

COMMON QUARTERLY EXAMINATION - 2024

Standard X

Reg.No.

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MATHEMATICS

Time : 3.00 hrs

Part - I

Marks : 100

14 x 1 = 14

I. Choose the correct answer:

1. $A = \{a, b, p\}$, $B = \{2, 3\}$, $C = \{p, q, r, s\}$ then $n[(A \cup C) \times B]$ is

- a) 8 b) 20 c) 12 d) 16

2. If $f(x) = 2x^2$ and $g(x) = \frac{1}{3x}$, then $f \circ g$ is

- a) $\frac{3}{2x^2}$ b) $\frac{2}{3x^2}$ c) $\frac{2}{9x^2}$ d) $\frac{1}{6x^2}$

3. A function $f : \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = ax^2 + bx + c$, ($a \neq 0$) is called a

- a) constant function b) cubic function
c) reciprocal function d) quadratic function

4. $7^{4K} \equiv \underline{\hspace{2cm}} \pmod{100}$

- a) 1 b) 2 c) 3 d) 4

5. The sum of first n natural numbers are also called _____.

- a) Amicable numbers b) Pyramidal numbers
c) Triangular numbers d) Friendly numbers

6. The value of $(1^3 + 2^3 + 3^3 + \dots + 15^3) - (1 + 2 + 3 + \dots + 15)$ is

- a) 14400 b) 14200 c) 14280 d) 14520

7. $\frac{3y-3}{y} + \frac{7y-7}{3y^2}$ is

- a) $\frac{9y}{7}$ b) $\frac{9y^3}{(21y-21)}$ c) $\frac{21y^2 - 42y + 21}{3y^3}$ d) $\frac{7(y^2 - 2y + 1)}{y^2}$

8. Graph of a linear equation is a _____.

- a) straight line b) circle c) parabola d) hyperbola

9. The square root of $\frac{256x^8y^4z^{10}}{25x^6y^6z^6}$ is equal to

- a) $\frac{16}{5} \left| \frac{x^2z^4}{y^2} \right|$ b) $16 \left| \frac{y^2}{x^2z^4} \right|$ c) $\frac{16}{5} \left| \frac{y}{xz^2} \right|$ d) $\frac{16}{5} \left| \frac{xz^2}{y} \right|$

10. If $\triangle ABC$ is an isosceles triangle with $\angle C = 90^\circ$ and $AC = 5$ cm, then AB is
- a) 2.5 cm b) 5 cm c) $5\sqrt{2}$ cm d) $5\sqrt{2}$ cm
11. In a $\triangle ABC$, AD is the bisector of $\angle BAC$. If $AB = 8$ cm, $BD = 6$ cm and $DC = 3$ cm. The length of the side AC is
- a) 6 cm b) 4 cm c) 3 cm d) 8 cm
12. The area of triangle formed by the points $(-5,0)$, $(0,-5)$ and $(5,0)$ is
- a) 0 sq.units b) 25 sq.units c) 5 sq.units d) none of these
13. The slope of the line joining $(12,3)$, $(4,a)$ is $\frac{1}{8}$. The value of 'a' is
- a) 1 b) 4 c) -5 d) 2
14. $\tan\theta \operatorname{cosec}^2\theta - \tan\theta$ is equal to
- a) $\sec\theta$ b) $\cot^2\theta$ c) $\sin\theta$ d) $\cot\theta$

Part - II

II. Answer any 10 questions. (Q.No.28 is compulsory) 10 x 2 = 20

15. A relation R is given by the set $\{(x,y) / y = x + 3, x \in \{0,1,2,3,4,5\}\}$. Determine its domain and range.
16. Given the function $f : x \rightarrow x^2 - 5x + 6$, evaluate
- i) $f(-1)$ ii) $f(2a)$
17. Find k if $f(f(k)) = 5$ where $f(k) = 2k - 1$.
18. Find the HCF of 252525 and 363636.
19. What is the time 15 hours before 11 p.m.?
20. Find the sum $3 + 1 + \frac{1}{3} + \dots + \infty$
21. Subtract $\frac{1}{x^2 + 2}$ from $\frac{2x^3 + x^2 + 3}{(x^2 + 2)^2}$
22. Solve $x^2 + 2x - 2 = 0$ by formula method.
23. If $\triangle ABC$ is similar to $\triangle DEF$ such that $BC = 3$ cm, $EF = 4$ cm and area of $\triangle ABC = 54$ cm². Find the area of $\triangle DEF$.
24. In $\triangle ABC$, D and E are points on the sides AB and AC respectively such that $DE \parallel BC$. If $\frac{AD}{DB} = \frac{3}{4}$ and $AC = 15$ cm, find AE .
25. Show that the points $(-2,5)$, $(6,-1)$ and $(2,2)$ are collinear.

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26. Find the slope and y intercept of $\sqrt{3}x + (1 - \sqrt{3})y = 3$

27. Prove that $\sec\theta - \cos\theta = \tan\theta \sin\theta$

28. Find the excluded values of the following expression : $\frac{7P + 2}{8P^2 + 13P + 5}$

Part - III

III. Answer any 10 questions. (Q.No.42 is compulsory)

10 x 5 = 50

29. Let $A = \{x \in W / x < 2\}$, $B = \{x \in N / 1 < x \leq 4\}$ and $C = \{3, 5\}$, verify that

$$A \times (B \cap C) = (A \times B) \cap (A \times C)$$

30. Let $A = \{1, 2, 3, 4\}$ and $B = \{2, 5, 8, 11, 14\}$ be two sets. Let $f : A \rightarrow B$ be a function given by $f(x) = 3x - 1$. Represent this function

i) by arrow diagram

ii) in a table form

iii) as a set of ordered pairs

iv) in a graphical form

31. A function $f : [-5, 9] \rightarrow R$ is defined as follows :

$$f(x) = \begin{cases} 6x + 1 & ; -5 \leq x < 2 \\ 5x^2 - 1 & ; 2 \leq x < 6 \\ 3x - 4 & ; 6 \leq x \leq 9 \end{cases}$$

Find

i) $f(-3) + f(2)$

ii) $f(7) - f(1)$

iii) $2f(4) + f(8)$

iv) $\frac{2f(-2) - f(6)}{f(4) + f(-2)}$

32. The sum of first n , $2n$ and $3n$ terms of an A.P are S_1 , S_2 and S_3 respectively. Prove that $S_3 = 3(S_2 - S_1)$.

33. In a G.P the product of three consecutive term is 27 and the sum of the product of two terms taken at a time is $\frac{57}{2}$. Find the three terms.

34. Solve the following system of linear equations in three variables

$$3x - 2y + z = 2, \quad 2x + 3y - z = 5, \quad x + y + z = 6$$

35. If $9x^4 + 12x^3 + 28x^2 + ax + b$ is a perfect square, find the values of a and b .

36. If α, β are the roots of $7x^2 + ax + 2 = 0$ and if $\beta - \alpha = \frac{-13}{7}$, find the value of a .

37. State and prove Thales theorem.

38. Find the area of the quadrilateral formed by the points (8,6), (5,11), (-5,12) and (-4,3)
39. You are downloading a song. The percent y (in decimal form) of mega bytes remaining to get downloaded in x second is given by $y = -0.1x + 1$
- Find the total MB of the song
 - After how many seconds will 75% of the songs gets downloaded?
 - After how many seconds the song will be downloaded completely?
40. Find the equation of the perpendicular bisector of the line joining the points A(-4,2) and B(6,-4)
41. If $\cot\theta + \tan\theta = x$ and $\sec\theta - \cos\theta = y$, then prove that $(x^2y)^{2/3} - (xy^2)^{2/3} = 1$
42. Find the sum of $10^3 + 11^3 + 12^3 + \dots + 20^3$

Part - IV

IV. Answer all the questions.

2 x 8 = 16

43. a) Construct a triangle similar to a given triangle PQR with its sides equal to $\frac{7}{3}$ of the

corresponding sides of the triangle PQR (Scale factor $\frac{7}{3} > 1$)

(OR)

- b) Construct a triangle ΔPQR such that $QR = 5$ cm, $\angle P = 30^\circ$ and the altitude from P to QR is of length 4.2 cm.
44. a) A bus is travelling at a uniform speed of 50 km/hr. Draw the distance-time graph and hence find
- The constant of variation
 - How far will it travel in 90 minutes?
 - The time required to cover a distance of 300 km from the graph.

(OR)

- b) Draw the graph of $xy = 24$, $x, y > 0$. Using the graph find,
- y when $x = 3$ and
 - x when $y = 6$
