# COMMON QUARTERLY EXAMINATION - 2024

**Standard X** Reg.No. ☐☐☐☐☐☐

## MATHEMATICS

**Time : 3.00 hrs** **Marks : 100**

**Part - I**

**I. Choose the correct answer:** **14 x 1 = 14**

1. A = {a,b,p}, B = {2,3}, C = {p,q,r,s} then n[(A ∪ C) x B] is
   a) 8 b) 20 c) 12 d) 16

2. If $f(x) = 2x^2$ and $g(x) = \frac{1}{3x}$, then fog 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 : R→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. $7^{4K} \equiv$ _____ (mod 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 $(1^3 + 2^3 + 3^3 + \ldots\ldots + 15^3) - (1 + 2 + 3 + \ldots\ldots + 15)$ is
   a) 14400 b) 14200 c) 14280 d) 14520

7. $\frac{3y-3}{y} \div \frac{7y-7}{3y^2}$ 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 $\Delta ABC$ is an isosceles triangle with $\angle C = 90^\circ$ and AC = 5cm, then AB is

a) 2.5 cm b) 5 cm c) 10 cm d) $5\sqrt{2}$ cm

11. In a $\Delta ABC$, 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 $f : x \to x^2 - 5x + 6$, evaluate

i) f(–1) ii) f(2a)

17. Find k if fof(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 $3 + 1 + \frac{1}{3} + \ldots\ldots\infty$

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 $\Delta ABC$ is similar to $\Delta DEF$ such that BC = 3 cm, EF = 4 cm and area of $\Delta ABC$ = 54 $cm^2$. Find the area of $\Delta DEF$.

24. In $\Delta ABC$, D andE are points on the sides AB and AC respectively such that DE||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.

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→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] → 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

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

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

36. If $\alpha$, $\beta$ 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 $y = -0.1x + 1$
    i) Find the total MB of the song
    ii) After how many seconds will 75% of the songs gets downloaded?
    iii) 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 $10^3 + 11^3 + 12^3 + \ldots\ldots\ldots + 20^3$

## 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, ∠P = 30° 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
    i) The constant of variation
    ii) How far will it travel in 90 minutes?
    iii) 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,
    i) y when x = 3 and
    ii) x when y = 6

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