

QUESTION 2012

Group - A

(Multiple Choice Type Questions)

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

i) The value of $\log_{\frac{1}{2}} 64$ is

a) 6

✓b) -6

c) $\frac{1}{6}$

d) $-\frac{1}{6}$

ii) The term containing x^8 in $(1+x^2)^{10}$ is

a) 5th

b) 4th

c) 6th

✓d) 7th

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- iii) Slope of the line parallel to the line joining the points (2,5) and (-4,3) is
a) -3 b) 3 c) 1/3 ✓d) -1/3
- iv) $(\sqrt{2+1})^n + (\sqrt{2-1})^n =$
a) 180 b) 90 c) 198 d) 99
- Correct answer is 28.
- v) If $\frac{1}{2}(\log a + \log b) = \log \frac{a+b}{2}$, then
a) $ab = 1$ ✓b) $a = b$ c) $a + b = 1$ d) $a - b = 1$
- vi) The mean proportion between p^3q and pq^3 is
a) pq b) p^2q^2 ✓c) $\pm p^2q^2$ d) p^4q^4
- vii) 10th term of the G.P. $1 + \frac{1}{4} + \frac{1}{4^2} + \dots$ is
a) $\frac{1}{4^8}$ ✓b) $\frac{1}{4^9}$ c) $\frac{1}{4^{10}}$ d) none of these
- viii) The points (1,2), (2,4) and (x,6) are collinear. Then $x =$
✓a) 3 b) 4 c) 0 d) -3
- ix) Radius of the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ is
✓a) $\sqrt{g^2 + f^2 - c}$ b) $\sqrt{g^2 - f^2 - c}$ c) $\sqrt{g^2 + f^2 + c}$ d) $\sqrt{g^2 - f^2 + c}$
- x) Which one of the following represents a circle?
a) $x^2 + y^2 - 2xy + 4x + 4y - 5 = 0$ ✓b) $x^2 + y^2 - 3x + 2y - 5 = 0$
c) $x^2 - y^2 + 4x - 7y + 3 = 0$ d) $x^2 + 2y^2 + 3x - y + 6 = 0$
- xi) If $f(x) = \frac{|x|}{x}$, then for any $\lambda > 0$, $|f(\lambda) - f(-\lambda)| =$
a) 1 ✓b) 2 c) -1 d) 0

Group - B

(Short Answer Type Questions)

2. If $a = xy^{p-1}$, $b = xy^{q-1}$, $c = xy^{r-1}$ then prove that

$$a^{q-r} \cdot b^{r-p} \cdot c^{p-q} = 1.$$

See Topic: **BASIC ALGEBRA, Short Answer Type Question No. 3.**

3. A straight line passes through the point (2, 3) and the sum of its intercepts on X axis and Y axis is 10. Prove that the equation of the straight line is $x + y = 5$.

See Topic: TWO DIMENSIONAL COORDINATE GEOMETRY, Short Answer Type Question No. 11.

If the coefficient of x^3 in the expansion of $\left(x^2 + \frac{k}{x}\right)^6$ be 160, find the value of k .

See Topic: MATHEMATICAL INDUCTION & BINOMIAL THEOREM, Short Answer Type Question No. 4.

4. In how many ways can the letters of the word 'BALLOON' be arranged, so that two O's do not come together?

See Topic: PERMUTATIONS AND COMBINATIONS, Short Answer Type Question No. 6.

5. Without using Venn Diagram prove that $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

See Topic: SETS, Short Answer Type Question No. 3.

Group - C

(Long Answer Type Questions)

6. a) If α and β are two non-zero roots of $x^2 + px + q = 0$, find the equation whose roots are $\frac{1}{\alpha + \beta}$ and $\frac{1}{\alpha} + \frac{1}{\beta}$.

See Topic: THEORY OF QUADRATIC EQUATION, Long Answer Type Question No. 12.

b) Find the equation of the straight line which passes through the point of intersection of the lines $x - y + 1 = 0$, $3x + y - 5 = 0$ and is parallel to the line $7x - 8y + 13 = 0$.

See Topic: TWO DIMENSIONAL COORDINATE GEOMETRY, Long Answer Type Question No. 1.

c) In a class of 50 students, 15 read Physics, 20 read Chemistry and 20 read Mathematics, 3 read Physics and Chemistry, 6 read Chemistry and Mathematics and 5 read Physics and Mathematics and 7 read none of the subject. How many students read all the subjects?

See Topic: SETS, Long Answer Type Question No. 11.

7. a) Divide 21 into three parts, which will be in A.P., such that the product of the first and second parts is 28.

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

b) If $f(x) = \frac{1-x}{1+x}$ find $f\left\{f\left(\frac{1}{x}\right)\right\}$.

See Topic: FUNCTIONS, Long Answer Type Question No. 3.

c) Show that $2 + \sqrt{17}$ is not a rational number.

See Topic: BASIC ALGEBRA, Long Answer Type Question No. 20.

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8. a) In a G.P. p -th, q -th and r -th terms are respectively a, b, c . Show that $a^{q-r}b^{r-p}c^{p-q} = 1$.

See Topic: SEQUENCES & SERIES, Long Answer Type Question No. 13.

b) If $x^2 + y^2 = 14xy$, prove that $2 \log \frac{x+y}{4} = \log x + \log y$.

See Topic: BASIC ALGEBRA, Long Answer Type Question No. 21.

c) If $\frac{x}{y+z} = \frac{y}{z+x} = \frac{z}{x+y}$, then show that $x+y+z = 0$ or each fraction = $\frac{1}{2}$

See Topic: BASIC ALGEBRA, Long Answer Type Question No. 22.

9. a) What is the present value of Rs 1000 due in 2 years at 5% compounded interest according as the interest is paid (i) yearly (ii) half-yearly.

See Topic: COMPOUND INTEREST AND ANNUITY, Long Answer Type Question No. 4.

b) Apply the principle of mathematical induction to prove that

$$\frac{1}{4.7} + \frac{1}{7.10} + \frac{1}{10.13} + \dots + \frac{1}{(3n+1).(3n+4)} = \frac{n}{4(3n+4)}$$

See Topic: MATHEMATICAL INDUCTION & BINOMIAL THEOREM, Long Answer Type Question No. 4.

c) Solve: $2^{x+2} + 2^{x-1} = 9$

See Topic: BASIC ALGEBRA, Long Answer Type Question No. 23.

10. a) Find the locus of the point, the ratio of whose distances from the line $x = 2$ and from the point $(5, -1)$ is 3 : 2.

See Topic: TWO DIMENSIONAL COORDINATE GEOMETRY, Long Answer Type Question No. 11.

b) State De Morgan's laws.

If $U = \{-1, -2, 0, 3, 5, 10, 12, 13, 16\}$, $P = \{-2, 3, 5, 12\}$, $Q = \{-1, -2, 0, 5, 12, 13\}$, then verify De Morgan's Laws.

See Topic: SETS, Long Answer Type Question No. 12.

c) Find the equation of the circle through the points $(4, 3)$ and $(-2, 5)$ and having its centre on the line $2x - 3y = 4$.

See Topic: TWO DIMENSIONAL COORDINATE GEOMETRY, Long Answer Type Question No. 12.