Practice Sheet- 01 | Try Yourself

01. A bus is traveling with 52 passengers. When it arrives at a stop, Y passengers get off and 4 get in at the next stop one-third of the passengers get off and 3 get on. There are 25 passengers. Find out how many passengers got off at the first stop?

02. A businessman, before closing his shop, counted the money kept in the cash box and found that there were x number of 50 paisa coins, x number of 1 taka notes, x number of 2 taka notes and x number of 5 taka notes. Apart from these, there was nothing else in the box. The next day, when he opened his shop he found the cash box had been stolen. As he was insured, he got taka 1,615, which is 95% of the stolen money, from the insurance company. How many 2 taka notes were there in the cash box?

03. The average age of student of class is 15.8 years. The average age of boys in the class is 16.4 years and that of the girls is 15.4 years. Find the ratio of number of boys to the number of girls in the class.

04. A printer quotes a price of taka 7,500 for printing 1,000 copies of a book and Taka 15,000 for printing 2,500 copies. Assuming a linear relationship and 2,000 books are printed, find –
(a) the variable cost per book,
(b) the average cost per book and
(c) the fixed cost.

05. In a two-digit number, the digit in the unit's place is more than twice the digit in ten's place by 1. If the digits in the unit's place and the ten's place are interchanged, difference between the newly formed number and the original number is less than the original number by 1. What is the original number?

06. A shop stocks four types of caps, there are $\frac{1}{3}$ as many red caps as blue caps and $\frac{1}{2}$ as many green caps as red caps. There are equal number of green caps and yellow caps. If there are 42 blue caps, then what percent of the total caps in the shop are blue?

07. If $x = \frac{4}{5}$, then $\frac{\sqrt{1+x}+\sqrt{1-x}}{\sqrt{1+x}-\sqrt{1-x}}$ =?

08. A boy purchased some chocolates from a shop for Tk 120. In the next shop he found that the price of per piece chocolate is Tk 3 less than that charged at the previous shop, as such he could have purchased 2 more chocolates. How many chocolates did he buy from the first shop?

09. 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 same from either choice.

10. Two tanks, X and Y, are filled to capacity with jet fuel. Tank X holds 600 gallons more than tank Y. If 100 gallons of fuel were to be pumped from each tank, tank X would then contain 3 times as much fuel as tank Y. What is the total number of gallons of fuel in the two full tanks?

11. The average monthly income of P and Q is Tk. 5050. The average monthly income of Q and R is Tk. 6250 and the average monthly income of P and R is Tk. 5200. The monthly income of P is:

12. A square office, 1000 feet by 1000 feet, is to be partitioned into two offices by a single interior wall. The difference between the perimeters of the resulting two officers is be to 400 feet. What are their dimensions?

13. A female worker of a factory serves on the basis of monthly salary. At the end of every year she gets a fixed increment. Her monthly salary becomes Tk. 4500 after 4 years of service and Tk. 5000 after 8 years of service. Find the salary at the beginning of her service and the amount of annual increment of salary.

14. A group of students has hired a bus for Taka 3000 for going to a picnic. They had an understanding that each participant would share the charge in equal amounts. But because of 10 students not turning up, the charged per student increased by Taka 10 over the initial estimates. What was the number of students who originally registered for the picnic?

15. A student completed $\frac{7}{9}$ of the math problems in a chapter in 1 day, Had he completed 3 more problems, he would have completed $\frac{5}{6}$ of the total problems. How many problems were there in the chapter?
16. What must be subtracted from $\frac{3y}{x}$ to get $\frac{x}{y}$?
17. Of the animals in Dhaka Zoo, $\frac{1}{3}$ are Zebras, $\frac{1}{6}$ are Giraffes, $\frac{1}{5}$ are tigers, and the rest is comprised of 36 Deer. How many Zebras are there in the Zoo?
18. Six years ago, the ratio of the ages of Kunal and Sagar was 6 : 5. Four years hence, the ratio of their ages will be 11 : 10. What is Sagar's age at present?
19. Present ages of Sameer and Anand are in the ratio of 5 : 4 respectively. Three years hence, the ratio of their ages will become 11 : 9 respectively. What is Anand's present age in years?
20. The captain of a cricket team of 11 members is 26 years old and the wicket keeper is 3 years older. If the ages of these two are excluded, the average age of the remaining players is one year less than the average age of the whole team. What is the average age of the team?
21. In Arun's opinion, his weight is greater than 65 kg but less than 72 kg. His brother doest not agree with Arun and he thinks that Arun's weight is greater than 60 kg but less than 70 kg. His mother's view is that his weight cannot be greater than 68 kg. If all are them are correct in their estimation, what is the average of different probable weights of Arun?
22. If 5 is added to the sum of two digits of a number consisting of two digits, the sum will be three times the digits of the tens place. Moreover, if the places of the digits are interchanged, the number thus found will be 9 less than the original number. Find the number.
23. In an examination, 80% of the students passed in English, 85% in Mathematics and 75% in both English and Mathematics. If 40 students failed in both the subjects, find the total number of students.
24. If $\left(x+\frac{1}{x}\right)=3$, then the value of $\left(x^6+\frac{1}{x^6}\right)$ =?
25. If he sum of five consecutive integers is S, what is the largest of those integers in terms of S?
26. The difference between two numbers is five and the difference between their squares is 65. What is the larger number?
27. If $\frac{\sqrt{2+x}+\sqrt{2-x}}{\sqrt{2+x}-\sqrt{2-x}}=2$, find the value of x.
28. A total of 50 employees work in a bank branch of these 22 have taken the accounting course, 15 have taken finance, 14 marketing, 9 of them taken exactly 2 of the courses, 1 of them has taken all. How many of the 50 employees have taken none of the course?
29. If $\sqrt[3]{8x^2\sqrt{32x\sqrt{4x^2}}}=4$, the find the value of x.
30. Given $x=3+\sqrt{8}$ find the value of $x^2+\frac{1}{x^2}$
31. Solve the inequality: $-2<\frac{6-2x<4}{3}$
32. A recent survey showed that 60% of total households of a country own television. Market experts predict that in a year, 10% of the non-owners will become owners and 5% of the owners will become non-owners. If 2,000 households currently do not own television and if the number of total households in the country remain unchanged, calculate the percentage of households who are likely to own television next year. What would be the % of non-owners?

33. In a certain town 41% of the people have brown hair, 26% have brown eyes and 11% have both brown eyes and brown hair. What percentage of the people in the town has neither brown hair nor brown eyes?
34. 35 percent of a group of 70 researchers will be assigned to team A and the remaining 65 percent to team B. However, 60 percent of the researchers prefer team A and 40 percent prefer team B. What is the least possible number of researchers who will NOT be assigned to the team they prefer?
35. Out of their annual net income, a couple spent 25 percent for food, 13.5 percent for entertainment, 20 percent for housing, 8 percent for car expenses, 15 percent for clothing, and saved the rest. What percent of their spending could they save?
36. In a survey of group of people, it was found that 50% had iodine deficiency, 25% had diabetes, and 12% had both. What percentage of people in that group had none of these two ailments?
37. In a survey, 60% of those surveyed owned a car and 80% of those surveyed owned a TV. If 55% owned both a car and a TV, what percent of those surveyed owned a car or a TV or both?
38. $a = \sqrt{3} + \sqrt{2}$ then value of $a^3 + 3a + 3a^{-1} + a^{-3}$ is?
39. $x - \frac{1}{x} = 2$ then the value of $x^4 \frac{1}{x^4}$ is?
40. $a - \frac{6}{a} = 1$ than the value of $\frac{6}{a^2 - a - 1}$ is ?
41. $a + b = \sqrt{7}$ and $b = a - \sqrt{3}$ what is the value of ab = ?
42. $x + \frac{1}{x} = 1$ then what is the value of $\left(x^2 + \frac{1}{x^2}\right)\left(x^4 + \frac{1}{x^4}\right)$?
43. On a certain transatlantic crossing, 20 percent of a ship's passengers held round-trip tickets and also took their cars abroad the ship. If 60 percent of the passengers with round-trip tickets did not take their cars abroad the ship, what percent of the ship's passengers held round-trip tickets?
44. If $a - \frac{1}{a} = m$, show that $a^4 + \frac{1}{a^4} = m^4 + 4m^2 + 2$
45. A two-digit number is such that the product of the digits is 8. When 18 is added to the number, then the digits are reversed. What is the number?
46. Robi was 4 times as old as his son 8 years ago. After 8 years, Robi will be twice as old as his son. What are their present ages?
47. The average weight of three men A, B and C is 84 kg. Another man D joins the group and the average becomes 80 kg. When another man E, whose weight is 3 kg more than that of D, replaces A, then average weight of B, C, D and E becomes 79 kg. What is the weight of A?
48. Tickets to cricket game costs Tk. 40 for reserved seats and Tk. 30 for general seats. If all 500 tickets were sold for Tk. 17600, then how many reserved seats were sold?
49. $a + b = \sqrt{7}$ and $a - b = \sqrt{5}$ then, $8ab\,(a^2+b^2)$?
50. Of the 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 of the lot have neither air-conditioning nor power windows?
51. In a class of 150 students 90 students have taken Finance (F), 75 students have taken Banking (B), and 55 students have taken Economics (E), 10 students have taken F and E but not B, 15 students have taken F and B but not E, and 25 students have taken B and E but not F. Find the number of students who have taken all the three courses.
    (B) We can put the data in a Venn-diagram below.
52. If $x = \frac{\sqrt{3}+1}{\sqrt{3}-1}$ and $y = \frac{\sqrt{3}-1}{\sqrt{3}+1}$, then the value of $(x^2 + y^2)$ is:

53. If $\left(\frac{a}{b}\right)^{x-1} = \left(\frac{b}{a}\right)^{x-3}$, then the value of x is:

54. $\frac{1}{1+x^{(b-a)}+x^{(c-a)}} + \frac{1}{1+x^{(a-b)}+x^{(c-b)}} + \frac{1}{1+x^{(b-c)}+x^{(a-c)}} = ?$

55. $\frac{(243)^{\frac{n}{5}} \times 3^{2n+1}}{9^n \times 3^{n-1}} = ?$

56. $x - \frac{1}{x} = 7$ then what value of $x^3 - \left(\frac{1}{x}\right)^3$ is ?

57. $\left(a + \frac{1}{a}\right)^2 = 3$ then the value of $a^3 + \frac{1}{a^3}$ is?

58. In an examination, 35% candidates failed in one subject and 42% failed in another subject while 15% failed in both the subjects. If 2500 candidates appeared at the examination, how many passed in either subject but not in both?

59. 50% of the people in an area read Ittefaq and 60% of the people in that area read Prothom Alo. 20% people read both the newspapers. What percent of people do not read any of the newspapers?

60. $a - \frac{1}{a} = 3$ then the value of $a^3 + \frac{1}{a^3}$ is ?

61. If $a^2 + \frac{1}{a^2} = 51$ then what is the value of $a - \frac{1}{a}$?

62. $a + b = 7$ and $a^2 + b^2 = 25$ the value of ab is ?

63. Mr. Akbar 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 a minimum of Tk 100 toll up to total sale of Tk 1000. For any amount of sale above Tk 1000, he has to pay an additional toll of 7.5% on the incremental amount. If the total amount of toll paid was Tk. 257.50 then what was his total sales proceeds from the potatoes?

Home Assignment- 01 — Solutions

01. According to question,

$52 - y + 4 - \frac{52 - y + 4}{3} + 3 = 25 \quad \Rightarrow \frac{3(52 - y + 4) - (52 - y + 4)}{3} = 25 - 3$

$\Rightarrow 2(52 - y + 4) = 22 \times 3; \quad \Rightarrow 104 - 2y + 8 = 66; \quad \Rightarrow 104 + 8 - 66 = 2y \quad \Rightarrow 2y = 46$

$\therefore y = 23$ **(Answer)**

02. The amount of stolen money = $\left(\frac{x}{2} + x + 2x + 5x\right) = \frac{x}{2} + 8x = \frac{x + 16x}{2}$ = Tk. $\frac{17x}{2}$

According to Question, 95% of stolen money = 1615

$\Rightarrow \frac{95}{100} \times \frac{17x}{2} = 1615 \qquad \Rightarrow x = \frac{1615 \times 200}{95 \times 17} = 200$

So, the number of 2 taka notes in the cash box was 200.

Answer: The number of 2 taka notes in the box is 200

03. Let, the number of boys be x
And number of girls be y
We get, $16.4 \times x + 15.4 \times y = 15.8 \times (x + y)$ $\Rightarrow 16.4x + 15.4y = 15.8x + 15.8y$

$\Rightarrow 16.4x - 15.8x$; $\Rightarrow 15.8y - 15.4y$; $\Rightarrow 0.6x = 0.4y$; $\Rightarrow \frac{x}{y} = \frac{.4}{.6} = \frac{4}{6} = \frac{2}{3}$

$\therefore x : y = 2 : 3$
Answer. The ratio of number of boys to the number of girls is 2 : 3 (Answer)

04. 1000 copies need 7500Tk
2500 copies need 15000Tk
$\therefore$ Extra 1500 copies need 7500Tk
This 1500 copies are fixed cost free,
We can get variable cost per book = $\frac{7500}{1500}$ = 5 Tk **(Answer)**
As cost function is linear and total cost for printing first 1000 copies is 7500Tk and the variable cost for per book is 5 Tk.
So, more 1000 copies cost = 5×1000 = 5000Tk
To print 2000 books we need = (7500 + 5000) =12,500Tk
(B) Average cost = $\frac{12,500}{2000}$ = 6.25 Tk **(Answer)**
(C) Fixed cost = (7500 – 5000) = 2500Tk **(Answer).**

05. Let the ten's digit be x.
then, unit's digit be $2x + 1$
The original number is = $10x + 2x + 1 = 12x + 1$
If the digits are interchanged then new number is = $10(2x + 1) + x = 21x + 10$
According to question, $(21x + 10) - (12x + 1) = (12x + 1) - 1$
$\Rightarrow 9x + 9 = 12x$ $\Rightarrow 3x = 9$ $\Rightarrow x = 3$
$\therefore$ The original number is = $12 \times 3 + 1 = 37$ **(Answer: 37)**

06. Say, there are x green caps
There are x yellow caps
There are $2x$ yellow caps
There are $6x$ yellow caps
Total caps = $x + x + 2x + 6x = 10x$
Percentage of blue caps = $\frac{6x}{10x} \times 100$ = 60%
Answer: 60% of the total caps are blue.

07. $x = \frac{4}{5}$ $\therefore \frac{\sqrt{1+x} + \sqrt{1-x}}{\sqrt{1+x} - \sqrt{1-x}}$ $= \frac{1 + x + 1 - x + 2\sqrt{1-x^2}}{2x}$ $= \frac{2 + 2\sqrt{1-x^2}}{2x}$

$= \frac{1+\sqrt{1-x^2}}{x}$ $= \frac{1+\sqrt{1-\frac{16}{25}}}{\frac{4}{5}} = \frac{1+\frac{3}{5}}{\frac{4}{5}} = \frac{8}{5}\times\frac{5}{4} = 2$ **(Answer)**

08. Let, he bought x numbers of chocolates.

So, price for each chocolate = $\frac{120}{x}$

On the next shop price for each chocolate = $\frac{120}{x} - 3$

According to the question, $\left(\frac{120}{x}-3\right) = \frac{120}{x+2} \Rightarrow \frac{120-3x}{x} = \frac{120}{x+2}$

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

$\Rightarrow 3(x^2 + 2x - 80) = 0$ $\Rightarrow x^2 + 10x - 8x - 80 = 0$ $\therefore (x+10)(x-8) = 0$

So, $x = 8$

$\therefore$ He bought 8 chocolate.

Alternate method :

Let the price of one piece chocolate in 1st shop = x

So, total chocolate = $\frac{120}{x}$

Price of one piece chocolate in 2nd shop = $x - 3$

Total chocolate = $\frac{120}{x-3}$

According to the question, $\frac{120}{x-3} - \frac{120}{x} = 2$

$\Rightarrow \frac{120x - 120x + 360}{x(x-3)} = 2$ $\Rightarrow 2x^2 - 6x = 360$ $\Rightarrow 2x^2 - 6x - 360 = 0$

$\Rightarrow x^2 - 3x - 180 = 0$ $\therefore (x+12)(x-15) = 0$

So, $x = 15$

Number of chocolates bought in the first shop = $\frac{120}{15} = 8$ **(Answer)**

09. According to the question Kalim will earn the same amount of money from both of the choices.
From the second choice he will get Tk 2000 and 10% of the royalties.
So we get, from the second option without the TK 2000,
Kalim has to earn more (13375 – 2000) or, 11,375 TK
Tk 3.25 is earned by selling 1 book.

$\therefore$ 1 is earned by selling = $\frac{1}{3.25}$ book.

$\therefore$ 11,375 is earned by selling = $\frac{1\times 11{,}375}{3.25}$ book; = 3500.

So, the number of book to be sold 3500.

The number of study guides needed to be sold is 3500 (Answer:)

10. Let, tank *y* contain p gallons and tank *x* contain p + 600 gallons
According to the question,
p + 600 – 100 = 3 (p – 100); $\Rightarrow$ p + 500 = 3p – 300; $\Rightarrow$ 2p = 800 $\Rightarrow$ p = 400
$\therefore$ *y* = 400 gallons and *x* = 400 + 600 = 1000 gallons
So, (*x* + *y*) or total number of gallons = (1000 + 400) = 1400 gallons (**Answer)**

11. Here, Total monthly income of P and Q = 5050 × 2 = 10100
Q and R = 6250 × 2 = 12500
P and R = 5200 × 2 = 10400
$\therefore$ 2 (P + Q + R) = 33000 $\Rightarrow$ P + Q + R = 16500
$\Rightarrow$ P + 12500 = 16500 [$\because$ Q + R = 12500]
$\Rightarrow$ P = 4000
$\therefore$ The monthly income of P is Tk.4000; Answer: Tk.4000

12. Let, one side after partition = *x*
And other side =1000 – *x*
According to the question,
2 (1000 + *x*) – 2(1000 +1000 – *x*) = 400
$\Rightarrow$ 2000 + 2*x* – 4000 + 2*x* = 400
$\therefore$ *x* = 600
So other side after partition = 1000 – 600 = 400 ft
$\therefore$ Dimensions of 1st office =1000 × 600 = 600000 sq. ft.
$\therefore$ Dimensions of 2nd office =1000 × 400 = 400000 sq. ft. **(Answer)**

13. According to question,
Beginning salary + 8 years annual increment = Tk.5,000
Beginning salary + 4 years annual increment = Tk.4,500
4 years increment =Tk.500
$\therefore$ 1 Beginning salary = Tk. (500 ÷ 4) or Tk. 125
$\therefore$ Only beginning salary = (4,500 – 500) = tk. 4000
Answer: beginning salary Tk. 4,000 and annual increment Tk. 125 (Answer)

14. Let, originally the number of students be *x*

$\therefore$ Amounts per head = Tk $\frac{3000}{x}$

For not turning up 10 students, the number was *x*-10 and then per head amount = Tk $\frac{3000}{x-10}$

According to question we get, $\frac{3000}{x-10}-\frac{3000}{x}=10$; $\Rightarrow x = 60$

$\therefore$ The number of students originally was (60 – 10) = 50 (Answer)

15. Let, Total math = *x*

$\frac{7x}{9}+3=\frac{5x}{6} \Rightarrow \frac{7x}{9}-\frac{5x}{6}=-3 \quad \Rightarrow \frac{14x-15x}{18}=-3 \quad \Rightarrow -x = -3 \times 18$

$\Rightarrow -x = -54$ $\Rightarrow x = 54$ **(Answer)**

16. Let, from this equation,

$\Rightarrow \frac{3y}{x} - p = \frac{x}{y}$ $\Rightarrow \frac{3y}{x} - \frac{x}{y} = p$ $\Rightarrow p = \frac{3y}{x} - \frac{x}{y}$ $\Rightarrow p = \frac{3y^2 - x^2}{xy}$

$\Rightarrow p = \frac{2y^2 + (y^2 - x^2)}{xy}$ $\Rightarrow p = \frac{\{2y^2 + (y+x)(y-x)\}}{xy}$ **(Answer)**

17. Let, Total animals = x

$\Rightarrow \frac{1}{3}$ of $x + \frac{1}{6}$ of $x + \frac{1}{5}$ of $x + 36 = x$ $\Rightarrow \frac{x}{3} + \frac{x}{6} + \frac{x}{5} + 36 = x$ $\Rightarrow x - \frac{x}{3} - \frac{x}{3} - \frac{x}{3} = 36$

$\Rightarrow \frac{30x - 10x - 5x - 6x}{30} = 36$ $\Rightarrow 9x = 36 \times 30$ $\Rightarrow x = \frac{36 \times 30}{9} = 120$

$\Rightarrow$ Total zebra = $\frac{1}{3}$ of 120 = 40 **(Answer)**

18. Let, the ages of Kunal and Sagar 6 years ago be $6x$
And $5x$ years respectively.

Then, $\frac{(6x+6)+4}{(5x+6)+4} = \frac{11}{10}$ $\Rightarrow 10\ (6x + 10) = 11(5x + 10)$

$\Rightarrow 5x = 10 \Rightarrow x = 2.$

$\therefore$ Sagar's present age = $(5x + 6) = 16$ years. **(Answer)**

19. Let, the present ages of Sameer and Anand be $5x$ years
And $4x$ years respectively.

Then, $\frac{5x+3}{4x+3} = \frac{11}{9}$

$\Rightarrow 9\ (5x + 3) = 11\ (4x + 3)$ $\Rightarrow 45x + 27 = 44x + 33$ $\Rightarrow 45x - 44x = 33 - 27$ $\Rightarrow x = 6.$

$\therefore$ Anand's present age = $4x = 24$ years. **(Answer)**

20. Let, the average age of the whole team by x years.

$\therefore\ 11x - (26 + 29) = 9(x - 1)$ $\Rightarrow 11x - 9x = 46$ $\Rightarrow 2x = 46$ $\Rightarrow x = 23.$ **(Answer)**

So, average age of the team is 23 years.

21. Let, Arun's weight by x kg.
According to Arun, $65 < x < 72$
According to Arun's brother, $60 < x < 70.$
According to Arun's mother, $x \leq 68$
The values satisfying all the above conditions are 66, 67 and 68.

$\therefore$ Require average = $\left(\frac{66+67+68}{3}\right) = \left(\frac{201}{3}\right) = 67$ kg. **(Answer)**

22. Let, the unit digit of the number be $x.$
And the tens digit of the number be $y.$
$\therefore$ The value of the number is = $10y + x$
From the information given we get,

$x + y + 5 = 3y$

$\Rightarrow x - 2y = -5$ ..... (i)

And, $10x + y = 10y + x - 9$

$\Rightarrow 9x - 9y = -9$

$\Rightarrow x - y = -1$ .....(ii)

$\therefore$ (i) – (ii) we get, $x - 2y = -5$

$\quad\quad\quad\quad\quad\quad\quad\quad x - y = -1$

$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad$ (–) $\quad\quad -y = -4$

$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad \Rightarrow y = 4$

Putting the value of y we get, $x - y = -1$

$\Rightarrow x - 4 = -1 \quad\quad \Rightarrow x = 3$

$\therefore$ The number is = $10 \times 4 + 3 = 43$. **Answer: 43**

23. Students passed in only English = (80 – 75)% = 5%

Students passed in only Math = (85 – 75)% =10%

So, total students passed in at least one subject is (75 + 5 + 10) = 90%

So, failed in both subject = (100 – 90)% = 10%

Here 10% = 40 students

$\therefore$ 100% = $\frac{40 \times 100}{10}$ = 400 = Total number of students. **Answer: 400**

24. $= \left\{\left(x + \frac{1}{x}\right)^3 - 3.x\frac{1}{x}\left(x + \frac{1}{x}\right)\right\}^2 - 2$

$= \left\{(3)^3 - 3 \times 3\right\}^2 - 2$; = $(27 - 9)^2 - 2$; = $(18)^2 - 2 = 322$ **(Answer).**

25. Let, the first integer be = x

$\therefore$ The second integer = $x + 1$

The third integer = $x + 2$

The fourth integer = $x + 3$

The fifth integer = $x + 4$

According to the question, $x + x + 1 + x + 2 + x + 3 + x + 4 = S$

$\Rightarrow 5x + 10 = S \quad\quad \Rightarrow 5x = S - 10 \quad\quad \Rightarrow x = \frac{S - 10}{5}$

$\therefore$ The largest integer = $x + 4 = \frac{S - 10}{5} + 4 \quad\quad = \frac{S - 10 + 20}{5} = \frac{S + 10}{5}$ **(Answer).**

26. Let, the numbers be x and y

$\therefore x - y = 5$ ..... (i)

and $x^2 - y^2 = 65$ ..... (ii)

From (ii) we get $x^2 - y^2 = 65$

$\Rightarrow (x + y)(x - y) = 65 \quad\quad \Rightarrow (x + y) \times 5 = 65 \quad\quad \Rightarrow x + y = \frac{65}{5}$

$\Rightarrow x + y = 13$ ..... (iii)

(i) + (iii) $\Rightarrow x - y + x + y = 5 + 13 \quad\quad \Rightarrow 2x = 18 \quad\quad \Rightarrow x = 9$

By putting the value of x in (iii), we get $9 + y = 13$

$\Rightarrow y = 13 - 9 \quad\quad \Rightarrow y = 4$

$\therefore$ The larger number is 9

Answer: The larger number is 9.

27. $\Rightarrow \frac{\sqrt{2+x}+\sqrt{2-x}}{\sqrt{2+x}-\sqrt{2-x}} = 2$ $\Rightarrow \frac{\sqrt{2+x}+\sqrt{2-x}+\sqrt{2+x}-\sqrt{2-x}}{\sqrt{2+x}+\sqrt{2-x}-\sqrt{2+x}+\sqrt{2-x}} = \frac{2+1}{2-1}$

$\Rightarrow \frac{2\sqrt{2+x}}{2\sqrt{2-x}} = \frac{3}{1}$ $\Rightarrow \left(\frac{\sqrt{2+x}}{\sqrt{2-x}}\right)^2 = (3)^2$ $\Rightarrow \frac{2+x}{2-x} = 9$

$\Rightarrow 2 + x = 18 - 9x$ $\Rightarrow x + 9x = 18 - 2$

$\Rightarrow 10x = 16 \Rightarrow x = \frac{8}{5} \Rightarrow x = \frac{8}{5}$; **Answer: $x = \frac{8}{5}$**

28. Here, one of the employees has taken all of the courses
And nine of the employee have taken exactly 2 of the courses
Number of employee have taken only Accounting = 22 – (9 + 1) = 12
Numbers of employee have taken only Finance = 15 – (9 + 1) = 5
Numbers of employee have taken only Marketing = 14 – 1 =13
Numbers of total employee have taken 1, 2 or 3 courses = 12 + 5 + 13 + 9 + 1= 40
So, employees who have not taken any course = 50 – 40 =10 **(Answer)**

29. $\Rightarrow \sqrt[3]{8x^2\sqrt{32x\sqrt{4x^2}}}$ $\Rightarrow \sqrt[3]{8x^2\sqrt{32x.2x}} = 4$ $\Rightarrow \sqrt[3]{8x^2.8x} = 4$

$\Rightarrow \sqrt[3]{64x^3} = 4$ $\Rightarrow \sqrt[3]{(4x)^3} = 4$

$\Rightarrow 4x = 4 \Rightarrow x = 1$. $\therefore$ **Answer: $x = 1$**

30. $x = 3 + \sqrt{8}$

$\therefore x^2 + \frac{1}{x^2} = \left(x + \frac{1}{x}\right)^2 - 2.x.\frac{1}{x}$ $= \left(3 + \sqrt{8} + \frac{1}{3+\sqrt{8}}\right)^2 - 2$ $= \left(\frac{9+6\sqrt{8}+8+1}{3+\sqrt{8}}\right)^2 - 2$

$= \left(\frac{18+6\sqrt{8}}{3+\sqrt{8}}\right)^2 - 2$ $= \left\{\frac{6(3+\sqrt{8})}{3+\sqrt{8}}\right\}^2 - 2$ $= 6^2 - 2 = 34$ **Answer: 34**

31. $-2 < \frac{6-2x}{3} < 4$ $-6 < 6 - 2x < 12$

$-12 < -2x < 6$ $-6 < -x < 3$ $6 > x > -3$ **Answer: $-3 < x < 6$**

32. The number of household who hold TV is 60%
$\therefore$ The number of household who does not hold TV is (100% – 60%) or 40%
Now, percentages of household who are likely to own TV next year are = (60% – 5% of 60% + 10% of 40%)
= 60% –3% + 4% = 61%
And household who would be the non-owners are = (40% – 10% of 40% + 5% of 60%)
= 40% – 4% + 3% = 39%
$\therefore$ **Answer: owners 61% and non-owners 39%|**

33. The number of people who have only brown hair is (41 – 11)% or 30%
The number of people who have only brown eyes is (26 – 11)% or 15%
The number of people who have both brown hair and brown eyes is 11%
The number of people who have at least one of brown hair and brown eyes is (30 + 15 + 11) % 56%
The number of people who have neither brown hair nor brown eyes is (100 – 56)% or 44%

∴ **Answer: 44%**

34. Number of researchers in team A = $70 \times \frac{35}{100} = 24.5 \approx 25$

Number of researchers in team B = 70 – 24.5 = 45.5 ≈ 45

No. of researchers who prefer team A = $70 \times 60\% = 70 \times \frac{3}{5} = 42$

No. of researchers who prefer team B = 70 – 42 = 28
Number of researchers preferring A but not assigned to A = 42 – 25 = 17
Number of researchers not preferring B but assigned to B = 45 – 28 = 17
∴ The least possible number of researchers disliking their assigned team is 17. **Answer: 17.**

35. Let the income be x.
Then spending = $(0.25 + 0.135 + .2 + .08 + .15)\, x = 0.715x$
Saving = $0.285x$.
Percentage of saving with respect to spend = .285/.715 = 40% **(Answer)**

36. Let, the total people be 100
People with iodine deficiency = 50% of 100 = 50
People with diabetes = 25% of 100 = 25
People with both iodine deficiency and diabetes = 12% of 100 = 12
People with only iodine deficiency = (50 – 12) = 38
People with only diabeties = (25 – 12) = 13
People who have only iodine deficiency and only diabeties and both disease = 38 + 13 + 12 = 63
People who have none of these two ailments = (100 – 63) = 37 ∴ **Answer is 37%**

37. Here, only Car owned by = 60 % – 55% = 5%
only TV owned by = 80% – 55% = 25%
So, owned only Car or TV or both = 5%+25% + 55% = 85% **(Answer).**

38. Given that,

$a = \sqrt{3} + \sqrt{2}$

$\Rightarrow \frac{1}{a} = \frac{1}{\sqrt{3}+\sqrt{2}}$

$= \frac{\sqrt{3}-\sqrt{2}}{(\sqrt{3}+\sqrt{2})(\sqrt{3}-\sqrt{2})}$

$\therefore \frac{1}{a} = (\sqrt{3}-\sqrt{2})$

Now, $a^3 + 3a + 3a^{-1} + a^{-3}$

$\Rightarrow a^3 + \frac{1}{a^3} + 3a + \frac{3}{a}$ $\Rightarrow \left(a+\frac{1}{a}\right)^3 - 3.a.\frac{1}{a}\left(a+\frac{1}{a}\right) + 3\left(a+\frac{1}{a}\right)$

$\Rightarrow \left(a+\frac{1}{a}\right)^3 - 3\left(a+\frac{1}{a}\right) + 3\left(a+\frac{1}{a}\right) \Rightarrow \left(a+\frac{1}{a}\right)^3 \Rightarrow \left(\sqrt{3}+\sqrt{2}+\sqrt{3}-\sqrt{2}\right)^3$

$\Rightarrow \left(2\sqrt{3}\right)^3 \Rightarrow 8.3\sqrt{3} \Rightarrow 24\sqrt{3}$ **(Answer).**

39. $x^4 \frac{1}{x^4} = \left(x^2 + \frac{1}{x^2}\right)^2 - 2.x^2.\frac{1}{x^2}$ $\Rightarrow \left\{\left(x-\frac{1}{x}\right)^2 + 2.x.\frac{1}{x}\right\}^2 - 2 = \left(2^2+2\right)^{2-2}$ $\left[\because x - \frac{1}{x} = 2\right]$

$\Rightarrow (4 + 2)^2 - 2 = 6^2 - 2 = 36 - 2 = 34$ **(Answer).**

40. Given that,

$a - \frac{6}{a} = 1 \Rightarrow \frac{a^2-6}{a} = 1$

$\Rightarrow \frac{6}{a^2-a-1} = \frac{6}{5}$ when a = 3

$\Rightarrow \frac{6}{a^2-a-1} = \frac{6}{5}$ when a = – 2

$\Rightarrow \frac{6}{a^2-a-1} = \frac{6}{5}$ **Answer.**

$\Rightarrow a^2 - a - 6 = 0$
$\Rightarrow a^2 - 3a + 2a - 6 = 0$
$\Rightarrow a(a - 3) + 2(a - 3) = 0$
$\Rightarrow (a - 3)(a + 2) = 0$
$\therefore a = 3, -2$

41. Given that,

$a + b = \sqrt{7}$

And $b = a - \sqrt{3}$

$\Rightarrow a - b = \sqrt{3}$

We know, $ab = \left(\frac{a+b}{2}\right)^2 - \left(\frac{a-b}{2}\right)^2 \quad \Rightarrow \left(\frac{\sqrt{7}}{2}\right)^2 - \left(\frac{\sqrt{3}}{2}\right)^2 \quad \Rightarrow \frac{7}{4} - \frac{3}{4} = \frac{7-3}{4} = \frac{4}{4} = 1$ **(Answer)**

42. $x + \frac{1}{x} = 1 \Rightarrow x^2 + \frac{1}{x^2} + 2.x.\frac{1}{x} = 1 \quad \Rightarrow x^2 + \frac{1}{x^2} = -1 \quad \Rightarrow x^4 + \frac{1}{x^4} + 2.x^2.\frac{1}{x^2} = 1$

$\Rightarrow x^4 + \frac{1}{x^4} = -1 \quad \because \left(x^2 + \frac{1}{x^2}\right)\left(x^4 + \frac{1}{x^4}\right) = (-1)(-1) = 1$ **(Answer).**

43. Let the total number of passenger be 100.
$\therefore$ The passenger with both round – trip ticket and cars is = 20
Let the passenger with round – trip ticket be x.
$\therefore$ The Number of passenger with car = 60% of x
$\therefore$ We get, x + 60% of x = 100 – 20 = 80 = 1.6x = 80 = x = 50 $\quad \therefore x = 50\%$ **(Answer)**

44. Given, $a - \frac{1}{a} = m$ or, $(a - \frac{1}{a})^2 = m^2$ [Squaring both side]

$\Rightarrow a^2 - 2 + \frac{1}{a^2} = m^2$ or, $a^2 + \frac{1}{a^2} = m^2 + 2$ or, $(a^2 + \frac{1}{a^2})^2 = (m^2 + 2)^2$

$\Rightarrow a^4 + 2 + \frac{1}{a^4} = m^4 + 4m^2 + 4$ or, $a^4 + \frac{1}{a^4} = m^4 + 4m^2 + 2$ (shown) **(Answer).**

45. Let the ten's and unit digit be x and $\frac{8}{x}$ respectively.

Then, $\left(10x + \frac{8}{x}\right) + 18 = 10 \times \frac{8}{x} + x$

$\Rightarrow 10x^2 + 8 + 18x = 80 + x^2 \quad \Rightarrow 9x^2 + 18x - 72 = 0 \quad \Rightarrow x^2 + 2x - 8 = 0 \quad \Rightarrow (x + 4)(x - 2) = 0 \quad \Rightarrow x = 2.$

So the number is $10 \times 2 + \frac{8}{2}$ or 24 **(Answer)**

46. Say, 8 years ago son's age was x
Then, Robi's age = 4x
After 8 years, son's age = $(x + 8) + 8 = x + 16$
Robi's age after 8 years = $(4x + 8) + 8 = 4x + 16$
Now, $2(x + 16) = 4x + 16; \Rightarrow 2x = 16; \therefore x = 8$

So, son's present age = $(x + 8) = 16$ years and
Robi's present age = $(4x + 8) = 40$ years.
Answer: Son 16 years and Robi 40 years

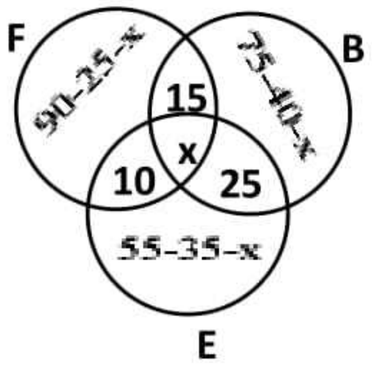
47. Total weight = A + B + C = 84 × 3 = 252
Total weight = A + B + C + D = 80 × 4 = 320
D's weight = (A + B + C+ D) – (A + B + C) = 320 – 252 = 68
Given that, E = D + 3
∴ Total weight = B + C + D + E = 79 × 4 = 316
⇒ B + C + D + D + 3 = 316 ⇒ B + C + 2D = 316 – 3 ⇒ B + C + 2D = 316 – 3
⇒ B + C + (2 × 68) = 313 ⇒ B + C = 313 – 136 ⇒ B + C = 177
Weight of A = (A + B + C) – (B + C) = 252 –177 = 75
∴ **Answer: The weight of A is 75 kg**

48. Let the number of reserved seats is x
and the number of general seats is = $(500 - x)$
According to question $40x + 30\ (500 - x) = 17600$
$\Rightarrow 40x + 15000 - 30x = 17600$
$\Rightarrow 10x = 17600 - 15000;$ $\Rightarrow 10x = 2600;$ $\Rightarrow x = 260$
So, the number of reserved seats was 260; **(Answer)**

49. Given that,
$a + b = \sqrt{7}$
$a - b = \sqrt{5}$
$\therefore 8ab\ (a^2 + b^2) = 4ab \times 2(a^2 + b^2)$
$= \{(a + b)^2 - (a - b)^2\} \times \{(a + b)^2 + (a - b)^2\}$
$= \left\{\left(\sqrt{7}\right)^2 - \left(\sqrt{5}\right)^2\right\} \times \left\{\left(\sqrt{7}\right)^2 + \left(\sqrt{5}\right)^2\right\}$
$= (7 - 5) \times (7 + 5) = 2 \times 12 = 24$ **(Answer).**

50. Total = All singles – both + none
65 = (45 + 30) – 12 + none
None = 65 – 63
None = 2

51. Here, Students taking only Finance = 90 – 25 – x,
only Banking = 75 – 40 – x and only Economics = 55 – 35 – x



Let, the number of students taken all three courses be x.
So, $90 - 25 - x + 75 - 40 - x + 55 - 35 - x + 10 + 15 + 25 + x = 150$
$\Rightarrow 170 - 2x = 150$ $\Rightarrow 2x = 20$ $\Rightarrow x = 10$
∴ Number of students taken all three courses is 10 **Answer: 10**

52. $x = \frac{\sqrt{3}+1}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1} = \frac{\left(\sqrt{3}+1\right)^2}{(3+)1} = \frac{3+1+2\sqrt{3}}{2} = 2 + \sqrt{3}.$

$y = \frac{\left(\sqrt{3}-1\right)}{\left(\sqrt{3}+1\right)} \times \frac{\left(\sqrt{3}-1\right)}{\left(\sqrt{3}-\right)} = \frac{\left(\sqrt{3}-1\right)^2}{(3-1)} = \frac{3+1-2\sqrt{3}}{2} = 2 - \sqrt{3}.$

$\therefore x^2 + y^2 = (2 + \sqrt{3})^2 + (2 - \sqrt{3})^2$ $= 2(4 + 3) = 14$ **Answer:**

53. $\left(\frac{a}{b}\right)^{x-1} = \left(\frac{b}{a}\right)^{x-3}$

$\Rightarrow \left(\frac{a}{b}\right)^{x-1} = \left(\frac{a}{b}\right)^{-(x-3)} = \left(\frac{a}{b}\right)^{-(x-3)} = \left(\frac{a}{b}\right)^{(3-x)}$ $\Rightarrow x - 1 = 3 - x; \Rightarrow 2x = 4; \quad \Rightarrow x = 2$ **(Answer).**

54. $\frac{1}{\left(1+\frac{x^b}{x^a}+\frac{x^c}{x^a}\right)} + \frac{1}{\left(1+\frac{x^a}{x^b}+\frac{x^c}{x^b}\right)} + \frac{1}{\left(1+\frac{x^b}{x^c}+\frac{x^a}{x^c}\right)}$

$= \frac{x^a}{\left(x^a+x^b+x^c\right)} + \frac{x^b}{\left(x^a+x^b+x^c\right)} + \frac{x^c}{\left(x^a+x^b+x^c\right)}$

$= \frac{\left(x^a+x^b+x^c\right)}{\left(x^a+x^b+x^c\right)} = 1$ **(Answer).**

55.

$\frac{(243)^{\frac{n}{5}} \times 3^{2n+1}}{9^n \times 3^{n-1}}$

$= \frac{\left(3^5\right)^{\left(\frac{n}{5}\right)} \times 3^{2n+1}}{\left(3^2\right)^n \times 3^{n-1}}$

$= \frac{\left(3^5\right)^{\frac{n}{5}} \times 3^{2n+1}}{\left(3^2\right)^n \times 3^{n-1}}$

$= \frac{3^5 \times \left(\frac{n}{5}\right) \times 3^{2n+1)}}{\left(3^{2n} \times 3^{n-1}\right)}$

$= \frac{3^n \times 3^{2n+1}}{3^{2n} \times 3^{n-1}}$

$= \frac{3^{(n+2n+1)}}{3^{(2n+n-1)}}$

$= \frac{3^{3n+1}}{3^{3n-1}}$

$= (3^{n+1-3n+1}) = 3^2 = 9$ (Answer).

56. $x^3 - \left(\frac{1}{x}\right)^3$

$\Rightarrow \left(x-\frac{1}{x}\right)^3 + 3x.\ \frac{1}{x}\left(x-\frac{1}{x}\right)$

$\Rightarrow (7)^3 + 3.7 \quad \left[\because x-\frac{1}{x} = 7\right]$

$= 364$ **(Answer).**

57. Given that,

$\left(a+\frac{1}{a}\right)^2 = 3; \Rightarrow a+\frac{1}{a} = \sqrt{3}$

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

$=\left(\sqrt{3}\right)^3-3\sqrt{3}$ $=3\sqrt{3}-3\sqrt{3}=0$ **(Answer).**

58. Failed in 1st subject = $\left(\frac{35}{100}\times 2500\right)=875.$

Failed in 2nd subject = $\left(\frac{42}{100}\times 2500\right)=1050.$

Failed in both = $\left(\frac{15}{100}\times 2500\right)=375.$

Failed in 1st subject only (875 – 375) = 500.
Failed in 2nd subject only = (1050 – 375) = 675.
Passed in 2nd only + Passed in 1st only = (675 + 500) = 1175. **(Answer).**

59. Total = All singles – both + none
100 = (50 + 60) – 20 + none
None = 100 – 90
None = 10 **(Answer).**

60. $a^3+\frac{1}{a^3}=\left(a+\frac{1}{a}\right)^3-3\left(a+\frac{1}{a}\right)=(3)^3-3.3=27-9=18$ **(Answer).**

61. Now, $a^2+\frac{1}{a^2}=51$

$\Rightarrow\left(a-\frac{1}{a}\right)^2+2.a.\frac{1}{a}=51;\ \Rightarrow\left(a-\frac{1}{a}\right)^2=51-2\ \Rightarrow\left(a-\frac{1}{a}\right)^2=49$

$\Rightarrow a-\frac{1}{a}=\pm 7$ **(Answer).**

62. Given that, $a^2+b^2=25;\ \Rightarrow (a+b)^2-2ab=25;\ \Rightarrow 49-2ab=25$ [$\because a+b=7$]
$\Rightarrow 2ab=24$
$\therefore\ ab=12$ **(Answer).**

63. Let the total sales be Tk x
So according to the question we get, $(x-1000)\times 7.5+100=257.5$
$\Rightarrow (x-1000)\times\frac{75}{1000}=257.50-100;\ \Rightarrow (x-1000)\times\frac{75}{1000}=157.50$
$\Rightarrow (x-1000)\times 75=157.50\times 1000;\ \Rightarrow 75x-75000=157500;\ \Rightarrow 75x=157500+75000$
$\Rightarrow x=\frac{2,23,500}{75}=3100.$ **(Answer)**
Answer: The total sales proceeds from the potatoes is Tk 3100

01. There are two numbers, 1st number is 12 more than the 2nd number. The average of the two numbers is 19. If 2 is added in both numbers, find the ratio of the number.

Bangladesh Bank, (AD, 19-04-19) [Written]

মনে করি, অপর সংখ্যাটি x

∴ একটি সংখ্যা = x + 12

প্রশ্নমতে, $\frac{x + x + 12}{2} = 19$

$\Rightarrow 2x + 12 = 38 \quad \Rightarrow 2x = 38 - 12 = 26 \quad \therefore x = \frac{26}{2} = 13$

অতএব, একটি সংখ্যা = 13 + 12 = 25 এবং অপর সংখ্যাটি = 13.

সংখ্যা দুটির উভয়ের সাথে 2 যোগ করা হলে তাদের অনুপাত হবে = (25 + 2): (13 + 2) = 27 : 18 = 9: 5.

02. A triangular plot with sides of 25 feet, 40 feet and 55 feet is to surround by a fence built on pillars set 5 feet apart. How many pillars will be required to surround the plot?

Dhaka Bank Ltd., TA (Cash Officer-19) [Written]

মোট খুঁটির সংখ্যা = $\left(\frac{25}{5} + \frac{40}{5} + \frac{55}{5}\right) = 5 + 8 + 11 = 24$ টি

কিন্তু জমিটি ত্রিভুজাকৃতির না হয়ে সোজা রাস্তার মতো হলে খুঁটি আরো 1টি বেশি লাগত।

03. In a class of 78 students 41 are taking French, 22 are taking German. Of the students taking French or German, 9 are taking both courses.

Dhaka Bank Ltd., TA (Cash Officer-19) [Written]

ফ্রেঞ্চ নিয়েছে 41 জন; জার্মান নিয়েছে 22 জন এবং উভয় কোর্সই নিয়েছে 9 জন শিক্ষার্থী

∴ ফ্রেঞ্চ, জার্মান কিংবা উভয় কোর্সই নিয়েছে = 41 + 22 – 9 = 54 জন।

অতএব, কোন কোর্সই নেয়নি এরূপ ছাত্রসংখ্যা = 78 – 54 = 24 জন।

04. Find the value of n, if $27-\frac{1}{3^n} = 243$

Dhaka Bank Ltd., TA (Cash Officer-19) [Written]

$3^3 - \left(n - \frac{1}{3}\right) = 3^5 \quad \Rightarrow 3\left(n - \frac{1}{3}\right) = 5 \quad \Rightarrow 3^n - 3 \times \frac{1}{3} = 5$

$\Rightarrow 3^n - 1 = 5 \quad \Rightarrow 3^n = 5 + 1 = 6 \quad \therefore n = \frac{6}{3} = 2$

05. If 16 + 4r is 10 more than 14, what is the value of 8x?

Dhaka Bank Ltd., TA (Cash Officer-19) [Written]

$16+4x= 10+4 \Rightarrow 16+4x=24 \Rightarrow 4x=24-16= 8 \quad \therefore x=\frac{8}{4} = 2$

অতএব, $8x = 8 \times 2 = 16$

06. Mr. Karim borrowed Tk. 500 at 5% simple interest per year. After some time, he borrowed Tic. 1 400 at $\frac{1}{2}$ % simple interest per year for the second time. Six months after the second time borrowing, he repaid both the borrowed money along with interest and the amount repaid was Tk. 99450. How many years after the first time borrowing Mr. Karim repaid the borrowed money?

NRB Bank Ltd., Management Trainee Officer-19

Let, He paid his first borrowings after x years.

Interest = 994.5 – 500 – 400 = 94.5

According to the question:

$500 \times 5\% \times x + 400 \times 3.5\% \times \frac{6}{12} = 94.5$

$\Rightarrow 25x + 7 = 94.5 \Rightarrow 25x = 94.5 - 7 \quad \Rightarrow 25x = 87.5 \qquad$ So, $x = 3.5$

07. $a + b = 3,\ ab = 2,\ b/a + a/b = ?$ *[Southeast Bank Ltd. TA (Officer)19, Written]*

Solution:

$$\frac{b}{a} + \frac{a}{b} = \frac{b^2 + a^2}{ab} = \frac{(a+b)^2 - 2ab}{ab} = \frac{(3)^2 - 2 \times 2}{2} = \frac{9-4}{2} = \frac{5}{2}$$

08. একটি বাক্সে ২০টি কলম বা ৩২টি পেন্সিল রাখা যায়। যদি ১৫টি কলম এর মধ্যে রাখা হয়, এর পর এর মধ্যে কতটি পেন্সিল রাখা যাবে?

[Southeast Bank Ltd. TA (Officer)19, Written]

Solution:

২০টি কলমের জায়গায় পেন্সিল রাখা যায় = ৩২টি

$\therefore$ ১ " " " " " " $= \frac{৩২}{২০}$ "

$\therefore$ ১৫ " " " " " " $= \frac{৩২ \times ১৫}{২০}$ " = ২৪ টি

$\therefore$ ঐ বাক্সে আরও পেন্সিল রাখা যাবে = (৩২−২৪) টি = ৮ টি

09. The total price of Cricket bat and ball is 1,350. If the price of bat increases 25% and the price of ball decreases 20% then the total price of bat and ball remains same. Find the prices of bat and ball?

NRB Bank Ltd., Management Trainee Officer-19

Solution:

ধরি, ব্যাটের দাম x টাকা এবং বলের দাম y টাকা

প্রশ্নমতে, $x + y = 1,350$ ..... (i)

এখন, ব্যাটের বর্ধিত মূল্য = x + x এর 25% $= x + \frac{25x}{100} = \left(x + \frac{x}{4}\right) = \frac{5x}{4}$ টাকা

বলের হ্রাসকৃত মূল্য = y − y এর 20% $= y - \frac{20y}{100} = \left(x + \frac{y}{5}\right) = \frac{4y}{5}$ টাকা

প্রশ্নমতে, $\frac{5x}{4} + \frac{৪y}{৫} = ১,৩৫০$

$\Rightarrow \frac{25x + 16y}{20} = 1,350$

$\therefore 25x + 16y = 27,000$ ..... (ii)

(i) নং কে 25 দিয়ে গুণ করে (i) নং হতে (ii) বিয়োগ করি

$25x + 25y = 37,750$

$25x + 16y = 27,000$

$9y = 6,750$

$\therefore y = \frac{6750}{9} = 750$

10. Sakib is now 10 years younger than Labib. If in 5 years Labib will be twice as old as Sakib, how old will Sakib be in 3 years? *[Sadharab Bima Corporation Asst. Manager19, Written]*

Solution:

Let, The present age of Labib is x years

$\therefore$ The present age of Sakibis (x−10) "

According to question,

$(x + 5) = 2(x - 10 + 5) \quad \Rightarrow x + 5 = 2x - 10 \quad \Rightarrow 2x - x = 10 + 5 \quad \therefore x = 15$

$\therefore$ In 3 years sakib will be = (15−10 + 3) years old = 8 years old

বিগত বছরের প্রশ্নাবলী ও বিশদ সমাধান	২০১৮ সালে অনুষ্ঠিত সকল সরকারী ও বেসরকারী ব্যাংকের প্রশ্নাবলী ও সমাধান

01. The sum of the digits of a two-digit number is subtracted from the number. How many such two-digit numbers can be formed so that the digit in the unit place of the resulting number is 6?

BB, Officer (General-2018) [Written]

solution:

Let, unit place digit be x

tenth " " be y

$\therefore$ the number is $10y + x$ and the sum of two digits $x + y$

Now, $10y + x - (x + y) = 10y + x - x - y = 9y$

So, the number resulting will be always the product of 9. since 6 is the unit place of the number, so the value of y must be 4 ($\therefore 9\times 4 = 36$).

$\therefore$ tenth place of the number must be 4.

So, total such number will be always 10 (40, 41, 42, 43, 44, 45, 46, 47, 48, 49).

02. How many ways are there to divide 50 people into 3 groups so that each group contains members equal to a prime number?

BB, Officer (General-2018) [Written]

solution:

Prime numbers 1 upto 50 are:

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 43, 47

Since each group has prime number

So, we can write

2+5+43 = 50

2 + 7 + 41 = 50

2+ 11 + 37 = 50

2 + 17 + 31 = 50

2 + 19 + 29 = 50

So, the total number of ways is 5.

03. Simplify: $\frac{x-1}{x^2-x-20} + \frac{4-x}{x^2-4x-5}$

BSC, (Officer-2018) [Written]

Solution:

$$\frac{x-1}{x^2-x-20} + \frac{4-x}{x^2-4x-5} = \frac{x-1}{x^2-5x+4x-20} + \frac{4-x}{x^2-5x+x-5}$$

$$= \frac{x-1}{x(x-5)+4(x-5)} + \frac{4-x}{x(x-5)+1(x-5)}$$

$$= \frac{x-1}{(x-5)+(x+4)} + \frac{4-x}{(x-5)+(x+1)}$$

$$= \frac{(x-1)(x+1)+(4-x)(x+4)}{(x-5)(x+4)(x+1)}$$

$$= \frac{x^2-1^2+4^2-x^2}{(x-5)(x+4)(x+1)}$$

$$= \frac{16-1}{(x-5)(x+4)(x+1)}$$

$$= \frac{15}{(x-5)(x+4)(x+1)} \text{ (Ans)}$$

04. A two digit number is four times the sum of the two digits. If the digits are reversed, the number so obtained is 18 more than the original number. What is the original number?

Sonali Bank Ltd. (Senior Officer-2018) [written]

Solution:

Let, the unit place be X & the tenth place be y

So, number is $10y + x$

According to question, $10y + x = 4(x + y)$

$\Rightarrow 10y + x = 4x + 4y$

$\Rightarrow 4x + 4y - 10y - x = 0$

$\Rightarrow 3x - 6y = 0$

$\therefore x - 2y = 0$ ------- (1)

Again, $10x + y - 10y - x = 18$

$\Rightarrow 9x - 9y = 18$

$\therefore x - y = 2$ -------- (2)

(1) – (2) করে, $x - 2y - 2x + 2y = 0 - 4$

$\Rightarrow -x = -4$

$\therefore x = 4$

(1) $\Rightarrow 4 - 2y = 0$

$\Rightarrow 2y = 4$

$\therefore y = 2$

So, the number is $10\times2 + 4 = 20 + 4 = 24$

Ans. 24

05. Solve: $x^2 - yx = 7, y^2 + xy = 30$

Sonali Bank Ltd. (Senior Officer-2018) [written]

Solution:

Given that,

$x^2 - yx = 7$ ..... (1)

$y^2\ xy = 30$ ..... (2)

+ (2) $\Rightarrow x^2 + y^2 = 37$ ..... (3)

Again, $y(x + y) = 30$

$\therefore x + y = \frac{30}{y}$ ..... (4)

(3) $\Rightarrow x^2 + y^2 = 37$

$\Rightarrow (x + y)^2 - 2xy = 37$

$\Rightarrow \left(\frac{30}{y}\right)^2 - 2(30 - y^2) = 37$

$\Rightarrow \frac{900}{y^2} - 60 + 2y^2 = 37$

$\Rightarrow 900 - 60y^2 + 2y^4 = 37y^2$

$\Rightarrow 2y^4 - 97^2 + 900 = 0$

$\Rightarrow 2y^4 - 72y^2 - 25y^2 + 900 = 0$

$\Rightarrow 2y^2(y^2 - 36) - 25(y^2 - 36) = 0$

$\Rightarrow (y^2 - 36)(2y^2 - 25) = 0$

$\Rightarrow y^2 - 36 = 0$ and $2y^2 - 25 = 0$

$\Rightarrow y^2 = 36$ $\Rightarrow 2y^2 = 25$

$\therefore y = \pm6$ $\Rightarrow y^2 = \frac{25}{2}$

$$\therefore y = \pm\frac{5}{\sqrt{2}}$$

From (4) we

If $y = 6 \Rightarrow x + 6 = \frac{30}{6}$

$\Rightarrow x = 5 - 6$

$\therefore x = -1$

If $y = -6 \Rightarrow x - 6 = -\frac{30}{6}$

$\Rightarrow x = -5 + 6$

$\therefore x = 1$

If $y = \frac{5}{\sqrt{2}} \Rightarrow \frac{5}{\sqrt{2}} = \frac{30}{5}$

$\sqrt{2}$

$\Rightarrow x = 6\sqrt{2} - \frac{5}{\sqrt{2}}$

$\Rightarrow x = \frac{12-5}{\sqrt{2}}$

$\therefore = \frac{7}{\sqrt{2}}$

If $y = -\frac{5}{\sqrt{2}} \Rightarrow x - \frac{5}{\sqrt{2}} = \frac{30}{\frac{5}{\sqrt{2}}}$

$\Rightarrow x - \frac{5}{\sqrt{2}} = -6\sqrt{2}$

$\Rightarrow x - 6\sqrt{2} + \frac{5}{\sqrt{2}}$

$\Rightarrow x = \frac{-12+5}{\sqrt{2}}$

$\therefore x = \frac{-7}{\sqrt{2}}$

So, Required value $x = \pm 1, \pm\frac{-7}{\sqrt{2}}$ and, $y = \pm 6, \pm\frac{5}{\sqrt{2}}$ Ans.

06. Someone plans to invest x taka in the bond of 'M' Company, which pays 10% interest and y taka in 'N' Company bonds, with pay 9% interest. He will invest 9000 taka and require that he receives 850 taka as interest. How much should he invest in each company?

Sonali Bank Ltd. (Senior Officer-2018) [written]

Solution:

Let, X = P and y = 9000 – P

According to question

$x \times 10\% \times 1 + y \times 9\% \times 1 = 850$

$\Rightarrow p \times \frac{10}{100} \times 1 + (9000 - p) \times \frac{9}{100} \times 1 = 850$

$\Rightarrow 10P + 81000 - 9p = 85000$

$\Rightarrow P = 4000$

$\therefore P = 4000$ Tk.

and y = (9000 – 4000) Tk = 5000 Tk

Ans: 4000 Tk and 5000 Tk.

07. Amin has 12 pieces of Tk. 10 and Tk. 5 notes in his wallet. If the total value of all the notes is less than Tk. 95, what is the maximum number of Tk. 10 notes that he has?

Sonali Bank Ltd., (Officer -2018) [Written]

Solution:

Let, the number of 10 Tk notes be x

So " " " 5 Tk " be (12 – x)

According to question

$10x + 5(12 - x) < 95$

$\Rightarrow 10x + 60 - 5x < 95$

$\Rightarrow 5x + 60 - 60 < 95 - 60$

$\Rightarrow \frac{5x}{5} < \frac{35}{5}$

$\therefore x < 7$

So, the maximum number of 10 Tk notes is 6

Ans. 6

08. 70 students are studying physics, mathematics, and chemistry. 40 students study mathematics, 35 students study physics and 30 students study chemistry. 15 students are studying all the subjects. How many students are studying exactly two of the subjects? Sonali Bank Ltd., (Officer -2018) [Written]

Solution:

Let, the set of students that studying physics be P

" " " " " " Mathematics be M

" " " " " " Chemistry be C

So, n(P) = 35, n(M) = 40, n(C) = 30

$n(P \cap M \cap C) = n(P) + n(M) + n(c) - \{n(P \cap C) + n(P \cap M) + n(M \cap C) + n(P \cap M \cap C)$

$\Rightarrow 70 = 35 + 40 + 30 - x + 15$

$\Rightarrow x = 120 - 70$

$\therefore x = 50$

So, number of students that studying two of the subjects is 50

$\therefore$ Exactly studying two of the subject = $50 - (3 \times 15) = 50 - 45 = 5$

Ans. 5 students.

09. Find the valuable of $x^6 + \frac{1}{x^6}$, if $x + \frac{1}{x} = 3$ Sonali Bank Ltd., (Officer -2018) [Written]

Solution:

Given that $x + \frac{1}{x} = 3$

Now $x^3 + \frac{1}{x^3} = \left(x + \frac{1}{x}\right)^3 - 3.x.\frac{1}{x}\left(x + \frac{1}{x}\right) = (3)^3 - 3 \times 3 = 27 - 9 = 18$

Now,

$\left(x^3 + \frac{1}{x^3}\right)\left(x^3 + \frac{1}{x^3}\right) = x^6 + 1 + 1 + \frac{1}{x^6}$

$\Rightarrow 18 \times 18 = x^6 + \frac{1}{x^6} + 2 \quad \Rightarrow x^6 + \frac{1}{x^6} = 324 - 2 \quad \therefore x^6 + \frac{1}{x^6} = 322$ (Ans.)

10. Solve the equation Sonali Bank Ltd., (Officer -2018) [Written]

Solution:

$\frac{3}{x+2} + \frac{x-1}{x-5} = 2$

$\Rightarrow \frac{3x-15+(x-1)(x+2)}{(x+2)(x-5)} = 2$ $\Rightarrow \frac{3x-15+x^2+2x-x-2}{x^2-5x+2x-10} = 2$

$\Rightarrow \frac{x^2+4x-17}{x^2-3x-10} = 2$ $\Rightarrow 2x^2-6x-20 = x^2+4x-17$

$\Rightarrow 2x^2-6x-20-x^2-4x+17=0$ $\Rightarrow x^2-10x-3=0$

$\Rightarrow x = \frac{-(10)\pm\sqrt{(-10)^2-4.1(-3)}}{2.1}$ $\Rightarrow x = \frac{10\pm\sqrt{100+12}}{2}$

$\Rightarrow x = \frac{10\pm\sqrt{112}}{2}$ $\Rightarrow x = \frac{10\pm4\sqrt{7}}{2}$

$\therefore x = 5\pm2\sqrt{7}$

So, required solution is $5\pm2\sqrt{7}$

11. A novelist earned Tk 100,000 from royalties on her book. She paid 20%income tax on the royalties' She invested Tk 50,000 at one rate and the rest at a rate that was 1% lower, earning 6,100 taka annual interest on the two investments. What was the lower rate? Agrani Bank Ltd., Officer (Cash-2018)

Solution:

Novelist earned except income take is Tk (100000 – 20% of 100000)

$= \text{Tk}\left(100000-\frac{20}{100}\times100000\right)$

$= \text{Tk}\,(100000-20000) = \text{k}\,80000$

Let, he invests Tk. 50000 at x%

So, he " Tk (80000 – 50000) or Tk 30000 at (x – 1)%

According to question

$50000\times\frac{x}{100}\times1+30000\times\frac{x-1}{100}\times1=6100$

$\Rightarrow 500x+300x-300=6100$

$\Rightarrow 800x=6100+300$

$\Rightarrow x=8$

So, the lowest rate is (8–1)% or 7%

Ans: 7%

13. If $a = xy^{p-1}$, $b = xy^{q-1}$, $c = xy^{y-1}$ and $p+q+r=3$, then prove that $a^{q-r}, b^{r-p}. c^{p-q} = 1$

Agrani Bank Ltd., Officer (Cash-2018)

Solution:

Given that, $a = xy^{p-1}$

$\Rightarrow a^{q-r} = x^{q-r}. y^{(p-1)(q-r)}$

$\therefore a^{q-r} = x^{q-r}.y^{pq-pr-q+r}$

Similarly, $b^{r-p} = x^{r-p}. y^{(q-1)(r-p)} = x^{r-p}. q r^{-pq-pq-r+p}$

$c^{p-q} = x^{p-q}.y^{(r-1)(p-q)} = x^{p-q}. y^{rp-rq-p+q}$

$\therefore a^{q-r}.b^{r-p}.c^{p-q} = x^{q-r}.y^{pq-pr-q+r}. x^{r-p}. y^{qr-pq-r+p}. x^{p-q}. y^{rp-rq-p+q}$

$= x^{q-r+r-p+p-q}.y^{pq-pr-q+r+qr-pq-r+rp-rq-p+q} = x^0.y^0 = 1.1$

$\therefore a^{q-r}.b^{r-p}.c^{p-q} = 1$ (Proved)

14. Solve: $\frac{x}{2}+\frac{y}{3}=1, \frac{x}{3}+\frac{y}{3}=1$ Agrani Bank Ltd., Officer (Cash-2018)

Solution: Given that

$\frac{x}{2}+\frac{y}{3}=1$ ..... (1) $\frac{x}{3}+\frac{y}{2}=1$ ..... (2)

Performing $(1)\times\frac{1}{2}-(2)\times\frac{1}{3}$,

$\frac{x}{4}+\frac{y}{6}=\frac{1}{3}$

(–) (–) (–)

$\Rightarrow \frac{x}{4}-\frac{x}{9}=\frac{1}{2}-\frac{1}{3}$

$\Rightarrow \frac{9x-4x}{36}=\frac{3-2}{6} \quad \Rightarrow \frac{5x}{36}=\frac{1}{6} \quad \Rightarrow 5x=\frac{36}{6} \quad \therefore x=\frac{6}{5}$

From (1) $\Rightarrow \frac{\frac{6}{5}}{2}+\frac{y}{3}=1 \quad \Rightarrow \frac{6}{5}\times\frac{1}{2}+\frac{y}{3}=1 \quad \Rightarrow \frac{y}{3}=1-\frac{3}{5}$

$\Rightarrow \frac{y}{3}=\frac{2}{5} \quad \therefore y=\frac{6}{5}$

$\therefore x=\frac{6}{5}$ and $y=\frac{6}{5}$ (Ans.)

15. Simplify: $\frac{5x+2}{x^2-x-20}+\frac{2x+1}{x^2-4x-5}$ Agrani Bank Ltd., Senior Officer (Auditor-2018)

Solution:

$\frac{5x+2}{x^2-x-20}+\frac{2x-1}{x^2\,4x-5}=\frac{5x+2}{x^2-5x+4x-20}+\frac{2x-1}{x(x-5)+1(x-5)}$

$=\frac{5x+2}{(x-5)(x+4)}+\frac{2x-1}{(x-5)(x+1)}=\frac{(5x+2)(x+1)+(2x-1)(x+4)}{(x-5)(x+4)(x+1)}$

$=\frac{5x^2+5x+2x+2+2x^2+8x-x-4}{(x-5)(x+4)(x+1)}=\frac{7x^2+14x-2}{(x-5)(x+4)(x+1)}$

Now,

Using partial fraction,

$\frac{7x^2+14x-2}{(x-5)(x+4)(x+1)}=\frac{A}{x-5}+\frac{B}{x+4}+\frac{C}{x+1}$ ... (i)

Now, multiplying bothsides by $(x-5)(x+4)(x+1)$

We get, $7x^2+14x-2=A(x+4)(x+1)+B(x-5)(x-5)(x+1)+c(x-5)(x+4)$

Now, Putting $x=5$

we get

$7(5)^2+14(5)-2=A(5+4)(5+1) \Rightarrow 175+70-2=54A$

$\Rightarrow A=\frac{243}{54} \Rightarrow A=\frac{9}{2}$

Again, putting $x=-1$

We get,

$7(-1)^2+14(-1)-2=C(-1-5)(-1+4) \Rightarrow 7-14-2=-18C$

$\Rightarrow C=\frac{9}{18} \Rightarrow C=\frac{1}{2}$

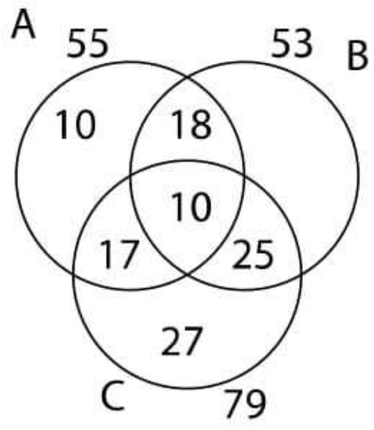
Now putting the value of A, B, C in (i) we get

$\therefore \frac{7x^2+14x-2}{(x-5)(x+4)(x+1)}=\frac{9}{2(x-5)}+\frac{2}{x+4}+\frac{1}{2(x+1)}$ Ans.

16. Ina survey at an airport, 55 travelers said that last year they had been to Spain, 53 to France and 7 to Germany, 18 had been to Spain and France, 17 to Spain and Germany and 25 to France and Germany, while 10 had to all three countries. 'How many Travelers took part in the survey?

Agrani Bank Ltd., Senior Officer (Auditor-2018)

Solution:



Let, The total people = x

We know, $N(A \cup B \cup C) = N(A) + N(B) + N(C) + N(A \cap B \cap C) - N(A \cap B) - N(B \cap C) - N(C \cap A)$

$\therefore$ According to the question,

$(55 + 53 + 79) + 10 - (18 + 17 + 25) = x$

$\Rightarrow 187 + 10 - 60 = x$

$\Rightarrow 197 - 60 = x$

$\Rightarrow x = 137$

17. Find the HCF of $x^3 - 16x$, $2x^3 + 9x^2 + 4x$, $2x^3 + x^2 - 28x$. Agrani Bank Ltd., Senior Officer (Auditor-2018)

Solution:

1st expression:

$x^3 - 16x$

$= x(x^2 - 16)$

$= x(x^2 - 4^2)$

$= x(x + 4)(x - 4)$

2nd expression:

$2x^3 + 9x^2 + 4x$

$= x(2x^2 + 9x + 4)$

$= x(2x^2 + 8x + x + 4)$

$= x\{2x(x + 4) + 1(x + 4)\}$

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

3rd expression:

$2x^3 + x^2 - 28x$

$= x(2x^2 + x - 28)$

$= x(2x^2 + 8x - 7x - 28)$

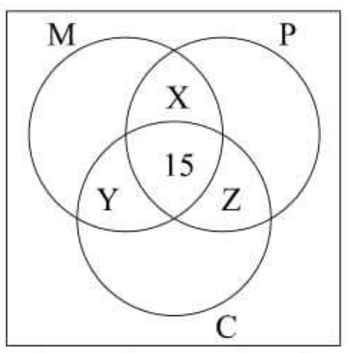
$= x\{2x(x + 4) - 7(x + 4)\}$

$= x(x + 4)(2x - 7)$

$\therefore$ HCF is $= x(x + 4)(x + 4)$ Ans

18. 70 students are studying physics, mathematics and chemisry. 40 students study mathematics, 35 study physics and 30 study chemistry. 15 students are studying all the subjects. How may students are studying exactly two of the subjects? Rupali Bank Ltd., Officer (Cash-2018 [Cancelled)]

Solution:



Let, the mumber of students take both Pysics and Mathematics be x

" " " " " " Mathemitics and Chemistry be y

$\therefore$ The number of students who take only Mathematic be $40 - (x + y + 15) = (25 - x - y)$

∴ " " " " " " " Physics be $35 - (x + z + 15) = (20 - x - z)$

" " " " " " " " Chemistry be $30 - (15 + y + z) = (15 - y - z)$

So that, $70 = (25 - x - y) + (20 - x - z) + (15 - y - z) + x + y + z + 15$

$\Rightarrow 70 = 75 - x - y - z$

$\Rightarrow x + y + z = 75 - 70$

$\therefore x + y + z = 5$

∴ The number of students are studing exactly two of the subjects = 5 (Ans.)

19. The profit of a company in Taka is given by $P = 3x^2 - 35x + 50$, where x is the amount in Taka i spent on advertising. For what values of x does the company make a profit?

Rupali Bank Ltd., Officer (Cash-2018 [Cancelled)]

Solution:

এখানে, $p = 3x^2 - 35x + 50 > 0$

$\Rightarrow 3x^2 - 30x - 5x + 50 > 0$

$\Rightarrow 3x(x - 10) - 5(x - 10) > 0$

$\Rightarrow (x - 10)(3x - 5) > 0$ ..... (i)

As the inequaltiy (i) is greater than 0, so that we can write $x > 10$ or $x < \frac{5}{3}$.

But since advertising cost cannot be negative. So we have to write $0 < x < \frac{5}{3}$.

Ans. $x > 10$ or $0 < x < \frac{5}{3}$

20. Find the three-digit prime number whose sum of the digits is 11 and each digit representing a prime number. Justify your answer.

Rupali Bank Ltd., Officer (Cash-2018 [Cancelled)]

Solution:

তিন অংকবিশিষ্ট মৌলিক সংখ্যাগুলো বের করতে হবে যাদের অংকগুলোর যোগফল ১১ ।

এরূপ মৌলিক সংখ্যাগুলো হলো ২২৭ এবং ৩৫৩

শুদ্ধি পরীক্ষা:

২২৭ এর ক্ষেত্রে, ২ + ২ + ৭ = ১১ এবং ২, ২, ৭ প্রত্যেক সংখ্যাই মৌলিক ।

৩৫৩ এর ক্ষেত্রে, ৩ + ৫ + ৩ = ১১ এবং ৩, ৫, ৩ প্রত্যেক সংখ্যাই মৌলিক ।

সুতরাং সংখ্যা দুটি হলো ২২৭ এবং ৩৫৩ ।

21. Solve: $\frac{x}{2} + \frac{6}{y} = 9, \frac{x}{3} + \frac{2}{y} = 5$

Rupali Bank Ltd., Officer (Cash-2018 [Cancelled)]

Solution: $\frac{x}{2} + \frac{6}{y} = 9$ ..... (i)

$\frac{x}{3} + \frac{2}{y} = 5$ ..... (ii)

Now, $\frac{1}{3} \times$ (i) we get, $\frac{x}{6} + \frac{6}{3y} = \frac{9}{3}$

$\Rightarrow \frac{x}{6} + \frac{2}{y} = 3$ ..... (iii)

And, $\frac{1}{2} \times$ (ii) we get, $\frac{x}{6} + \frac{2}{2y} = \frac{5}{2}$

$\Rightarrow \frac{x}{6} + \frac{1}{y} = \frac{5}{2}$ ..... (iv)

(iii)–(iv) $\Rightarrow \frac{x}{6} + \frac{2}{y} - \frac{x}{6} - \frac{1}{y} = 3 - \frac{5}{2}$

$\Rightarrow \frac{2-1}{y} = \frac{6-5}{2}$

$$\Rightarrow \frac{1}{y} = \frac{1}{2}$$

$$\therefore\ y = 2$$

Putting this value in (i) $\Rightarrow \frac{x}{2} + \frac{6}{2} = 9$

$$\Rightarrow \frac{x}{2} = 9 - 3$$

$$\Rightarrow \frac{x}{2} = 6$$

$\therefore$ (x,y) = (12, 2) (Ans).

22. A family has 480 kg of rice for x number of weeks. If they need to use same amount of rice for 4 more weeks, they need to cut down their weekly consumption of rice by 4 kg. Find value of x.

Rupali Bank Ltd., Officer (Cash-2018)

Solution:

Weekly consumption for x weeks = $\frac{480}{x}$

According to question,

$$\frac{480}{x} - \frac{480}{x+4} = 4$$

$$\Rightarrow \frac{480\,[x + 4 - x]}{x(x + 4)} = 4$$

$$\Rightarrow \frac{480 \times 4}{x(x + 4)} = 4$$

$$\Rightarrow x^2 + 4x = \frac{480 \times 4}{4}$$

$$\Rightarrow x^2 + 4x - 480 = 0$$

$$\Rightarrow x^2 + 4x - 20x - 480 = 0$$

$$\Rightarrow x^2 (x + 24) - 20(x + 24) = 0$$

$$\Rightarrow (x + 24)(x - 20) = 0$$

Now, $x + 24 = 0$
$\Rightarrow x = -24$ [not acceptable]

and, $x - 20 = 0$
$\Rightarrow x = 20$

Ans. 20

23. If $a = xy^{p-1}$, xy^{q-1}, $c = xy^{r-1}$, then compute $a^{q-r}.b^{r-p}.c^{p-q}$

Rupali Bank Ltd., Officer (Cash-2018)

Solution:

Give that, $a = xy^{p-1}$, $b = xy^{q-1}$, $c = xy^{r-1}$ .....(i)

Now, $a^{q-r}.\ b^{r-p}.c^{p-q}$

$= (xy^{p-1})q-r(xy^{q-1})^{r-p}(xy^{r-1})^{p-q}$ [from (i)]

$= x^{q-r}.y^{(p-1)(q-r)}.x^{r-p}.y^{(q-1)(r-p)}.x^{p-q}.y^{(r-1)(p-q)}$

$= x^{q-r+r-p+q}.y^{pq-pr-q+r+qr-pq-r+p+rp-rq-p+q}$

$x^0 \times y^0$

$= 1 \times 1 = 1$

Ans. 1

24. Price of 3 tables and 5 chairs is Tk. 2000. Again, price of 5 tables and 7 chairs is Tk. 3200. What is the price of 1 table and 1 chair?

Rupali Bank Ltd., Officer (Cash-2018)

Solution:

Let,

The price of 1 table be x taka.

" " " 1 chair be y taka.

According to the question,
$3x + 5y = 2000$ ..... (i)
$5x + 7y = 3200$ ..... (ii)
(i) × 5 – (ii) × 3 ⇒
$15x + 25y = 10{,}000$
$15x + 21y = 9600$
(–) (–) (–)
$\Rightarrow 4y = 400$
$\therefore y = 100$
(i) $\Rightarrow 3x + 5 \times 100 = 2000$
$\Rightarrow 3x = 1500$
$\therefore x = 500$
So, the price of 1 table is 500 taka and 1 chair is 100 taka.
Ans. The price of 1 table is 500 taka and 1 chair is 100 taka.

25. Solve: $\frac{1}{2x} + \frac{6}{y} = 3$, $\frac{5}{x} + \frac{3}{y} = 11$ Rupali Bank Ltd., Officer (Cash-2018)

Solution:

$\frac{1}{2x} + \frac{6}{y} = 3$ ..... (i)
$\frac{5}{x} + \frac{3}{y} = 11$ ..... (ii)
(i) × 1 – (ii) × 2 ⇒
$\frac{1}{2x} + \frac{6}{y} = 3$
$\frac{10}{x} + \frac{6}{y} = 22$
(–) (–) (–)
$\therefore \frac{1}{2x} - \frac{10}{x} = -19$
$\Rightarrow \frac{1-20}{2x} = -19$
$\Rightarrow 2x = \frac{-19}{-19}$
$\therefore x = \frac{1}{2}$
(i) $\Rightarrow \frac{1}{2\frac{1}{2}} + \frac{6}{y} = 3$
$\Rightarrow \frac{6}{y} = 3 - 1$
$\Rightarrow \frac{6}{y} = 2$
$\therefore y = 3$
$\therefore (x,y) = \left(\frac{1}{2}, 3\right)$ (Ans.)

26. In a survey at an airport, 55 travelers said that last year they had been to India, 53 to Nepal and 79 to Bhutan, 18 had been to India and Nepal, 17 to India and Bhutan and 25 to Nepal and Bhutan, While 10 had to all three countries. How many travelers took part in the survey?

Rupali Bank Ltd., Officer (Cash-2018)

Solution:

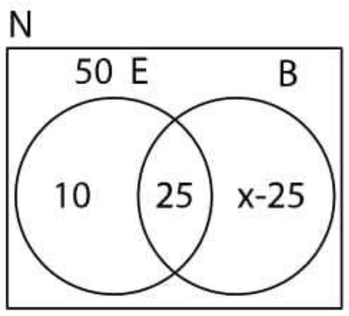
Let, S be the number of total travelers.
N(A) " " " " " travelers who travels India.
N(B) " " " " " " " " Nepal.
N(C) " " " " " " " " Bhutan.

We know,
$S = N(A) + N(B) + N(C) - N(A \cap B) - N(B \cap C) - N(A \cap C) + (N(A \cap B \cap C)$
$= 55 + 53 + 79 - 18 - 17 - 25 + 10$
$= 55 + 53 + 79 - 18 - 17 - 25 + 10$
$= 137$
So the total travelers took part in the survey is 137.

Since,
$N(A) = 55$
$N(B) = 53$
$N(C) = 79$
$N(A \cap B) = 18$
$N(B \cap C) = 17$
$N(A \cap CB) = 18$
$N(B \cap C) = 17$
$N(A \cap C) = 25$
$N(A \cap B \cap C) = 10$

28. Among 50 people, 35 can speak English, 25 can speak both English and Bangla and each can speak at least in one of the two language. How many of them can speak only Bangla? (৫০ জন লোকের মধ্যে ৩৫ জন ইংরেজি বলতে পারে, ২৫ জন বাংলা ও ইংরেজি উভয়ই বলতে পারে এবং প্রত্যেকেই কমপক্ষে একটি ভাষা বলতে পারে। তাদের মধ্যে কতজন শুধু বাংলা বলতে পারে?)

BKB, Officer (Cash-2018)



Solution:

Total people = 50 person
Can speak English = 35 person
Can speak both Bangla and English = 25 person
Let, there are x people who can speak Bangla.
$\therefore n(E \cup B) = n(E) + n(B) - n(E \cap B)$
$\Rightarrow 50 = 35 + x - 25$
$\Rightarrow x = 50 - 10$
$\therefore x = 40$
So, number of people who can speak only Bangla = 40 – 25 = 15 (Ans.)

29. What should be the values of a and b for which $64x^3 - 9ax^2 + 108x - b$ will be a perfect cube? (a এবং b এর কোন মানের জন্য $64x^3 - 9ax^2 + 108x - b$ একটি পূর্ণ ঘন হবে?)

BKB, Officer (Cash-2018)

Solution:

We know that, $(p-q)^3 = p^3 - 3p^2q + 3pq^2 - q^3$
Comparing with given equation.
$p^3 = 64x^3$
$\Rightarrow p^3 = (4x)^3$
$\Rightarrow p = 4x$ ..... (i)
Again,
$3p^2q = 9ax^2$ ..... (ii)
$3pq^2 = 108x$ ..... (iii)
$q^3 = b$ ..... (iv)
from (iii) we get,

$3pq^2 = 3.4x.3^2$
$\Rightarrow 3pq^2 = 3.p.3^2$
$\therefore q = 3$
(iv) $\Rightarrow b = 3^3$
$\therefore b = 27$
From (ii) we get,
$3p^2q = 9ax^2$
$\Rightarrow 3.(4x)^2.3 = 9ax^2$
$\Rightarrow 3.16.x^2.3 = 9ax^2$
$\Rightarrow 144x^2 = 9ax^2$
$\Rightarrow a = \frac{144x^2}{9x^2}$
$\Rightarrow a = 16$
$\therefore a = 16$ and $b = 27$ (Ans.)

30. Price of 3 tables and 5 chairs is Tk. 2000. Again, price of 5 tables and 7 chairs is Tk. 3200. What is the price of 1 table and 1 chair? (৩টি টেবিল এবং ৫টি চেয়ারের মূল্য একত্রে ২০০০ টাকা। আবার, ৫টি টেবিল এবং ৭টি চেয়ারের মূল্য একত্রে ৩২০০ টাকা। একটি চেয়ার এবং একটি টেবিলের মূল্য কত টাকা?) BKB, Officer (Cash-2018)

Solution:
The price of 3 tabels + 5 chairs = 2000 Tk. ..... (i)
" " " 5 " + 7 chairs = 3200 Tk. ..... (ii)
Now, multiplying (i) by 5 and (ii) by 3 then substracting
We get,
15 tables + 25 chairs = 10,000 Tk.
15 tables + 21 chairs = 9,600 Tk.
(–) (–) (–)
4 chairs = 400 Tk.
$\Rightarrow$ 1 chair = 100 Tk.
Now, 3 tables + 5 × 100 = 2000 Tk.
$\Rightarrow$ 3 tables = 200–500
$\Rightarrow 1 \text{ table} = \frac{1500}{3}$
$\Rightarrow$ 1 table = 500 Tk.
So the price of 1 table is 500 Tk and the price of 1 chair is 100 Tk. (Ans.)

31. Resolve into factors: (উৎপাদেক বিশ্লেষণ করুন) $a^2 + \frac{1}{a^2} + 2 - 2a - \frac{2}{a}$ BKB, Officer (Cash-2018)

Solution:
$a^2 + \frac{1}{a^2} + 2 - 2a - \frac{2}{a}$
$= a^2\ 2.a.\frac{1}{a} + \left(\frac{1}{a}\right)^2 - 2\left(a + \frac{1}{a}\right)$
$= \left(a + \frac{1}{a}\right)^2 - 2\left(a + \frac{1}{a}\right)$
$= \left(a + \frac{1}{a}\right)\left(a + \frac{1}{a} - 2\right)$ (Ans.)

32. যদি $a - \frac{1}{a} = 1$ হয়, তবে দেখাও যে, $a^3 - \frac{1}{a^3} = 4$ BKB, (Data Entry/Control Operator02018) [Written)]

সমাধান:

দেয়া আছে,

$a - \frac{1}{a} = 1$ ..... (i)

বামপক্ষ:

$a^3 - \frac{1}{a^3}$

$= \left(a - \frac{1}{a}\right)^3 + 3.a.\frac{1}{a}\left(a - \frac{1}{a}\right)$

$= 1^3\ 3.1$ [(i) নং হতে]

$= 1 + 3$

$= 4$

∴ বামপক্ষ = ডানপক্ষ (দেখানো হলো)

33. The profit of a company is given in Taka by $P=3x^2 - 35x + 50$, where x is the amount in Taka spent on advertising. For what values of x does the compay make a profit?

Bangladesh Development Bank Ltd. (Senior Officer 2018)

Solution:

এখানে, $p = 3x^2 - 35x + 50 > 0$

$\Rightarrow 3x^2 - 30x - 5x + 50 > 0$

$\Rightarrow 3x\ (x - 10) - 5(x - 10) > 0$

$\Rightarrow (x - 10)\ (3x - 5) > 0$

এখানে যেহেতু অসমতাটির মান ০ (শূণ্য) অপেক্ষা বড় তাই অসমতাটির $(x - 10)\ x\ (3I - 5)$ এর উভয়টিই হয় ধনাত্মক হবে, না হয় ঋণাত্মক হবে।

অর্থাৎ $x < \frac{5}{3}$ অথবা $x > 10$।

উত্তর: $x < \frac{5}{3}$ অথবা $x > 10$।

34. Find the three-digit prime number whose sum of the digits is 11 and each digit representing a prime number. Justify your answer.

Bangladesh Development Bank Ltd. (Senior Officer 2018)

Solution:

তিন অঙ্কবিশিস্ট মৌলিক সংখ্যাগুলো বের করতে হবে যাদের অংকগুলোর যোগফল ১১।

এরূপ মৌলিক সংখ্যাগুলো হলো ২২৭ এবং ৩৫৩

শুদ্ধি পরীক্ষা:

২২৭ এর ক্ষেত্রে, ২ + ২ + ৭ = ১১ এবং ২, ২, ৭ প্রত্যেক সংখ্যাই মৌলিক।

৩৫৩ এর ক্ষেত্রে, ৩ + ৫ + ৩ = ১১ এবং ৩, ৫, ৩ প্রক্যেকেই মৌলিক সংখ্যা।

সুতরাং সংখ্যা দুটি হলো ২২৭ এবং ৩৫৩। (উত্তর)

35. If $\frac{a}{q-r} = \frac{b}{r-p} = \frac{c}{p-q}$ the show that, a+b+c = pa + qb + rc

Bangladesh Development Bank Ltd. (Senior Officer 2018)

Solution:

ধরি, $\frac{a}{q-r} = \frac{b}{r-p} = \frac{c}{p-q} = k$

$\Rightarrow \frac{a}{q-r} = k$ $\quad$ $\frac{b}{r-p} = k$ $\quad$ $\frac{c}{p-q} = k$

$\Rightarrow a = k\ (q-r)$ $\quad$ $b = k(r - p)$ $\quad$ $c = k(p - q)$

∴ বামপক্ষ:

$a + b + c$

$= k(q - r) + k\ (r - p) + k(p - q)$

$= k\ (q - r + r - p + p - q)$

$= k \times 0$

$= 0$

ডানপক্ষ:

$pa + qb + rc$

$= pk(q - r) + qk(r - p) + rk(p - q)$

$= pkq - pkr + qkr - qkp + rkp - rkq$

$= 0$

∴ বামপক্ষ = ডানপক্ষ

(প্রমাণিত)

36. Solve the equatios: $\frac{x}{2} + \frac{6}{y} = 9$; $\frac{x}{3} + \frac{2}{y} = 4$ Bangladesh Development Bank Ltd. (Senior Officer 2018)

Solution:

$\frac{x}{2} + \frac{6}{y} = 9$ .... (i)

$\frac{x}{3} + \frac{2}{y} = 4$ .. (ii)

(ii) নং সমীকরণেকে 3 দ্বারা গুণ করে পাই, $\frac{3x}{3} + \frac{6}{y}$ 12

$\Rightarrow x + \frac{6}{y} = 12$ .... (iii)

(iii) – (i) ⇒

$x + \frac{6}{y} = 12$

$\frac{x}{2} + \frac{6}{y} = 9$

– – –

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

$\Rightarrow x = 6$

x এর মান (iii) নং এ বসাই, $6 + \frac{6}{y} = 12$

$\Rightarrow \frac{6}{y} = 6$

$\Rightarrow y = \frac{6}{6}$

$\Rightarrow y = 1$

∴ x = 6, y = 1 (Ans.)

37. $f(x) = x^3 - 6x^2 + 11x - 6$ হলে, x এর কোন মানের জন্য $f(x) = 0$ হবে? Jiban Bima Corporation (Junior Officer 2018)

Solution:

$f(x) = x^3 - 6x^2 + 11x - 6$

$\Rightarrow 0 = x^3 - x^2 - 5x^2 + 5x + 6x - 6$

$\Rightarrow x^2(x - 1) - 5x(x - 1) + 6(x - 1) = 0$

$\Rightarrow (x - 1)(x^2 - 5x + 6) = 0$

$\Rightarrow (x - 1)\{x^2 - 5x + 6) = 0$

$\Rightarrow (x - 1)\{x^2 - 2x - 3x + 6\} = 0$

$\Rightarrow (x - 1)\{x(x - 2) - 3(x - 2)\} = 0$

$\Rightarrow (x - 1)(x - 2)(x - 3) = 0$

$\therefore$ x = 1, 2, 3

38. $x + \frac{1}{x} = 3$ হলে $x^5 + \frac{1}{x^5}$ এর মান নির্ণয় করুন। Jiban Bima Corporation (Junior Officer 2018)

Solution:

$$x^3 + \frac{1}{x^3} = \left(x + \frac{1}{x}\right)^3 - 3.x.\frac{1}{x}\left(x + \frac{1}{x}\right) = (3)^3 - 3(3) = 27 - 9 = 18$$

$$x^2 + \frac{1}{x^2} = \left(x + \frac{1}{x}\right)^2 - 2x.\frac{1}{x} = (3)^2 - 2 = 7$$

এখন, $\left(x^3 + \frac{1}{x^3}\right)\left(x^2 + \frac{1}{x^2}\right) = x^5 + x + \frac{1}{x} + \frac{1}{x^5}$

$$\Rightarrow 18 \times 7 = x^5 + \frac{1}{x^5} + 3 \Rightarrow x^5 + \frac{1}{x^5} = 126 - 3$$

$$\therefore x^5 + \frac{1}{x^5} = 123$$

39. সমাধান করুন: $\frac{10}{2x-5} + \frac{1}{x+5} = \frac{18}{3x-5}$ Jiban Bima Corporation (Junior Officer 2018)

Solution:

$$\frac{10}{2x-5} + \frac{1}{x+5} = \frac{18}{3x-5}$$

$$\Rightarrow \frac{10}{2x-5} + \frac{15}{3x+5} = \frac{3}{3x-5} + \frac{1}{x+5}$$

$$\Rightarrow \frac{25}{2x-5} = \frac{20}{x+5}$$

$$\Rightarrow 8x - 20 = 5x + 25$$

$$\Rightarrow x = \frac{45}{3}$$

$$\Rightarrow \frac{10}{2x-5} + \frac{1}{x+5} = \frac{15}{3x-5} + \frac{3}{3x-5}$$

$$\Rightarrow \frac{30x - 50 - 30x + 75}{(2x-5)(3x-5)} = \frac{3x + 15 - 3x + 5}{(3x-5)(x+5)}$$

$$\Rightarrow \frac{5}{2x-5} = \frac{4}{x+5}$$

$$\Rightarrow 8x - 5x = 25 + 20$$

$$\therefore x = 15$$

$\therefore$ নির্ণেয় সমাধান **x = 15**

40. Find the value of $x^6 + \frac{1}{x^6}$, if $x + \frac{1}{x} = 3$ *[Sonali Bank Ltd. (Officer)-18]*

Solution:

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

Now, $\left(x^6 + \frac{1}{x^6}\right) = (x^3)^2 + \left(\frac{1}{x^3}\right)^2 = \left(x^3 + \frac{1}{x^3}\right)^2 - 2 \times x^3 \times \frac{1}{x^3}$

$= \left\{\left(x + \frac{1}{x}\right)^3 - 3 \times x \times \frac{1}{x}\left(x + \frac{1}{x}\right)\right\}^2 - 2 = \{(3)^3 - 3.3\}^2 - 2$

$= 343 - 2 = 322.$

Ans. 322.

41. Solve the equation: $\frac{3}{x+2} + \frac{x-1}{x-5} = 2$ *[Sonali Bank Ltd. (Officer)-18]*

Solution:

$$\frac{3}{x+2} + \frac{x-1}{x-5} = 2 \Rightarrow \frac{3}{x+2} + \frac{x-1}{x-5} = 1 + 1$$

$$\Rightarrow \frac{3}{x+2} - 1 = 1 - \frac{x-1}{x-5} \Rightarrow \frac{3-(x+2)}{x+2} = \frac{x-5-(x-1)}{x-5} \Rightarrow \frac{3-x-2}{x+2} = \frac{x-5-x+1}{x-5} \Rightarrow \frac{1-x}{x+2} = \frac{-4}{x-5}$$

$\Rightarrow (1-x)(x-5) = -4(x+2) \Rightarrow x - 5 - x^2 + 5x = -4x - 8$

$\therefore x^2 - 10x - 3 = 0$

We know, $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

$\therefore x = \frac{-(-10) \pm \sqrt{(-10)^2 - 4 \times 1 \times (-3)}}{2 \times 1} \Rightarrow x = \frac{10 \pm \sqrt{100+12}}{2} \Rightarrow x = \frac{10 \pm \sqrt{16 \times 7}}{2}$

$\Rightarrow x = \frac{10 \pm 4\sqrt{7}}{2}$

Ans: $x = 5 \pm 2\sqrt{7}$

42. A train starts from station A with some passengers. At station B, 10% of the passengers get down and 100 passengers get in. At station C, 50% get down and 25 get in. At station D, 50% get down and 50 get in making the total number of passengers 200. How many passengers did board the train at station A?

[Uttara Bank Ltd. (PO)-18]

Solution:

Let, x passengers were boarded at station A.

After getting down 10% passengers, the number of passengers = x – 10% of x = $x - \frac{10x}{100} = x - \frac{x}{10} = \frac{9x}{10}$

$\therefore$ After getting in 100 passengers, the number of passengers at station B= $\frac{9x}{10} + 100 = \frac{9x+1000}{10}$

After getting down 50% passengers, the number of passengers At Station C

$= \frac{9x+1000}{10} - 50\% \text{ of } \left(\frac{9x+1000}{10}\right) = \frac{9x+1000}{10} - \frac{50}{100}\left(\frac{9x+1000}{10}\right) = \frac{9x+1000}{10} - \frac{1}{2}\left(\frac{9x+1000}{10}\right)$

$= \frac{1}{2}\left(\frac{9x+1000}{10}\right) = \frac{9x+1000}{20}$

$\therefore$ After getting in 25 passengers, the number of passengers at station C= $\frac{9x+1000}{20} + 25 = \frac{9x+1500}{20}$

After getting down 50% passengers, the number of passengers At Station D

$= \frac{9x+1500}{20} - 50\% \text{ of } \left(\frac{9x+1500}{20}\right) = \frac{9x+1500}{20} - \frac{50}{100}\left(\frac{9x+1500}{20}\right) = \frac{9x+1500}{20} - \frac{1}{2}\left(\frac{9x+1500}{20}\right)$

$= \frac{1}{2}\left(\frac{9x+1500}{20}\right) = \frac{9x+1500}{40}$

$\therefore$ According to question,

The number of passengers at station D will be, $\frac{9x+1500}{40} + 50 = 200$

$\Rightarrow \frac{9x+1500}{40} = 200 - 50 \Rightarrow \frac{9x+1500}{40} = 150 \Rightarrow 9x + 1{,}500 = 6000 \Rightarrow 9x = 6{,}000 - 1{,}500$

$\Rightarrow x = \frac{4500}{9} \qquad \therefore x = 500$

$\therefore$ 500 passengers were boarded at station A.

Ans: 500