

# 10<sup>TH</sup> - MATHS - 2023

## Answer key

### PART-I

1. c) 12
2. d)  $2^{PQ}$
3. d) 11
4. b) an Arithmetic Progression
5. a)  $\frac{9y}{7}$
6. a) parabola
7. c)  $\angle B = \angle D$
8. b) point of contact
9. c)  $\infty$
10. a)  $\frac{3}{2}$
11. a) 12 cm
12. d) 3 : 1 : 2
13. a) 37
14. c)  $\frac{23}{26}$ .

## PART-II

15. Sol:  
 $A = \{3, 4\}$   
 $B = \{-2, 0, 3\}$

16. Sol:  
 $f \circ f(k) = 5$   
 $2(2k-1) - 1 = 5$   
 $4k - 2 - 1 = 5$   
 $4k = 5 + 3$   
 $4k = 8$   
 $\boxed{k = 2}$

17. Sol:  
 $\frac{t_2}{t_1} = \frac{t_3}{t_2}$   
 $\frac{x+12}{x+6} = \frac{x+15}{x+12}$   
 $(x+12)^2 = (x+15)(x+6)$   
 $x^2 + 144 + 24x = x^2 + 6x + 15x + 90$   
 $3x = 90 - 144$   
 $3x = -54$   
 $\boxed{x = -18}$

18) Sol  
 $\frac{x+2}{4y} \times \frac{\cancel{4y}^x}{x^2-x-6}$   
 $= \frac{(x+2) \times 3y}{(x+2)(x-3)}$   
 $= \frac{3y}{x-3}$

19)  
 $\Delta = b^2 - 4ac$   
 $\Delta = (-1)^2 - 4(2)(-1)$   
 $= 1 + 8$   
 $= 9 > 0$

Roots are real and unequal.

20). by ABT  
 $\frac{AB}{AC} = \frac{BD}{DC}$

$$\frac{10}{14} = \frac{x}{x-6}$$

$$\frac{5}{7} = \frac{x}{x-6}$$

$$30 - 5x + 30 = 7x$$

$$12x = 30$$

$$BC = 2.5 \quad x = \frac{30}{12} = 2.5$$

$$21. \quad (-6, -4) \text{ and } (5, 1)$$

$$x_1, y_1 \qquad x_2, y_2$$

$$\frac{y - y_1}{y_2 - y_1} = \frac{x - x_1}{x_2 - x_1}$$

$$\frac{y + 4}{11 + 4} = \frac{x + 6}{5 + 6}$$

$$\frac{y + 4}{15} = \frac{x + 6}{11}$$

$$11y + 44 = 15x + 90$$

$$\Rightarrow \boxed{15x - 11y + 46 = 0}$$

22. sol:

$$12y = -(p+3)x + 12$$

$$(p+3)x + 12y - 12 = 0$$

$$m_1 = -\frac{a}{b} = \frac{-(p+3)}{12}$$

$$12x - 7y - 16 = 0$$

$$m_2 = -\frac{a}{b} = \frac{-12}{-7} = \frac{12}{7}$$

$$m_1 \times m_2 = -1$$

$$\frac{-(p+3)}{12} \times \frac{12}{7} = -1$$

$$p+3 = 7$$

$$\boxed{p = 4}$$

23.

$$\begin{aligned} \frac{\sec \theta}{\sin \theta} - \frac{\sin \theta}{\cos \theta} &= \frac{1/\cos \theta}{\sin \theta} - \frac{\sin \theta}{\cos \theta} \\ &= \frac{1}{\cos \theta \cdot \sin \theta} - \frac{\sin \theta}{\cos \theta} \\ &= \frac{1 - \sin^2 \theta}{\cos \theta \cdot \sin \theta} = \frac{\cos^2 \theta}{\cancel{\cos \theta} \cdot \sin \theta} \\ &= \cot \theta. \end{aligned}$$

24.

$$l = \sqrt{r^2 + h^2}$$

$$l = \sqrt{7^2 + 24^2} = \sqrt{49 + 576} = \sqrt{625}$$

$$l = 25 \text{ m.}$$

$$CSA = \pi r l \text{ sq. u}$$

$$= \frac{22}{7} \times 7 \times 25 = 550 \text{ m}^2$$

$$\text{length} = \frac{\text{Area}}{\text{width}} = \frac{550}{4} = 137.5 \text{ m.}$$

25.

$$r_1 : r_2 = 4 : 7$$

$$\frac{\frac{4}{3} \pi r_1^3}{\frac{4}{3} \pi r_2^3} = \frac{r_1^3}{r_2^3} = \frac{4^3}{7^3} = \frac{64}{343}$$

$$CSA_1 : CSA_2 = 64 : 343$$



26.

$$R = L - S$$

$$= 125 - 63$$

$$R = 62$$

$$C.R = \frac{L - S}{L + S}$$

$$= \frac{125 - 63}{125 + 63}$$

$$C.R = \frac{62}{188} = 0.33$$

27.

$$P(A \cup B) \leq 1$$

$$P(A) + P(B) - P(A \cap B) \leq 1$$

$$0.5 + P(B) - 0.3 \leq 1$$

$$P(B) + 0.2 \leq 1$$

$$P(B) \leq 1 - 0.2$$

$$P(B) \leq 0.8$$

28.

$$315000 = 2^3 \times 3^2 \times 5^4 \times 7^1$$

$$= 5^3 \times p^2 \times r^4 \times q$$

Hence  $p = 3$ ,  $q = 7$ ,  $r = 5$   
 $s = 2$

28)

$$\begin{array}{r} 2 \overline{) 315000} \\ \underline{2} \phantom{157500} \\ 2 \phantom{157500} \phantom{0} \\ \underline{2} \phantom{157500} \phantom{0} \phantom{0} \\ 3 \phantom{157500} \phantom{0} \phantom{0} \phantom{0} \\ \underline{3} \phantom{157500} \phantom{0} \phantom{0} \phantom{0} \\ 3 \phantom{157500} \phantom{0} \phantom{0} \phantom{0} \phantom{0} \\ \underline{3} \phantom{157500} \phantom{0} \phantom{0} \phantom{0} \phantom{0} \\ 5 \phantom{157500} \phantom{0} \phantom{0} \phantom{0} \phantom{0} \phantom{0} \\ \underline{5} \phantom{157500} \phantom{0} \phantom{0} \phantom{0} \phantom{0} \phantom{0} \\ 5 \phantom{157500} \phantom{0} \phantom{0} \phantom{0} \phantom{0} \phantom{0} \phantom{0} \\ \underline{5} \phantom{157500} \phantom{0} \phantom{0} \phantom{0} \phantom{0} \phantom{0} \phantom{0} \\ 5 \phantom{157500} \phantom{0} \phantom{0} \phantom{0} \phantom{0} \phantom{0} \phantom{0} \phantom{0} \\ \underline{5} \phantom{157500} \phantom{0} \phantom{0} \phantom{0} \phantom{0} \phantom{0} \phantom{0} \phantom{0} \\ 7 \overline{) 7} \end{array}$$

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## PART-III

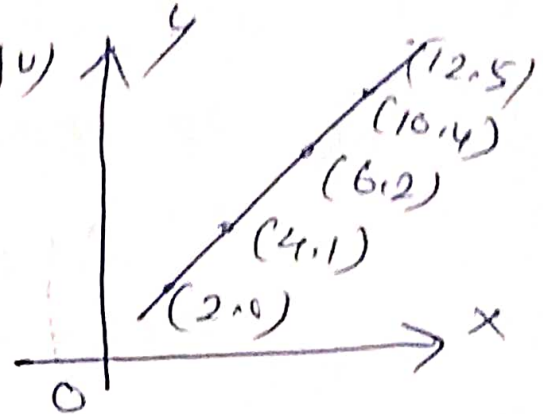
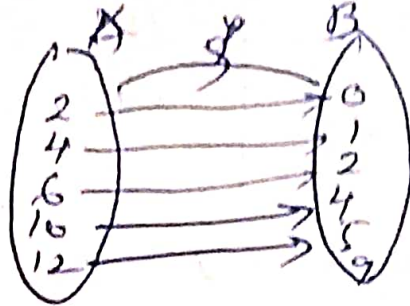
29.

(i)  $\{(2,0), (4,1), (6,2), (10,4), (12,5)\}$

(ii) 

x	2	4	6	10	12
y	0	1	2	4	5

(iii)



(iv)

30.

sol.

$$1+2+3+\dots+(n-1) = (n+1)+(n+2)+\dots+49$$

$$\frac{n-1}{2} (1+(n-1)) = \frac{49}{2} [1+49] - \frac{n}{2} [1+n]$$

$$S_n = \frac{n}{2} [a+l]$$

$$n^2 - n = 2450 - n^2 - n$$

$$2n^2 = 2450$$

$$n^2 = 1225$$

$$\boxed{n = 35}$$

31.

$$S_n = 5 + 55 + 555 + \dots \text{ n terms.}$$

$$= \frac{5}{9} (9 + 99 + \dots \text{ n terms})$$

$$S_n = \frac{a(r^n - 1)}{r - 1}$$

$$= \frac{5}{9} [(10 + 100 + 1000) - (1 + 1 + \dots)]$$

$$S_n = \frac{5}{9} \left[ \frac{10(10^n - 1)}{9} - n \right]$$

32.

$$x+20 = \frac{3y}{2} + 10 = 2z+5 = 110 - (y+z)$$

$$x+20 = \frac{3y}{2} + 10$$

$$x - \frac{3y}{2} = -20 + 10$$

$$\frac{2x - 3y}{2} = -10$$

$$2x - 3y = -20 \rightarrow \textcircled{1}$$

$$\frac{3y}{2} + 10 = 2z + 5$$

$$\frac{3y}{2} - 2z = -5$$

$$3y - 4z = -10 \rightarrow \textcircled{2}$$

$$2z + 5 = 110 - y - z$$

$$\Rightarrow 3z + y = 105 \rightarrow \textcircled{3}$$

Solving eqn  $\textcircled{1}$  &  $\textcircled{2}$   $\textcircled{3}$

$$x = 35$$

$$y = 30$$

$$z = 25$$

33.

$$AB = \begin{bmatrix} 5+2+45 & 35+4-9 \\ 1+2+40 & 7+4-8 \end{bmatrix}$$

$$AB = \begin{bmatrix} 52 & 30 \\ 43 & 3 \end{bmatrix}$$

$$(AB)^T = \begin{bmatrix} 52 & 43 \\ 30 & 3 \end{bmatrix} \rightarrow \textcircled{1}$$

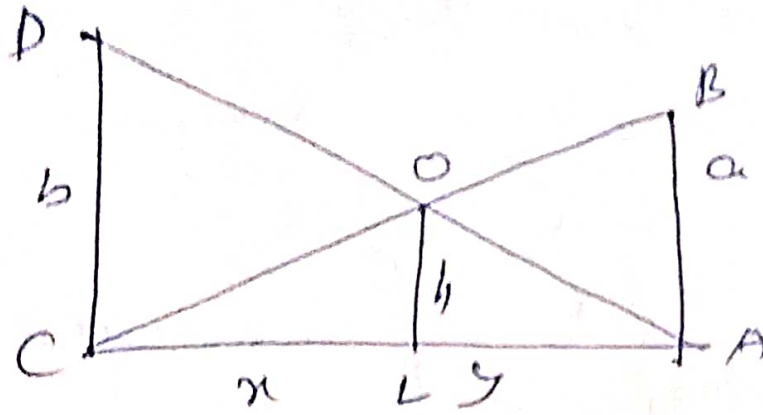
$$B^T A^T = \begin{bmatrix} 52 & 43 \\ 30 & 3 \end{bmatrix} \rightarrow \textcircled{2}$$

$\textcircled{1}$  &  $\textcircled{2}$

$$(AB)^T = B^T A^T$$



34.


 $\triangle CAB \sim \triangle CLO$ 

$$\frac{CA}{CL} = \frac{AB}{LO} \Rightarrow \frac{p}{x} = \frac{a}{h}$$

$$x = \frac{ph}{a} \rightarrow \textcircled{1}$$

and

 $\triangle ALO \sim \triangle ACD$ 

$$\frac{AL}{AC} = \frac{OL}{DC} \Rightarrow \frac{y}{p} = \frac{h}{b}$$

$$y = \frac{ph}{b} \rightarrow \textcircled{2}$$

 $\textcircled{1} + \textcircled{2}$ 

$$x + y = \frac{ph}{a} + \frac{ph}{b}$$

$$p = ph \left[ \frac{1}{a} + \frac{1}{b} \right]$$

$$1 = h \left( \frac{a+b}{ab} \right)$$

$$\Rightarrow h = \frac{ab}{a+b}$$





$$\textcircled{2} \Rightarrow x - 2\left(\frac{9}{11}\right) = -3$$

$$x - \frac{18}{11} = -3$$

$$x = -3 + \frac{18}{11}$$

$$x = \frac{-33 + 18}{11}$$

$$x = \frac{-15}{11}$$

$$\begin{array}{r} 2 \\ 33 \\ 18 \\ \hline 15 \end{array}$$

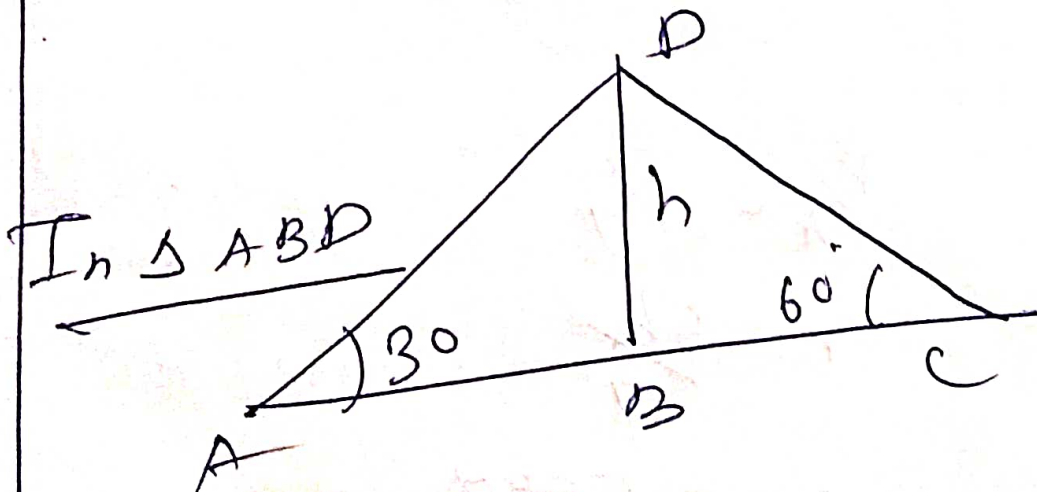
point  $\left(-\frac{15}{11}, \frac{9}{11}\right)$ .

equal. parallel to x-axis

$$y = \frac{9}{11}$$

$$\boxed{11y - 9 = 0}$$

38.



$$\tan 30^\circ = \frac{BD}{AB}$$

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

$$AB = h\sqrt{3}$$

$\hookrightarrow \textcircled{0}$

In  $\triangle BCD$

$$\tan 60^\circ = \frac{h}{BC}$$

$$\sqrt{3} = \frac{h}{BC}$$

$$BC = \frac{h}{\sqrt{3}} \rightarrow \textcircled{2}$$

① + ②

$$AB + BC = AC$$

$$\Rightarrow AC = h\sqrt{3} + \frac{h}{\sqrt{3}}$$

$$AC = \frac{4h}{\sqrt{3}} \text{ m.}$$

39)

$$\frac{r}{h} = \frac{5}{7}$$

$$r = \frac{5h}{7}$$

$$CSA = 5500$$

$$2\pi rh = 5500$$

$$r = 25 \text{ cm}$$

$$h = 35 \text{ cm}$$

40)

$$\pi r^2 = 150 \times 4$$

$$= 600 \text{ m}^2$$

$$\text{Vol} = 150 \times 40$$

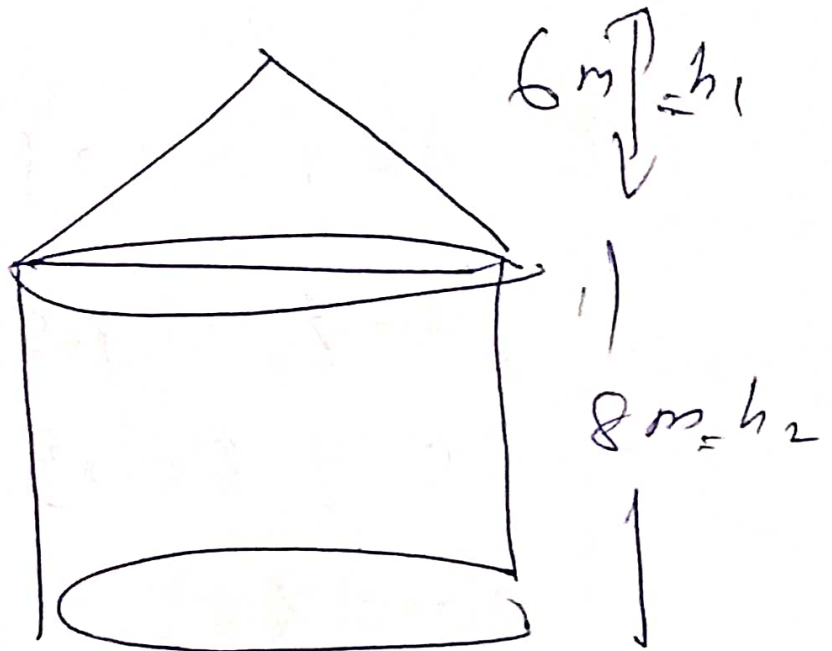
$$= 6000 \text{ m}^3$$

$$\pi r^2 h_1 + \frac{1}{3} \pi r^2 h_2 = 6000$$

$$\pi r^2 \left[ h_1 + \frac{1}{3} h_2 \right] = 6000$$

$$\frac{1}{3} h_2 = \frac{6000}{600}$$

$$h_2 = 6 \text{ m}$$



41)

$$n(s) = 36$$

(i) a doublet =  $\frac{1}{6}$

(ii)  $\frac{1}{6}$

(iii)  $\frac{5}{12}$

(iv) 0.



$$42). \quad A = \{0, 1, 2\}$$

$$B = \{2, 3, 4, 5\}$$

$$C = \{3, 5, 7\}$$

$$B \cup C = \{2, 3, 4, 5, 7\}$$

$$A \times (B \cup C) = \{0, 1, 2\} \times \{2, 3, 4, 5, 7\}$$

$$= \{ (0, 2), (0, 3), (0, 4), (0, 5), (0, 7), \\ (1, 2), (1, 3), (1, 4), (1, 5), (1, 7), \\ (2, 2), (2, 3), (2, 4), (2, 5), (2, 7) \}$$

↳ (1)

$$A \times B = \{ (0, 2), (0, 3), (0, 4), (0, 5), \\ (1, 2), (1, 3), (1, 4), (1, 5), \\ (2, 2), (2, 3), (2, 4), (2, 5) \}$$

$$A \times C = \{ (2, 3), (2, 5), (2, 7), \\ (3, 3), (3, 5), (3, 7), \\ (4, 3), (4, 5), (4, 7), \\ (5, 3), (5, 5), (5, 7) \}$$

$$(A \times B) \cup (A \times C)$$

$$= \{(0,2), (0,3), (0,4), (0,5), (0,7), \\ (1,2), (1,3), (1,4), (1,5), (1,7), \\ (2,2), (2,3), (2,4), (2,5), (2,7)\}$$

$\rightarrow \textcircled{2}$

From eqn  $\textcircled{1}$  &  $\textcircled{2}$  we get

$$\boxed{A \times (B \cup C) = (A \times B) \cup (A \times C)}$$

43) a)  $P(A) = P(B) = 10.2$  (or)  $10.3 \text{ cm}$ .

44) a)  $y = 18.6$

(b) sol  $\{2, 7\}$ .

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