + 12 + 12\sqrt{2} = 24 + 12(1.414) = 41\text{inch}$

(E) Given, in a regular hexagon, $r = 5, \therefore \text{each side} = 5$

$\therefore \text{Perimeter} = 6 \times 5 = 30\text{inch}$

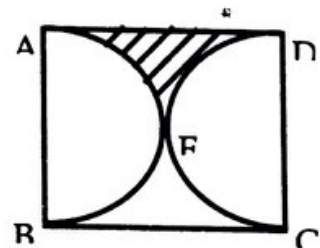
So, (D) has the largest perimeter.

14. (B) $ABCD \text{ area} = 4^2 = 16$

Radius of each circle = $AB/2 = 4/2 = 2$

$\therefore \text{Combined area of both semicircles} = 2 \times \frac{\pi 2^2}{2} = 4\pi$

$\therefore \text{Area of shaded region} = \frac{16 - 4\pi}{2} = 8 - 2\pi$



15. (B) $2x \cdot x = 32$

$x^2 = 16, \therefore x = 4$

$\therefore (\text{diagonal})^2 = x^2 + (2x)^2 = 5x^2 = 5(4)^2 = 80$

$\therefore \text{diagonal} = 4\sqrt{5}$

$\therefore r = \frac{4\sqrt{5}}{2} = 2\sqrt{5}$

Now, circumference = $2\pi r = 4\pi\sqrt{5}$

16. (D) $6 + 2x = 12$

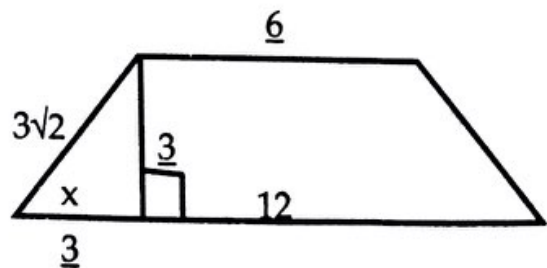
$\Rightarrow 2x = 6$

$\Rightarrow x = 3$

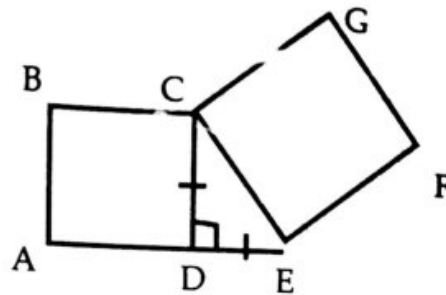
Now, $(\text{Hypotenuse})^2 = 3^2 + 3^2 = 18$

$\therefore \text{Hypotenuse} = 3\sqrt{2}$

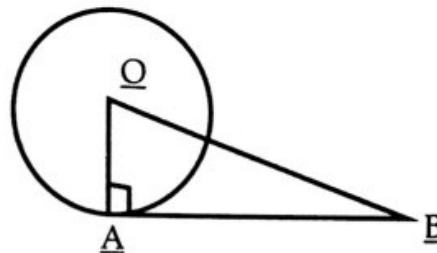
$\therefore \text{perimeter} = 12 + 6 + 2(3\sqrt{2}) = 18 + 3\sqrt{2}$



17. (D) Area of CEFG = 36
 $\therefore CE = 6$
 Given, $CD = DE$
 $CD^2 + DE^2 = 36$
 $\Rightarrow 2CD^2 = 36$
 $\Rightarrow CD^2 = 18$
 \Rightarrow Area of ABCD = 18

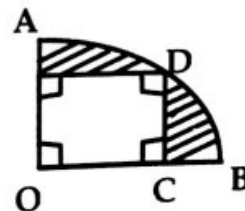


18. (C) Given, $OA = 8$, \therefore area of the circle = $\pi \times 8^2 = 64\pi$
 Area of $\triangle OAB = \frac{1}{2} \times OA \times OB = \frac{1}{2} \times 8 \times OB = 4AB$
 Given, $4AB = 32$, $\therefore AB = 8$
 \therefore OAB is an isosceles triangle.
 $\therefore \angle AOB = \angle ABO$
 Again, $\angle AOB + \angle ABO + \angle OAB = 180^\circ$
 $\Rightarrow 2\angle AOB + 90^\circ = 180^\circ$
 $\Rightarrow 2\angle AOB = 90^\circ$
 $\Rightarrow \angle AOB = 45^\circ$



So, the common portion of the figure holds an area of $\frac{45 \times 64\pi}{360} = 8\pi$
 \therefore Area of entire figure = area of the circle + area of the triangle - common area
 $= 64\pi + 32 - 8\pi = 56\pi + 32$

19. (B) 90° is held in the center by arc length of 5π
 $\therefore 360^\circ$ is held by an arc length of 20π
 $\therefore 2\pi r = 20\pi$, $\therefore r = 10 \therefore \frac{\pi r^2}{4} = 100\pi/4 = 25\pi$



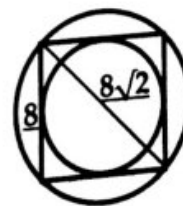
Given, $CB = 4$
 $\therefore OC = OB - CB = 10 - 4 = 6$
 Let us name point D. Here, $OD = 10$, $OC = 6$, and $\angle AOC = 90^\circ$. So, by Pythagoras, $DC = 8$
 \therefore Area of rectangle = $6 \times 8 = 48$
 \therefore Shaded portion = $25\pi - 48$

20. (B) Given, length of each side of the square = 8
 \therefore diagonal = $8\sqrt{2}$

so, $r_{\text{small}} = \frac{8}{2} = 4$

and, $r_{\text{large}} = \frac{8\sqrt{2}}{2} = 4\sqrt{2}$

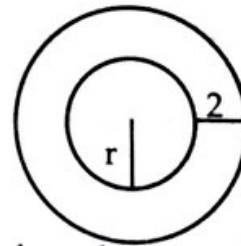
\therefore large circle area: small circle area = $\pi(4\sqrt{2})^2 : \pi(4)^2 = 32\pi : 16\pi = 2:1$



Exercise 3.3: Circles

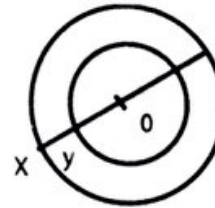
- To find the diameter of a circle whose circumference is 30 inches, (BBA 93-94)
 A. multiply 30 by π B. divide 30 by 2π C. divide 15 by 2π
 D. divide 30 by π E. multiply 30 by $\pi/2$
- If the radius of a circle is increased by 100%, by what percent is the area of the circle increased? (BBA 93-94)
 A. 500% B. 400% C. 300% D. 200% E. 100%
- A 2-foot wide circular path is created around a circular field with a radius of r feet. Find the value of r , in feet, if the area of the field including the path is twice that of the field alone. (BBA 94)

- (A) $2\sqrt{2}$ (B) $4\sqrt{2}$ (C) $2 + 2\sqrt{2}$
 (D) 4 (E) Cannot be determined



- For the two concentric circles, centre O, shown below, the circumference of the inner circle is 15π . If $xy = 1$, what is the circumference of the outer circle? (BBA 94-95)

- (A) 16π (B) 17π (C) 18π
 (D) $15\pi + 2$ (E) None of these

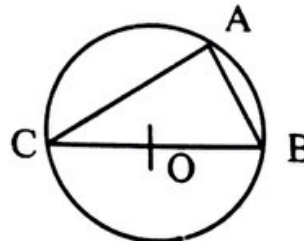


- A bicycle has two wheels (one large and one small) of 120 cm and 40 cm in diameters. When the large wheel makes 10 revolutions, how many revolutions does the small wheel make in that time? (BBA 96-97)
 (A) 30 (B) 25 (C) 20 (D) 15 (E) None of these

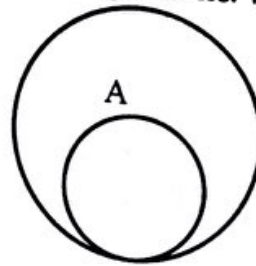
- What is the length of a chord which is 5 cm distant from the centre of a circle whose radius is 13 cm? (BBA 96-97)
 (A) 24 (B) 18 (C) 16 (D) 12 (E) None of these

- OB, the radius of the circle given below, equals to 2.5 cm and $AB = 3$ cm. What is the area (in sq. cm) of the triangle ABC? (BBA 96-97)

- (A) 8 (B) 6 (C) 5
 (D) 4.5 (E) 4

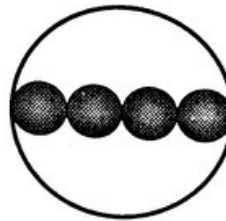


In the figure below, point A is the center of the larger circle. What is the ratio of the area of the large to the area of the small circle? (BBA 97-98)



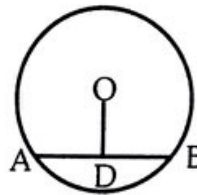
- (A) 2 (B) 2.25 (C) 3
(D) 3.25 (E) 4

In the figure below, the centers of 4 equal circles lie along the diameter of the large circle. If the circumference of the large circle is 64π , what is the area of the shaded portion? (BBA 97-98)



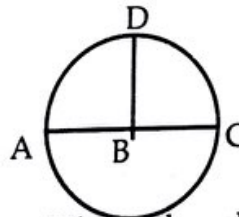
- (A) 256π (B) 128π (C) 64π
(D) 32π (E) 16π

O is the center of the circle and OD is the perpendicular to AB. If OD = 3cm and the diameter of the circle is 10 cm, what is the length of AB in cm? (BBA 97-98)



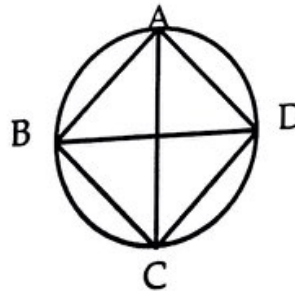
- (A) 8 (B) 6 (C) 5
(D) 4 (E) None of these

In the circle AC is diameter. DB is perpendicular to AC. If $AB : BC = 3 : 1$ & $BC = 2\text{cm}$, find the length of BD in cm. (BBA 98-99)



- (A) 2.5 (B) 3 (C) $3\sqrt{2}$
(D) $2\sqrt{3}$ (E) None of these

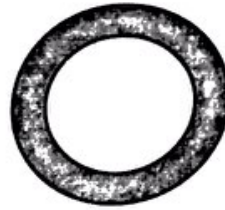
In the figure below $\angle DAC = \angle CAB$ and $BC = 5\text{cm}$. What is the value of CD? (BBA 00-01)



- A. 3 B. 4 C. 5
D. $3\sqrt{3}$ E. cannot be determined

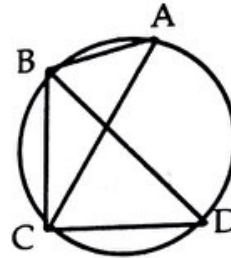
13. If the diameter of the outer circle is 8 cm more than that of the inner circle and the area of the shaded portion is 40π , what is the area of the inner circle? (BBA 02-03)

- A. 6π B. 9π C. $12\pi/\sqrt{2}$
 D. 16π E. none of these



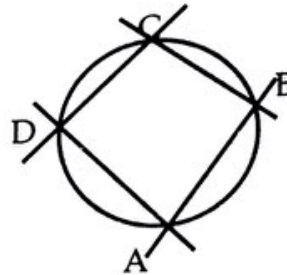
14. BD is the diameter of the circle. $\angle CAB=40^\circ$. Calculate $\angle CBD$ (BBA 03-04)

- (A) 45° (B) 50° (C) 60°
 (D) 70° (E) none of these



15. In the figure, $\angle DCB=2x$, $\angle BAD =x$ and $\angle CBA =81^\circ$. Calculate x. (BBA 04-05)

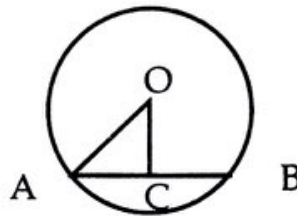
- (A) 79° (B) 72° (C) 60°
 (D) 45° (E) None of these



16. If the diameter of a circle is doubled, the area will be: (BBA 05-06)
 (A) 4 times (B) 3 times (C) 2 times (D) 1 time (E) None of these

17. If the diameter of a wheel is 2 feet, approximately how many times it rotates to cross 2 miles? (MBA 97-98)
 (A) 2130 (B) 1850 (C) 1680 (D) 1056 (E) None

18. The length of a room is 1.5 times of its breadth. If the area of the room is 216 sq. meter, what is the perimeter of the room? (MBA 97-98)
 (A) 60 (B) 54 (C) 48
 (D) 42 (E) none of these

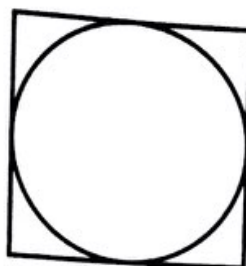


19. In the figure, O is the center of the circle. OC is perpendicular to AB and is 2 cm less than AC. If the diameter of the circle is 20 cm, what is the length of AB in cm? (MBA 97-98)
 (A) 8.5 (B) 10 (C) 15 (D) 18 (E) none of these

ie area
22-03)

21. A circle is inscribed inside a square as shown in the figure. What is the ratio of the circle to the area of the square? (MBA 97-98)

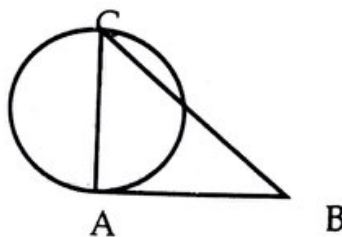
- (A) $\pi / 4$
- (B) $4 / \pi$
- (C) $\pi / 2$
- (D) $\pi / 3$
- (E) none of these



3-04)

22. In the figure, AB is tangent to the circle at A. AC is a diameter. If BC = 12, and AB = 8, what is the area of the circle? (MBA 99-00)

- A. 8π
- B. 9π
- C. 12π
- D. 20π
- E. 24π



-05)

23. A picture measuring 16cm. x 24cm, has a frame 1cm wide on all sides. About how many times greater than the area of the frame is the area of the picture? (MBA 00-01)

- A. 1.2
- B. 4.5
- C. 12
- D. 45
- E. 80

24. The size of the smaller angle between the hands of the clock at half past six, in degrees, is

(MBA 00-01)

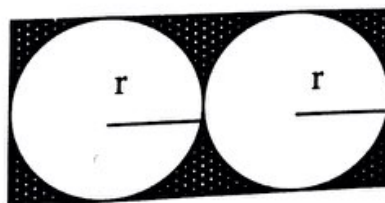
06)

- A. 7.5°
- B. 15°
- C. 22.5°
- D. 30°
- E. more than $22\frac{1}{2}^\circ$ but less than 30°

ss 2
98)

25. Referring to the figure below, the area of the shaded portion is (MBA 00-01)

- A. $2r^2(\pi - 2)$
- B. $2r^2(2 - \pi)$
- C. $2r^2(\pi - 4)$
- D. $2r^2(4 - \pi)$
- E. $r^2(2 - \pi)$



ter,
98)

26. A circle with radius 2 is intersected by a line at points R and T. The maximum possible distance between R and T is (MBA 03-04)

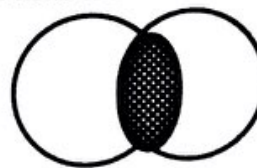
- (A) 1
- (B) 2
- (C) π
- (D) 4
- (E) 4π

ss
98)

27. A circular region has circumference c inches and area k square inches. If $c = 3k$, what is the radius of the circle in inches? (MBA 03-04)

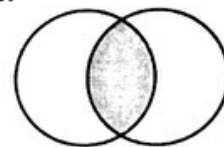
- (A) $\sqrt{2/3}$
- (B) $\sqrt{2/3}$
- (C) $2/3$
- (D) $4\pi/9$
- (E) none of these

27. In the figure below, each of the circles has radius 4 and the area enclosed by both circles is 28π . What is the area of the shaded region? (MBA 04-05)



- A) 0 B) 2π C) 4π D) $4\pi^2$ E) 16π
28. If the radius of a circle is decreased by 30 percent, by what percent will the area of the circular region be decreased? (MBA 04-05)
- A) 15% B) 49% C) 51% D) 60% E) 90%
29. A certain cake recipe states that the cake should be baked in a pan 8 inches in diameter. If Salma wants to use the recipe to make a cake of the same depth but 12 inches in diameter, by what factor should she multiply the recipe ingredients? (MBA 09-10)
- A) 2.5 B) 2.25 C) 1.5 D) 1.33 E) None of these
30. A motorcycle stunt man belonging to a fair rides over a circular wall at an average speed of 54 km/h for 5 minutes. If the radius of the wall is 5 meters then the distance traveled is - (MBA 09-10)
- A) 2.5 km B) 3.5 km C) 5 km D) 4.5 km E) None of these

31. In the figure in the right, each of the circles has radius 4 and the area enclosed by both circles is 28π . What is the area of the shaded region? (MBA 10-11)



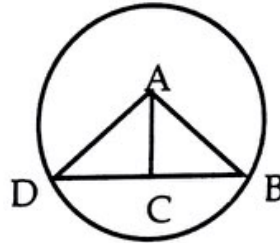
- A. 0 B. 2π C. 4π
D. $4\pi^2$ E. None of these
32. A bicycle has two wheels (one large and one small) of 120 cm and 40 cm in diameter respectively. When the large wheel makes 10 revolutions, how many revolutions does the small wheel make in that time?
- A. 15 B. 20 C. 30 D. 40 E. none of these

Answer Key Exercise 3.3

1.D	2.C	3.C	4.B	5.A	6.A	7.B	8.E	9.A	10.A
11.D	12.C	13.B	14.B	15.C	16.A	17.C	18.A	19.E	20.A
21.D	22.B	23.B	24.D	25.D	26.C	27.C	28.C	29.B	30.D
31.C	32.C	-	-	-	-	-	-	-	-

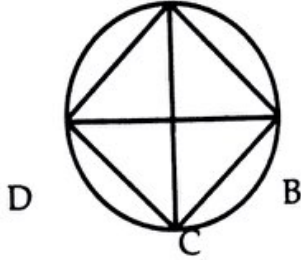
Solution to Exercise 3.3

1. (D) πd (circumference) = $30'' \therefore d = \frac{30''}{\pi}$
2. (C) মনে করি, radius = 10; সুতরাং area = $\pi r^2 = 100\pi$
radius 100% বাড়ল। নতুন radius = 20; area = $\pi r^2 = 400\pi$ area increase করলো 300%.
3. (C) Given, $\pi(r + 2)^2 = 2 \times \pi r^2 \Rightarrow r^2 + 4r + 4 = 2r^2; r^2 - 4r - 4 = 0; r = \frac{4 \pm \sqrt{.16 + 16}}{2} = \frac{4 \pm 4\sqrt{2}}{2} = 2 \pm 2\sqrt{2}; \therefore r = 2 + 2\sqrt{2}$.
4. (B) $2\pi r = 15\pi \Rightarrow r = \frac{15}{2}$ (inner circle) আবার, $xy = 1$ হলে outer circle এর radius = $\frac{15}{2} + 1 = \frac{17}{2}$ অতএব, circumference = $2 \times \frac{17}{2} \pi = 17\pi$
5. (A) For large wheel, diameter = 120cm \therefore circumference = $\pi d = 120\pi \therefore$ প্রতি revolution এ $= \pi d = 120\pi$ দরত্ব \therefore 10 revolution এ যায় $120 \times 10 = 1200\pi$ এখানে, দেখতে হবে এই 1200π যেতে 40cm diameter এর wheel টার কতটা revolution দেয়া লাগে। 40cm এর diameter এর wheel এর circumference = $d = 40\pi$ answer = $1200\pi / 40\pi = 30$
6. (A) ছবি একে নিলে সুবিধা হবে। $\triangle ACB$ হলো সমকোণী ত্রিভুজ। $AB = 13, AC = 5$ হওয়াতে $BC = 12$ (পিথাগোরাস অনুসারে) \therefore chord $BD = 24$



7. (B) $OB = 2.5; \therefore BC = 5; \triangle ABC$ হলো right angle triangle. $\therefore AC = 4$
 \therefore area = $\frac{1}{2} \times AC \times AB = \frac{1}{2} \times 4 \times 3 = 6$
8. (E) মনে করি, বড় বৃত্তটির radius = $x; \therefore$ area of larger circle = πx^2 ; ছোট বৃত্তটির radius = $x/2$
 \therefore ছোট বৃত্তটির area = $\frac{\pi x^2}{4}$ Answer = $\frac{\pi x^2}{4} = 4$
9. (A) মনে করি, large circle এর radius = $r;$
 $\therefore 2\pi r = 64\pi \Rightarrow r = 32$; মনে করি, ছোট circle এর radius = $r_1;$
 $\therefore 4r_1 = 32 \therefore r_1 = 8 \therefore$ Answer = $4 \times \pi \times 8^2 = 4 \times \pi \times 64 = 256\pi$
10. (A) $OA = 10/2 = 5; OD = 3; \therefore AD = 4$ and $AB = 8$

11. (D) $BC = 2, AB = 6 \therefore AC = AB + BC = 8; \therefore AC^2 = AD^2 + DC^2; \therefore AC^2 = BD^2 + AB^2 + BD^2 + BC^2 \Rightarrow 8^2 = 2BD^2 + 6^2 + 2^2 \Rightarrow 64 - 36 - 4 = 2BD^2 = 24/2 = 12 \therefore BD = 2\sqrt{3}$
12. (C)



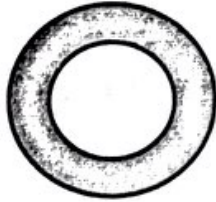
যেহেতু $\angle DAC = \angle CAB$, যেহেতু কোণগুলোর corresponding বৃত্তচাপ গুলো সমান।

$BC = 2$ cm হলে $CD = 5$ cm.

13. (B) ধরি, ভেতরের বৃত্তের ব্যাস = x C.M

$$\therefore \text{বাইরের বৃত্তের ব্যাস} = (x + 8) \text{ C.M}$$

$$\text{বাইরের বৃত্তের ব্যাসার্ধ} = \frac{x + 8}{2} \text{ C.M}$$



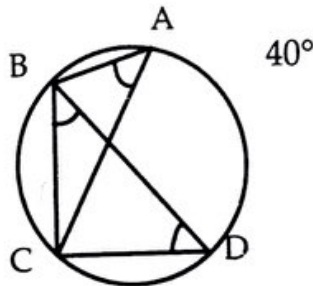
$$\text{এবং area} = \pi \left(\frac{x + 8}{2} \right)^2$$

$$\text{অর্থাৎ, } \pi \left(\frac{x + 8}{2} \right)^2 - \pi \left(\frac{x}{2} \right)^2 = 40\pi$$

$$\rightarrow \frac{(x + 8)^2}{4} - \frac{x^2}{4} \rightarrow x^2 + 16x + 64 - x^2 = 160 = 40 \quad \text{or, } 16x = 96 \therefore x = 6$$

$$\text{অতএব, ভেতরের বৃত্তের ক্ষেত্রফল} = \left(\frac{x}{2} \right)^2 \pi = \frac{6^2}{4} \pi = 9\pi$$

14. (B)



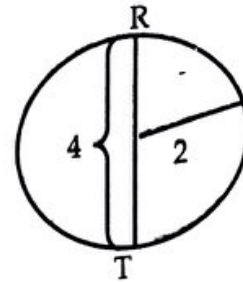
BD diameter, সুতরাং $\angle BCD = 90^\circ$ BC বৃত্তচাপের উপর $\angle BAC = \angle BDC = 40^\circ$

$$\therefore \Delta BCD - \text{এ } \angle CBD = 180^\circ - (90^\circ + 40^\circ) = 180^\circ - 130^\circ = 50^\circ.$$

15. (C) চতুর্ভুজের দুই বিপরীত কোণের সমষ্টি $180^\circ \therefore 3x = 180^\circ, x = 60^\circ$ [when inscribed in a circle]
16. (A) diameter যত গুণ হবে, area তার বর্গ গুণ হবে।
এখানে diameter 2 গুণ হচ্ছে, সুতরাং area $(2)^2$ বা 4 গুণ হবে।

17. (C) 1 rotation এ যাওয়া দূরত্ব = $\pi d = 2\pi$ feet এখন 2 miles = 5280 feet তাহলে rotation সংখ্যা $\frac{2 \times 5280}{2\pi} = \frac{5280}{\pi} = \frac{5280 \times 7}{22} = 1680$ ।
18. (A) Say. Breadth = x meter; \therefore length = $1.5x$; $\therefore x \times 1.5x = 216$; $\Rightarrow x^2 = 216 / 1.5 = 144$; $\therefore x = 12$ \therefore length = $1.5 \times 12 = 18$; \therefore perimeter = $2(12 + 18) = 60$ meter.
19. (E) ধরি, $OC = x$; $\therefore AC = x + 2$; এখন, $OA =$ radius = 10; in right ΔOAC ; $x^2 + (x + 2)^2 = 10^2$
 $\Rightarrow 2x^2 + 4x + 4 = 100 \Rightarrow 2(x^2 + 2x - 48) = 0 \Rightarrow (x + 8)(x - 6) = 0 \therefore x = 6 \therefore AC = 8$; $\therefore AB = 16$.
20. (A) inscribed অর্থ অন্তর্লিখিত, অর্থাৎ circle টা square এর ভিতর আঁকা হয়েছে। মনে করি, circle এর radius = r ; \therefore diameter = $2r$; \therefore square এর প্রতি বাহু $2r$;
 $\therefore \frac{\text{area of circle}}{\text{area of square}} = \frac{\pi r^2}{(2r)^2} = \frac{\pi}{4}$
21. (D) AB হলো A বিন্দুতে tangent (স্পর্শক)। \therefore AB অবশ্যই AC এর উপর লম্ব। $\therefore \Delta ACB$ হলো right angled triangle \therefore Pythagorean theory প্রয়োগ করে পাওয়া যায়, $AC^2 + AB^2 = BC^2 \Rightarrow AC^2 = 12^2 - 8^2$
 $\Rightarrow AC^2 = 144 - 64 = 80 \therefore AC = \sqrt{16 \times 5} = 4\sqrt{5}$ আবার, AC হলো diameter \therefore radius, $r = \frac{AC}{2}$
 $= 2\sqrt{5} \therefore$ Area = $\pi r^2 = \pi \times (2\sqrt{5})^2 = \pi \times 4 \times 5 = 20\pi$
22. (B) picture এর area = $16 \times 24 = 384$ sq.cm.
 frame সহ picture এর area = $(16 + 1 + 1) \times (24 \times 1 \times 1) = 18 \times 26 = 468$ sq.cm
 \therefore frame এর area $(468 - 384)$ sq.cm = 84 sq.cm অর্থাৎ $\frac{\text{area of picture}}{\text{area of frame}} = \frac{384}{84}$
23. 4.5 (approx.)
 (B) সাড়ে ছয়টায় minute এর কাঁটা থাকবে ঘড়ির 6 সংখ্যা, বরাবর এবং hour এর কাঁটা থাকবে ঘড়ির 7 ও 6 এর ঠিক মাঝখানে। এখন, 6 ও 7 এর মধ্যবর্তী কোণটি 30° অর্থাৎ, সাড়ে ছয়টায় কোণটি হবে 15° ।
24. (D) Length of the rectangle = $4r$ এবং width = $2r \therefore$ area = $4r \times 2r = 8r^2$
 circle এর মোট area = $\pi r^2 \times 2 = 2\pi r^2 \therefore$ shaded portion = $8r^2 - 2\pi r^2 \Rightarrow 2\pi^2(4 - \pi)$
25. (D)

Maximum possible distance = diameter = $2 + 2 = 4$.



26. (C) $2\pi r = C = 3K \Rightarrow K = \frac{C}{3}$
 প্রশ্নমতে, $\pi r^2 = K \Rightarrow \pi r^2 = \frac{C}{3} \Rightarrow \pi r^2 = \frac{2\pi r}{3} \Rightarrow 3\pi r^2 = 2\pi r$
 $\Rightarrow 3r = 2 \Rightarrow r = \frac{2}{3}$.

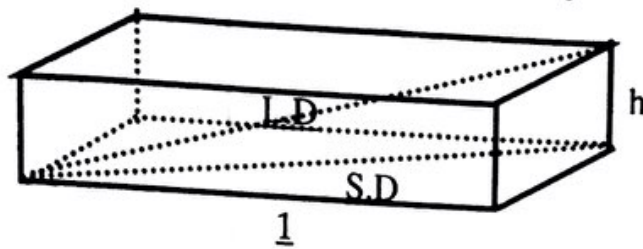
27. (C) মোট area = $\pi (4)^2 + \pi (4)^2 = 32\pi$
 \therefore shaded portion এর area = $32\pi - 28\pi = 4\pi$

28. (C) ধরি, radius ছিল =10; অর্থাৎ, area = $\pi (10)^2 = 100\pi$
 এখন radius ছিল = 7; অর্থাৎ area = $\pi (7)^2 = 49\pi$
 অর্থাৎ, $(100-49) = 51\%$ decrease করবে।
29. (B) প্রথম ক্ষেত্রে, Volume = $\pi(4)^2.h = 16\pi h$ (diameter 8 inches)
 দ্বিতীয় ক্ষেত্রে, Volume = $\pi(6)^2 h = 36\pi h$ (diameter 12 inches)
 অর্থাৎ, Volume দাঁড়ায় = $\frac{36\pi h}{16\pi h} = \frac{9}{4} = 2.25$ times
 Ingredients হবে 2.25 times.
30. (D) Distance travelled = speed \times time
 $= 54 \text{ km/h} \times 5 \text{ min} = 54 \text{ km/h} \times \frac{5}{60} \text{ hour} = 54 \times \frac{5}{60} \text{ km.}$
 $= 4.5 \text{ km.}$
31. (C) Radius 4 হলে area = 16π
 অর্থাৎ, total area = $16\pi + 16\pi = 32\pi$ (এখানে shaded region কে ২ বার include করা হয়েছে।
 Actual area = 28π
 অর্থাৎ, shaded region এর area = $32\pi - 28\pi = 4\pi$.
32. (C) বড় wheel 10 revolutions এ অতিক্রম করে = $10 \times 2\pi \times 60 = 600 \times 2\pi$ । অর্থাৎ ছোট টির সমান দূরত্ব
 অতিক্রম করতে লাগবে = $(600 \times 2\pi / 20 \times 2\pi) = 30$ revolutions.

Chapter 4

Solid Geometry

Chapter 4: Solid Geometry



Rectangular solid এর চারটি vertex বা শীর্ষবিন্দু আছে। এর total 12 টি edge বা প্রান্ত আছে।

$$\text{Total edge} = 4(l + w + h)$$

Rectangular solid এর মোট উপর পৃষ্ঠের ক্ষেত্রফল বা total surface area,

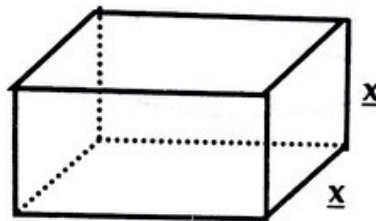
$$\text{TSA} = 2(lw + lh + wh) \quad [\text{TSA}=\text{Total Surface Area}]$$

$$\text{Volume} = \text{base} \times \text{height} = \text{length} \times \text{width} \times \text{height} \\ = l \times w \times h$$

Short diagonal 3 টির পরিমাপ $\sqrt{l^2 + w^2}$, $\sqrt{l^2 + h^2}$ এবং $\sqrt{w^2 + h^2}$ longest diagonal (দূরবর্তী vertex) এর distance = $\sqrt{l^2 + w^2 + h^2}$

N. B. Volume হচ্ছে একটি ঘন বস্তু কি পরিমাণ স্থান জুড়ে অবস্থান করে বা কি পরিমাণ বস্তু ধারণ করে তার পরিমাপ।

Cube: Cube বা ঘনক অনেকটা rectangular solid এর মতোই। তবে এর প্রত্যেকটি প্রান্তই সমান অর্থাৎ, $l = w = h$



Cube এর একটি প্রান্ত x হলে,

$$\text{Total edge} = 12x \quad x$$

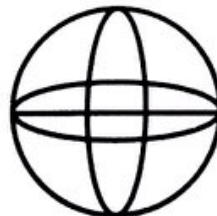
$$\text{TSA} = 6x^2 \quad [\text{TSA}=\text{total Surface Area}]$$

$$\text{Volume} = x^3$$

$$\text{Short diagonal} = x\sqrt{2}$$

$$\text{Longest diagonal} = x\sqrt{3}$$

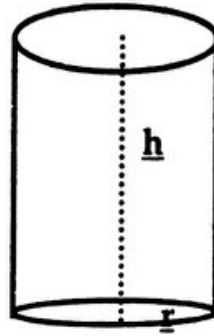
Sphere: Sphere বা গোলকের radius r হলে



$$\text{Volume} = \frac{4}{3}\pi r^3$$

$$\text{T. S. A} = 4\pi r^2 \quad [\text{TSA}=\text{total Surface Area}]$$

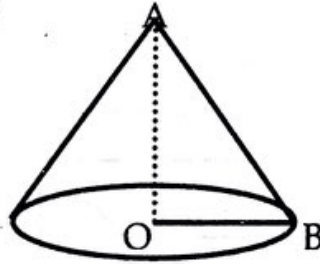
Cylinder: cylinder বা কেলুন এর আকার নিম্নরূপ :



Cylinder এর height h এবং circular surface এর radius r হলে

$$\begin{aligned} \text{T.S.A.} &= 2\pi rh + 2\pi r^2 && [\text{TSA}=\text{total Surface Area}] \\ &= 2\pi r (h + r) \\ \text{Volume} &= \text{base} \times \text{height} \\ &= \pi r^2 \times h \\ &= \pi r^2 h \end{aligned}$$

Cone: Cone বা কোনক এর আকার নিম্নরূপ :



এখানে OB = radius = r, AO = height = h এবং AB = l হলে

$$\begin{aligned} V &= \frac{1}{3} \pi r^2 h \\ \text{T.S.A} &= \pi r (r + l) && [\text{TSA}=\text{total Surface Area}] \end{aligned}$$

N. B. Solid এর volume এর unit বা একক হবে cubic inches বা cubit feet বা cubic meter বা c.c (cubic centimeter)

Exercise 4.1: Solid Geometry

What is the volume of a cube with a surface area of 96?

- (A) 8 (B) 16 (C) 27 (D) 48 (E) 64

A cylinder has a volume of 72π cubic inches and height of 8 inches. If the height is increased by 4 inches, what will be the new volume, in cubic inches?

- (A) 84π (B) 96π (C) 108π (D) 120π (E) 144π

A cube and a rectangular solid are equal in volume. If the lengths of the edges of the rectangular solid are 4, 8 and 16, what is the length of an edge of the cube?

- (A) 8 (B) 10 (C) 12 (D) 16 (E) $16\sqrt{2}$

What is the volume of a cylinder with diameter 6 and height 6?

- (A) 36π (B) 54π (C) 54 (D) 16 (E) 216π

If the length of an edge in a cube is $3\sqrt{3}$, what is the length of the longest diagonal?

- (A) $3\sqrt{6}$ (B) 9 (C) $9\sqrt{3}$ (D) 2 (E) $2\sqrt{3}$

If the edges of a cube add up to 4 feet in length, what is the volume of the cube?

- (A) 64 cubic inches (B) 125 cubic inches (C) 216 cubic inches
(D) 16 cubic feet (E) 64 cubic feet

The volume of a sphere is equal to the volume of a cylinder. If the radius of the sphere is 4 meters and the radius of the cylinder is 8 meters, what is the height of the cylinder?

- (A) 4 meters (B) $\frac{4}{3}$ meters (C) 8 meters (D) $\frac{16}{3}$ meters (E) 16 meters

If the volume of a cube is 216 c.c., find the surface area of the cube.

- (A) 36 sq. c.m (B) 54 sq. c.m (C) 216 sq. c.m
(D) 36 c.c (E) 216 c.d.

If the radius of the base of a cylinder is tripled, and height is divided by three, what is the ratio of the volume of the new cylinder to that of the original cylinder?

- (A) 1:9 (B) 1:3 (C) 1:1 (D) 3:1 (E) 9:1

A rectangular block with a volume of 250 cubic inches was sliced into 2 cubes of equal volume. How much greater, in square inches, is the combined surface area of the 2 cubes than the original surface area of the rectangular block?

- (A) 5 sq. inches (B) 10 sq. inches (C) 25 sq. inches
(D) 50 sq. inches (E) 125 sq. Inches

11. A metallic sheet is of rectangular shape with dimensions 48 m x 36 m. From each of its corners, a square is cut off so as to make an open box. If the length of the square is 8 m, the volume of the box (in m³) is- (BBA 13-14)
 (A) 5120 (B) 6420 (C) 8960 (D) 4830 (E) none of these
12. If a rectangular block that is 4 inches by 4 inches by 10 inches is placed inside a right circular cylinder of radius 3 inches and height of 10 inches, the volume of the unoccupied portion of the cylinder is how many cubic inches? (BBA 13-14)
 (A) $6\pi-16$ (B) $9\pi-16$ (C) $160\pi-30\pi$ (D) $60\pi-160$ (E) $90\pi-160$

Answer Key Exercise 4.1

1.E	3.A	5.B	7.B	9.D
2.C	4.B	6.A	8.C	10.D
11.A	12.E			

Solution to Exercise 4.1

of its
8 m,
14)
ght
the
4)

(E) let, side of the cube = a
Surface area = $6a^2$
Given, surface area = 96
 $\therefore 6a^2 = 96 \therefore a = 4$
Volume $a^3 = 64$

2. (C) Volume of cylinder

$$\pi r^2 h = 72\pi$$

$$\Rightarrow \pi r^2 h = 72$$

$$\Rightarrow \text{Given, } h = 8$$

$$\therefore 8r^2 = 72$$

$$\therefore r = 3$$

If height is increased by 4 inches new volume = $\pi 3^2 (12) = 108\pi$

3. (A) cube volume = a^3

rectangular solid volume = $l \times b \times h$

given, $l = 4, b = 8, h = 16$

now, given, cube volume = rectangular solid volume

$$\therefore a^3 = 4 \times 8 \times 16 = 512$$

$$\therefore a = 8$$

4. (B) Given, height = 6, diameter = 6, $\therefore r = 3$

$$\text{Volume} = \pi r^2 h = \pi 3^2 (6) = 54\pi$$

5. (B) Given, $a = 3\sqrt{3}$

$$\text{Longest diagonal} = a\sqrt{3} = 3\sqrt{3} \cdot \sqrt{3} = 9$$

6. (A) There are 6 sides and 12 edges on a cube

Given, sum of 12 sides = 4 feet = 48 inches

$$\therefore \text{One side} = 4 \text{ inches}$$

$$\therefore \text{Volume} = 4^3 = 64 \text{ cubic inches}$$

7. (B) Given,

$$\frac{4}{3} \pi r^3 = \pi r^2 h$$

$$\Rightarrow \frac{4}{3} \pi (4)^3 = \pi (8)^2 h$$

$$\Rightarrow 256\pi = 192 \pi h$$

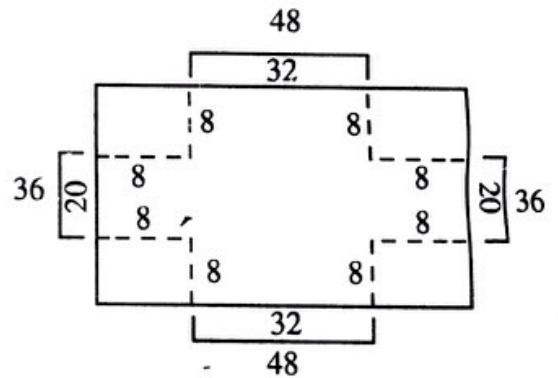
$$\Rightarrow h = 256/192 = 4/3 \text{ m}$$

8. (C) Given $a^3 = 216\text{cc} = 216\text{cm}^3$
 \therefore Side $a = 6$
 \therefore Total surface area $= 6a^2 = 6(6)^2 = 216\text{ cm}^2$

9. (D) volume of original cylinder $= \pi r^2 h$
 If radius is tripled and height is divided by 3,
 Volume of new cylinder $= \pi (3r)^2 \left(\frac{h}{3}\right) = 3\pi r^2 h$
 \therefore new volume : original volume $= 3:1$

10. (D) Given, rectangular block volume $= 250$ cubic inches
 Since the block is cut into two equal cube, each cube has a volume of 125cm^3
 \therefore volume of each cube $a^3 = 125$
 $\therefore a = 5$
 \therefore When the block is cut in two, two new rectangular surface is created with side 5. So, area increase is $2(5^2) = 50$

11. (A) একটি $48\text{ m} \times 36\text{ m}$ metallic sheet এর চার দিক থেকে $8\text{ m} \times 8\text{ m}$ এর বর্গাকৃতির shape কেটে নেয়া হয়েছে। এখন metallic sheet টি একটি খোলা বক্স এর shape পেয়েছে।
 যেহেতু চার দিকের প্রতি দিক থেকে 8 m করে কমে গিয়েছে, সুতরাং length and width উভয়ই কমে গেল $8 \times 2 = 16\text{ m}$
 সুতরাং, নতুন length $(48 - 16)\text{ m} = 32\text{ m}$
 এবং নতুন width $(36 - 16)\text{ m} = 20\text{ m}$
 এবং height 8 m (প্রতি দিক থেকে 8 m করে কাটা হয়েছে)
 So, volume $= 32 \times 20 \times 8 = 5120\text{m}^3$

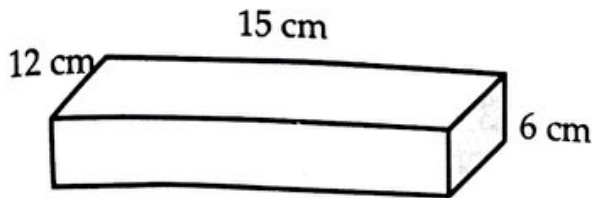


12. (E) Rectangular block এর area $(4 \times 4 \times 10)$ cubic inch $= 160$ cubic inch
 Cylinder এর area $= \pi r^2 h = \pi(3)^2 10 = 90\pi$
 সুতরাং area বাকি থাকবে $160 - 90\pi$ cubic inch

Exercise 4.2: Solid Geometry

A square water tank, which is 2.5 meters deep, can hold 80,000 liters of water. What is the length, in meters, of each side of the tank?
 (A) 56.57 (B) 5.2 (C) 4.5 (D) $4\sqrt{2}$ (E) $5\sqrt{2}$
 (BBA 94)

(BBA 95-96)



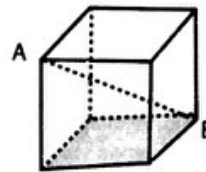
What is the maximum number of cubes each 3 cms. on an edge that can be packed into a rectangular box with inside dimensions shown above?

- (A) 360 (B) 120 (C) 90 (D) 40 (E) 20

5. So, Find the volume of a triangular solid cylinder with the following dimensions: 4 feet base, 3 feet height of triangle, and 10 feet height of the cylinder. (BBA 06-07)

- (A) 120cft (B) 60cft (C) 80cft (D) 65cft (E) None of these

4. The cube on the right hand side below has a volume of 64 cubic inches. What is the length of the line segment AB? (figure not drawn to scale) (BBA 09-10)



- (A) 4 (B) 5 (C) $3\sqrt{3}$ (D) $4\sqrt{2}$ (E) $4\sqrt{3}$

6. A rectangular tank is L cm long, W cm wide and H cm high. If the height of the tank is reduced by 1 cm, the volume of the tank will be reduced by (MBA 96-97)

- (A) LW cc (B) HLW cc (C) LW sq.cm. (D) 1 cc (E) $(H-1)$ cc

6. If the radius of a cylinder is tripled while its height halved, its volume will be.

(MBA 10-11)

- (A) halved (B) unchanged (C) doubled
 (D) increased by 50% (E) None of these

7. The length of one edge of a cube equals 4. What is the distance between the center of the cube and one of its vertices? (BBA 15-16)

- A. 2 B. $2\sqrt{2}$ C. $2\sqrt{3}$ D. $4\sqrt{2}$ E. none of these

Answer Key Exercise 4.1

1.D	2.D	3.B	4.E	5.A	6.E	7.%
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Exercise 4.2: Answers

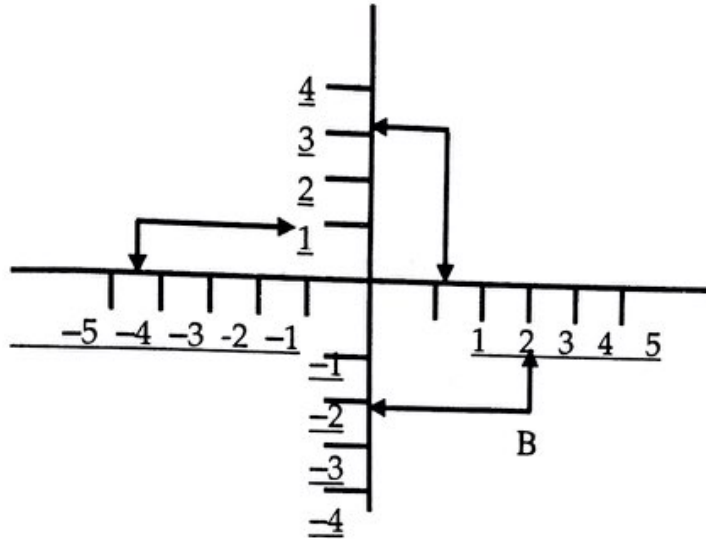
1. (D) Volume = length \times breadth \times depth; যেহেতু tank টা square (বর্গাকৃতি);
 \therefore length = breadth; $x^2 \times 2.5 = 80$ [Since, 1L = .001 m³] $\Rightarrow x^2 = 32$; $\therefore x = 4\sqrt{2}$
2. (D) Volume of the rectangular box = $12 \times 15 \times 6 = 1080 \text{ cm}^3$
 Volume of the cube = $3^3 = 27 \text{ cm}^3$. $\therefore 1080/27 = 40$. Maximum 40 cubes can be fitted.
3. (B) Volume of cone = Area \times Height = $0.5 \times 4 \times 3 \times 10 = 60 \text{ c. ft.}$
4. (E) Volume, $a^3 = 64$
 $a = 4$
 Length of line segment AB = $\sqrt{a^2 + a^2 + a^2} = a\sqrt{3} = 4\sqrt{3}$ Ans: (E) $4\sqrt{3}$
5. (A) previous volume = LWH, Current volume = LW(H-1), reduction in volume = LWH - LW(H-1) = LWH - LWH + LW = LW cc.
6. (E) Cylinder এর volume = $\pi r^2 h$
 অর্থাৎ, radius triple করলে $3^2 = 9$ times বাড়বে এবং Height halved হলে $\frac{1}{2}$ times কমবে।
 অতএব, Volume change = $9 \times \frac{1}{5} = 4.5$ times increase
7. (C) If cube's side is 4 then longest diagonal of that cube is $4\sqrt{3}$
 Half of that longest diagonal is distance between the center of the cube and one of its vertices which is $2\sqrt{3}$

Chapter 5

Coordinate Geometry

Chapter 5: Coordinate Geometry

Cartesian Grid: Cartesian grid basically cross আকারে দুটি perpendicular axis (number line)। এখানে horizontal line টিকে x-axis এবং vertical line টিকে y-axis বলা হয়। x-axis এবং y-axis এর point of intersection কে Origin বলে। x-axis ও y-axis এর cross একটি plane কে চারটি ভাগে বিভক্ত করে এবং এদেরকে Quadrant বলে।



একটি plane-এ কোন point এর অবস্থান এই grid এর সাহায্যে নির্ণয় করা যায়। x-axis ও y-axis এর উপর point টি থেকে লম্ব টেনে x-axis এর উপরের বিন্দুটি x এর মান ও y-axis এর উপরের বিন্দুটি y এর মান নিয়ে বিন্দুর অবস্থান (x,y) নির্ণয় করা হয়। উপরের grid এর মতো চারটি quadrant-এ x ও y এর মানের sign নির্ধারিত হয়। Grid টিতে B point এর x এর মান 2 এবং y এর মান -2। অতএব B এর coordinate (2,-2)

Mid Point: দুটি point A (x, y) এবং B (x', y') হলে, তাদের midpoint, C এর coordinate হবে :

$$\text{Coordinates of Midpoint} = \left(\frac{x + x'}{2}, \frac{y + y'}{2} \right)$$

Example: A (2,4) এবং B (6, -2) হলে midpoint হবে $\left(\frac{2+6}{2}, \frac{4+(-2)}{2} \right)$ বা (4,1)

Distance: দুটি point A (x, y) এবং B (x', y') হলে তাদের distance হবে :

$$\text{Distance} = \sqrt{(x - x')^2 + (y - y')^2}$$

Example: A (0, 2) এবং B (6, -2) হলে

$$\text{Distance} = \sqrt{(8-0)^2 + (17-2)^2} = \sqrt{8^2 + 15^2} = 17$$

Area of a Triangle: তিনটি point A(x_1, y_1), B(x_2, y_2) এবং C(x_3, y_3) হলে

$$\text{Area of } \Delta ABC = \frac{1}{2}$$

$$\begin{bmatrix} x_1 & y_1 \\ x_2 & y_2 \\ x_3 & y_3 \\ x_1 & y_1 \end{bmatrix}$$

$$= \frac{1}{2} [x_1 y_2 + x_2 y_3 + x_3 y_1 - y_1 x_2 - y_2 x_3 - y_3 x_1]$$

N. B. Point গুলোর sequence এর কারণে negative sign আসলে তা ignore করতে হবে।

Example: Area of a triangle: তিনটি point A(0,4), B(2,8) এবং C(6, 5) হলে

$$\text{Area of } \Delta ABC = \frac{1}{2}$$

$$\begin{bmatrix} 0 & 4 \\ 2 & 8 \\ 6 & 5 \\ 0 & 4 \end{bmatrix}$$

$$= \frac{1}{2} (0 + 10 + 24 - 8 - 48 - 0)$$

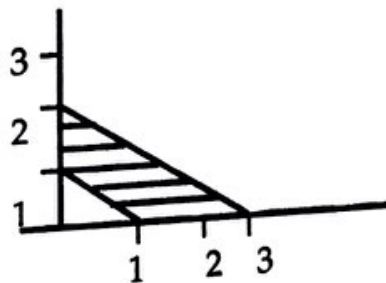
$$= \frac{1}{2} (-22)$$

$$= -11$$

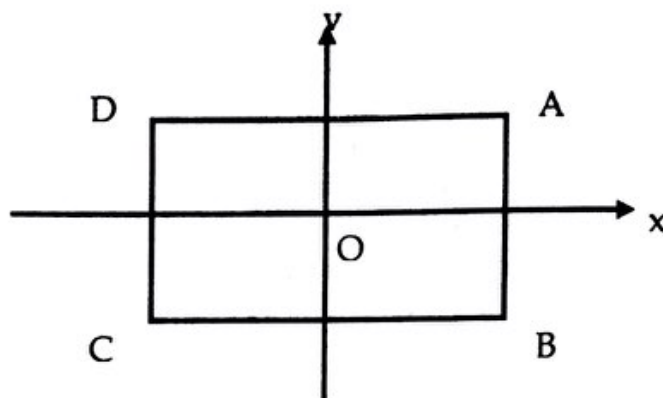
কিন্তু area negative হতে পারে না। অতএব এক্ষেত্রে area হবে -11 এর absolute value বা 11.

Exercise 5.1: Coordinate Geometry

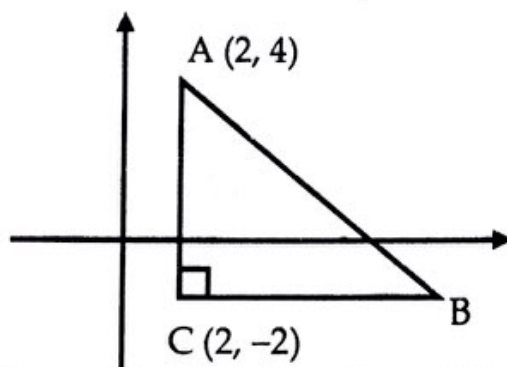
1. A line segment AB is drawn from point (2, 3) and point (4, 7). What are the coordinates of the midpoint?
 (A) (5, 3) (B) (3, 5) (C) (6, 10) (D) (2, 4) (E) (4, 2)
2. What is the distance from point A (3,4) to point B (-3, -4)?
 (A) 2 (B) 5 (C) 10 (D) 13 (E) 14
3. Point P (4,2) is the midpoint of line OPC, where O is at origin (0, 0). The coordinates of C are
 (A) (2, 3) (B) (4, 8) (C) (4, 4) (D) (8, 2) (E) (8, 4)
4. Point P (0, -4) is the midpoint of line AB, where the coordinates of point A are (-2,-5). The coordinates of point B are
 (A) (-4, -10) (B) (2, -5) (C) (2, 5) (D) (2, -3) (E) (2, 3)
5. The vertices of triangle ABC are (-1, 2), (-1, 1) and (-3, 2). Triangle ABC is
 (A) obtuse (B) isosceles (C) right
 (D) equilateral (E) either isosceles or equilateral
6. Triangle ABC has the following vertices: A(1, 1), B (9, 4) and C (1, 7). Which of the following statements is true?
 (A) $AB = BC$ (B) $AB = AC$ (C) $AB > BC$ (D) $AB < AC$ (E) $AC = BC$
7. The area of a circle whose center is at (0,0) is 9π . The circle passes through all of the following points except.
 (A) (-3, 0) (B) (3, 0) (C) (0, 3) (D) (0, -3) (E) (3, 3)
8. AB is a diameter of a circle whose center is O. The coordinates of point A are (- 2,0) and point B are (2, 0). The circle passes through a point whose coordinates are (BBA 14-15)
 (A) (-2, -2) (B) (-2, 2) (C) (0, 4) (D) (0, -2) (E) (2, 2)
9. The coordinates of a point equally distant from A(4, -2) and B (4, 6) and on the y-axis are (BBA 14-15)
 (A) (0, 2) (B) (0, 4) (C) (0, 8) (D) (2, 0) (E) (2, 2)
10. What is the area of a triangle with vertices at (5, 3), (11, 3) and (8, 8)? (BBA 14-15)
 (A) 7 (B) 15 (C) 24 (D) 30 (E) 64



11. In the figure above, what is the area of the shaded region?
 (A) 1.5 (B) 2 (C) 2.5 (D) 3 (E) 3.5



12. In the figure above, ABCD is a square with center at the origin. If the coordinates of vertex A are (4, 4), what are the coordinates of vertex C?
 (A) $(-4\sqrt{2}, -4\sqrt{2})$ (B) $(-4\sqrt{2}, -4)$ (C) $(-4, -4)$ (D) $(-4, 4)$ (E) $(4, -4)$
13. Point A has coordinates (1, 2) and point B has coordinates (9, b). If the distance between points A and B is 10, find the value of b.
 (A) 4 (B) 6 (C) 7 (D) 8 (E) 10
14. What is the area of the triangle having co-ordinates of (0,2), (4, 7) and (3, 6)?
 (A) 3 (B) 7.5 (C) 22 (D) 0.5 (E) 1.5



15. In the rectangular coordinate system above, if the area of right triangle ABC is 24, what are the coordinates of point B?
 (A) (10, -2) (B) (10, 2) (C) (2, 6) (D) (8, -2) (E) cannot be determined

Answer key:

1. B	4. D	7. E	10. B	13. D
2. C	5. C	8. D	11. C	14. D
3. E	6. A	9. A	12. C	15. A

Solution to Exercise 5.1

1. (B) midpoint = $\left(\frac{x+x'}{2}, \frac{y+y'}{2}\right) = \left(\frac{2+4}{2}, \frac{3+7}{2}\right) = (3,5)$

2. (C) distance = $\sqrt{(x-x')^2 + (y-y')^2}$
 $= \sqrt{(3-(-3))^2 + (4-(-4))^2}$
 $= \sqrt{(6)^2 + (8)^2} = \sqrt{100} = 10$

3. (E) Let, C(x,y). Given, P (4,2) is the midpoint of OPC line and O is origin (0,0)

So, $\frac{0+x}{2} = 4$, and, $\frac{0+y}{2} = 2$

$\therefore x = 8, y = 4 \therefore C (8,4)$

4. (D) Given, P is the midpoint of AB. Let, B(x,y). Given, P (0, -4), A(-2, -5)

So, $\frac{x-2}{2} = 0$, and, $\frac{y-5}{2} = -4$

$\therefore x = 2, y = -3 \therefore B (2, -3)$

5. (C) Given A(-1,2), B(-1,1), C(-3,2) are three vertices of ΔABC

$AB = \sqrt{((-1) - (-1))^2 + (2 - 1)^2} = \sqrt{(1)^2} = 1$

$AC = \sqrt{((-1) - (-3))^2 + (2 - 2)^2} = \sqrt{4} = 2$

$BC = \sqrt{((-1) - (-3))^2 + (1 - 2)^2} = \sqrt{4 + 1} = \sqrt{5}$

Now, $AB^2 + AC^2 = 1^2 + 2^2 = 5 = (\sqrt{5})^2 = BC^2$

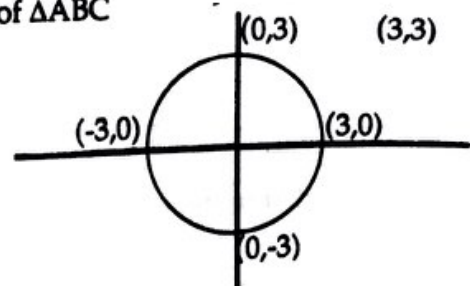
So, ΔABC is a right triangle with hypotenuse BC

6. (A) Given A(1,1), B(9,4) and C(1,7) are the vertices of ΔABC

$AB = \sqrt{(1-9)^2 + (1-4)^2} = \sqrt{64+9} = \sqrt{73}$

$BC = \sqrt{(9-1)^2 + (4-7)^2} = \sqrt{64+9} = \sqrt{73}$

$\therefore AB = BC$



7. (E) Here, $\pi r^2 = 9\pi$

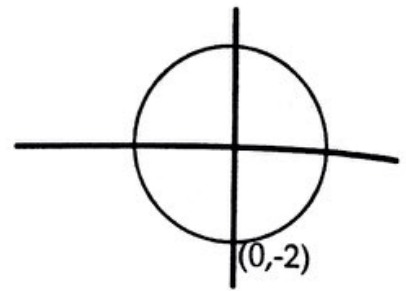
$\therefore r^2 = 9$

$\therefore r = 3$

The circle passes through all the points except (3,3)

8. (D) Midpoint of AB = $\left(\frac{-2+2}{2}, \frac{0+0}{2}\right) = \text{Origin O } (0,0)$

So, The center of the circle is O(0,0) with radius 2.
The circle passes through (0, -2)



9. (A) Since the point is on the Y-axis, its X-coordinate is 0
Let, the point is O (0,y). Given, A (4, -2) and B (4, 6)

$$OA = \sqrt{(0-4)^2 + (y-(-2))^2} = \sqrt{16 + (y+2)^2} = \sqrt{y^2 + 4y + 20}$$

$$OB = \sqrt{(0-4)^2 + (y-6)^2} = \sqrt{y^2 - 12y + 52}$$

Given OA = OB

$$\therefore \sqrt{y^2 + 4y + 20} = \sqrt{y^2 - 12y + 52}$$

$$\Rightarrow y^2 + 4y + 20 = y^2 - 12y + 52$$

$$\Rightarrow 16y = 32$$

$$\Rightarrow y = 2$$

\therefore The point is (0,2)

10. (B) The vertices are (5,3), (11,3) and (8,8)

$$\therefore \text{area of triangle} = \frac{1}{2} [x_1 y_2 + x_2 y_3 + x_3 y_1 - y_1 x_2 - y_2 x_3 - y_3 x_1]$$

$$= \frac{1}{2} [(5 \times 3) + (11 \times 8) + (8 \times 3) - (3 \times 11) - (3 \times 8) - (8 \times 5)]$$

$$= \frac{1}{2} [15 + 88 + 24 - 33 - 24 - 40]$$

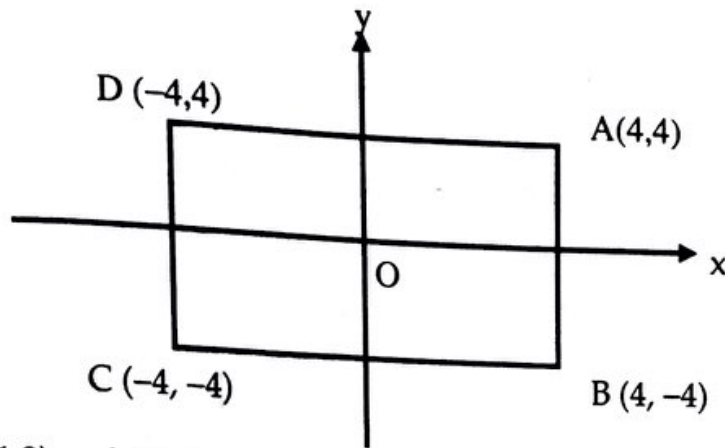
$$= \frac{1}{2} (30) = 15$$

11. (C) unshaded triangle এর area + shaded area = $\frac{1}{2} \times 3 \times 2 = 3$

$$\text{unshaded triangle এর area} = \frac{1}{2} \times 1 \times 1 = 0.5$$

$$\therefore \text{shaded area} = 3 - 0.5 = 2.5$$

12. (C) See the figure.



13. (D) Given A(1,2) and B(9,b)

$$AB = \sqrt{(1-9)^2 + (2-b)^2} = \sqrt{64 + 4 + b^2 - 4b} = \sqrt{b^2 - 4b + 68}$$

Given, $AB = 10$

$$\therefore \sqrt{b^2 - 4b + 68} = 10$$

$$\Rightarrow b^2 - 4b + 68 = 100$$

$$\Rightarrow b^2 - 4b - 32 = 0$$

$$\Rightarrow b^2 - 8b + 4b - 32 = 0$$

$$\Rightarrow b(b-8) + 4(b-8) = 0$$

$$\Rightarrow (b+4)(b-8) = 0$$

$$\Rightarrow b = 8, -4$$

14. (D) The vertices are (0,2), (4,7) and (3,6)

$$\therefore \text{Area of triangle} = \frac{1}{2} [x_1 y_2 + x_2 y_3 + x_3 y_1 - y_1 x_2 - y_2 x_3 - y_3 x_1]$$

$$= \frac{1}{2} [(0 \times 7) + (4 \times 6) + (3 \times 2) - (2 \times 4) - (7 \times 3) - (6 \times 0)]$$

$$= \frac{1}{2} [24 + 6 - 8 - 21]$$

$$= \frac{1}{2} (1) = 0.5$$

15. (A) Given A (2,4) and C(2, -2) are two vertices of triangle. Let the other vertex B (x,y)

$$\begin{aligned} \therefore \text{Area of triangle} &= \frac{1}{2} [x_1 y_2 + x_2 y_3 + x_3 y_1 - y_1 x_2 - y_2 x_3 - y_3 x_1] \\ &= \frac{1}{2} [(2(-2)) + 2y + 4x - (4 \times 2) - (-2x) - 2y] \\ &= \frac{1}{2} [-4 + 2y + 4x - 8 + 2x - 2y] \\ &= \frac{1}{2} (6x - 12) = 3x - 6 \end{aligned}$$

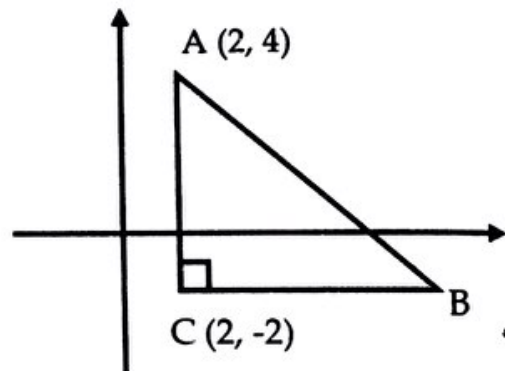
Given $3x - 6 = 24$

$\therefore 3x = 30$

$\therefore x = 10$

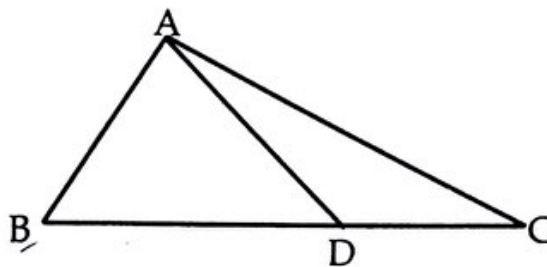
From the figure we can see the $y = -2$

$\therefore B (10, -2)$



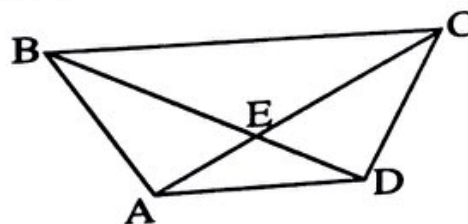
Exercise 5.2: Coordinate Geometry

1. The points (2,7) and (x,3) are 5 units apart. What does x equal? (BBA 93)
 (A) -1 (B) 3 (C) 6 (D) $\sqrt{13}$ (E) None of these
2. The mid-point of a line joining (-3,5) to (-3, -1) is : (BBA 97-98)
 (A) (1, -4) (B) (-3, 2) (C) (-2, -1) (D) (-3, 1) (E) (1, -1)
3. If 1.4 is halfway between two point x and y, what are the possible values of x and y? (BBA 03-04)
 (A) -1.4 and 2.4 (B) -1 and 2 (C) -0.3 and 3.1 (D) 0.15 and 1.55 (E) None of these



4. Point A (1, 0) is drawn to B (5, 0) and is joined to C (3, 4). Which of the following is true? (BBA 05-06)
 (A) CA = CB (B) AB = BC (C) AC = AB (D) AC > BC (E) None of these
5. Co-ordinates of 4 points are: A (5,8), B (7,8), C (13,2) & D (3,2). Find the area of quadrilateral ABCD? (MBA 96-97)
 (A) 30 (B) 24 (C) 48 (D) 35 (E) 36
6. If the co-ordinates of a quadrilateral is (2,5), (-3,0), (4, -1) and (6,0), What is the area of the quadrilateral? (MBA 97-98)
 (A) 35 (B) 33.33 (C) 30 (D) 27 (E) None
7. A piece of rope is lying on horizontal line. One of its ends is at coordinate -4 and the other is at coordinate 7. What is the length of the rope? (MBA 03-04)
 (A) 3 (B) 5 (C) 7 (D) 9 (E) 11

8. In the figure, AD is parallel to BC. BC = 12 cm and AD = 3 cm. If AE = 2 cm, what is the length of EC in cm? (BBA 14-15)
 (A) 6 (B) 8
 (C) 9 (D) 12
 (E) none of these



9. A piece of wood measuring 3cm x 3cm x 2cm is divided into 18 square shaped cubes of identical shape. What is the total surface area of all the identical cubes (in cm²)?

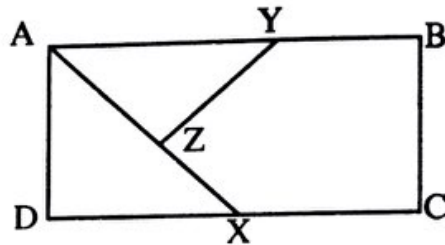
R(BBA 14-15)

- (A) 42 (B) 48 (C) 96 (D) 108 (E) none of these

10. ABCD is a rectangle. $\angle ZXD = 30^\circ$ and $\angle AZY = 80^\circ$, Find $\angle ZYB$.

(BBA 14-15)

- (A) 100° (B) 110° (C) 120°
 (D) 130° (E) none of these



Answer Key Exercise 5.2

1.A	2.B	3.C	4.A	5.E	6.D	7.E	8.B	9.D	10.B
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Solution to Exercise 5.2

1. (A) (2,7) এরং (x, 3) এর distance হচ্ছে

$$\sqrt{(2-x)^2 + (7-3)^2}$$

$$\therefore 5 = \sqrt{(2-x)^2 + (7-3)^2}$$

$$\Rightarrow 25 = (2-x)^2 + (7-3)^2 \Rightarrow 25 = 4 - 4x + x^2 + 16 \Rightarrow x^2 - 4x - 5 = 0$$

$$\Rightarrow x^2 - 5x + x - 5 = 0 \Rightarrow x(x-5) + 1(x-5) = 0 \Rightarrow (x-5)(x+1) = 0$$

$\therefore x = 5, -1$, একটি value উত্তরে আছে।

2. (B) দুটো বিন্দু যাদের co-ordinates হলো (x_1, y_1) এবং (x_2, y_2) , তাদের মধ্যবিন্দু হলো: $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) =$

$$\frac{-3 + (-3)}{2}, \frac{5 + (1-)}{2} = (-3, 2)$$

3. (C) তে 1.4 ও -0.3 এর distance 1.4

4. (A) $AB^2 = (1-5)^2 + (0-0)^2 = 16$

$$BC^2 = (5-3)^2 + (0-4)^2 = 20$$

$$CA^2 = (3-1)^2 + (4-0)^2 = 20$$

So, $BC = CA$

5. (E)

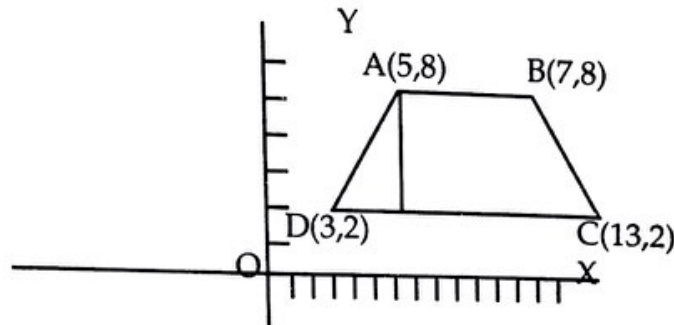
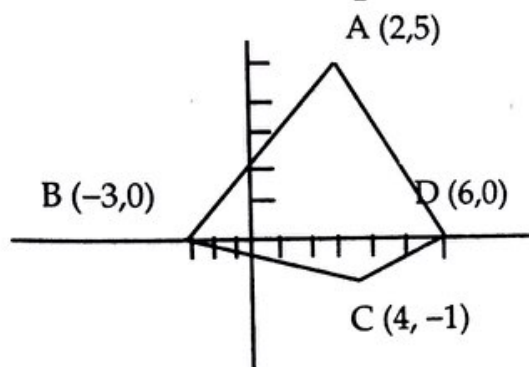


figure টি trapezoid . যার area = $\frac{1}{2} (AB + CD) \times \text{height} = \frac{1}{2} (2 + 10) \times 6 = 36$.

6. (D)



$$\Delta ABD = \frac{1}{2} \times BD \times \text{height} = \frac{1}{2} \times 9 \times 5 = 22.5, \Delta CBD = \frac{1}{2} \times 1 \times 9 = 4.5$$

area of the quadrilateral = $22.5 + 4.5 = 27$.

7. (E) length of rope = $7 - (-4) = 11$.

8. (B) সমবাহু Triangle use করলে we get

$$\frac{AD}{BC} = \frac{AE}{EC}$$

$$\text{So, } \frac{3}{12} = \frac{2}{EC}$$

$$\text{So } EC=8$$

Answer is Option B

9. (D)

$$3 \times 3 \times 2 = 18 \text{ cm}^3$$

ছোট cube আছে 18 টা

তাহলে একেক Cube এর ভলিউম 1 cm^3 করে হবে।

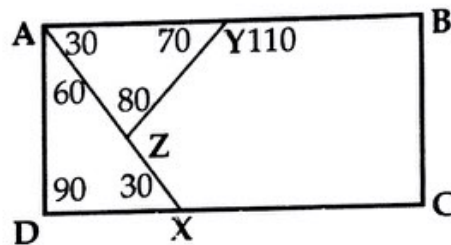
তাহলে একেক cube এর side 1 cm . করে হবে কারণ $1 \times 1 \times 1 = 1 \text{ cm}^3$

$$\text{Cube Surface area} = 6a^2 = 6 \times 1^2 = 6$$

$$\text{Since, 18 cubes, } 6 \times 18 = 108r$$

10. (B)

The answer can be deduced from the following figure:



It is given in triangle ADX, $\angle ZXD = 30$, $\angle ADX = 90$ (vertex of a rectangle),

So, $\angle DAX = 60$

Again, $\angle BAD = 90$ (vertex of a rectangle), So, $\angle YAZ = 30$.

Given $\angle AZY = 80$. So, $\angle AYZ = 180 - \angle AZY - \angle YAZ = 180 - 80 - 30 = 70$.

Since AB is a straight line, $\angle BYZ = 180 - \angle AYZ = 180 - 70 = 110$ (ans.)

Chapter 6

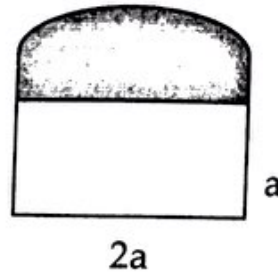
Mixed Questions



Chapter 6: Mixed Questions

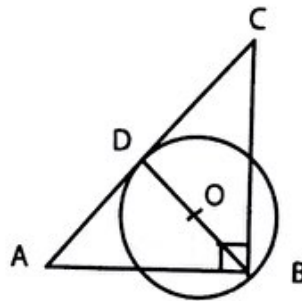
1. A semicircle is attached to a rectangle whose length is $2a$ and whose width is a , as shown below. A formula for finding the area of the whole figure is (BBA 93-94)

- A. $3\pi a^2$
- B. $2a^2 + \pi a^2$
- C. $2a^2 + (\pi a^2)/2$
- D. $2\pi a^2$
- E. $2a^2 + 2\pi a^2$



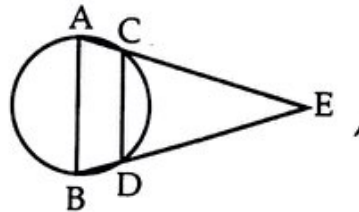
2. In the figure below, ABC is a triangle where $AB = BC = 2$ ft and $\angle ABC = 90^\circ$. The centre of the circle is O. AC touches the circle at D. What is the radius of the circle? (BBA 94-95)

- (A) $\sqrt{2}$
- (B) 2
- (C) $2\sqrt{2}$
- (D) $1/\sqrt{2}$
- (E) $1/2$



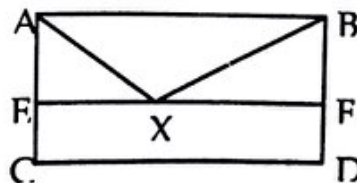
3. In the figure, AB, the diameter of the circle, is parallel to CD. If $\angle AEB = 40^\circ$, $\angle ACD = ?$ (BBA 98-99)

- (A) 100°
- (B) 105°
- (C) 115°
- (D) 120°
- (E) None of these



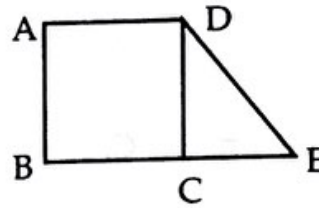
4. In the parallelogram, E is the mid point of AC and EF is parallel to AB. If the area of ABCD is 36 sq. cm. and $EX = 6$ c.m. What is the area of triangle ABX in sq. c.m.? (BBA 98-99)

- (A) 16
- (B) 15
- (C) 12
- (D) 9
- (E) None of these



5. In triangle DCE, $\angle CDE = \angle DEC$. If the triangle's area is 8, what is the area of the square ABCD? (BBA 98-99)

- (A) 82 (B) 16 (C) 8
(D) 4 (E) 22

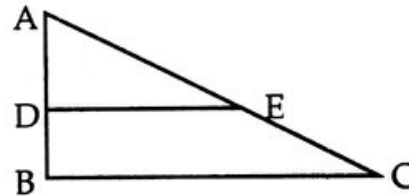


6. If a right angle isosceles triangle is inscribed in a semi circle, what is the ratio of the area of the circle to the area of the triangle? (BBA 98-99)

- (A) $\frac{1}{4}$ (B) $\frac{1}{2}$ (C) $\pi / 2$ (D) 2π (E) π

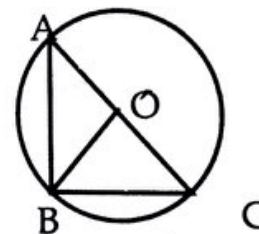
7. In the triangle ABC, $\angle ABC = 90^\circ$. DE is parallel to BC and equal to 4 and D is the midpoint of AB. If AD = 3 cm, what is the area of BCED in square cm? (BBA 98-99)

- (A) 12 (B) 16 (C) 20
(D) 24 (E) None of these

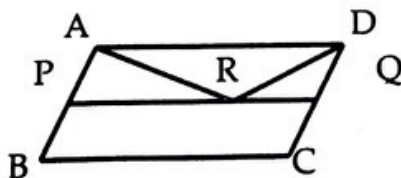


8. In the figure below, O is the centre of the circle. If $OC = BC$, what is the value of angle BAC? (BBA 99-00)

- (A) 22.5° (B) 30° (C) 45°
(D) 60° (E) None of these



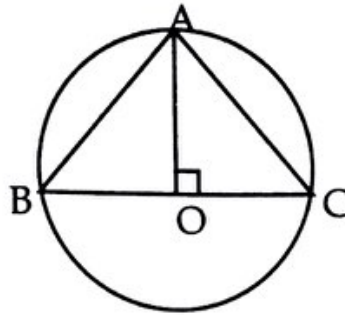
9. (BBA 00-01)



In the parallelogram, $PQ \parallel BC$ and P is the midpoint of AB. If $PR = 16$ cm and area of ABCD is 128 sq. cm, what is the area of the ARD in sq. cm?

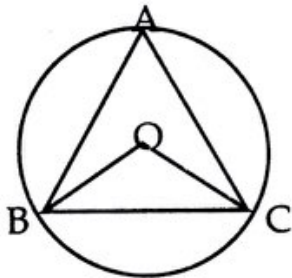
- (A) 16 (B) 20 (C) 24 (D) 28 (E) 32

(BBA 01-02)



O is the centre of the circle. If $BC = d$, $AC = x$ and $AB = y$, what is the length of AO ?
 (A) xy/d (B) dx/y (C) dy/x (D) $0.5dx$ (E) none of these

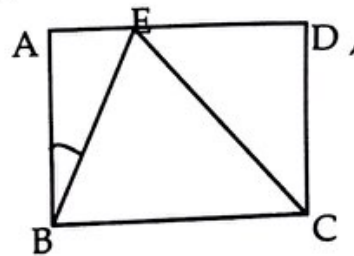
(BBA 01-02)



O is the centre of the circle. If $\angle BAC$ is 55° , what is the value of $\angle OCB$?
 A. 55° B. 45° C. 35° D. 25° E. None of these

12. 20. ABCD is a rectangle. $\angle ABE = 30^\circ$, BC 6 cm and $ED = 2 AE$
 What is the area of the triangle AEB in cm^2 ?

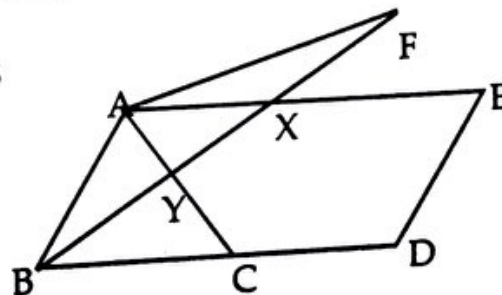
(BBA 02-03)



- A. 4 B. $2\sqrt{3}$ C. $3\sqrt{2}$
 D. $8/\sqrt{3}$ E. none of these

13. ABDE is a parallelogram. $AB = AC$, $AX = FX$
 and $\angle ABC = 50^\circ$. $\angle AYX = 90^\circ$. What is the value of $\angle AFX$?

(BBA 02-03)



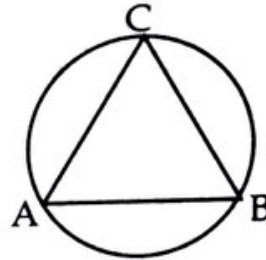
- A. 15 B. 20 C. 25
 D. 30 E. none of these

14. A cow is tied to the corner of a square of side 15m with a rope of length 14m. Find the area the cow can graze and the area which it cannot. (BBA 06-07)

- (A) $144 \text{ m}^2, 77 \text{ m}^2$ (B) $135 \text{ m}^2, 73 \text{ m}^2$ (C) $164 \text{ m}^2, 77 \text{ m}^2$
 (D) $154 \text{ m}^2, 71 \text{ m}^2$ (E) None of these

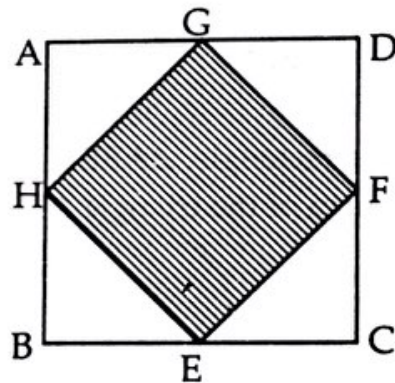
15. ABC is an equilateral triangle, inscribed in a circle. If $AB = 6 \text{ cm}$, find the area of the circle in Cm^2 . (BBA 08-09)

- (A) 36π (B) 12π
 (C) $12\pi / \sqrt{3}$ (D) $12\sqrt{3}\pi$
 (E) none of these



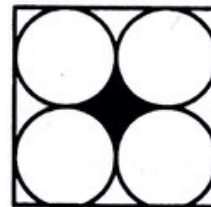
16. ABCD is a square with $AB = 23 \text{ cm}$. If $BE = CF = GD = AH = 9 \text{ cm}$, find the area of the shaded region. (BBA 08-09)

- (A) 169 (B) 256 (C) 277
 (D) 312 (E) none of these

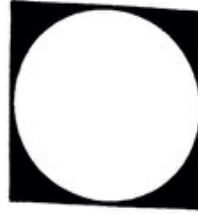


17. The length of one side of the square in the picture below is 8. All the four circles are inscribed within the square and of equal radius. What is the area of the shaded region? (figure not drawn to scale) (BBA 09-10)

- (A) 16π (B) $64 - 16\pi$
 (C) $16 - 4\pi$ (D) $64 - 32\pi$ (E) $64 - 26\pi$.



18. In the figure below there is a circle inscribed inside a square. The length of one side of the square is 7 inches; determine the approximate area of the shaded region inside the square, (figure not drawn to scale)

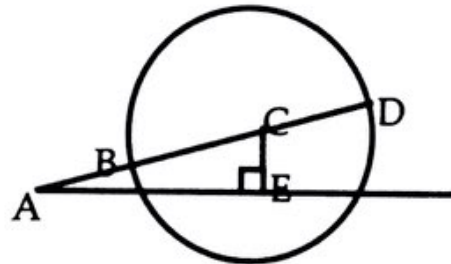


(BBA 09-10)

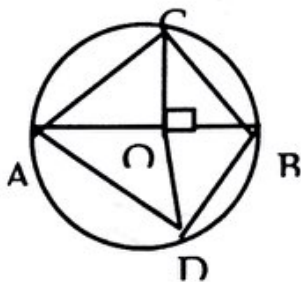
- (A) 9.3 sq inches
 (D) 49 sq inches
 (B) 10.5 sq inches
 (E) 104.8 sq inches
 (C) 16.4 sq inches

19. C is center of the circle. If diameter of circle is 5cm, $AB = \frac{1}{2} AC$ and $AE = 4$ cm, find the area of triangle ACE? (MBA 97-98)

- (A) 3
 (D) 12
 (B) 6
 (E) None
 (C) 9



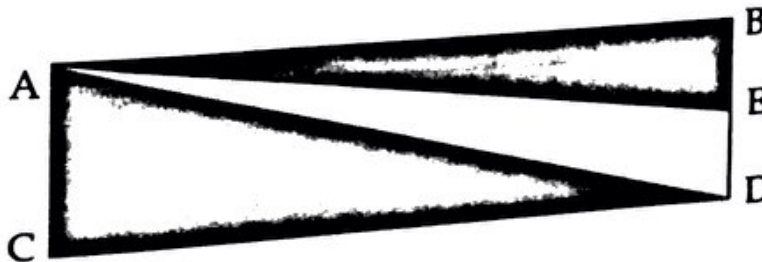
20. In the figure below AB is the diameter and "O" is the center. If $\angle AOD$ is greater than 90° , which of the following is true? (MBA 97-98)



- I. $\angle CAB = \angle ABD$
 II. $\angle CBA = \angle CAB$
 III. Area of $\triangle ACB \neq$ area of $\triangle ABD$

- (A) only I
 (B) only II
 (C) only III
 (D) both II & III
 (E) both I & II

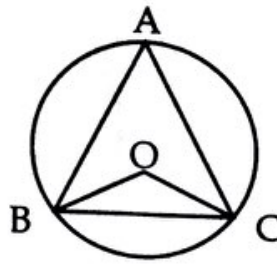
21. ABCD is a square and E is the mid point of BD. Find the percentage of the square that is shaded. (MBA 97-98)



- (A) 50%
 (B) 60%
 (C) 25%
 (D) 75%
 (E) None

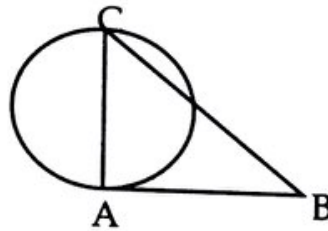
22. In the figure, O is the center of the circle and $\angle OCB = 35^\circ$. What is the value of $\angle BAC$? (MBA 98-99)

- (A) 65° (B) 60°
 (C) 55° (D) 50°
 (E) None of these



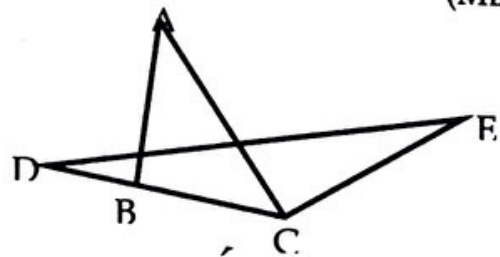
23. In the figure, AB is tangent to the circle at A. AC is a diameter. If $BC = 12$, and $AB = 8$, what is the area of the circle? (MBA 99-00)

- (A) 8π
 (B) 9π
 (C) 12π
 (D) 20π
 (E) 24π



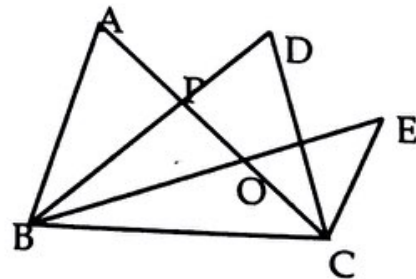
24. In the figure, AC bisects $\angle DCE$. AB is perpendicular to DC. $\angle BAC = 40^\circ$ & $\angle DEC = 20^\circ$. What is the measure of $\angle EDC$? (MBA 99-00)

- (A) 45° (B) 50° (C) 60°
 (D) 80° (E) Cannot be determined



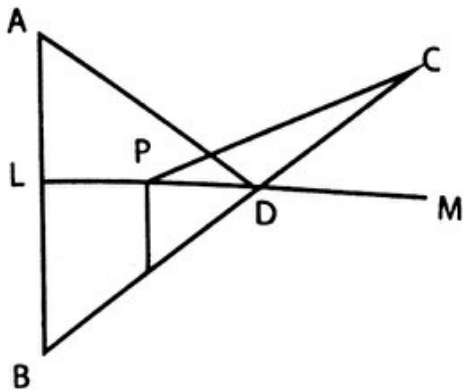
25. In the figure, $\angle ABD = \angle DBE = \angle EBC$. If $\angle DPQ = 80^\circ$ and $\angle EQC = 60^\circ$, what is the value of $\angle ABC$? (MBA 99-00)

- (A) 30° (B) 45° (C) 60°
 (D) 75° (E) None



26. In the figure below, if $AL = LB$, which of the following must be true?

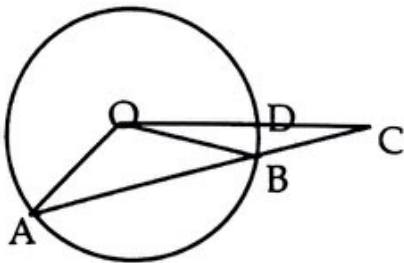
(MBA 99-00)



- (A) $AD + DB > BP + CP$
- (B) $AD + DB > LM$
- (C) $AL + BL < LD$
- (D) $AD + DC < BP + PC$
- (E) None of these

27. In the figure, O is the center of the circle. D is the midpoint of OC. $BC = OD$. If $\angle OCB = 40^\circ$, what is the value of $\angle BAO$?

(MBA 99-00)

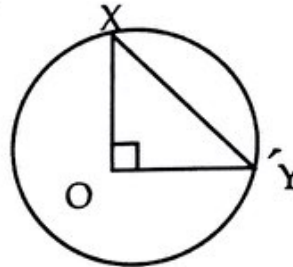


- (A) 65°
- (B) 70°
- (C) 75°
- (D) 80°
- (E) None of these

28. O is the center of the circle at the right. XO is perpendicular to YO and the area of triangle XOY is 32. What the area of circle O?

(MBA 00-01)

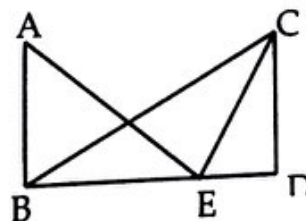
- (A) 16π
- (B) 32π
- (C) 64π
- (D) 128π
- (E) 256π



29. In the figure, $\angle ABE = \angle BDC = 90^\circ$, $AB = 4$ cm and $\angle BAE = 45^\circ$. If $CD = AE$, what is the area of the triangle BCE, in sq. cm?

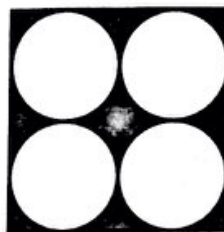
(MBA 01-02)

- (A) 8
- (B) $8\sqrt{2}$
- (C) 12
- (D) $12\sqrt{2}$
- (E) None of these



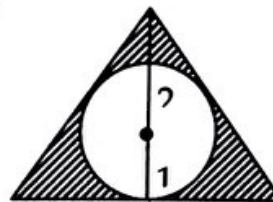
30. In the figure below, four equal circles are drawn within a square whose perimeter is 32. What is the area of the shaded portion? (MBA 01-02)

- (A) $32 - 16\pi$ (B) $64 - 16\pi$
 (C) $64 - 32\pi$ (D) $32\pi - 32$
 (E) $64\pi - 64$



31. In the figure below, the circle is inscribed in the equilateral triangle. If the diameter of the circle is 2, what is the sum of the shaded area? (MBA 03-04)

- (A) $3\sqrt{3} - \pi$ (B) $3\sqrt{3} - 4\pi$ (C) $3\sqrt{3} - 3\pi/2$
 (D) $6\sqrt{3} - 3\pi/2$ (E) $108 - \pi$

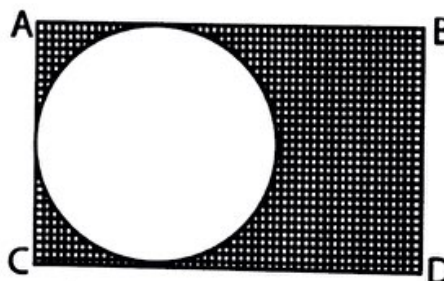


32. Which of the following has the largest area? (MBA 04-05)

- I. A circle of radius $\sqrt{2}$
 II. An equilateral triangle of side 4
 III. A triangle whose sides are 3, 4 and 5.

- (A) I (B) II (C) III (D) I and II (E) II and III

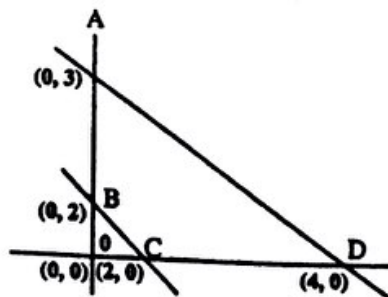
33. In the rectangle ABCD, $2 AB = 3 BD$. If the radius of the circle is $\sqrt{7}$ find the area of the shaded region. (MBA 07-08)



- (A) $42 - 7\pi$ (B) $32 - 5\pi$ (C) $13 - 7\pi$ (D) $56 - 7\pi$ (E) None of these

34. Find the area of ABCD in square units.

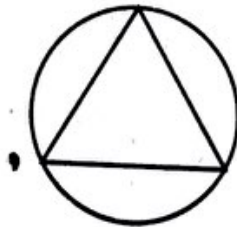
- (A) 2 (B) 3.5
 (C) 4 (D) 6
 (E) none of these



(MBA 07-08)

2.)2) 35. A certain cake recipe states that the cake should be baked in a pan 8 inches in diameter. If Salma wants to use the recipe to make a cake of the same depth but 12 inches in diameter, by what factor should she multiply the recipe ingredients? (MBA 09-10)
- (A) 2.5 (B) 2.25 (C) 1.5 (D) 1.33 (E) None of these

36. An equilateral triangle is inscribed in a circle, as shown below. If the radius of the circle is 2, what is the area of the triangle? (figure not drawn to scale) (MBA 09-10)



- (A) $\frac{\sqrt{2}}{2}$ (B) $\sqrt{2}$ (C) $3\sqrt{3}$ (D) $10\sqrt{3}$ (E) None of these

Answer Key Exercise 6

1.C	2.D	3.E	4.D	5.B	6.E	7.E	8.B	9.E	10.A
11.C	12.B	13.B	14.D	15.B	16.C	17.C	18.B	19.B	20.D
21.D	22.C	23.D	24.C	25.C	26.D	27.D	28.C	29.B	30.B
31.A	32.B	33.A	34.C	35.B	36.C	-	-	-	-

Solution to Exercise 6

1. (C) Rectangle এর area $2a \times a = 2a^2$.

Circle এর radius = a; area = πa^2 , semicircle = $\frac{\pi a^2}{2}$

Total area = $2a^2 + \frac{\pi a^2}{2}$

2. (D) ΔABC - তে অতিভুজ $AC = 2\sqrt{2}$ $\therefore AD = \frac{2\sqrt{2}}{2} = \sqrt{2}$

অর্থাৎ, ΔADB -তে $(\sqrt{2})^2 + BD^2 = 2^2 \Rightarrow BD^2 = 2 \Rightarrow BD = \sqrt{2}$

\therefore radius = $OB = \frac{BD}{2} = \frac{\sqrt{2}}{2} = \frac{1}{\sqrt{2}}$

3. (E) একটু চিন্তা করলেই বোঝা যায়, $CE = DE$; $\therefore \angle ECD = \angle EDC$;

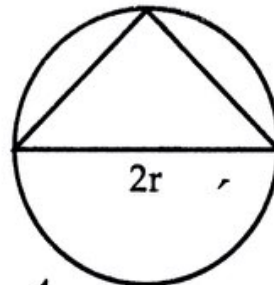
এখন, ΔECD এ $\angle E + \angle ECD + \angle EDC = 180^\circ \Rightarrow 40^\circ + \angle ECD = 180^\circ \Rightarrow \angle ECD = 70^\circ$ \therefore
 $\angle ACD = 180^\circ - \angle ECD = 110^\circ$

4. (D) Let, h_1 = height from A to CD; Area of $ABX = \frac{1}{2} \times AB \times (\frac{h_1}{2}) = \frac{1}{4} \times 36 = 9$

5. (B) $\frac{1}{2} DC \times CE = 8 \Rightarrow DC^2 = 16 \Rightarrow DC = 4$; area of ABCD = $4^2 = 16$

6. (E)

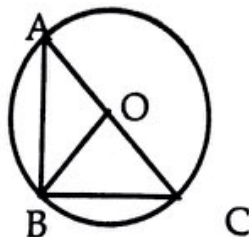
$\frac{\text{area of circle}}{\text{area of triangle}} = \frac{\pi r^2}{\frac{1}{2} \times \frac{2r}{\sqrt{2}} \times \frac{2r}{\sqrt{2}}} = \pi$



7. (E) ΔADE এবং ΔABC সদৃশ $\therefore \frac{A}{D} = \frac{DE}{BC} \Rightarrow \frac{3}{6} = \frac{4}{BC} \therefore BC = 8$

Area of trapezium BCED = $\frac{DE + BC}{2} \times BD = \frac{4 + 8}{2} \times 3 = 18$

8. (B) $OC = BC \therefore AC = 2BC \therefore \angle A = 30^\circ$ (recall 30: 60: 90 triangle)



(E) P mid point এবং PQ || BC ফলে APQD এর area ABCD এর 1/2 আবার AD base আর parallel AD এবং PQ এর মাঝে triangle এর APQD এর 1/2 area of Δ ARD = 1/4 × 128 = 32

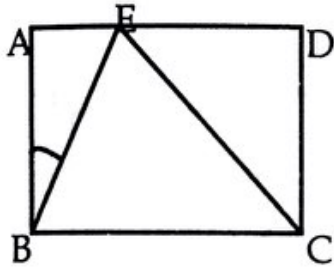
(A) অর্ধবৃত্তস্থ কোণ সমকোণ

∴ Δ ABC এবং Δ ABO similar ∴ $\frac{AO}{AC} = \frac{AB}{BC}$

or, $\frac{AO}{y} = \frac{x}{d}$ ∴ $AO = \frac{xy}{d}$

11. (C) central ∠ O = 2 inscribed ∠ BAC = 110°
 Δ OBC - এ OB = OC [radius] ∴ ∠ OBC = ∠ OCB
 ∴ ∠ OCB = 0.5(180 - 110) = 35°

12. (B) ABCD একটি আয়তক্ষেত্র।

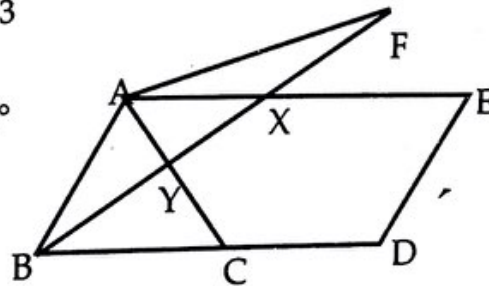


∠ ABE = 30°; BC = 6 cm; ED = 2AE
 Δ ABE এ ∠ ABE = 30° এবং ∠ BAE = 90°
 ∴ ∠ AEB = 60°
 BC = 6 cm; ∴ AD = 6 cm
 আবার, AD = AE + ED = AE + 2AE = 3AE
 ∴ AE = 2 cm

30° এর বিপরীত বাহু 2 cm হলে 60° এর বিপরীত বাহু $2\sqrt{3}$ cm

∴ area of Δ AEB = $\frac{1}{2} \times 2 \times 2\sqrt{3} = 2\sqrt{3}$

13. (B) AB = AC, AX = FX; ∠ ABC = 50°
 ∠ AYX = 90°



আমরা জানি, parallelogram বা সামান্তরিকের বিপরীত কোণগুলো পরস্পর সমান। অর্থাৎ ∠ ABC = ∠ AED = 50°

অর্থাৎ ∠ ABC + ∠ AED = 100°

অতএব, ∠ BAE + ∠ EDB = 360° - 100° = 260°

∴ ∠ BAE = 130°

আবার, Δ ABC এ ∠ ABC = ∠ ACB [কারণ AB = AC]

∴ ∠ BAC = 80° [180° - (50° + 50°)]

অর্থাৎ ∠ CAE = 50° [130° - 80°]

Δ AYX - এ ∠ YAX = 50° ও ∠ AYX = 90°;

অতএব, ∠ AXY = 40° ∴ ∠ AXF = 140°

∴ ∠ FAX + ∠ AFX = 180° - 140° = 40°

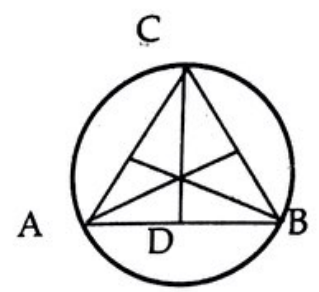
বেহেতু AX = FX; সুতরাং কোণদ্বয় সমান ∴ ∠ AFX = 20°

14. (D) area of the square is $= 15^2 = 225 \text{ m}^2$
 Area the cow can graze is one fourth of a circle with radius equal to the length of the rope. So, area is $= (\pi \times 14^2)/4 = 154 \text{ m}^2$. Area the cow cannot graze is $225 - 154 = 71 \text{ m}^2$

15. (B) O is the center of the circle

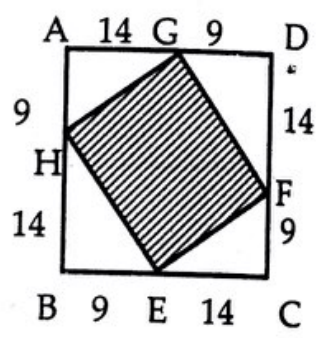
$$\frac{1}{2} \times 6 \times CD = \frac{\sqrt{3}}{4} \times 6^2$$

$\therefore CD = 3\sqrt{3}$
 $\therefore OD = \sqrt{3}$
 Now, $OD^2 + AD^2 = OA^2$
 $(\sqrt{3})^2 + (3)^2 = OA^2$
 $\therefore OA = \sqrt{12}$
 Area $= 12\pi$



16. (C)

Area of the shaded region $= (23)^2 - 4 \left(\frac{1}{2} \times 14 \times 9 \right)$
 $= 529 - 252$
 $= 277$



17. (C) square - এর প্রতিটি বাহু = 8

\therefore circle -এর radius $= \frac{8}{4} = 2$

Area of square $= 8^2 = 64$
 Area of 4 circles $= \pi (2)^2 \times 4 = 16\pi$

\therefore Shaded region এর area $= \frac{64 - 16\pi}{4} = 16 - 4\pi$

Ans: (C) $16 - 4\pi$

18. (B) Area of square $= 7^2 = 49$

Radius of circle $= \frac{7}{2} = 3.5$

Area of circle $= \pi r^2 = \frac{22}{7} \times 3.5 \times 3.5 = 38.5$

\therefore Shaded -এর area $= 49 - 38.5 = 10.5 \text{ sq inches}$ Ans: (B) 10.5 sq inches

19. (B) $AB = \frac{1}{2} AC$ কাজেই $AB = BC$, আবার $BD = 5$ কাজেই $BC = CD = AB = 2.5 \text{ cm}$. এখন $AC = 2AB$

$= 2 \times 2.5 = 5$ দেওয়া আছে, $AE = 4$ পিথাগোরাসের উপপাদ্য অনুযায়ী $CE = 3$, $\Delta ACE = \frac{1}{2} AE \times CE = \frac{1}{2} \times 4 \times 3 = 6$.

10. (D) $OA = OC = OB$ এবং $\angle COB = \angle COA = 90^\circ$ বলে $AC = BC$, কাজেই $\triangle ACB$ তে $\angle CBA = \angle CAB$, আবার, $\triangle ACB$ ও $\triangle ADB$ সমকোণী হলেও এবং এদের ভূমি AB common হলেও উচ্চতা অসমান। কাজেই area ও unequal.
11. (D) $\triangle ACD = \triangle ADB$, আবার, $DE = EB$, কাজেই $\triangle ADE = \triangle ABE$, তাহলে $\triangle AED = \frac{1}{4}$ $ABDC$ তাহলে shaded region $\frac{3}{4} = 75\%$.
12. (C) $\triangle OCBG$ তে radius $OB = OC$. $\therefore \angle OBC = \angle OCB = 35^\circ$; $\therefore \angle BOC = 180^\circ - 35^\circ - 35^\circ = 110^\circ$; আমরা জানি, কেন্দ্রস্থ কোণ পরিধিস্থ কোণের দ্বিগুণ। \therefore পরিধিস্থ কোণ $\angle BAC = \text{কেন্দ্রস্থ কোণ } \angle BOC / 2 = \frac{1}{2} \times 110^\circ = 55^\circ$
13. (D) AB হলো A বিন্দুতে tangent (স্পর্শক)। $\therefore AB$ অবশ্যই AC এর উপর লম্ব। $\therefore \triangle ACB$ হলো right angled triangle \therefore Pythagorean theory প্রয়োগ করে পাওয়া যায়, $AC^2 + AB^2 = BC^2 \Rightarrow 8^2 = 12^2 \Rightarrow AC^2 = 144 - 64 = 80 \therefore AC = \sqrt{16 \times 5} = 4\sqrt{5}$ আবার, AC হলো diameter \therefore radius, $r = \frac{AC}{2} = 2\sqrt{5} \therefore$ Area $= \pi r^2 = \pi \times (2\sqrt{5})^2 = \pi \times 4 \times 5 = 20\pi$
24. (C) $\triangle ABC$ এ $\angle ACB = 180^\circ - 40^\circ - 90^\circ = 50^\circ$ এখন একটু চিন্তা করে দেখুন, কোনোভাবেই $\angle EDC$ বের করা যাবে না। So, $\angle DCF = 50^\circ \times 2 = 100^\circ$. So, in $\triangle DEC$, $\angle EDC = 180^\circ - (100^\circ + 20^\circ) = 60^\circ$
 \therefore (E) হলো উত্তর।
25. (C) $\angle DPQ$ হলো $\triangle PBQ$ এর বহিঃস্থ কোণ। $\therefore \angle DPQ = \angle PBQ + \angle PQB \Rightarrow 80^\circ - \angle DBE + \angle EQC \Rightarrow 80^\circ = \angle DBE + 60^\circ \therefore \angle DBE = 80^\circ - 60^\circ = 20^\circ \therefore \angle ABC = \angle ABD + \angle DBE + \angle EBC = 20^\circ + 20^\circ + 20^\circ = 60^\circ$.
26. (D) এটিও উত্তর থেকে আসতে হবে। (A) এর ডান পক্ষে যে CP আছে, এই CP এর C বিন্দুর কোনো নির্দিষ্ট অবস্থান নেই অর্থাৎ BD -কে বর্ধিত করে C বিন্দুকে অনেক দূরে নেয়া যায়, আবার D এর অনেক কাছেও আনা যায়। ফলে, নিশ্চিতভাবে বলা যায় না যে, $AD + DB > BP + CP$. একই ভাবে (B) এর M বিন্দুর কোনো নির্দিষ্ট অবস্থান না থাকতে LM এর দৈর্ঘ্য সম্পর্কে নির্দিষ্টভাবে কিছু বলা যাচ্ছে না। একইভাবে (C) এর (D) বিন্দুও অনির্দিষ্ট হওয়াতে $AL + BL < LD$ হতে পারে, আবার, নাও হতে পারে। এখন (D) এর ডান পক্ষের BP এবং PC হলো $\triangle BPC$ এর দুই বাহু। সুতরাং ত্রিভুজের দুই বাহুর সমষ্টি তৃতীয় বাহু অপেক্ষা বড় এই সূত্র হতে পাওয়া যায়, $\triangle BPC$ এ $BP + PC > BC \Rightarrow BP + PC > BD + CD \dots\dots (1)$ আবার, $\triangle ALD$ এবং $\triangle BLD$ এর মধ্যে $AL = LB$; $\angle ALD = \angle BLD = 90^\circ$ এবং LD হলো সাধারণ বাহু। \therefore ত্রিভুজদ্বয় সর্বসম। $\therefore AD = BD \therefore (1)$ থেকে, $BP + PC > AD + DC < BP + PC \therefore$ (D) উত্তর।
27. (D) $OD = OB$ (যেহেতু উভয়ই হলো ব্যাসার্ধ) আবার, দেয়া আছে, $BC = OD \therefore OBC$ তে $BC = OB \therefore \angle BOC = \angle OCB = 40^\circ \therefore \angle OBC = 180^\circ - 40^\circ - 40^\circ = 100^\circ \therefore \angle OBA = 180^\circ - \angle OBC = 180^\circ - 100^\circ = 80^\circ$; আবার, $\triangle OAB$ এ $OA = OB$ (ব্যাসার্ধ হওয়াতে) $\therefore \angle BAO = \angle OBA = 80^\circ$.
28. (C) Radius $= r = XO = YO$; আবার, $\frac{1}{2} \times XO \times YO = 32 \Rightarrow \frac{r^2}{2} = 32 \Rightarrow r = 8$ অর্থাৎ, circle এর area $= r^2 = \pi \times 8^2 = 64\pi$

29. (B) ΔABE তে $\angle B = 90^\circ$, $\angle A = 45^\circ \therefore \angle E = 45^\circ$

$$\therefore AB = BE = 4 \therefore \text{Area of } \Delta BEC = \frac{1}{2} BE \times CD = \frac{1}{2} 4 \times 4 = 8$$

30. (B) perimeter of the square = 32

\therefore each side of the square = 8 \therefore area of the square = 64

Radius of each circle = $8 \div 4 = 2 \therefore$ Area of each circle = 4π

\therefore Sum of the area of the circles = $4\pi \times 4 = 16\pi \therefore$ Area of the shaded portion = $64 - 16\pi$

31. (A) circle এর diameter 2 হলে radius = 1

অর্থাৎ area = $\pi r^2 = \pi$

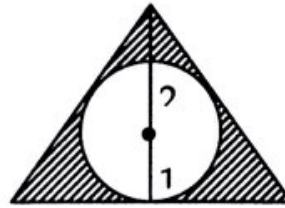
লম্ব $2 + 1 = 3$

$$\therefore a^2 - \left(\frac{a}{2}\right)^2 = 3^2$$

$$\Rightarrow \frac{3a^2}{4} = 9 \Rightarrow a^2 = \frac{4 \times 9}{3} = 12$$

$$\therefore \text{ত্রিভুজের area} = \frac{\sqrt{3}a^2}{4} = \frac{\sqrt{3} \times 12}{4} = 3\sqrt{3}$$

অর্থাৎ, shaded portion এর area = $3\sqrt{3} - \pi$



32. (B) area = $\pi r^2 = \pi (\sqrt{2})^2 = 2\pi = 6.28$ (approx.)

$$\text{II) area} = \frac{\sqrt{3}a^2}{4} = \frac{\sqrt{3} \times 4^2}{4} = 4\sqrt{3} = 6.92$$
 (approx.)

$$\text{III) area} = \frac{1}{2} \times 3 \times 4 = \frac{12}{2} = 6$$

33. (A) বৃত্তটির ব্যাসার্ধ = $\sqrt{7} \therefore$ ব্যাস = $2\sqrt{7}$; BD এবং ব্যাসের দৈর্ঘ্য সমান, $\therefore BD = 2\sqrt{7}$

$$2AB = 3BD \Rightarrow 2AB = 3 \times 2\sqrt{7} \Rightarrow AB = 3\sqrt{7}$$

$$\therefore \text{Area} = \text{length} \times \text{width} = AB \times BD = 3\sqrt{7} \times 2\sqrt{7} = 6 \times 7 = 42$$

Area of the circle = $\pi (\sqrt{7})^2 = 7\pi$; Area of the shaded region = $42 - 7\pi$

34. (C) ΔAOD area = $\frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times 4 \times 3 = 6$; ΔBOC এর area = $\frac{1}{2} \times 2 \times 2 = 2$

$\therefore ABCD$ এর area = $6 - 2 = 4$;

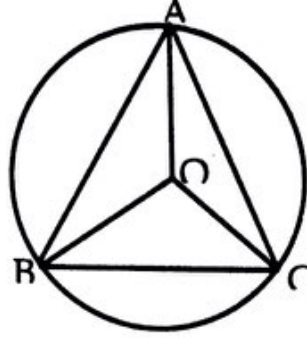
(B) প্রথম ক্ষেত্রে, Volume = $\pi(4)^2 \cdot h = 16\pi h$ (diameter 16 inches)

দ্বিতীয় ক্ষেত্রে, Volume = $\pi(6)^2 h = 36\pi h$ (diameter 12 inches)

অর্থাৎ, Volume দাঁড়ায় = $\frac{36\pi h}{16\pi h} = \frac{9}{4} = 2.25$ times

Ingredients হবে 2.25 times

C)

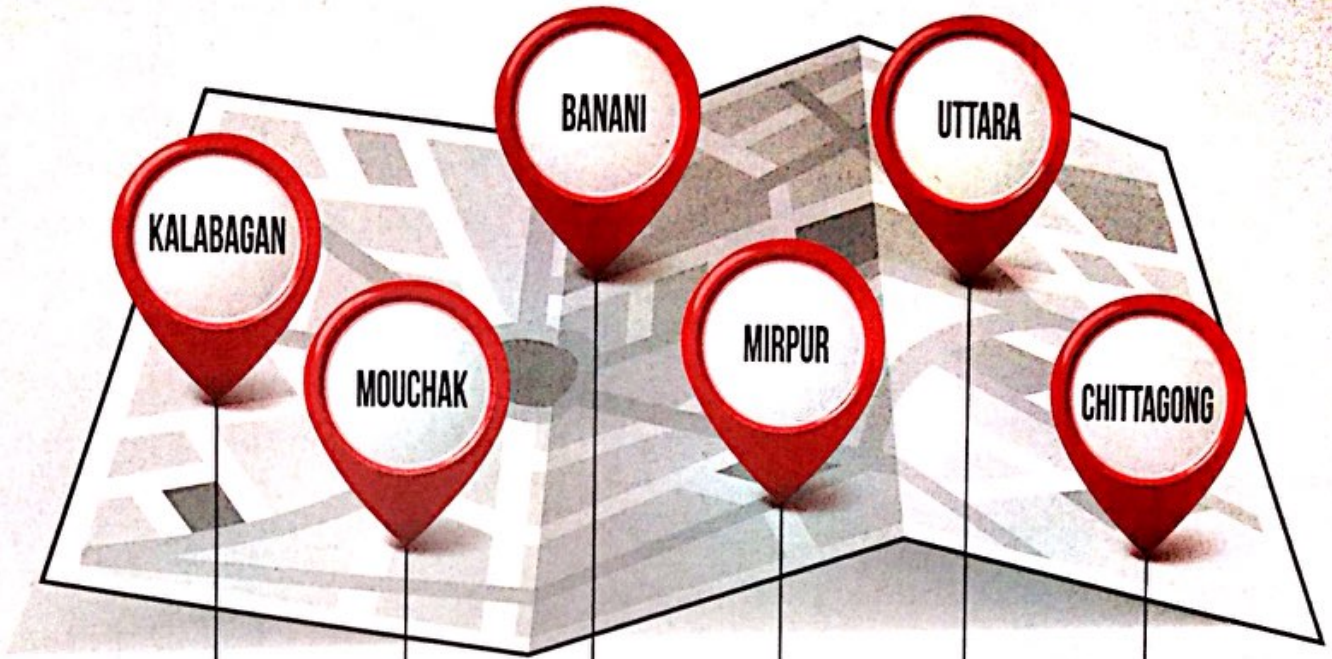


এখন, ত্রিভুজের তিন শীর্ষ A, B, C ধরি, মনেকরি কেন্দ্র O,

O, A; O, B; O, C যোগ করি, তাহলে তিনটি সমদ্বিবাহু ত্রিভুজ পাওয়া যায়, এখন সমদ্বিবাহু ত্রিভুজের সমান বাহুদ্বয়ের দৈর্ঘ্য অপেক্ষা অপর বাহুটি $\sqrt{3}$ গুণ,

এখন, $OB = OC = 2 \therefore BC = 2\sqrt{3} \therefore \Delta ABC$ এর ক্ষেত্রফল = $\frac{\sqrt{3}}{4} a^2$

$$= \frac{\sqrt{3}}{4} (2\sqrt{3})^2 = \frac{\sqrt{3}}{4} \times 4 \times 3 = 3\sqrt{3}$$



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