CAPSTONE

Math Lecture#02

পেট্রোবাংলা স্পেশাল কোর্স

Topic: Algebra

- ☑ Fraction
- ☑ Equation & Exponent

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Class Test on Lecture Sheet 1

Total Marks: 10 **Obtained Mark:** **Time: 10 minutes**

1. If A is an integers, which of the following CANNOT be inferred the statement above? [বেজা (সহঃ ব্যবস্থাপক)-২০]
   A. If A is a multiple of 5, then a is a multiple of 10
   B. If A is not a multiple of 5, then a is not a multiple of 10
   C. If A is a multiple of 10 implies that a is a multiple of 5
   D. A necessary condition for A to be a multiple of 10 is that A is a multiple of 5

2. A natural number when increased by 12, equals to 160 times reciprocal. The number is- [BB Officer-22]
   A. 16 B. 8 C. 6 D. 18

3. In a division problem, the divisor is 7 times of quotient and 5 times of remainder. If the dividend is 6 times of remainder, then the quotient is equal to-
   A. 7 B. 5 C. 3 D. 1

4. If p and q are positive integers with $pq = 36$, then $\frac{p}{q}$ cannot be:
   A. $\frac{1}{4}$ B. $\frac{4}{9}$ C. $\frac{1}{2}$
   D. None of these E. Cannot be determined

5. If m and n are positive integers, then the digit in the unit's place of $5^n + 6^m$ is always-
   A. 1 B. 5 C. 6 D. $n + m$

6. x, y are positive integers. When x is divided by y, the remainder is 5. If $\frac{x}{y} = 5.20$, what is the value of x?
   A. 130 B. 155 C. 330 D. 425

7. A certain integer 'n' when divided by 5 yield a remainder of 4. Which of these cannot be an integer?
   A. $\frac{n}{4}$ B. $\frac{n}{6}$ C. $\frac{n}{7}$ D. $\frac{n}{10}$ E. None of these

8. If $xy > 0$ and $yz < 0$, which of the following must be negative? [Bank Asia MTO-2017]
   A. xyz B. xyz^2 C. xy^2z D. xy^2z^2

9. Difference between two number is 2 and their sum is 4, then what is the difference of their square?
   A. 8 B. 10 C. 6 D. 16 E. 4

10. If $a + b + c = 35$ and $a^2 + b^2 + c^2 = 825$, then $ab + bc + ca = ?$ [দুদক (সহকারী পরিচালক) ২০২০]
    A. 100 B. 200 C. 125 D. 225

ভগ্নাংশ (Fraction)

- **ভগ্নাংশ (Fraction):** দুটি পূর্ণ সংখ্যাকে অনুপাত বা ভাগ করলে যে রাশি পাওয়া যায় তাকে ভগ্নাংশ বলে। ভগ্নাংশ $= \frac{\text{লব}}{\text{হর}}$।
- **প্রকৃত ভগ্নাংশ (Proper Fraction):** কোনো ভগ্নাংশের লব, হর অপেক্ষা ছোট হলে তাকে প্রকৃত ভগ্নাংশ বলা হয়। যেমন: $\frac{5}{7}$।
- **অপ্রকৃত ভগ্নাংশ (Improper Fraction):** কোনো ভগ্নাংশের লব, হর অপেক্ষা বড় হলে তাকে অপ্রকৃত ভগ্নাংশ বলা হয়। যেমন: $\frac{7}{5}$।
- **মিশ্র ভগ্নাংশ (Mixed Fraction):** অপ্রকৃত ভগ্নাংশের অপর রূপ মিশ্র ভগ্নাংশ। মূলত, মিশ্র, ভগ্নাংশ হলো একটি পূর্ণ সংখ্যা এবং একটি প্রকৃত ভগ্নাংশের যোগফল। যেমন: $\frac{7}{5}$ একটি। আবার, $\frac{7}{5} = \frac{5+2}{5} = \frac{5}{5} + \frac{2}{5} = 1 + \frac{2}{5} = 1\frac{2}{5}$।
- **ভগ্নাংশের তুলনা:** দুটি ভগ্নাংশের প্রথমটির লব ও দ্বিতীয়টির হরের গুণফল প্রথম ভগ্নাংশের উপরে বসবে। দ্বিতীয়টির লব ও প্রথমটির হরের গুণফল দ্বিতীয় ভগ্নাংশের উপর বসবে। যে ভগ্নাংশের উপরে লেখা গুণফল বড় হবে সে ভগ্নাংশটি বড়।

  1. $\frac{2}{11}$ ও $\frac{3}{13}$ এর মধ্যে কোন ভগ্নাংশটির মান বৃহত্তর?

  সমাধান:

  $\frac{2}{11} \times \frac{3}{13}$

  $2 \times 13 = 26$ এবং $3 \times 11 = 33$। এখানে, $26 < 33$। তাই, $\frac{2}{11} < \frac{3}{13}$।
- **দশমিক ভগ্নাংশ (Decimal):** সাধারণ ভগ্নাংশকে দশমিক আকারে প্রকাশ করলে যে ভগ্নাংশ পাওয়া যায় তাকে দশমিক ভগ্নাংশ পাওয়া যায় তাকে দশমিক ভগ্নাংশ বলা হয়। যেমন: $\frac{5}{2} = 2.5$।
- **সসীম দশমিক ভগ্নাংশ:** যদি কোনো দশমিক ভগ্নাংশে দশমিক চিহ্নের ডান দিকে সসীম সংখ্যক অংক থাকে তবে তাকে সসীম দশমিক ভগ্নাংশ বলা হয়। যেমন: $0.1035, 0.57, 5.59$ ইত্যাদি।
- **অসীম দশমিক ভগ্নাংশ:** যদি কোনো দশমিক ভগ্নাংশে দশমিক চিহ্নের পর অসীম সংখ্যক অংক থাকে অর্থাৎ অংক কখনো শেষ হয় না তবে তাকে অসীম দশমিক ভগ্নাংশ বলে। যেমন: $3.7347251 \ldots \ldots \ldots$।
- **আবৃত দশমিক ভগ্নাংশ:** কোনো অসীম দশমিক ভগ্নাংশের দশমিক চিহ্নের ডান দিকের অংকগুলো বা এর অংশবিশেষ বারবার থাকলে তাকে আবৃত দশমিক ভগ্নাংশ বলা হয়। যেমন: $35.3264264264 \ldots \ldots \ldots$।
- **আবৃত দশমিকের সাধারণ ভগ্নাংশে রূপান্তর:**

  ১. লব = দশমিক বিন্দু বাদ দিয়ে প্রাপ্ত সংখ্যা ও অনাবৃত অংশ দ্বারা গঠিত সংখ্যার বিয়োগফল।

  ২. হর = দশমিক বিন্দুর পর আবৃত অংশের অংক সংখ্যার সমান সংখ্যক ৯ ও অনাবৃত অংশের অংক সংখ্যার সমান সংখ্যক ০ দ্বারা গঠিত সংখ্যা।

  2. $35.3\dot{2}6\dot{4}$ কে সাধারণ ভগ্নাংশে প্রকাশ করুন।

  সমাধান: $35.3\dot{2}6\dot{4} = \frac{353264-353}{9990} = \frac{352911}{9990} = 35\frac{3261}{9990}$
- **অনাবৃত দশমিক ভগ্নাংশ:** কোনো অসীম দশমিক ভগ্নাংশের দশমিক চিহ্নের ডানদিকের অংকগুলো যদি কোনো বিন্যাস অনুসরণ করে পুনরাবৃত্তি না হয় তাহলে তাকে অসীম অনাবৃত দশমিক ভগ্নাংশ বলে।

Note:

1. Since a fraction is a division and division by 0 is undefined, the denominator of fraction cannot be 0.
2. If the numerator is 0 (and the denominator is not 0), than the fraction equal 0.
3. The value of fraction is unchanged when the numerator and denominator are multiplied by the same quantity.

Some common used fraction, decimal, percentage:

Fraction	*Decimal*	*Percent*	*Fraction*	*Decimal*	*Percent*	*Fraction*	*Decimal*	*Percent*
$\frac{1}{2}$	0.5	50%	$\frac{1}{6}$	0.1666...	16.66%	$\frac{5}{9}$	0.555...	55.55%
$\frac{1}{3}$	0.33...	33.33%	$\frac{5}{6}$	0.8333...	83.33%	$\frac{7}{9}$	0.777...	77.77%
$\frac{2}{3}$	0.66...	66.66%	$\frac{1}{8}$	0.125	12.5%	$\frac{8}{9}$	0.888...	88.88%
$\frac{1}{4}$	0.25	25%	$\frac{3}{8}$	0.375	37.5%	$\frac{1}{10}$	0.1	10%
$\frac{3}{4}$	0.75	75%	$\frac{5}{8}$	0.625	62.5%	$\frac{1}{11}$	0.0909	9.09%
$\frac{1}{5}$	0.2	20%	$\frac{7}{8}$	0.875	87.5%	$\frac{1}{12}$	0.0833	8.33%
$\frac{2}{5}$	0.4	40%	$\frac{1}{9}$	0.111...	11.11%	$\frac{1}{16}$	0.0625	6.25%
$\frac{3}{5}$	0.6	60%	$\frac{2}{9}$	0.222...	22.22%	$\frac{1}{32}$	0.03125	3.13%
$\frac{4}{5}$	0.8	80%	$\frac{4}{9}$	0.444...	44.44%			

সূচক (Exponent)

$a^n = a \times a \times a \times \ldots\ldots\ldots \times a$ (n সংখ্যক a)। n সংখ্যক a এর ক্রমিক গুণফল → a^n এর n কে a এর সূচক বা ঘাত বলা হয়। a কে বলা হয় ভিত্তি (Base)।

সূচকের প্রয়োজনীয় সূত্রাবলী:

1. $a^0 = 1$
2. $a^1 = a$
3. $(a^m)^n = a^{mn}$
4. $a^m . a^n = a^{m+n}$
5. $a^m \div a^n = a^{m-n}$
6. $\sqrt{a} = a^{\frac{1}{2}}$
7. $\sqrt[3]{a} = a^{\frac{1}{3}}$
8. $\sqrt[n]{a} = a^{\frac{1}{n}}$
9. $\sqrt[n]{a^m} = a^{\frac{m}{n}}$
10. $(ab)^m = a^m . a^m$
11. $\left(\frac{a}{b}\right)^m = a^m . \left(\frac{1}{b}\right)^m = a^m . b^{-m} = \frac{a^m}{b^m}$
12. $a^{-n} = \frac{1}{a^n}$
13. $\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n$
14. $a^x = a^y$ হলে, $x = y$
15. $a^x = b^x$ হলে, $a = b$
16. $\sqrt[n]{ab} = \sqrt[n]{a} . \sqrt[n]{b}$
17. $\sqrt[n]{\frac{a}{b}} = \frac{(\sqrt[n]{a})}{(\sqrt[n]{b})}$
18. $\sqrt{a} . \sqrt{b} = \sqrt{ab}$
19. $\frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}}$

Square (n^2) of 1 to 30

$1^2 = 1$	$6^2 = 36$	$11^2 = 121$	$16^2 = 256$	$21^2 = 441$	$26^2 = 676$
$2^2 = 4$	$7^2 = 49$	$12^2 = 144$	$17^2 = 289$	$22^2 = 484$	$27^2 = 729$
$3^2 = 9$	$8^2 = 64$	$13^2 = 169$	$18^2 = 324$	$23^2 = 529$	$28^2 = 784$
$4^2 = 16$	$9^2 = 81$	$14^2 = 196$	$19^2 = 361$	$24^2 = 576$	$29^2 = 841$
$5^2 = 25$	$10^2 = 100$	$15^2 = 225$	$20^2 = 400$	$25^2 = 625$	$30^2 = 900$

Cube (n^3) of 1 to 10

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

Square root ($\sqrt{n}$) of 1 to 10

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

হিসাবের সুবিধার্থে নিচের ছকটি মনে রাখুন:

$2^2 = 4$ $2^3 = 8$ $2^4 = 16$ $2^5 = 32$ $2^6 = 64$ $2^7 = 128$ $2^8 = 256$	$3^2 = 9$ $3^3 = 27$ $3^4 = 81$ $3^5 = 243$	$4^2 = 16$ $4^3 = 64$ $4^4 = 256$ $4^5 = 1024$	$5^2 = 25$ $5^3 = 125$ $5^4 = 625$	$6^2 = 36$ $6^3 = 216$ $6^4 = 1296$

3. $a = 3, m = 2, n = 1$ হলে $(a^m)^n$ এর মান কত?
   সমাধান: $(a^m)^n = a^{mn}$
   $= 3^{2\times1}$
   $= 3^2$
   $= 9$ (উত্তর)

4. $x^{-3} = 0.2$ হলে x^{12} কত?
   সমাধান: $x^{-3} = 0.2$
   $\Rightarrow \frac{1}{x^3} = \frac{2}{10}$
   $\Rightarrow x^3 = 5$
   $\Rightarrow (x^3)^4 = 5^4$
   $\Rightarrow x^{12} = 625$ (উত্তর)

5. $1-\left(1-\frac{1}{m}\right)^{-1} \div \left(\frac{m-1}{m}\right)^{-1}$ এর মান কত?

সমাধান: $1-\left(1-\frac{1}{m}\right)^{-1} \div \left(\frac{m-1}{m}\right)^{-1}$

$= 1-\left(\frac{m-1}{m}\right)^{-1} \div \left(\frac{m-1}{m}\right)^{-1}$

$= 1-\left(\frac{m}{m-1}\right) \div \left(\frac{m}{m-1}\right) \left[\because \left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^{n}\right]$

$= 1-\left(\frac{m}{m-1}\right)^{1-1}$

$= 1-\left(\frac{m}{m-1}\right)^{0}$

$= 1-1$

$= 0$ (উত্তর)

6. $\left(\sqrt{3}\times\sqrt{7}\right)^{4}$ এর মান কত?

Solution: $\left(\sqrt{3}\times\sqrt{7}\right)^{4}$

$= \left(\sqrt{3}\right)^{4} \times \left(\sqrt{7}\right)^{4}$

$= \left(\sqrt{3}\right)^{2\times2} \times \left(\sqrt{7}\right)^{2\times2}$

$= \left\{\left(\sqrt{3}\right)^{2}\right\}^{2} \times \left\{\left(\sqrt{7}\right)^{2}\right\}^{2}$

$= 3^2 \times 7^2$

$= 9 \times 49$

$= 441$ (Answer)

7. $\sqrt[5]{x} \times \frac{1}{\sqrt[5]{x}}$ এর সঠিক মান?

সমাধান: $\sqrt[5]{x} \times \frac{1}{\sqrt[5]{x}}$

$= x^{\frac{1}{5}} \times x^{-\frac{1}{5}}$

$= x^{\frac{1}{5}-\frac{1}{5}}$

$= x^0$

$= 1$

8. মান নির্ণয় করুন: $3^{2x+2} + 27^{x+1} = 36$

সমাধান: $3^{2x+2} + 27^{x+1} = 36$

$\Rightarrow 3^{2x}.3^2 + (3^3)^{x+1} = 36$

$\Rightarrow 9.(3^x)^2 + 3^{3x}.3^3 = 36$

$\Rightarrow 9.(3^x)^2 + 27.(3^x)^3 = 36$

$\Rightarrow 9a^2 + 27a^3 - 36 = 0$ [$3^x = a$ ধরে]

$\Rightarrow 9(a^2 + 3a^3 - 4) = 0$

$\Rightarrow 3a^3 + a^2 - 4 = 0$

$\Rightarrow 3a^3 - 3a^2 + 4a^2 - 4 = 0$

$\Rightarrow 3a^2(a-1) + 4(a^2-1) = 0$

$\Rightarrow 3a^2(a-1) + 4(a+1)(a-1) = 0$

$\Rightarrow (a-1)(3a^2 + 4a + 4) = 0$

$\therefore a - 1 = 0$

[এখানে $3a^2 + 4a + 4 \neq 0$ কারণ, $a = 3^x > 0$]

$\Rightarrow a = 1$

$\Rightarrow 3^x = 1$

$\Rightarrow 3^x = 3^0$

$\therefore x = 0$ (Answer)

9. $\frac{9^x-4}{3^x-2} - 2$ এর মান কত?

সমাধান: $\frac{9^x-4}{3^x-2} - 2$

$= \frac{\left(3^2\right)^x-2^2}{3^x-2} - 2$

$= \frac{(3^x)^2-2^2}{3^x-2} - 2$

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

$= (3^x + 2) - 2$

$= 3^x$ (উত্তর)

10. $\sqrt{x^{-1}y} \cdot \sqrt{y^{-1}z} \cdot \sqrt{z^{-1}x}$ এর মান কত?

সমাধান: $\sqrt{x^{-1}y} \cdot \sqrt{y^{-1}z} \cdot \sqrt{z^{-1}x}$

$= \sqrt{\frac{1}{x}y} \cdot \sqrt{\frac{1}{y}z} \cdot \sqrt{\frac{1}{z}x}$

$= \sqrt{\frac{y}{x}} \cdot \sqrt{\frac{z}{y}} \cdot \sqrt{\frac{x}{z}}$

$= \sqrt{\frac{y}{x} \cdot \frac{z}{y} \cdot \frac{x}{z}}$

$= \sqrt{1}$

$= 1$ (Answer)

11. If $7^{x+1} = 343$, then find the value of x?

সমাধান: $7^{x+1} = 343$

or, $7^{x+1} = 7^3$

or, $x + 1 = 3$ [$a^x = a^y$ হলে $x = y$ হয়]

or, $x = 3 - 1$

$\therefore x = 2$

12. $\sqrt[3]{\sqrt[3]{x^3}}$ এর মান কত?

সমাধান: $\sqrt[3]{\sqrt[3]{x^3}}$

$= \sqrt[3]{(x^3)^{\frac{1}{3}}}$ [$\because \sqrt[n]{x} = x^{\frac{1}{n}}$]

$= \sqrt[3]{x^{3\times\frac{1}{3}}}$ [$\because (x^m)^n = x^{mn}$]

$= \sqrt[3]{x}$

$= x^{\frac{1}{3}}$ (উত্তর)

সমীকরণ (Equation)

♦ When simplifying algebraic expressions, we perform operations within parentheses first and then exponents and then multiplication and then division and then addition and lastly subtraction. This can be remembered by the mnemonic: **PEMDAS**

♦ When solving equations, however, we apply the mnemonic in reverse order: **SADMEP**. This is often expressed as follows: inverse operations in inverse order. The goal in solving an equation is to isolate the variable on one side of the equal sign (usually the left side). This is done by identifying the main operation—addition, multiplication, etc.—and then performing the opposite operation.

Quadratic Equation: A general quadratic equation can be written in the form $ax^2 + bx + c = 0$, where x represents a variable or an unknown, and a, b, and c are constants with $a \neq 0$.

Special Notes:
1. If the $b^2 - 4ac$ is positive, then there are two distinct roots.
2. If the $b^2 - 4ac$ is 0, then there is exactly one real root.
3. If the $b^2 - 4ac$ is negative, then there are no real roots. Rather, there are two distinct (non-real) complex roots.

The solutions are: $x = \frac{-b+\sqrt{b^2-4ac}}{2a}$ and $x = \frac{-b-\sqrt{b^2-4ac}}{2a}$

Solve the following equation: $\frac{x^2+10x+16}{x+8} = 0$

13. If $a + 3a$ is 4 less than $b + 3b$, then $a - b = ?$

A. –4 B. –1 C. $\frac{1}{5}$ D. $\frac{1}{3}$ E. 2

Solution: Translating the sentence into an equation gives: $a + 3a = b + 3b - 4$
Combining like terms gives: $4a = 4b - 4$
Subtracting $4b$ from both sides gives $4a - 4b = -4$
Finally, dividing by 4 gives $a - b = -1$
Hence, the answer is (B).
Sometimes on the IBA, a system of 3 equations will be written as one long "triple" equation. For example, the three equations $x = y$, $y = z$, $x = z$, can be written more compactly as $x = y = z$.

14. If $w \neq 2$ and $w = 2x = \sqrt{2}y$, what is the value of $w - x$ in terms of y?

A. 2y B. $\left(\frac{\sqrt{2}}{2}\right)y$ C. 2y D. $\left(\frac{4}{\sqrt{2}}\right)y$ E. y

Solution: The equation $w = 2x = \sqrt{2}y$, stands for three equations: $w = 2x$, $2x = \sqrt{2}y$, and $w = \sqrt{2}y$.
From the last equation, we get $w = \sqrt{2}y$, and from the second equation we get, $x = \left(\frac{\sqrt{2}}{2}\right)y$
Hence, $w - x = \sqrt{2}y - \left(\frac{\sqrt{2}}{2}\right)y = \left(\frac{2}{2}\right)\sqrt{2}y - \left(\frac{\sqrt{2}}{2}\right)y = \left(\frac{\sqrt{2}}{2}\right)y$ Hence, the answer is (B).

15. If $a + 2b = 6$ and $ab = 4$, what is $\frac{2}{a} + \frac{1}{b}$?

A. $\frac{1}{2}$ B. 1 C. $\frac{3}{2}$ D. 2 E. $\frac{5}{2}$

Solution: Here, $\frac{2}{a} + \frac{1}{b} = \frac{2b+a}{ab} = \frac{a+2b}{ab} = \frac{6}{4} = \frac{3}{2}$ (Answer: C)

16. $50^7 \times 20^7$ is 10^x times larger than 1×10^8, where x is:

A. 13 B. 6 C. 21 D. 29 E. 31

Solution: $50^7 \times 20^7 = (50 \times 20)^7 = (1000)^7 = (10^3)^7 = 10^{21}$
Now, according to the question, $10^x \times 1 \times 10^8 = 10^{21}$
$\Rightarrow 10^{x+8} = 10^{21}$
$\Rightarrow x + 8 = 21$
$\Rightarrow x = 13$ (Answer: A)

Practice Math

1. $(10)^2$ is how many times of $(0.01)^3$? [BB AD 2022]
   A. 10^5 B. 10^2 C. 10^1 D. 10^8

2. In dividing a sum of money, the eldest of three brothers got $\frac{2}{5}^{th}$ of it and the youngest got Tk. 120. What was the total sum in Tk. if amount received by the other brother was $\frac{1}{3}^{rd}$ of the total?
   [Agrani Bank (Officer) 2013]
   A. 400 B. 425 C. 450 D. 500

3. In a department, $\frac{3}{5}$ of the worker are men and the rest women. If $\frac{1}{2}$ of the men and $\frac{3}{7}$ of the women in the department are over 35, what fraction of all the worker in the department are over 35?
   A. $\frac{33}{70}$ B. $\frac{66}{70}$ C. $\frac{33}{140}$ D. $\frac{35}{140}$

4. If $\frac{x}{y} = \frac{1}{3}$, then the value of $\frac{x^2+y^2}{x^2-y^2}$ is- [BB AD 2022]
   A. $\frac{-10}{9}$ B. $\frac{5}{4}$ C. $\frac{-5}{4}$ D. $\frac{-5}{3}$

5. If $a + b + c = 12$, $a + b = 4$ and $a + c = 7$, what is the value of a? [বেজা (সহঃ ব্যবস্থাপক) ২০২০]
   A. 2 B. -1 C. $\frac{3}{23}$ D. 2

6. The electricity bill of a certain establishment is partially fixed and and partially varies as the number of units of electricity consumed. When in a certain month 540 units are consumed, the bill is Tk. 1800. In another month 620 units are consumed are the bill is Tk. 2040. In yet another month if 500 units are consumed what would be the bill (in Tk.) for that month?
   A. 1950 B. 1560 C. 1840 D. 1680

7. In an examination, a student scores 4 marks for every correct answer and loses 1 mark for every wrong answer. If he attempts all 80 questions and secures 120 marks, the number of questions he attempted correctly is- [BISIC Chief Auditor-2021]
   A. 30 B. 60 C. 80 D. 40

8. In a class, if 4 students sit in each bench, there are 3 empty benches, but 6 students have to stand if 3 students sit each bench. How many students are there in that class? [GTCL (Asst. Manager) 2021]
   A. 50 B. 60 C. 70 D. 80

9. An employee may claim Tk. 7 for each kilometer when he travels by taxi and Tk. 6 for each kilometer when he drives his own car. If in one weak he claimed Tk. 900 for travelling 135 km, how many kilometer did he travel by taxi? [BB AD 2022]
   A. 90 km B. 100 km C. 110 km D. 120 km

10. Shaheen bought some pen for 240 taka. If he got a pen more for the same price, then price of each pen would be 1 taka less. How many pens did he bought? [বিমান বাংলাদেশ এয়ারলাইন্স (সহকারী ব্যবস্থাপক) ২০২১]
    A. 16 B. 17 C. 15 D. 18

11. If the numerator of a fraction is increased by 2 and the denominator by 1 it becomes 1. Again, if the numerator decreased by 4 and the denominator by 2 it becomes $\frac{1}{2}$. Find the fraction. [BB AD 2022]

A. $\frac{4}{5}$ B. $\frac{5}{6}$ C. $\frac{6}{7}$ D. $\frac{7}{8}$

12. In a group of buffaloes and ducks, the number of legs is 24 more than twice the number of heads. What is the number of buffaloes? [BB AD 2022]

A. 12 B. 10 C. 8 D. 6

13. The difference between a positive proper fraction and its reciprocal is $\frac{9}{20}$. The fraction is- [Agrani Bank (SO) 2017]

A. $\frac{2}{5}$ B. $\frac{3}{10}$ C. $\frac{4}{5}$ D. $\frac{5}{4}$

14. A boy was asked to multiply a number by $\frac{7}{8}$, instead he divided the number by $\frac{7}{8}$ and got the result $\frac{15}{14}$ more than what he should have got if he had multiplied the number by $\frac{7}{8}$. The number is- [One Bank (SCO) 2017]

A. 4 B. 6 C. 8 D. None of these

15. For which value of P, $4x^2 - Px + 9$ would be a perfect square ? [দি সিকিউরিটি প্রিন্টিং কর্পোরেশন (সহকারী ব্যবস্থাপক) ২০২১; গ্যাস ট্রান্সমিশন কোম্পানি লি. (সহকারী ব্যবস্থাপক) ২০২১]

A. ± 12 B. 8 C. ± 6 D. 0

16. $5^{-3} + 5^{-3} + 5^{-3} + 5^{-3} + 5^{-3} = ?$ [Agrani Bank (SO) 2017]

A. 25^{-15} B. 25^{-3} C. 5^{-2} D. 5^{-15}

17. $2^x = \sqrt[7]{1024}$, Find the value of x? [BISIC Chief Auditor-2021]

A. $\frac{10}{9}$ B. $\frac{9}{7}$ C. $\frac{10}{7}$ D. 11

18. XYZ Ltd has profited tk. 1,08,000 from its ventures in FY 2017. Its investment strategy for FY 2018 is as follows. Out of the total profit it will invest $\frac{1}{6}^{th}$ in customer care, of the remaining amount it will invest $\frac{1}{3}^{rd}$ in advertising and product development, and out of the balance it will invest $\frac{2}{3}^{rd}$ in increasing production facilities. If the company plans to create an employee entertainment fund of the remaining amount, how much would that fund amount to?

A. tk. 17,000 B. tk. 19,000 C. tk. 21,000 D. tk. 20,000 E. tk. 2000

19. If a and c are positive integers and $4a + 3 = b$ and $4c + 1 = d$, which of the following could be the value of (b+d)? [IBA MBA Dec' 2020]

A. 46 B. 58 C. 68 D. 74 E. 82

20. a = $-3, 2, 0$ and b = $-4, 2, -3$, which can be maximum result as $2a + b^2$? [IBA MBA, Dec' 2021]

A. 20 B. 16 C. -5 D. 0 E. None of these

21. On a particular day, a shop sold 3 fewer laptops of brand X than two times the numbers of laptops of brand Y. If a customer who bought a laptop of X brand had purchased a laptop of Y brand instead of X brand, number of brand X and brand Y sold would have been the same. What is the total number of laptops sold? [IBA MBA 15-16]

A. 8 B. 9 C. 10 D. 12 E. None of these

22. A box contains only marbles. If $\frac{1}{4}$ of the marbles were removed, the box would be filled $\frac{1}{3}$ of its capacity. If instead 100 marbles were added, the box would be full. How many marbles are there in the box? [IBA MBA 15-16]

A. 80 B. 110 C. 140 D. 170 E. None of these

23. In a charity 70 people contributes 11500 taka , 100 per men and 200 per women , find the number of women that contributed. [IBA MBA Dec 2019]

A. 36 B. 40 C. 42 D. 45 E. none of these

24. A company bought $7.3 * 10^5$ papers , research department use $8.9 * 10^3$ papers , papers left is- [IBA MBA Dec 2019]

A. $1.6 * 10^2$ B. $1.6 * 10^4$ C. $7.2 * 10^3$ D. $7.2 * 10^5$ E. None of these

25. $7^{\sqrt{x}} + 24^{\sqrt{x}} = 25^{\sqrt{x}}$, x = ? [IBA MBA, Dec' 2021]

A. 2 B. 3 C. 4 D. A+C E. None of these

Home Task Math

1. A fuel tank is $\frac{1^{th}}{5}$ full and requires 32 gallons more to make it $\frac{3}{7}$ full. What is the capacity of the tank?

A. 120 gallons B. 140 gallons C. 135 gallons D. 141 gallons

2. Which of the following is the solution of $x^2 - (p+q)x + pq = 0$? [জনপ্রশাসন মন্ত্রণালয়ের অধীনে পিএসসি'র (সহকারী পরিচালক) ২০১৬]

A. $\{p, q\}$ B. $\{p, -q\}$ C. $\{-p, -q\}$ D. $\{\neq p, q\}$

3. If one of the roots of $x^2 + mx + 24 = 0$ is 1.5, what is the value of m? [উত্তরা ব্যাংক (প্রবেশনারি অফিসার) ২০২১]

A. -22.5 B. 16 C. -17.5 D. 10.5

4. If $2x + 3y = 36$ and $2x + y = 16$, what is the value of (x, y)? [মাদকদ্রব্য নিয়ন্ত্রণ অধিদপ্তর (উপ-পরিদর্শক)-১৩, জাতীয় রাজস্ব বোর্ডের ইন্সপেক্টর/ এপ্রেইজার/ প্রিভেন্টিভ অফিসার/ গোয়েন্দা কর্মকর্তা-১০, গণপূর্ত অধিদপ্তর উপ-সহকারী প্রকৌশলী)-১১]

A. $(2, 10)$ B. $(3,10)$ C. $(3, 5)$ D. $(6,10)$

5. For what value of 'k' will the pair of equations $3x + 4y = 12$ and $kx + 12y = 30$ does not have a unique solution? [Janata Bank (AEO) 2017]

A. 3 B. 7.5 C. 9 D. 12

6. Asad went to the market to buy 12 oranges. But he found that he had the money to buy only 10 oranges. He calculated that if the price per piece of orange was tk. 3 less, he could have bought 12 oranges. How money did Asad have? [তিতাস গ্যাস ট্রান্সমিশন অ্যান্ড ডিস্ট্রিবিউশন কো. লি. (সহকারী ব্যবস্থাপক) ২০২১]

A. 150 B. 160 C. 175 D. 180

7. If $x = y^a, y = z^b, z = x^c$, then the value of abc is: [PKB (SEO) '18, BHBFC (SO) '17, 16th NTRCA '20]

A. 1 B. 2 C. 0 D. 0.5 E. -1

8. If 'm' and 'n' are whole numbers such that $m^n = 121$, the value of $(m-10)^{(n+1)}$ is:

A. 21 B. 10 C. 100 D. 1000 E. None of these

9. If $\left(\frac{1}{5}\right)^{3y} = 0.008$, then what would $(0.25)^y = ?$

A. 0.75 B. -0.75 C. 0.25 D. 0.0

10. If $16^{2x+4} = 4^{3x+3}$, then x = ? [BKB (Officer) 2017]

A. -5 B. 1 C. $\frac{13}{5}$ D. -1

11. $50^7 \times 20^7$ is 10^x times larger then 1×10^7; where x is-

A. 6 B. 7 C. 13 D. 14

12. If $\left(\frac{a}{b}\right)^{x-1} = \left(\frac{b}{a}\right)^{x-3}$ [Standard Bank (Pro. Off.) 2008]

A. 1 B. 2 C. $\frac{1}{2}$ D. $\frac{7}{2}$

13. At a certain club, the number of male members is twice than that of female members. It $\frac{1}{4}$ male members are engineers and $\frac{1}{5}$ of female members are engineer, what fraction of the members are non-engineers? [IBA MBA '17]

A. $\frac{13}{25}$ B. $\frac{23}{30}$ C. $\frac{2}{5}$ D. $\frac{8}{19}$ E. None of these

14. 5 times of a number is equal 2 times of cube of the number less than 6. What is the square of the number? [IBA MBA Dec '19]

A. $\frac{1}{4}$ B. 2 C. $\frac{9}{4}$ D. 4 E. None of these

15. If x & y are integers, and $7x-4y=20$, which of the following could be the value of x? [IBA MBA 15-16]

A. 6 B. 8 C. 9 D. 15 E. None of these

16. If $(a + a + a) = (b + b + b + b)$ & $a + b = 7$, then what is the value of $(a^2 - b^2)$? [IBA MBA 16-17]

A. 0 B. 3 C. 4 D. 7 E. None of these

17. A man sells seven different sized balls. Each ball costs n taka more than the next one below it in size, and the price of the biggest ball is tk. 46. If the sum of the prices of seven different balls is tk. 196, what is the value of n? [IBA MBA '16]

A. 6 B. 7 C. 8 D. 9 E. None of these

18. A tank that was 40% full of oil emptied into a 20 gallon bucket. If the oil fills 35% of the bucket's volume, then what is the total capacity of the tank, in gallons? [IBA MBA Dec' 20]

A. 8.75 B. 15 C. 16 D. 17.5 E. 19

19. 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? [IBA BBA 14-15]

A. 75 B. 80 C. 100 D. 125 E. None of these

20. The cost of 12 pencils and 10 pens is tk. 320. The cost of 20 pencils and 15 pens is tk. 500. What is the difference between the cost of a pen and a pencil? [IBA MBA '17]

A. 5 B. 10 C. 15 D. 20 E. None of these

21. 6 students did not participate and 10 students failed in exam. Among the students who passed in the exam, Abir stood 15th from the top and 30th from the bottom in the merit list. How many students were there in the class? [IBA MBA '18]

A. 44 B. 50 C. 60 D. 57 E. None of these

22. Asif, Rakib and Saad have x, y and z number of marbles respectively. If $x = 6y = 3z$, what fraction of his marbles should Asif give to Rakib and Saad so that all of them have equal number of marbles? [IBA MBA 16-17]

A. $\frac{1}{5}$ B. $\frac{1}{4}$ C. $\frac{1}{3}$ D. $\frac{1}{2}$ E. None of these

23. If $(125)^{14} \times (48)^8$ were expressed as an integer, how many consecutive zeros would that integer have immediately to the left of its decimal point? [If $(125)^{14} \times (48)^8 = x$, then how many trailing zeros does x have? [IBA MBA Dec' 2020]

A. 22 B. 32 C. 42 D. 50 E. 112

24. If x and y are positive integers and $x^4y^5 = 512$, which of the following is the value of xy? [IBA MBA 15-16]

A. 2 B. 4 C. 8 D. 10 E. None of these

25. If $4^a + 4^{a+1} = 4^{a+2} - 176$, what is the value of a?

A. 2 B. 4 C. 6 D. 8 E. 10

Written Math

1. Rahim gave half of his stamps to Karim, Karim gave half of his stamps to Fatima, Fatima gave $\frac{1}{4}$ of stamps given to the Tonmoy and kept the remaining 12. How many stamps did Rahim start with? [PGCL – AM- 2021]

2. Abir contributed $\frac{2}{3}$ of his salary to a charity, which is half the salary of Sadib. Sadib contributed $\frac{3}{4}$ of his salary to the same charity which is twice the salary of Tazul. Tazul contributed $\frac{1}{4}$ of his salary to the charity. If Sadib's salary is tk. 20,000, what was the total contribution to the charity? [IBA BBA 14-15]

3. Eight people are planning to share the cost of rental car. If one person withdrawn from the arrangement and the others share equally the entire cost of the car, then the share of each of the remaining persons will be increased by-

4. 3 people are splitting a tk. 150 bill. If Ayon pays tk. 5 less than Abir, while Tazul pays more than tk. 60, what is the most Ayon can pay, given all of them pay integer amounts? [IBA MBA '18]

5. A son got $\frac{3\text{th}}{5}$ of his father's property. He sells $\frac{2\text{rd}}{3}$ of his share for tk. 1,00,000. What is the value of the original property owned by his father?

6. Tasty cookies sells two kinds of cakes: lemon for tk. 40 and cheese for tk. 25. On a certain day, the shop sold 100 cakes and got tk. 2980 in revenue from the sales. How many lemon cakes did they sell? [IBA MBA 15-16]

7. Tazul has X number of books, which is 3 times as many as Sadib and $\frac{1}{2}$ as many as Mimi. How many books do the three of them have altogether , in terms of x? [IBA MBA '17]

8. Abir took $\frac{3}{5}$ of the marbles kept in a box. His younger took another $\frac{3}{5}$ of the remaining marbles. Then his sister took another $\frac{3}{5}$ of the remaining marbles. What fraction of the marbles left in the box? [IBA MBA-16]

9. A man spent $\frac{1}{2}$ of his money and then lost $\frac{1}{4}$ of the remainder. He was left with tk. 3600. How much did he start with? [IBA MBA 2015-16]

10. Abir and Chaity buy chocolates and pens at a grocery store that sales each of its chocolates for a certain price and each of its pan for a certain price. Abir spends twice as much as Chaity spends buying three times as much chocolate and the same number of pens. If Chaity spends Tk. 500 on four chocolates and five pens. How much does one pen cost?