

QUESTION 2011

Group - A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any ten of the following:

i) 5P_2 means

- a) 10 ✓b) 20 c) 3 d) 2

ii) The value of $\log_3 27$ is

- a) 5 ✓b) 3 c) 4 d) 2

iii) Which of the following is a null set?

- a) $\{0\}$ b) $\{\phi\}$ ✓c) $\{x: x \text{ is an integer and } 1 < x < 2\}$ d) none of these

iv) If $f(x) = \frac{ax-b}{bx-a}$ then $f(x)f\left(\frac{1}{x}\right)$ is

- a) 0 ✓b) 1 c) -1 d) 2

v) The centre and radius of the circle $x^2 + y^2 - 4x + 6y - 12 = 0$ are respectively

- a) $(2, 3)$ and $\sqrt{5}$ units ✓b) $(2, -3)$ and 5 units
c) $(-4, 6)$ and 10 units d) none of these

vi) The sum of the binomial coefficients $C_0 + C_1 + C_2 + \dots + C_n$ is

- a) 2 b) 2^n c) 2^{n-1} d) none of these

vii) Sum of the first n natural numbers $1 + 2 + 3 + \dots + n$ is

- a) $\frac{n+1}{2}$ ✓b) $\frac{n(n+1)}{2}$ c) $\frac{n(n-1)}{2}$ d) $\frac{n}{2}$

viii) $y = x$ denotes a graph of a

- a) circle ✓b) straight line c) particular point d) none of these

ix) The function $f(x) = x/(x^2 - 9)$ cannot be defined when $x =$

- a) 3, 1 b) -3, 1 ✓c) 3, -3 d) 9, -9

x) if $\frac{a}{b} = \frac{c}{d}$, then each of the ratio is equal to

- ✓a) $\frac{a+c}{b+d}$ b) $\frac{a-d}{b-c}$ c) $\frac{\pm a \pm c}{\pm b \pm d}$ d) none of these

xi) If α and β are the roots of the equation $x^2 - 2x + 1 = 0$, then the value of $\frac{1}{\alpha} + \frac{1}{\beta}$ is

- a) -2 b) 0 c) 1 ✓d) 2

xii) The value of x for which the equation $2^x = 3^{-x}$ is satisfied is

- a) 1 ✓b) 0 c) -1 d) none of these

Group - B

(Short Answer Type Questions)

2. Show that the two circles $x^2 + y^2 + 2gx + 2fy = 0$ and $x^2 + y^2 + 2g'x + 2f'y = 0$ will touch each other if $f'g = g'f$.

See Topic: **TWO DIMENSIONAL COORDINATE GEOMETRY**, Short Answer Type Question No. 10.

3. In how many ways can 12 examination papers be arranged so that the best and the worst papers may not come together?

See Topic: **PERMUTATIONS AND COMBINATIONS**, Short Answer Type Question No. 4.

4. The 10th term of an A.P. is 15 and 16th term is 45, find the 30th term.

See Topic: **SEQUENCES & SERIES**, Short Answer Type Question No. 4.

5. If $\log\left(\frac{a-b}{3}\right) = \frac{1}{2}(\log a + \log b)$, then show that $a^2 + b^2 = 11ab$.

See Topic: BASIC ALGEBRA, Short Answer Type Question No. 2.

6. Prove that: $(A \cup B) - (A \cap B) = (A - B) \cup (B - A)$.

See Topic: SETS, Short Answer Type Question No. 2.

Group - C

(Long Answer Type Questions)

7. a) A man can buy a flat for Rs. 1,00,000 cash or for Rs. 50,000 down and Rs. 60,000 at the end of the year. If money is worth 10% per year compounds half yearly, which plan should be chosen?
See Topic: COMPOUND INTEREST AND ANNUITY, Long Answer Type Question No. 3.

b) If $x = \frac{\sqrt{a+b} + \sqrt{a-b}}{\sqrt{a+b} - \sqrt{a-b}}$ then show that $bx^2 - 2ax + b = 0$

See Topic: BASIC ALGEBRA, Long Answer Type Question No. 9.

c) Prove that $\log(1+2+3) = \log 1 + \log 2 + \log 3$

See Topic: BASIC ALGEBRA, Long Answer Type Question No. 19.

8. a) How many ways can the letters of the word VOWEL be arranged?

i) How many of these begin with V?

ii) How many begin with V and do not end with L?

See Topic: PERMUTATIONS AND COMBINATIONS, Long Answer Type Question No. 3.

b) A moving straight line always passes through the point (h, k) . Prove that the locus of the middle point of the portion of the straight line intercepted between the axes of coordinates is

$$\frac{h}{x} + \frac{k}{y} = 2.$$

See Topic: TWO DIMENSIONAL COORDINATE GEOMETRY, Long Answer Type Question No. 14.

c) For $\Omega = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$; $A = \{2, 3, 5, 7\}$; $B = \{2, 3, 4, 5, 6\}$; $C = \{2, 4, 6, 8\}$, verify the following results:

i) $A - (B \cup C) = (A - B) \cap (A - C)$

ii) $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$

iii) $(A \cap B)^c = (A^c \cup B^c)$

See Topic: SETS, Long Answer Type Question No. 10.

9. a) For what of value of x , $3x^2 + 6x + 7$ is least? Also find the least value of this expression.

See Topic: THEORY OF QUADRATIC EQUATION, Long Answer Type Question No. 11.

b) Find the equation of the straight line passing through the intersection of $2x - 3y + 4 = 0$ & $3x + 4y - 5 = 0$ and is perpendicular to the line $6x - 7y + 8 = 0$.

See Topic: **TWO DIMENSIONAL COORDINATE GEOMETRY**, Long Answer Type Question No. 15.

c) If $(3x - 2y) : (3x + 2y) = 4 : 5$, then what is the value of $x : y$?

See Topic: **RATIO, PROPORTION AND VARIATION**, Long Answer Type Question No. 5.

10. a) If $a^x = b^y = c^z$ and $b^2 = ac$, prove that $\frac{1}{x} + \frac{1}{z} = \frac{2}{y}$.

See Topic: **BASIC ALGEBRA**, Long Answer Type Question No. 1.

b) The expenses of boarding house are partly fixed and partly variable with the number of boarders. The expenses are Rs. 700 per head when there are 25 boarders and Rs. 600 per head when there are 50 boarders. Find the expenses per head when there are 100 boarders.

See Topic: **RATIO, PROPORTION AND VARIATION**, Long Answer Type Question No. 4.

c) In a cricket team of 14 players, there are 6 bowlers. How many different teams of 11 players can be formed taking at least 4 bowlers in the team?

See Topic: **PERMUTATIONS AND COMBINATIONS**, Long Answer Type Question No. 4.

11. a) Find the sum to n terms: $0.7 + 0.77 + 0.777 + \dots$

See Topic: **SEQUENCES & SERIES**, Long Answer Type Question No. 11.

b) If $f(x) = \frac{|x|}{x}$, $x \neq 0$ and c be a non-zero real number, show that $|f(c) - f(-c)| = 2$.

See Topic: **FUNCTIONS**, Long Answer Type Question No. 2.

c) If $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in A.P. and $a + b + c \neq 0$, then show that $\frac{b+c}{a}, \frac{c+a}{b}, \frac{a+b}{c}$ are also in

A.P.

See Topic: **SEQUENCES & SERIES**, Long Answer Type Question No. 12.