Tiruvannamalai District

SECOND REVISION TEST - 2023
MATHS

X - Std

Time : 3.00 Hrs | Marks : 100

PART - I

Note : (i) Answer all questions.

(ii) Choose the correct answer and write with option :- 14 X 1 = 14

1. The range of the relation $R = \{(x, x^2) \mid x$ is a prime number less than 13$\}$ is

a) {2, 3, 5, 7} b) {2, 3, 5, 7, 11} c) {4, 9, 25, 49, 121} d) {1, 4, 9, 25, 49, 121}

2. $7^{4k} \equiv$ .... (mod 100)

a) 1 b) 2 c) 3 d) 4

3. If 2nd term is $\sqrt{6}$ and 3rd term is $9\sqrt{6}$ in G.P. then the common ratio ....

a) $\sqrt{6}$ b) $9\sqrt{6}$ c) 9 d) None of these

4. $\frac{3y-3}{y} \div \frac{7y-7}{3y^2}$ is

a) $\frac{9y}{7}$ b) $\frac{9y^3}{(21y-21)}$ c) $\frac{21y^2-42y+21}{3y^3}$ d) $\frac{7(y^2-2y+1)}{y^2}$

5. If $A = \begin{pmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \end{pmatrix}$, $B = \begin{pmatrix} 1 & 0 \\ 2 & -1 \\ 0 & 2 \end{pmatrix}$ and $C = \begin{pmatrix} 0 & 1 \\ -2 & 5 \end{pmatrix}$ which of the following statements are correct?

i) $AB + C = \begin{pmatrix} 5 & 5 \\ 5 & 5 \end{pmatrix}$ ii) $BC = \begin{pmatrix} 0 & 1 \\ 2 & -3 \\ -4 & 10 \end{pmatrix}$

iii) $BA + C = \begin{pmatrix} 2 & 5 \\ 3 & 0 \end{pmatrix}$ iv) $(AB)C = \begin{pmatrix} -8 & 20 \\ -8 & 13 \end{pmatrix}$

a) (i) and (ii) only b) (ii) and (iii) only c) (iii) and (iv) only d) all of these

6. If Δ ABC is an isosceles triangle with $\angle C = 90^\circ$ and AC = 5cm, then AB is

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

7. The point of intersection of 3x – y = 4 and x + y = 8 is

a) (5, 3) b) (2, 4) c) (3, 5) d) (4, 4)

8. Slop of line ax + by + c = 0 is ....

a) $\frac{-b}{a}$ b) $\frac{-a}{b}$ c) $\frac{b}{a}$ d) $\frac{a}{b}$

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 total surface area of a cylinder whose radius is $\frac{1}{3}$ of its height is

a) $\frac{9\pi h^2}{8}$ sq. units b) $24\pi h^2$ sq. units c) $\frac{8\pi h^2}{9}$ sq. units d) $\frac{56\pi h^2}{9}$ sq. units

11. A spherical ball of radius r_1 units is melted to make 8 new identical balls each of radius r_2 units. Then $r_1 : r_2$ is

a) 2 : 1 b) 1 : 2 c) 4 : 1 d) 1 : 4

12. The GCD of a^m, a^{m+1}, a^{m+2} is

a) a^m b) a^{m+1} c) a^{m+2} d) 1

13. The range of the data 8, 8, 8, 8, 8 .... 8 is

a) 0 b) 1 c) 8 d) 3

14. Kamalam went to play a lucky draw contest 135 tickets of the lucky draw were sold. If the probability of Kamalam winning is $\frac{1}{9}$, then the number of tickets bought by Kamalam is

a) 5 b) 10 c) 15 d) 20

PART - II

Note : Answer any 10 questions. Q.No. 28 is compulsory :- 10 X 2 = 20

15. Let A = {1, 2, 3} and B = {x/x is a prime number less than 10} find A X B and B X A.
16. Find K is fo f(K) = 5, where f(K) = 2K–1.
17. Find the least positive value of x such that $67 + x \equiv 1 \pmod 4$.
18. Find the sum of $1^3 + 2^3 + 3^3 + \dots\dots + 15^3$.
19. Find the 8^{th} term of the G.P. 9, 3, 1 ....
20. Find the LCM of $x^4 - 1$, $x^2 - 2x + 1$.
21. Determine the nature of roots of $x^2 - x - 1 = 0$.
22. Construct a 3 X 3 matrix whose elements are given by $a_{ij} = |i - 2j|$.
23. Find the slope and indination of a line joining the given points (–3, 4) and (–3, 5).
24. Find the area of the triangle whose vertices are (–3, 5), (5, 6) and (5, –2).
25. A tower stands vertically on the ground. From a point on the ground, which is 48m 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.

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26. A cylindrical box has a height of 20cm and base diameter 28cm. Find its curved surface area.

27. Find the range and coefficient of range of the following data : 25, 67, 48, 53, 18, 39, 44.

28. In ΔABC, D and E are points in the sides AB and AC respectively such that DE || BC. If 4AD = 3DB and AC = 15cm find AE.

PART - III

Note : Answer any 10 questions. Q.No. 42 is compulsory : 10 X 5 = 50

29. Given A = {1, 2, 3}, B = {2, 3, 5}, C = {3, 4} and D = {1, 3, 5} check if $(A \cap C) \times (B \cap D) = (A \times B) \cap (C \times D)$ is true?

30. Let f : A → B be a function defined by f(x) = 3x − 1, when A = {1, 2, 3, 4} and B = {2, 5, 8, 11, 14}. Represent f by (i) an arrow diagram (ii) a table (iii) set of ordered pairs (iv) a graph.

31. Use Euclid's Division Algoritham to find HCF of 84, 90 and 120.

32. A mother divides Rs. 207 into three parts such that the amount are in A.P. and gives it to her three children. The product of the two least amounts that the children had Rs. 4623. Find the amount received by each child.

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

34. If $A = \frac{2x+1}{2x-1}$, $B = \frac{2x-1}{2x+1}$ find $\frac{1}{A-B} - \frac{2B}{A^2 - B^2}$.

35. If $A = \begin{pmatrix} 1 & 2 & 1 \\ 2 & -1 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & -1 \\ -1 & 4 \\ 0 & 2 \end{pmatrix}$ show that $(AB)^T = B^T A^T$.

36. If A (−5, t), B (−4, −5), C (−1, −6) and D (4, 5) are the vertices of a quadrilateral, find the area of the quadrilateral ABCD.

37. Find the equation of a straight line parallel to y axis and passing through the point of intersection of the lines $4x + 5y = 13$ and $x - 8y + 9 = 0$.

38. An industrial metallic bucket is in the shape of the frustum of a right circular cone whose top and bottom diameters are 10m and 4m and whose height is 4m. Find the curved and total surface area of the bucket.

39. A solid right circular cone of diameter 14cm and height 8cm is melted to form a hollow sphere. If the external diameter of a sphere is 10cm, find the internal diameter.

40. State and prove the angle bisector theorem.

41. A coin is tossed thrice. Find the probability of getting exactly two heads or atleast one tail or two consecutive heads.

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42. Two boats are sailing in the sea on either sides of a light house. The angle of elevation of the top of the lighthouse as observed from the boats are 30^0 and 45^0 respectively. If the light house is 700m high, find the distance between the two boats. $\left(\sqrt{3} = 1.732\right)$

PART - IV

Note : Answer all the questions :- $2 \times 8 = 16$

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

(b) Draw a triangle ABC of base BC = 8cm, $\angle A = 60^0$ and the bisector of $\angle A$ meets BC and D such that BD = 6cm.

44. (a) A school announces that for a certain competitions, that cash price will be distributed fo all the participants equally as show below.

No.of participants (x)	2	4	6	8	10
Amount for each participant in(y)	180	90	60	45	36

(i) Find the constant of variation

(ii) Graph the above data and hence, find how much will each participant get if the number of participants are 12. ***(OR)***

(b) Draw the graph of $y = x^2 + 4x + 3$ and hence find the roots of $x^2 + x + 1 = 0$.

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1	(c) {4,9,25,49,121}
2	(a) 1
3	(c) 9
4	(a) $\frac{9y}{7}$
5	(a) (i) and (ii) only
6	(d) $5\sqrt{2}$ cm
7	(c) (3,5)
8	(b) $\frac{-a}{b}$
9	(b) $\frac{3}{2}$
10	(c) $\frac{8\pi h^2}{9}$
11	(a) 2:1
12	(a) a^m
13	(a) 0
14	(c) 15
15	Let A = {1, 2, 3} ; B = {2, 3, 5, 7} A × B = {(1, 2) (1, 3) (1, 5) (1, 7) (2, 2) (2, 3) (2, 5) (2, 7) (3, 2) (3, 3) (3, 5) (3, 7)} B × A = {2, 3, 5, 7} × {1, 2, 3} = {(2, 1) (2, 2) (2, 3) (3, 1) (3, 2) (3, 2) (3, 3) (3, 3) (5, 1) (5, 2) (5, 3) (5, 3) (7, 1) (7, 2) (7, 3)}
16	$f \circ f(k) = f(f(k))$ $= 2(2k-1) - 1 = 4k - 3$ Thus, $f \circ f(k) = 4k - 3$ But, it is given that $f \circ f(k) = 5$ Therefore $4k - 3 = 5 \Rightarrow k = 2$.
17	$67 + x \equiv 1 \pmod{4}$ $67 + x - 1 = 4n$, for some integer n $66 + x = 4n$ $66 + x$ is a multiple of 4. Therefore, the least positive value of x must be 2, since 68 is the nearest multiple of 4 more than 66.

18	The sum of the cubes of the first n natural numbers is given as $1^3+2^3+3^3+\ldots\ldots.+n^3=\frac{n^2(n+1)^2}{4}$ Here we have $n=15$ Hence, the sum of the cubes of the first 15 natural numbers is given as $1^3+2^3+3^3+\ldots.+15^3=\frac{15^2(15+1)^2}{4}$ $=\frac{225\times256}{4}$ $=\frac{57600}{4}$ $\Rightarrow 1^3+2^3+3^3+\ldots.+15^3=14400$ Hence, the sum of the series, $1^3+2^3+3^3+\ldots.+15^3$ is 14400. The sum of the cubes of the first n natural numbers is given as $1^3+2^3+3^3+\ldots\ldots.+n^3=\frac{n^2(n+1)^2}{4}$ Here we have $n=15$ Hence, the sum of the cubes of the first 15 natural numbers is given as $1^3+2^3+3^3+\ldots.+15^3=\frac{15^2(15+1)^2}{4}$ $=\frac{225\times256}{4}$ $=\frac{57600}{4}$ $\Rightarrow 1^3+2^3+3^3+\ldots.+15^3=14400$ Hence, the sum of the series, $1^3+2^3+3^3+\ldots.+15^3$ is 14400.
19	To find the 8th term we have to use the n^{th} term formula $t_n = ar^{n-1}$ First term $a = 9$, common ratio $r = \frac{t_2}{t_1}=\frac{3}{9}=\frac{1}{3}$ $t_8=9\times\left(\frac{1}{3}\right)^{8-1}=9\times\left(\frac{1}{3}\right)^7=\frac{1}{243}$ Therefore the 8th term of the G.P. is 1/243
20	$(x^4-1),\ x^2-2x+1$ $x^4-1=(x^2)^2-1=(x^2+1)(x^2-1)=(x^2+1)(x+1)(x-1)$ $x^2-2x+1=(x-1)^2$ Therefore, LCM $[(x^4-1),(x^2-2x+1)]=(x^2+1)(x+1)(x-1)^2$

21	$x^2 - x - 1 = 0$ Here $a = 1,\ b = -1,\ c = -1$ $\Delta = b^2 - 4ac$ $= (-1)^2 - 4 \times 1 \times (-1)$ $= 1 + 4$ $= 5$ $\Delta > 0$ ∴ The roots are real and unequal.
22	$a_{11} = \lvert 1 - 2 \times 1 \rvert = \lvert 1 - 2 \rvert = 1$ $a_{12} = \lvert 1 - 2 \times 2 \rvert = \lvert 1 - 4 \rvert = 3$ $a_{13} = \lvert 1 - 2 \times 3 \rvert = \lvert 1 - 6 \rvert = 5$ $a_{21} = \lvert 2 - 2 \times 1 \rvert = \lvert 2 - 2 \rvert = 0$ $a_{22} = \lvert 2 - 2 \times 2 \rvert = \lvert 2 - 4 \rvert = 2$ $a_{23} = \lvert 2 - 2 \times 3 \rvert = \lvert 2 - 6 \rvert = 4$ $a_{31} = \lvert 3 - 2 \times 1 \rvert = \lvert 3 - 2 \rvert = 1$ $a_{32} = \lvert 3 - 2 \times 2 \rvert = \lvert 3 - 4 \rvert = 1$ $a_{33} = \lvert 3 - 2 \times 3 \rvert = \lvert 3 - 6 \rvert = 3$ Hence the required 3×3 matrix is $\begin{bmatrix} 1 & 3 & 5 \\ 0 & 2 & 4 \\ 1 & 1 & 3 \end{bmatrix}$
23	Let $(x_1, y_2) = (-3,4)$; $(x_1, y_2) = (-3,5)$ Slope (m) $= \frac{y_2 - y_1}{x_2 - x_1} = \frac{5-4}{-3-(-3)} = \frac{1}{0} = \infty$(undefined) $\tan\theta$ = Slope (m) $= \infty$ But $\tan 90° = \infty$ Therefore, Inclination $(\theta) = 90°$
24	Plot the points in a rough diagram and take them in counter-clockwise order.

Let the vertices be $A(-3,5)$, $B(5,-2)$, $C(5,6)$

(x_1, y_1) (x_2, y_2) (x_3, y_3)

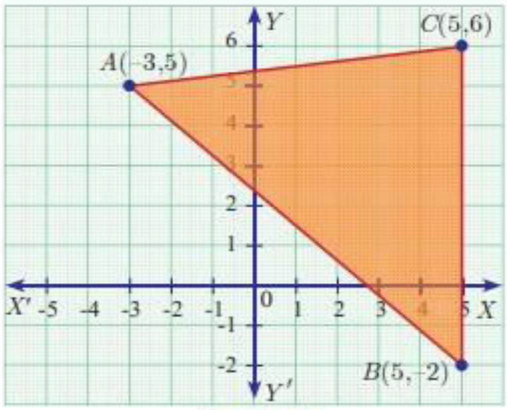

Fig. 5.10

The area of ΔABC is

$$= \frac{1}{2}\{(x_1y_2 + x_2y_3 + x_3y_1) - (x_2y_1 + x_3y_2 + x_1y_3)\}$$

$$= \frac{1}{2}\{(6 + 30 + 25) - (25 - 10 - 18)\}$$

$$= \frac{1}{2}\{61 + 3\}$$

$$= \frac{1}{2}(64) = 32 \text{ sq.units}$$

25 Let PQ be the height of the tower.
Take $PQ = h$ and QR is the distance between the tower and the point R. In right triangle PQR, $\angle PRQ = 30°$

$$\tan\theta = \frac{PQ}{QR}$$

$$\tan 30° = \frac{h}{48} \quad \text{gives,} \quad \frac{1}{\sqrt{3}} = \frac{h}{48} \quad \text{so, } h = 16\sqrt{3}$$

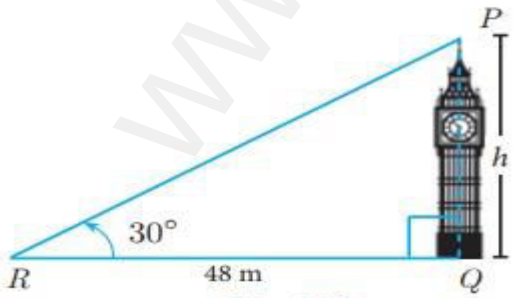

Fig. 6.13

Therefore the height of the tower is $16\sqrt{3}$ m

26 Given that, height of the cylinder h = 20 cm ; radius $r = \frac{d}{2} = \frac{28}{2} = 14$ cm
Now, C.S.A. of the cylinder = $2\pi rh$ sq. units
C.S.A. of the cylinder = 2 × (22/7) × 14 ×20 = 2 ×22 × 2 ×20 = 1760 cm^2

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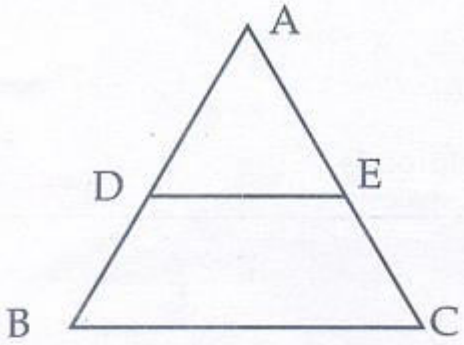
27	Largest value $L = 67$; Smallest value $S = 18$ Range R = $L - S = 67 - 18 = 49$ Coefficient of range = $(L - S) / (L + S)$ Coefficient of range = $(67 - 18) / (67 + 18) = 49/85$ $= 0.576$
28	 i) In ΔABC, $DE \parallel BC$ $\therefore \frac{AD}{DB} = \frac{AE}{EC}$ [Let AE = x, $\therefore$ EC = 15, –x] $\Rightarrow \frac{3}{4} = \frac{x}{15-x}$ $\Rightarrow 3(15-x) = 4x$ $\Rightarrow 45 - 3x = 4x$ $7x = 45$ $x = \frac{45}{7} = 6.42$

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Solution:

L.H.S $(A \cap C) \times (B \cap D)$

$A \cap C = \{1, 2, 3\} \cap \{3, 4\}$

$= \{3\}$

$B \cap D = \{2, 3, 5\} \cap \{1, 3, 5\}$

$= \{3, 5\}$

$(A \cap C) \times (B \cap D) = \{3\} \times \{3, 5\}$

$= \{(3,3)\ (3, 5)$ ——— ❶

R.H.S $(A \times B) \cap (C \times D)$

$A \times B = \{1, 2, 3\} \times \{2, 3, 5\}$

$= \{\ (1, 2)\ (1, 3)\ (1, 5)\ (2, 2)\ (2, 3)\ (2, 5)\ (3, 2)\ (3, 3)\ (3, 5)\}$

$C \times D = \{\ (3, 4) \times (1, 3, 5)\}$

$= \{(3, 1)\ (3, 3)\ (3, 5)\ (4, 1)\ (4, 3)\ (4, 5)\}$

$(A \times B) \cap (C \times D) = \{\ (3, 3)\ (3, 5)\ \}$ ——— ❷

$\therefore (A \cap C) \times (B \cap D) = (A \times B) \cap (C \cap D)$

L.H.S = R.H.S $\Rightarrow$ True

30

$A = \{1, 2, 3, 4\}$; $B = \{2, 5, 8, 11, 14\}$; $f(x) = 3x - 1$

$f(1) = 3(1) - 1 = 3 - 1 = 2$; $f(2) = 3(2) - 1 = 6 - 1 = 5$

$f(3) = 3(3) - 1 = 9 - 1 = 8$; $f(4) = 4(3) - 1 = 12 - 1 = 11$

(i) Arrow diagram

Let us represent the function : $A \rightarrow B$ by an arrow diagram (Fig.1.19).

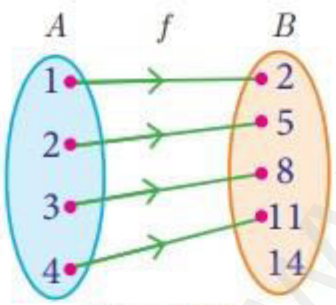

Fig. 1.19

(ii) Table form

The given function f can be represented in a tabular form as given below

x	1	2	3	4
$f(x)$	2	5	8	11

(iii) Set of ordered pairs

The function f can be represented as a set of ordered pairs as

$f = \{(1,2),(2,5),(3,8),(4,11)\}$

(iv) Graphical form

In the adjacent xy -plane the points

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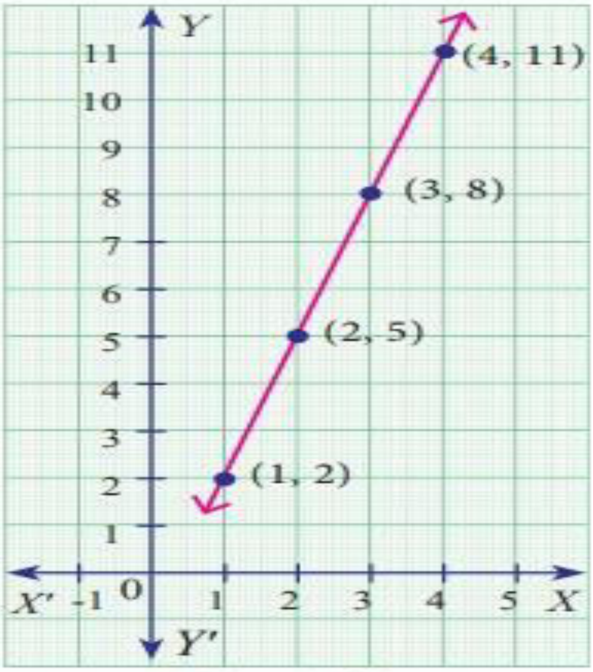
	(1,2), (2,5), (3,8), (4,11) are plotted (Fig.1.20).  Fig. 1.20
31	84, 90 and 120 $90 = 84 \times 1 + 6$ $84 = 6 \times 14 + 0$ $120 = 6 \times 20 + 0$ So H.C.F of 84, 90 and 120 = 6
32	Let the amount received by the three children be in the form of A.P. is given by $a - d$, a, $a + d$. Since, sum of the amount is ₹207, we have $(a - d) + a + (a + d) = 207$ $3a = 207$ gives $a = 69$ It is given that product of the two least amounts is 4623. $(a - d)a = 4623$ $(69 - d)69 = 4623$ $d = 2$ Therefore, amount given by the mother to her three children are ₹(69–2), ₹69, ₹(69+2). That is, ₹67, ₹69 and ₹71.
33	Let, $x + 2y - z = 5$ …(1) $x - y + z = -2$ …(2) $x - y + z = -2$ …(2) $-5x - 4y + z = -11$ …(3)

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	Adding (1) and (2) we get, $x + 2y - z = 5$ $x - y + z = -2$ (+) $2x + y = 3$ ...(4) Subtracting (2) and (3), $x - y + z = -2$ $-5x - 4y + z = -11$ (–) $6x + 3y = 9$ Dividing by 3 $2x + y = 3$ ...(5) Subtracting (4) and (5), $2x + y = 3$ $2x + y = 3$ $0 = 0$ Here we arrive at an identity 0=0. Hence the system has an infinite number of solutions.
34	$\frac{1}{A-B} - \frac{2B}{A^2-B^2} = \frac{1}{A-B} - \frac{2B}{(A+B)(A-B)}$ $= \frac{A+B-2B}{(A+B)(A-B)} = \frac{A-B}{(A+B)(A-B)}$ $= \frac{1}{A+B}$ $= \frac{1}{\frac{2x+1}{2x-1} + \frac{2x-1}{2x+1}}$ $= \frac{1}{\frac{(2x+1)^2+(2x-1)^2}{(2x-1)(2x+1)}}$ Note $(a+b)^2 + (a-b)^2 = 2(a^2+b^2)$ $= \frac{1}{\frac{2(4x^2+1)}{4x^2-1}}$ $= \frac{4x^2-1}{2(4x^2+1)}$

35

LHS $(AB)^T$

$$AB = \begin{pmatrix} 1 & 2 & 1 \\ 2 & -1 & 1 \end{pmatrix}_{2\times 3} \times \begin{pmatrix} 2 & -1 \\ -1 & 4 \\ 0 & 2 \end{pmatrix}_{3\times 2}$$

$$= \begin{pmatrix} 2-2+0 & -1+8+2 \\ 4+1+0 & -2-4+2 \end{pmatrix} = \begin{pmatrix} 0 & 9 \\ 5 & -4 \end{pmatrix}$$

$$(AB)^T = \begin{pmatrix} 0 & 9 \\ 5 & -4 \end{pmatrix}^T = \begin{pmatrix} 0 & 5 \\ 9 & -4 \end{pmatrix} \quad \ldots(1)$$

RHS ($B^T A^T$)

$$B^T = \begin{pmatrix} 2 & -1 & 0 \\ -1 & 4 & 2 \end{pmatrix}, \; A^T = \begin{pmatrix} 1 & 2 \\ 2 & -1 \\ 1 & 1 \end{pmatrix}$$

$$B^T A^T = \begin{pmatrix} 2 & -1 & 0 \\ -1 & 4 & 2 \end{pmatrix}_{2\times 3} \times \begin{pmatrix} 1 & 2 \\ 2 & -1 \\ 1 & 1 \end{pmatrix}_{3\times 2}$$

$$= \begin{pmatrix} 2-2+0 & 4+1+0 \\ -1+8+2 & -2-4+2 \end{pmatrix}$$

$$B^T A^T = \begin{pmatrix} 0 & 5 \\ 9 & -4 \end{pmatrix} \quad \ldots(2)$$

From (1) and (2), $(AB)^T = B^T A^T$.
Hence proved.

36

The first point in the question is incorrect.
That is (-5, t) .So, <u>no solution</u> can be found

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Given lines $4x + 5y - 13 = 0$ ...(1)
$x - 8y + 9 = 0$ ...(2)
To find the point of intersection, solve equation (1) and (2)

$$\begin{matrix} & x & & y & & 1 & \\ 5 & & -13 & & 4 & & 5 \\ -8 & & 9 & & 1 & & -8 \end{matrix}$$

$$\frac{x}{45-104} = \frac{y}{-13-36} = \frac{1}{-32-5}$$

$$\frac{x}{-59} = \frac{y}{-49} = \frac{1}{-37}$$

$$x = \frac{59}{37}, \; y = \frac{49}{37}$$

Therefore, the point of intersection $(x, y) = \left(\frac{59}{37}, \frac{49}{37}\right)$

The equation of line parallel to Y axis is $x = c$.

It passes through $(x, y) = \left(\frac{59}{37}, \frac{49}{37}\right)$. Therefore, $c = \frac{59}{37}$.

The equation of the line is $x = 59/37$ gives $37x - 59 = 0$

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Let h, l, R and r be the height, slant height, outer radius and inner radius of the frustum.

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Fig. 7.24

Given that, diameter of the top =10 m; radius of the top $R = 5$ m.
diameter of the bottom = 4 m; radius of the bottom $r = 2$ m, height $h = 4$ m

Now, $l = \sqrt{h^2 + (R-r)^2}$

$= \sqrt{4^2 + (5-2)^2}$

$l = \sqrt{16+9} = \sqrt{25} = 5\text{m}$

Here, C.S.A. $= \pi(R+r)l$ sq. units

$= \frac{22}{7}(5+2)\times 5 = 110\, m^2$

T.S.A. $= \pi(R+r)l + \pi R^2 + \pi r^2$ sq. units

$= \frac{22}{7}\left[(5+2)5 + 25 + 4\right] = \frac{1408}{7} = 201.14$

Therefore, C.S.A. = 110 m^2 and T.S.A. = 201.14 m^2

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Solution:

Hollow sphere:	Cone:
R = 5 cm	r = 7 cm
r = ?	h = 8 cm

Volume of Hollow sphere = Volume of cone

$\frac{4}{3}\pi(R^3 - r^3) = \frac{1}{3}\pi r^2 h$

$4(5^3 - r^3) = 7\times7\times8$

$(125 - r^3) = \frac{7\times7\times8}{4}$

$125 - r^3 = 98$

$-r^3 = 98 - 125$

$-r^3 = -27$

$r^3 = 27 = 3^3$

$\boxed{r = 3 \text{ cm}}$

diameter = 2r = 2×3 = 6cm

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Angle Bisector Theorem

Statement

The internal bisector of an angle of a triangle divides the opposite side internally in the ratio of the corresponding sides containing the angle.

Proof

Given : In ΔABC, AD is the internal bisector

To prove : $\frac{AB}{AC} = \frac{BD}{CD}$

Construction : Draw a line through *C* parallel to *AB*. Extend *AD* to meet line through *C* at *E*

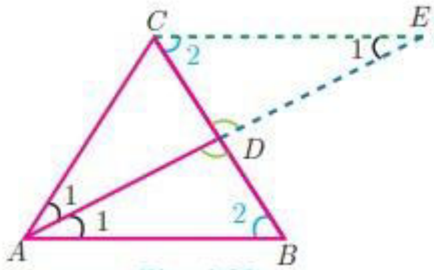

Fig. 4.33

No	Statement	Reason
1.	$\angle AEC = \angle BAE = \angle 1$	Two parallel lines cut by a transversal make alternate angles equal.
2.	ΔACE is isosceles AC = CE ... (1)	In $\Delta ACE, \angle CAE = \angle CEA$
3.	$\Delta ABD \sim \Delta ECD$ $\frac{AB}{CE} = \frac{BD}{CD}$	By AA Similarity
4.	$\frac{AB}{AC} = \frac{BD}{CD}$	From (1) $AC = CE$. Hence proved.

41

Solution:

Three coins are tossed

S = {HHH, HHT, HTH, THH, TTH, THT, HTT, TTT}

n(S) = 8

Let A be the event of getting exactly two heads

A = {HHT, HTH, THH} ⇒ n(A) = 3

$P(A) = \frac{n(A)}{n(S)} = \frac{3}{8}$

Let B be the event of getting atleast one tail

B = {HHH, HHT, HTH, THH, TTH, THT, HTT, TTT}

n(B) = 7

$P(B) = \frac{n(B)}{n(S)} = \frac{7}{8}$

Let C be the event of getting consecutively two heads

C = {HHT, THH, HHH} ⇒ n(C) = 3

$P(C) = \frac{n(C)}{n(S)} = \frac{3}{8}$

A∩B = {HHT, HTH, THH}

$n(A\cap B) = 3$

$P(A\cap B) = \frac{3}{8}$

B∩C = {HHT, THH}

$n(B\cap C) = 2$

$P(B\cap C) = \frac{2}{8}$

C∩A = {HHT, THH}

$n(C\cap A) = 2$

$P(C\cap A) = \frac{2}{8}$

A∩B∩C = {HHT, THH}

$n(A\cap B\cap C) = 2$

$P(A\cap B\cap C) = \frac{2}{8}$

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

$= \frac{3}{8}+\frac{7}{8}+\frac{3}{8}-\frac{3}{8}-\frac{2}{8}-\frac{2}{8}+\frac{2}{8}$

$= \frac{8}{8} = 1$

Answer: P(atleast one tail or exactly two heads or consecutively two heads) = 1

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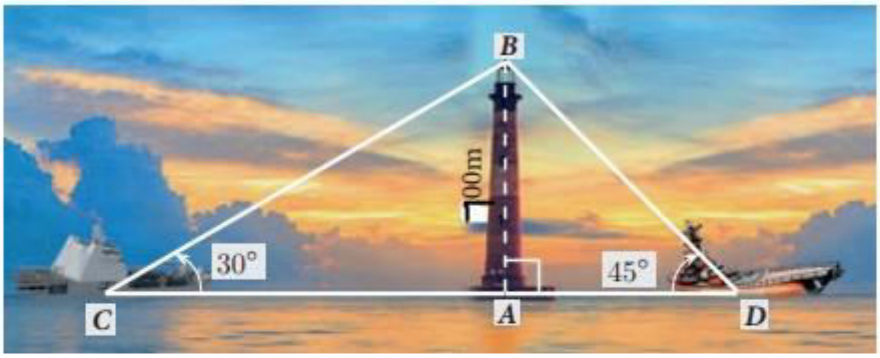
42 Let AB be the lighthouse. Let C and D be the positions of the two ships.



Then, $AB = 700$ m.

$\angle ACB = 30°$, $\angle ADB = 45°$

In right triangle BAC, $\tan 30° = AB/AC$

$1/\sqrt{3} = 700/AC$ gives $AC = 700\sqrt{3}$ ...(1)

In right triangle BAD, $\tan 45° = AB/AD$

$1 = 700/AD$ gives $AD = 700$ ...(2)

Now, $CD = AC + AD = 700\sqrt{3} + 700$ [by (1) and (2)]

$CD = 700(\sqrt{3} + 1) = 700 \times 2.732 = 1912.4$

Distance between two ships is 1912.4 m.

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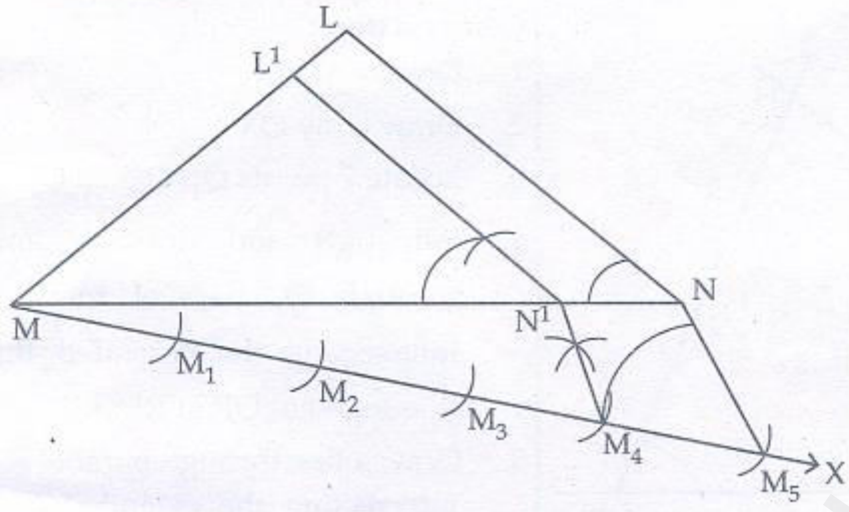
43	a	**Solution :**  **Construction :** 1. Construct a ΔLMN 2. Draw a ray MX 3. Locate 5 points M_1, M_2, M_3, M_4 and M_5 on MX 4. Join M_5 and draw a line a line through M_4 parallel to M_5N to intersect MN at O′ N′ 5. Draw line through N′ parallel to the line LN to intersect LM at L′ Then L″MN′ is the required triangle each of whose sides is $\frac{4}{5}$ of the corresponding sides of ΔLMN.
		or
	b	

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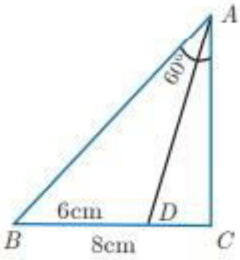

Rough diagram

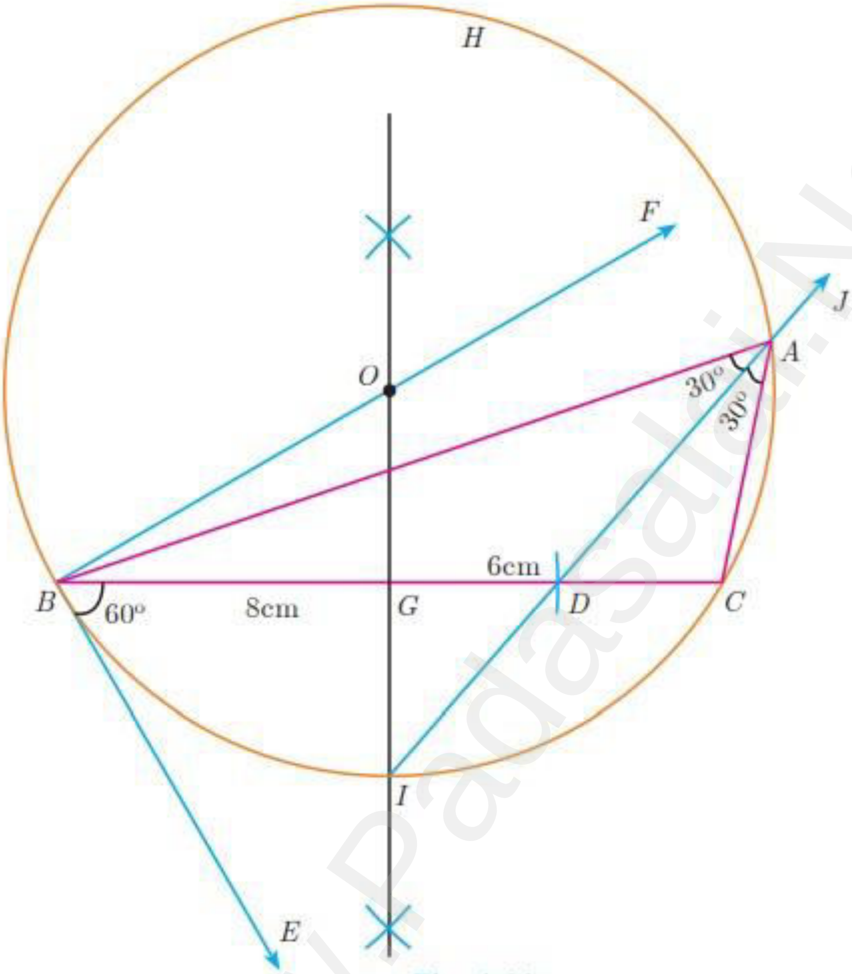

Fig. 4.44

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Construction

Step 1 : Draw a line segment BC= 8 cm.

Step 2 : At B, draw BE such that $\angle CBE = 60°$

Step 3 : At B, draw BF such that $\angle EBF = 90°$.

Step 4 : Draw the perpendicular bisector to BC, which intersects BF at O and BC at G.

Step 5 : With O as centre and OB as radius draw a circle.

Step 6 : From B, mark an arc of 6cm on BC at D.

Step 7 : The perpendicular bisector intersects the circle at I. Joint ID.

Step 8 : ID produced meets the circle at A. Now join AB and AC. Then ΔABC is the required triangle.

44 a

GIVEN:-

No. of Participants (x)	2	4	6	8	10
Amount for each participant (Rs.) (y)	180	90	60	45	36

POINTS:-

(2, 180), (4, 90), (6, 60), (8, 45), (10, 36)

VARIATION:- Indirect Variation.

CONSTANT OF VARIATION:-

$$xy = k$$

$$k = xy = 2 \times 180 = 360$$

EQUATION:- $xy = 180$

SCALE:-

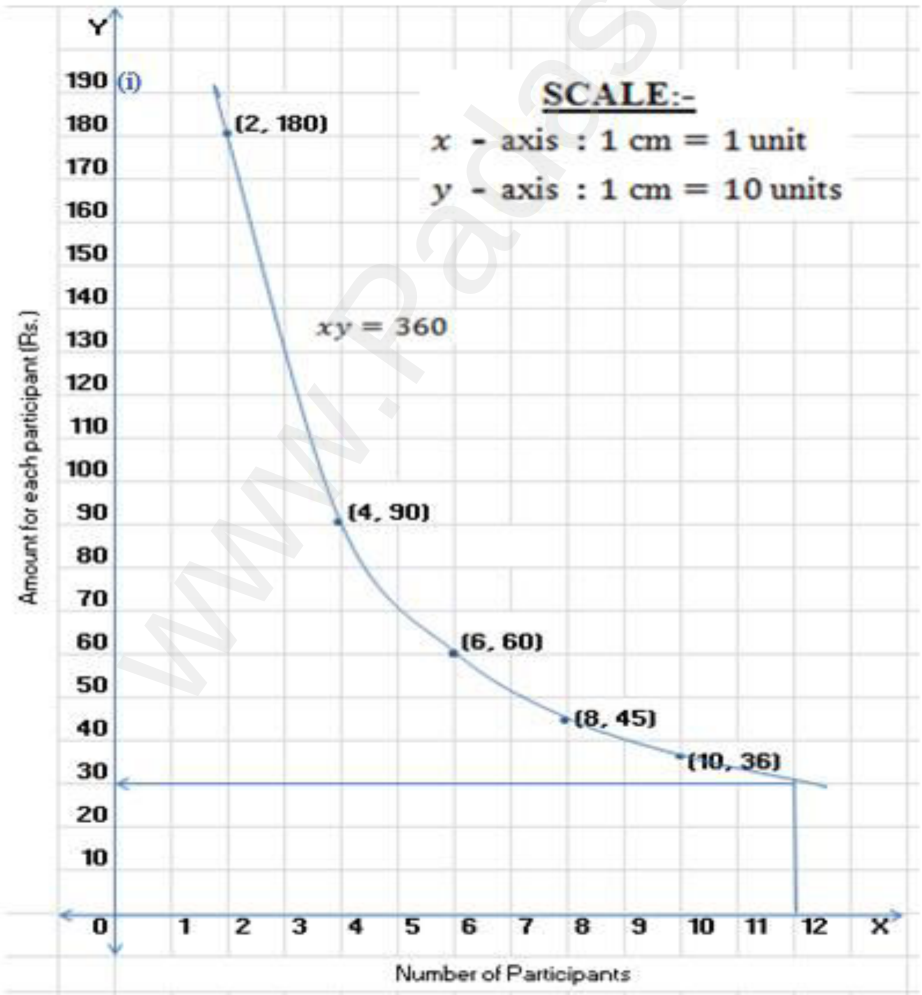
x -axis: 1 cm = 1 unit

y -axis: 1 cm = 10 units

From the graph,

If $x = 12$, then $y = 30$

If The number of participants are 12, each participant will get Rs.30.



or

b Draw the graph of $y = x^2 - 4x + 3$ by preparing the table of values as below

x	−2	−1	0	1	2	3	4
y	15	8	3	0	−1	0	3

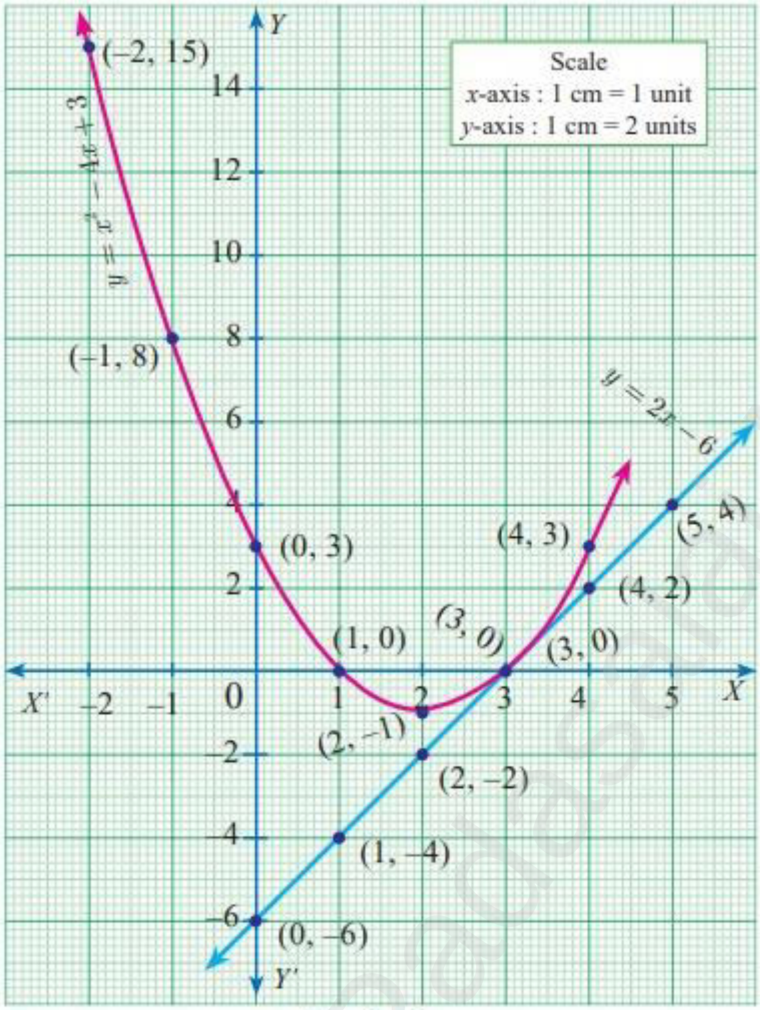


Fig. 3.18

Step 2

To solve $x^2 - 6x + 9 = 0$, subtract $x^2 - 6x + 9 = 0$ from $y = x^2 - 4x + 3$ that is

$$\begin{aligned} y &= x^2 - 4x + 3 \\ 0 &= x^2 - 6x + 9 \quad (-) \\ \hline y &= \quad 2x - 6 \end{aligned}$$

The equation $y = 2x - 6$ represent a straight line. Draw the graph of $y = 2x - 6$ forming the table of values as below.

x	0	1	2	3	4	5
y	−6	−4	−2	0	2	4

The line $y = 2x - 6$ intersect $y = x^2 - 4x + 3$ only at one point

Step 3

Mark the point of intersection of the curve $y = x^2 - 4x + 3$ and $y = 2x - 6$ that is

		(3,0). Therefore, the x coordinate 3 is the only solution for the equation $x^2 - 6x + 9 = 0$.

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