

# 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)  $\frac{16}{5} \sqrt{\frac{x^2z^4}{y^2}}$                       b)  $16 \sqrt{\frac{y^2}{x^2z^4}}$                       c)  $\frac{16}{5} \sqrt{\frac{y}{xz^2}}$                       d)  $\frac{16}{5} \sqrt{\frac{xz^2}{y}}$



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) 10 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  $\triangle ABC = 54$  cm<sup>2</sup>. 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.

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  $\alpha, \beta$  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  $y = -0.1x + 1$
- 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 × 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  $\Delta PQR$  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  $y = 6$

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