

MODEL QUARTELY EXAMINATION- 2024

STD:10

MATHEMATICS

MARKS :100

TIME 3 HRS

CHOOSE THE CORRECT ANSWER :

14X1=14

- If there are 1024 relations from a set $A = \{1, 2, 3, 4, 5\}$ to a set B , then the number of elements in B is
(A) 3 (B) 2 (C) 4 (D) 8
- Let $f(x) = \sqrt{1+x^2}$ then
(A) $f(xy) = f(x).f(y)$ (B) $f(xy) \geq f(x).f(y)$
(C) $f(xy) \leq f(x).f(y)$ (D) None of these
- If the HCF of 65 and 117 is expressible in the form of $65m-117$, then the value of m is
(A) 4 (B) 2 (C) 1 (D) 3
- 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
- $y^2 + \frac{1}{y^2}$ is not equal to
(A) $\frac{y^4+1}{y^2}$ (B) $(y + \frac{1}{y})^2$ (C) $(y - \frac{1}{y})^2 + 2$ (D) $(y + \frac{1}{y})^2 - 2$
- Graph of a linear equation is a _____
(A) straight line (B) circle (C) parabola (D) hyperbola
- The solution of $(2x - 1)^2 = 9$ is equal to
(A) -1 (B) 2 (C) -1, 2 (D) None of
- If in triangles ABC and EDF , $\frac{AB}{DE} = \frac{BC}{FD}$ then they will be similar,
(A) $\angle B = \angle E$ (B) $\angle A = \angle D$ (C) $\angle B = \angle D$ (D) $\angle A = \angle F$
- 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
- 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
- The slope of the line which is perpendicular to a line joining the points $(0,0)$ and $(-8,8)$ is
(A) -1 (B) 1 (C) $\frac{1}{3}$ (D) -8
- When proving that a quadrilateral is a parallelogram by using slopes you must find
(A) The slopes of two sides (B) The slopes of two pair of opposite sides
(C) The lengths of all sides (D) Both the lengths and
- The value of $\sin^2\theta + \frac{1}{1+\tan^2\theta}$ is equal to
(A) $\tan^2\theta$ (B) 1 (C) $\cot^2\theta$ (D) 0

14. Given $F_1 = 1$, $F_2 = 3$ and $F_n = F_{n-1} + F_{n-2}$ then F_4 is
 (A)3 (B)5 (C)7 (D)11

(A) SECTION-B

II. Answer any 10 questions. Question No.28 is compulsory 10x2=20

15. If $A \times B = \{(3, 2), (3, 4), (5, 2), (5, 4)\}$, then find A and B
16. If $A = \{-2, -1, 0, 1, 2\}$ and $f: A \rightarrow B$ is an onto function defined by
 $f(x) = x^2 + x + 1$ then find B .
17. Find k if $f \circ f(k) = 5$, where $f(k) = 2k - 1$.
18. a and b are two positive integers such that $a^b \times b^a = 800$.
 Find a and b .
19. Write an A.P. whose first term is 20 and common difference is 8.
20. Find the sum $3 + 1 + \frac{1}{3} + \dots \infty$
21. Find the LCM of $p^2 - 3p + 2$, $p^2 - 4$
22. Determine the quadratic equations, whose sum and product of roots are
 -9, 20
23. Determine the nature of roots for the following quadratic equations
 $x^2 - x - 20 = 0$
24. 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 $\triangle DEF$.
25. If the area of the triangle formed by the vertices $A(-1, 2)$, $B(k, -2)$ and
 $C(7, 4)$ (taken in order) is 22 sq. units, find the value of k .
26. Show that the given points are collinear $(-3, -4)$, $(7, 2)$ and $(12, 5)$.
27. Prove that $\frac{\sec \theta}{\sin \theta} - \frac{\sin \theta}{\cos \theta} = \cot \theta$
28. If the straight lines $12y = -(p + 3)x + 12$, $12x - 7y = 16$ are
 perpendicular, then find 'p'.

SECTION -C

III. Answer any 10 questions. Question No.42 is compulsory 10x5=50

29. Let $A = \{x \in \mathbb{N} \mid 1 < x < 4\}$, $B = \{x \in \mathbb{W} \mid 0 \leq x < 2\}$

$C = \{x \in \mathbb{N} \mid x < 3\}$. Then verify that $A \times (B \cup C) = (A \times B) \cup (A \times C)$

30. A function $f: [-5, 9] \rightarrow \mathbb{R}$ is defined as follows:

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

(i) $f(-3) + f(2)$ (ii) $f(7) - f(1)$ (iii) $2f(4) + f(8)$ (iv) $\frac{2f(-2) - f(6)}{f(4) + f(-2)}$

31. If $f(x) = 2x + 3$, $g(x) = 1 - 2x$ and $h(x) = 3x$. Prove that

$$f \circ (g \circ h) = (f \circ g) \circ h$$

32. If $p_1^{x_1} \times p_2^{x_2} \times p_3^{x_3} \times p_4^{x_4} = 113400$ where p_1, p_2, p_3, p_4 are primes in ascending order and x_1, x_2, x_3, x_4 are integers, find the value of p_1, p_2, p_3, p_4 And x_1, x_2, x_3, x_4

33. The sum of 3 consecutive terms that are in A.P. is 27 and their product is 288. Find the 3 terms.

34. Find the sum to n terms of the series $5 + 55 + 555 + \dots$

35. Rekha has 15 square colour papers of sizes 10 cm , 11 cm , 12 cm , ..., 24 cm . How much area can be decorated with these colour papers?

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

37. Solve $x + 2y - z = 5$; $x - y + z = -2$; $-5x - 4y + z = -11$

38. If α and β are the roots of $3x^2 + 7x - 2 = 0$ find the values of

$$(i) \frac{\alpha}{\beta} + \frac{\beta}{\alpha} \quad (ii) \frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha}$$

39. State and prove Thales theorem.

40. Find the equation of a straight line through the intersection of lines $5x - 6y = 2$, $3x + 2y = 10$ and perpendicular to the line $4x - 7y + 13 = 0$.

41. If $\frac{\cos^2 \theta}{\sin \theta} = p$, $\frac{\sin^2 \theta}{\cos \theta} = q$, then prove that $p^2 q^2 (p^2 + q^2 + 3) = 1$

42. Find the area of the quadrilateral formed by the points $(8, 6)$, $(5, 11)$, $(-5, 12)$ and $(-4, 3)$.

SECTION – D

IV. Answer the following questions.

2x8=16

43. Construct a triangle similar to a given triangle PQR with its sides equal to $\frac{3}{5}$ of the corresponding sides of the triangle PQR (scale factor $\frac{3}{5} < 1$)

OR

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 company initially started with 40 workers to complete the work by 150 days. Later, it decided to fasten up the work increasing the number of workers as shown below.

Number of workers (x)	40	50	60	75
Number of days (y)	150	120	100	80

- (i) Graph the above data and identify the type of variation.
- (ii) From the graph, find the number of days required to complete the work if the company decides to opt for 120 workers?
- (iii) If the work has to be completed by 200 days, how many workers are required?

OR

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 $y = 7.5$.

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