

QUARTERLY EXAMINATION - 2024

STD - X

MATHEMATICS

TIME : 3.00 Hrs

MARKS : 100

I. Choose the most suitable answers from the given four alternatives.

14 x 1 = 14

1. $f(x) = (x+1)^3 - (x-1)^3$ represents a function which is
a) linear b) cubic c) reciprocal d) quadratic
2. If $A = \{x, y, z\}$ $B = \{3, 5\}$ $C = \{z, a, b, c\}$ $n[(A \cup C) \times B]$ is
a) 16 b) 12 c) 20 d) 8
3. $7^{4k} \equiv \dots \pmod{100}$ a) 1 b) 2 c) 3 d) 4
4. The value of $(1^3 + 2^3 + 3^3 + \dots + 15^3) - (1 + 2 + 3 + \dots + 15)$
a) 14200 b) 14280 c) 14520 d) 14400
5. The value of a, b if $4x^4 - 24x^3 + 76x^2 + ax + b$ is a perfect square.
a) 100, 120 b) 10, 12 c) -120, 100 d) 12, 10
6. The solution of $(2x - 1)^2 = 9$ is equal to a) -1 b) 2 c) -1, 2 d) none of these
7. If in $\triangle ABC$, $DB \parallel BC$, $AB = 3.6$ cm, $AC = 2.4$ cm and $AD = 2.1$ cm, then length of AE is
a) 1.4 cm b) 1.8 cm c) 1.2 cm d) 1.05 cm
8. The point of intersection of $3x - y = 4$ and $x + y = 8$ is
a) (5, 3) b) (3, 5) c) (4, 4) d) (2, 4)
9. The slope of the line which is perpendicular to a line joining the points (0,0) and (-8,8) is
a) -8 b) $\frac{1}{3}$ c) 1 d) -1
10. The value of $(1 + \tan \theta + \sec \theta)(1 - \cot \theta - \operatorname{cosec} \theta)$ is a) -1 b) 0 c) 1 d) 2
11. The value of $\sin^2 \theta + \frac{1}{1 + \tan^2 \theta}$ is a) \tan^2 b) 1 c) $\cot^2 \theta$ d) 0
12. If $\sqrt{4m^2 - 24m + 36} = 0$ a) $4(m-3)$ b) $2(m-3)$ c) $(2m-3)^2$ d) $(m-3)$
13. The HCF of number of the form 2^m and 3^n is a) mn b) 2^{m+n} c) 1 d) 2^{mn}
14. What is the time 100 hours after 6 am? a) 11 a.m b) 9 a.m c) 11 p.m d) 10 a.m

II. Answer any 10 questions. Q.No.28 is compulsory.

10 x 2 = 20

15. If $A = B = \{p, q\}$ find i) $A \times B$ ii) $B \times A$
16. Find the value of k , such that $f \circ g = g \circ f$. $f(x) = 3x + 2$, $g(x) = 6x - k$
17. If $a^b \times b^a = 800$. Find a and b .
18. Find x, y and z given that the numbers $x, 10, y, 24, z$ are in A.P.
19. 9, 3, 1 are in G.P find 8th term.
20. Simplify : $\frac{x^2 - 11x + 18}{x^2 - 4x + 4}$
21. Find the sum and product of the roots for following quadratic equation $x^2 + 8x - 65 = 0$.
22. Find the square root of the following rational expression. $\frac{121(a+b)^8(x+y)^8(b-c)^8}{81(b-c)^4(a-b)^{12}(b-c)^4}$
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. Find the value of a for which the given points are collinear. $(2, 3)$ $(4, a)$ $(6, -3)$
25. Find the slope of a line joining the points $(7, \sqrt{7})$ with the origin.

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26. Prove that $\frac{\sec \theta}{\sin \theta} - \frac{\sin \theta}{\cos \theta} = \cot \theta$

27. Prove that $\frac{\sqrt{1+\cos \theta}}{1-\cos \theta} = \operatorname{cosec} \theta + \cot \theta$

28. Find the equation of a straight line passing through (5, -3) (7, -4).

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

10 x 5 = 50

29. Let $A = \{x \in W / x < 2\}$ $B = \{x \in N / 1 < x \leq 4\}$ $C = \{3, 5\}$ verify that $wAx(B \cup C) = (Ax \cap B) \cup (Ax \cap C)$

30. The function 't' which maps temperature in celsius(C) into temperature in Fahrenheit(F) is defined by

$$t(c) = F \text{ where } F = \frac{9}{5}C + 32. \text{ Find i) } t(0) \text{ ii) } t(28) \text{ iii) } t(-10) \text{ iv) the value of } C \text{ when } t(C) = 212$$

v) the temperature when the celsius value is equal to the Fahrenheit value.

31. If $f(x) = x - 4$ $g(x) = x^2$ $h(x) = 3x - 5$. Prove that $(f \circ g) \circ h = f \circ (g \circ h)$

32. If 'd' is the highest common factor of 32 and 60. Find x and y satisfying $d = 32x + 60y$

33. Find the middle term of an A.P. The sum of first three terms are -3, the sum of last three terms are 69. Total number of terms are 15.

34. Find the sum of $15^2 + 16^2 + \dots + 28^2$.

35. Solve: $3x + y - 32 = 1$, $-2x - y + 22 = 1$, $-x - y + z = 2$.

36. Simplify: $\frac{b^2 + 3b - 28}{b^2 + 4b + 4} \div \frac{b^2 - 47}{b^2 - 5b - 14}$

37. If $ax^4 + bx^3 + 361x^2 + 220x + 100$ is a perfect square, find the values of a and b.

38. State and prove Basic Proportionality theorem.

39. Prove that $\tan^2 A - \tan^2 B = \frac{\sin^2 A - \sin^2 B}{\cos^2 A \cos^2 B}$

40. If the vertices of a ΔABC are A(6,2) B(-5, -1) and C(1,9) i) Find the equation of median (ii) find the equation of altitude.

41. Find the equation of a straight line joining the point of intersection $3x + y + z = 0$ and $x - 2y - 4 = 0$ to the point of intersection of $7x - 3y = -12$ and $2y = x + 3$.

42. Find the value of k if the area of a quadrilateral is 72 sq. units. Whose vertices are taken in the order A(-5, 7) B(-4, k) C(-1, -6) and D(4, 5)

IV. Answer all the questions.

2 x 8 = 16

43. a) Construct a ΔPQR in which $PQ = 8\text{cm}$, $R = 60^\circ$ and the median RG from R to PQ is 5.8 cm. Find the length of altitude from R to PQ . (OR)

b) Construct a triangle similar to given triangle LMN with its sides equal to $\frac{4}{5}$ of the corresponding sides of the triangle LMN. (Scale factor $\frac{4}{5} < 1$).

44. a) Varshika drew 6 circles with different sizes. Draw a graph for the relationship between the diameter and circumference (approximately related) of each circle as shown in the table and use it to find the circumference of a circle when its diameter is 6cm.

Diameter (x) cm	1	2	3	4	5
Circumference (y) cm	3.1	6.2	9.3	12.4	15.5

(OR)

b) Graph the following linear function $y = \frac{1}{2}x$. Identify the constant of variation and verify it with the graph.

Also i) find y when x = 9 ii) find x when y = 7.5