

QUESTION 2014

Group - A
(Multiple Choice Type Questions)

1. Answer any ten questions

i) The value of $\log_3 27$ is

a) 5

✓ b) 3

c) 4

d) 2

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- ii) If A and B are any two sets then $A \cap (A \cap B)^c =$
- ✓a) ϕ b) B^c c) A^c d) B
- iii) 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
- iv) 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
- v) The value of $\log_b a \times \log_c b \times \log_a c$ is equal to
- ✓a) 1 b) 0 c) 2 d) none of these
- vi) If $f(x) = x^2 - 2x + 2$ is an
- a) even function b) odd function
c) both (a) and (b) ✓d) neither (a) nor (b)
- vii) 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
- viii) Angle made by the straight line $y = x$ with x-axis is
- a) 30° ✓b) 45° c) 60° d) 90°
- ix) In how much time will Rs. 3000 amount to Rs. 3993 at 40% p.a. compounded quarterly?
- ✓a) 8 months b) 6 months c) 9 months d) 11 months
- x) Centre and radius of the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ is
- a) (g, f) and $\sqrt{g^2 + f^2 + c}$ ✓b) $(-g, -f)$ and $\sqrt{g^2 + f^2 - c}$
c) $(-g, -f)$ and $\sqrt{g^2 + f^2 + c}$ d) (g, f) and $\sqrt{g^2 + f^2 - c}$
- xi) $(a+b)^5$ contains
- a) 5 terms ✓b) 6 terms c) 4 terms d) 7 terms

Group - B
(Short Answer Type Questions)

2. In a class of 100 students, 45 students read physics, 52 students read chemistry and 17 students read both the subjects. Find the no. of students who study neither physics nor chemistry.
See Topic: SET, Long Answer Type Question No. 5.

3. If $x \propto y$ and $y \propto z$ then prove that $(x^2 + y^2 + z^2) \propto (x^3 + y^3 + z^3)^{\frac{2}{3}}$.

See Topic: RATIO, PROPORTION AND VARIATION, Short Answer Type Question No. 2.

4. In how many ways can the letters of the word INDIA be arranged?

See Topic: PERMUTATIONS AND COMBINATIONS, Short Answer Type Question No. 2.

5. Find the equation of the locus of a point such that the difference of its distances from the points (5, 0) and (-5, 0) is always 5 units.

See Topic: TWO DIMENSIONAL COORDINATE GEOMETRY, Short Answer Type Question No. 4.

6. Find the co-efficient of x^{10} in the expansion of $\left(x - \frac{2}{x}\right)^{16}$.

See Topic: MATHEMATICAL INDUCTION & BINOMIAL THEOREM, Short Answer Type Question No. 2.

Group - C

(Long Answer Type Questions)

7. a) If $x = 3 + 2\sqrt{2}$, find the values of $x^3 + \frac{1}{x^3}$ and $x^4 - \frac{1}{x^4}$.

b) If one root of the equation $x^2 + px + q = 0$ be three times the other root, then show that $3p^2 = 16q$

c) Sum and product of three numbers of a G.P are respectively 52 and 1728. Find the numbers.

a) See Topic: BASIC ALGEBRA, Short Answer Type Question No. 5.

b) See Topic: THEORY OF QUADRATIC EQUATION, Long Answer Type Question No. 4.

c) See Topic: SEQUENCES & SERIES, Long Answer Type Question No. 6.

8. a) Find the sum of the series $1 \times 2 + 2 \times 3 + 3 \times 4 + \dots$ upto n terms.

b) Show that the points (3, 0), (6, 4) and (-1, 3) are the vertices of a right-angled isosceles triangle.

c) Find the angle between the straight lines $x - 2y + 1 = 0$ and $x + 3y = 2$.

a) See Topic: SEQUENCES & SERIES, Long Answer Type Question No. 1.

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

7.
c) See Topic: TWO DIMENSIONAL COORDINATE GEOMETRY, Short Answer Type Question No. 12.

9. a) Find the equation of the circle concentric to

$x^2 + y^2 - 4x + 6y - 13 = 0$ and passing through the point (-4, 5).

b) Show that the circle $x^2 + y^2 - 6x - 8y + 23 = 0$ does not touch the straight line $4x - 7y + 28 = 0$.

c) Find the square root of $(18 + 12\sqrt{3})$

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

9.

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b) See Topic: **TWO DIMENSIONAL COORDINATE GEOMETRY**, Short Answer Type Question No. 13.

c) See Topic: **BASIC ALGEBRA**, Long Answer Type Question No. 2

10. a) The expenses of a boarding house are partly fixed (house rent, establishment, etc) and partly variable with the number of boarders (expenses for daily food, etc.). The expenses are Rs. 70 per head when there are 25 boarders and Rs. 60 per head when there are 50 boarders. Find the expenses per head when there are 100 boarders.

b) 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?

c) 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?

a) See Topic: **RATIO, PROPORTION AND VARIATION**, Long Answer Type Question No. 1.

b) See Topic: **PERMUTATIONS AND COMBINATIONS**, Long Answer Type Question No. 1.

c) See Topic: **COMPOUND INTEREST AND ANNUITY**, Long Answer Type Question No. 1.

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

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

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

d) Without using Venn diagram, prove that $(A \cup B)^c = A^c \cap B^c$

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

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

c) See Topic: **BASIC ALGEBRA**, Short Answer Type Question No. 6.

d) See Topic: **SET**, Short Answer Type Question No. 5.