

SECOND REVISION TEST - 2024

Standard X

Reg.No.

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MATHEMATICS

Time : 3.00 hrs

Part - I

Marks : 100

I. Choose the correct answer:

14 x 1 = 14

1. $A = \{a, b, p\}$, $B = \{2, 3\}$, $C = \{p, q, r, s\}$ then $n[(A \cup C) \times B]$ is
 a) 8 b) 20 c) 12 d) 16
2. If $g = \{(1,1), (2,3), (3,5), (4,7)\}$ is a function given by $g(x) = \alpha x + \beta$ then the values of α and β are
 a) $(-1,2)$ b) $(2,-1)$ c) $(-1,-2)$ d) $(1,2)$
3. 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
4. The solution of $(2x - 1)^2 = 9$ is equal to
 a) -1 b) 2 c) -1, 2 d) none of these
5. In square matrix $A = [a_{ij}]_{n \times n}$, if $i < j$ and $a_{ij} = 0$ then its called
 a) zero matrix b) upper triangular matrix
 c) lower triangular matrix d) identity matrix
6. 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
7. 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
8. Find the number of straight lines that have slope '1' and pass through the point $(3,0)$
 a) 1 b) 2 c) 4 d) countless
9. If $\sin\theta = \cos\theta$, then $2\tan^2\theta + \sin^2\theta - 1$ is equal to
 a) $-\frac{3}{2}$ b) $\frac{3}{2}$ c) $\frac{2}{3}$ d) $-\frac{2}{3}$
10. The electric pole subtends an angle of 30° at a point on the same level as its foot. At a second point 'b' metres above the first, the depression of the foot of the pole is 60° . The height of the pole (in metres) is equal to
 a) $\sqrt{3}b$ b) $\frac{b}{3}$ c) $\frac{b}{2}$ d) $\frac{b}{\sqrt{3}}$

11. If the surface area of a cylinder is 264 m^2 and the volume is 924 m^3 , the ratio of its diameter to its height is
 a) 3 : 7 b) 7 : 3 c) 6 : 7 d) 7 : 6
12. A shuttle cock used for playing badminton has the shape of the combination of
 a) a cylinder and a sphere b) a hemisphere and a cone
 c) a sphere and a cone d) frustum of a cone and a hemisphere
13. Which of the following is correct?
 a) $P(A) > 0$ b) $0 \leq P(A) \leq 1$ c) $P(\phi) = \infty$ d) $P(A) < 0$
14. The range of the data 8, 8, 8, 8, 8 is
 a) 0 b) 1 c) 8 d) 3

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. 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. Compute x, such that $10^4 \equiv x \pmod{19}$
18. Find a_8 and a_{15} whose n^{th} term is $a_n = \begin{cases} \frac{n^2-1}{n+3} ; n \text{ is even}, n \in \mathbb{N} \\ \frac{n^2}{2n+1} ; n \text{ is odd}, n \in \mathbb{N} \end{cases}$
19. Determine the nature of roots for the quadratic equation $2x^2 - 2x + 9 = 0$
20. If $A = \begin{bmatrix} 5 & 2 & 2 \\ -\sqrt{17} & 0.7 & 5/2 \\ 8 & 3 & 1 \end{bmatrix}$, then verify $(A^T)^T = A$
21. The perimeters of two similar triangles ABC and PQR are respectively 36 cm and 24 cm. If PQ = 10 cm, find AB.
22. The line through the points $(-2, a)$ and $(9, 3)$ has slope $-\frac{1}{2}$. Find the value of a.
23. Find the equation of a line whose intercepts on the x and y axis are -5 and $\frac{3}{4}$
24. A tower stands vertically on the ground. From a point on the ground, which is 48 m away from the foot of the tower, the angle of elevation of the top of the tower is 30° . Find the height of the tower.
25. The radius of a sphere increases 25%. Find the percentage increase in its surface area.

26. The volumes of a solid right circular cone is 11088 cm^3 . If its height is 24 cm, then find the radius of the cone.
27. The mean of a data is 25.6 and its coefficient of variation is 18.75. Find the standard deviation.
28. Gokul and Rahul are friends. What is the probability that both will have (i) different birthdays (ii) the same birthday? (ignoring a leap year)

Part - III

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

10 x 5 = 50

29. Let $A = \{x \in \mathbb{N} / 1 < x < 4\}$, $B = \{x \in \mathbb{W} / 0 \leq x < 2\}$ and $C = \{x \in \mathbb{N} / x < 3\}$. Then verify that $A \times (B \cap C) = (A \times B) \cap (A \times C)$
30. A function $f : [-5, 9] \rightarrow \mathbb{R}$ is defined as follows :

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

31. If $S_1, S_2, S_3, \dots, S_m$ are the sums of n terms of m A.P's whose first terms are $1, 2, 3, \dots, m$ and whose common differences are $1, 3, 5, \dots, (2m-1)$ respectively, then show that

$$S_1 + S_2 + S_3 + \dots + S_m = \frac{1}{2} mn(mn + 1)$$

32. Find the sum of $15^2 + 16^2 + 17^2 + \dots + 28^2$
33. Find the values of a and b if the polynomial is perfect square : $4x^4 - 12x^3 + 37x^2 + bx + a$
34. The hypotenuse of a right angled triangle is 25 cm and its perimeter 56 cm. Find the length of the smallest side.
35. State and prove Angle Bisector theorem.
36. Find the area of the quadrilateral whose vertices are at $(-9, 0)$, $(-8, 6)$, $(-1, -2)$ and $(-6, -3)$
37. You are downloading a song. The percent y (in decimal form) of mega bytes remaining to get downloaded in x seconds is given by $y = -0.1x + 1$.
- Find the total MB of the song
 - After how many seconds will 75% of the song gets downloaded?
 - After how many seconds the song will be downloaded completely?
38. If $\cot\theta + \tan\theta = x$ and $\sec\theta - \cos\theta = y$, then prove that $(x^2 y)^{\frac{2}{3}} - (xy^2)^{\frac{2}{3}} = 1$

39. If the radii of the circular ends of a frustum which is 45 cm high are 28 cm and 7 cm, find the volume of the frustum.
40. Water is flowing at the rate of 15 km per hour through a pipe of diameter 14 cm into a rectangular tank which is 50 m long and 44 m wide. Find the time in which the level of water in the tank will rise by 21 cm.
41. A coin is tossed thrice. What is the probability of getting atmost 2 tails or atleast 2 heads?
42. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$, find the matrix C, such that $4A - 3B + C = 0$.

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 ΔPQR in which $QR = 5$ cm, $\angle P = 40^\circ$ and the median PG from P to QR is 4.4 cm. Find the length of the altitude from P to QR.
44. a) Nishanth is the winner in a Marathon race of 12 km distance. He ran at the uniform speed of 12 km/hr and reached the destination in 1 hour. He was followed by Aradhana, Jeyanth, Sathya and Swetha with their respective speed of 6 km/hr, 4 km/hr, 3 km/hr and 2 km/hr. And they covered the distance in 2 hrs, 3 hrs, 4 hrs and 6 hours respectively.

Draw the speed-time graph and use it to find the time taken to Kaushik with his speed of 2.4 km/hr.

(OR)

- b) Draw the graph of $y = 2x^2 - 3x - 5$ and hence solve $2x^2 - 4x - 6 = 0$

Key X Maths 2024, 2nd Revision
Kancheepuram Dt

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Choose :

- 1) c) 12
- 2) b) (2, -1)
- 3) b) 2
- 4) c) -1, 2
- 5) c) lower

Triangular
Matrix

- 6) d) $5\sqrt{2}$ cm
- 7) b) 25 sq units
- 8) d) countless
- 9) b) $3\frac{1}{2}$
- 10) b) $b/3$
- 11) a) 3:7

12) d) frustum
of cone & hemisphere

- 13) b) $0 \leq P(A) \leq 1$
- 14) a) 0

II Answers
2 mark

- 15) Domain: $\{0, 1, 2, 3, 4, 5\}$
Range: $\{3, 4, 5, 6, 7, 8\}$

$$16) f(-2) = f(1) = 3$$

$$f(-1) = f(0) = 1$$

$$f(2) = 7$$

$$\therefore B = \{1, 3, 7\}$$

$$17) 10^4 = (10^2)^2 = 5^2 \pmod{19}$$

$$10^4 = 6 \pmod{19}$$

$$\therefore x = 6$$

$$18) a_8 = \frac{8^2 - 1}{8 + 3} = \frac{63}{11}$$

$$a_{15} = \frac{15^2}{2(5) + 1} = \frac{225}{31}$$

$$19) \Delta = b^2 - 4ac$$

$$= (-2)^2 - 4(2)(9) = -68 < 0$$

$$\therefore \text{no real roots.}$$

$$20) (A^T)^T = A = \begin{bmatrix} 5 & 2 & 2 \\ -\sqrt{17} & 0.7 & 5/2 \\ 8 & 3 & 1 \end{bmatrix}$$

$$21) \frac{AB}{PQ} = \frac{36}{24} \Rightarrow \frac{AB}{10} = \frac{36}{24}$$

$$A = 15 \text{ cm}$$

$$22) m = \frac{y_2 - y_1}{x_2 - x_1} \Rightarrow \frac{3 - a}{9 + 2} = -\frac{1}{2}$$

$$a = \frac{17}{2}$$

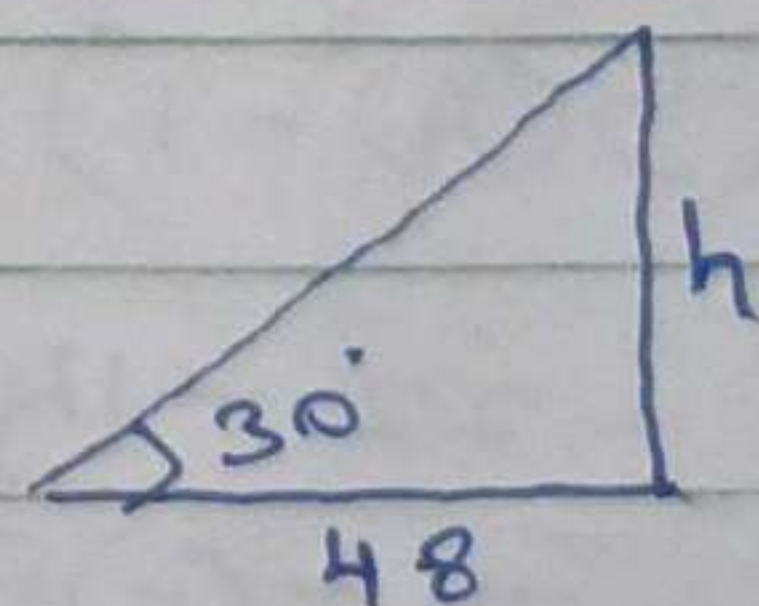
$$23) \frac{x}{a} + \frac{y}{b} = 1 \Rightarrow \frac{x}{-5} + \frac{4y}{3} = 1$$

$$3x - 20y + 15 = 0$$

$$24) \tan 30^\circ = \frac{h}{48}$$

$$\frac{1}{\sqrt{3}} = \frac{h}{48}$$

$$h = 16\sqrt{3} \text{ m}$$



25) $S.A = 4\pi r^2$
 New $r = \frac{5}{4}r$
 New $S.A = \frac{25\pi r^2}{4}$
 $\% = 56.25\%$

26) $\frac{1}{3}\pi r^2 h = 11088$
 $r^2 = 441$
 $r = 21 \text{ cm}$

27) $C.V = \frac{\sigma}{\bar{x}} \times 100\%$
 $\Rightarrow 18.75 = \frac{\sigma}{25.6} \times 100$
 $\sigma = 4.8$

28) i) $365 - 1 = 364$
 $P(E) = \frac{364}{365}$

ii) $P(E)' = 1 - P(E)$
 $= 1 - \frac{364}{365} = \frac{1}{365}$

III Answer: 5 marks.

29.) $A \times (B \cap C) = \{2, 3\} \times \{1\}$
 $= \{(2, 1), (3, 1)\}$

$(A \times B) \cap (A \times C) = \{(2, 0), (2, 1), (3, 0), (3, 1)\} \cap \{(2, 1), (2, 2), (3, 1), (3, 2)\}$
 $= \{(2, 1), (3, 1)\}$

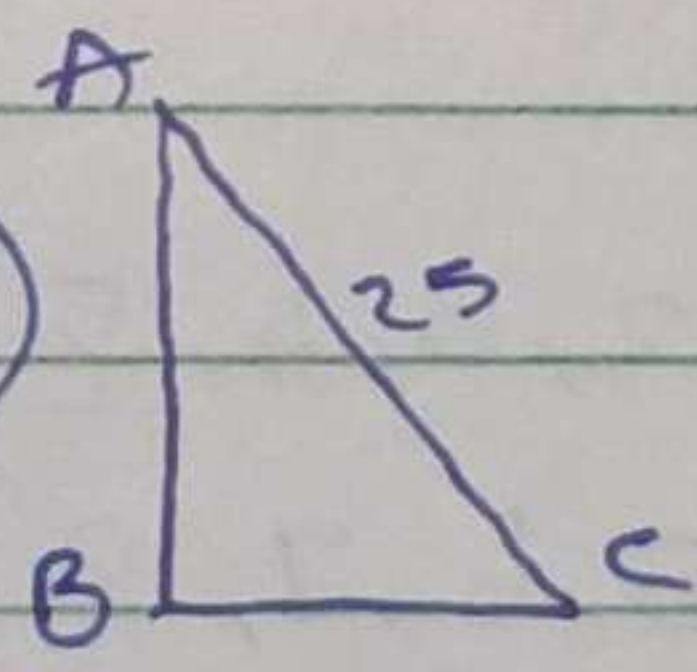
30.) $\frac{2(6(-2)+1) - (3(6)-4)}{(5(4)^2-1) + (6(-2)+1)}$

$= \frac{-22-14}{79+(-11)} = \frac{-36}{68} = \frac{-9}{17}$

31.) $S_1 = \frac{n}{2}(n+1), S_2 = \frac{n}{2}(3n+1)$
 $S_m = \frac{n}{2}[(2m-1)n+1]$
 $= \frac{n}{2}[n+3n+\dots+(2m-1)n + (1+1+\dots+m \text{ terms})]$
 $= \frac{n}{2}[n(m^2)+m]$
 $= \frac{1}{2}mn[mn+1]$

32.) $(1^2 + \dots + 28^2) - (1^2 + \dots + 14^2)$
 $\Rightarrow \frac{n(n+1)(2n+1)}{6}$
 $= \frac{28 \times 29 \times 57}{6} - \frac{14 \times 15 \times 29}{6}$
 $= 7714 - 1015 = 6699$

33.)
$$\begin{array}{r} 2x^2 \overline{) 4x^4 - 12x^3 + 37x^2 + bx + a} \\ \underline{4x^4} \\ -12x^3 + 37x^2 + bx + a \\ \underline{-12x^3 + 9x^2} \\ 28x^2 + bx + a \\ \underline{28x^2 - 42x + 49} \\ b = -42, a = 49 \end{array}$$

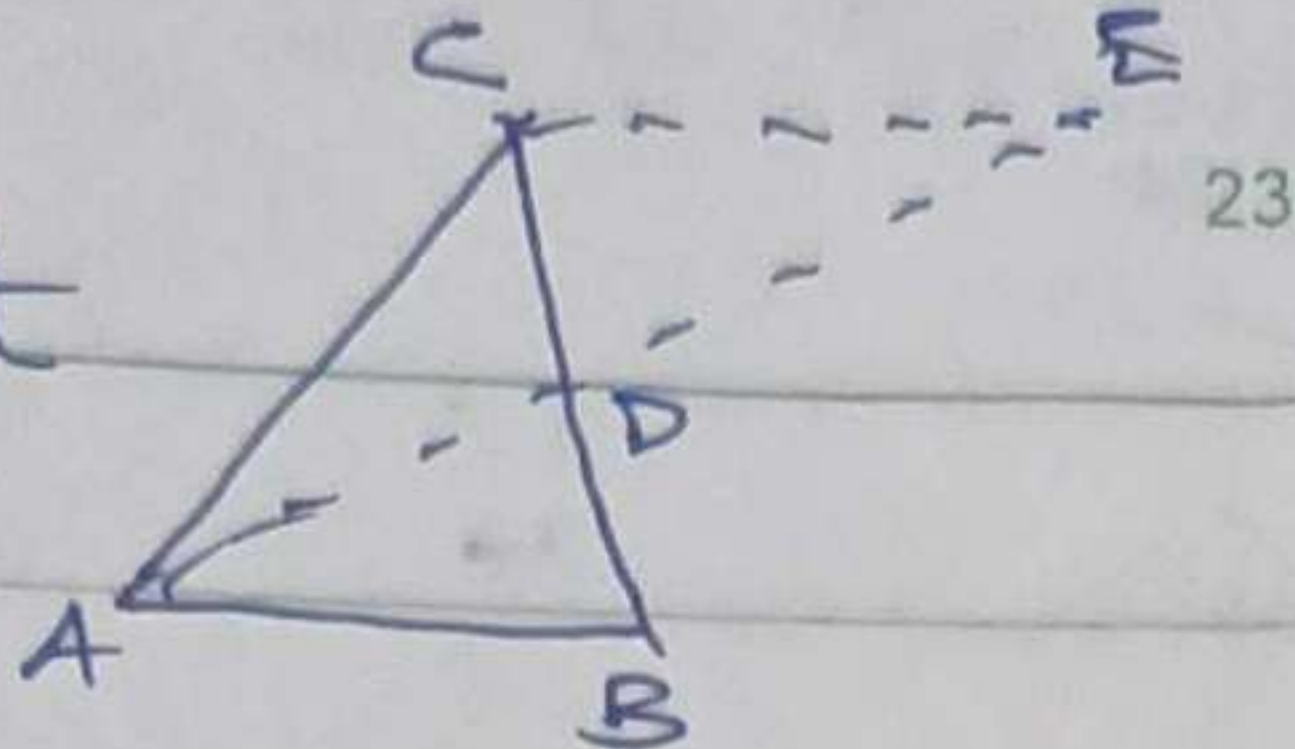
34.) 
 $AB + BC + CA = 56$
 $AB + BC = 31$
 $AB^2 + BC^2 = AC^2$
 $(AB + BC)^2 - 2AB \cdot BC = AC^2$
 $-2AB \cdot BC = -336$

$AB \cdot BC = 168$ (By solving for $x^2 - 31x + 168 = 0$)
 $x = 24, 7$
 $\frac{48}{2}, \frac{14}{2}$

35) ABT

Statement

$$\frac{AB}{AC} = \frac{BD}{CD}$$



$\angle E = \angle BAE$
 $\angle ABD = \angle ECD$ } $\triangle ACE$ is
 Isosceles

$$\therefore AC = CE$$

$$\triangle ABD \sim \triangle ECD$$

$$\frac{AB}{CE} = \frac{BD}{CD} \Rightarrow \frac{AB}{AC} = \frac{BD}{CD}$$

36) $(-9, 0), (-6, -3), (-1, -2), (-8, 6)$

$$= \frac{1}{2} \begin{Bmatrix} -9 & -6 & -1 & -8 & -9 \\ 0 & -3 & -2 & 6 & 0 \end{Bmatrix}$$

$$= \frac{1}{2} \{33 + 35\} = 34 \text{ Sq units}$$

37) i) 1 MB $y = -0.1(0) + 1$

ii) 7.5 sec

iii) 10 sec

38) $\cot \theta + \tan \theta = x$

$$\sec \theta - \cos \theta = y$$

$$(x^2 y)^{2/3} - (x y^2)^{2/3} = 1$$

$$x = \frac{1}{\sin \theta \cos \theta}, y = \frac{\sin^2 \theta}{\cos \theta}$$

$$\text{LHS} = \left[\frac{1}{\sin^2 \cos^2} \times \frac{\sin^2}{\cos^2} \right]^{2/3} - \left[\frac{1}{\sin \cos} \times \frac{\sin^4}{\cos^2} \right]^{2/3}$$

$$= (\sec^3)^{2/3} - (\tan^3)^{2/3}$$

$$= 1$$

39)

$$V = \frac{1}{3} \pi [R^2 + Rr + r^2] h$$

$$= \frac{1}{3} \times \frac{22}{7} \{28^2 + (28 \times 7) + 7^2\} \times 45$$

$$= 48510 \text{ cm}^3$$



40) $H = 15000 \text{ m}, r = \frac{7}{100} \text{ m}$

Tank

$$l = 50 \text{ m}, b = 44 \text{ m}, h = \frac{21}{100} \text{ m}$$

$$\text{Req Time} = \frac{l b h}{\pi r^2 H}$$

$$= \frac{50 \times 44 \times \frac{21}{100}}{\frac{22}{7} \times \frac{7}{100} \times \frac{7}{100} \times 15000}$$

$$= 2 \text{ hrs}$$

41) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$$= \frac{7}{8} + \frac{4}{8} - \frac{4}{8}$$

$$= \frac{7}{8}$$

42) $4A - 3B + C = 0$

$$\begin{pmatrix} 4 & 8 \\ 12 & 16 \end{pmatrix} + \begin{pmatrix} -6 & -9 \\ -12 & -15 \end{pmatrix} + C = 0$$

$$C = \begin{pmatrix} 2 & 1 \\ 0 & -1 \end{pmatrix}$$