UNIVERSAL INSTITUTIONS
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SALEM

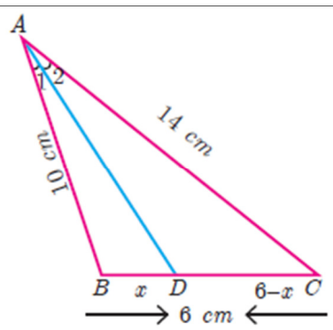
S.S.L.C PUBLIC EXAMS – APRIL – **2023**

ANSWER KEY

SUBJECT : MATHEMATICS MEDIUM : ENGLISH

PART – I		
Qn.No.	KEY ANSWERS	
1.	(C)	12
2.	(D)	2^{pq}
3.	(D)	11
4.	(B)	an Arithmetic Progression
5.	(A)	$\frac{9y}{7}$
6.	(C)	parabola
7.	(C)	$\angle B = \angle D$
8.	(B)	point of contact
9.	(C)	∞
10.	(A)	$\frac{3}{2}$
11.	(A)	12 cm
12.	(D)	3 : 1 : 2
13.	(A)	37
14.	(C)	$\frac{23}{26}$

PART – II [Qn.No.. 28 – COMPULSORY]	
Qn.No.	KEY ANSWERS
15.	$A = \{3, 4\}$ $B = \{-2, 0, 3$
16.	$fof(k) = (2k-1)\ o\ (2k-1)$ $= 4k - 3$ **Given,** $fof(k) = 5$ $4k - 3 = 5$ $k = 2$
17.	**Given,** $a = x + 6,\ b = x + 12,\ c = x + 15.$ **WKT**, a, b, c are the three consecutive terms of a geometric progression, then $b^2 = ac$. $(x + 12)^2 = (x + 6)(x + 15)$ $x = -18$
18.	$\frac{x+2}{4y} \div \frac{x^2 - x - 6}{12y^2} = \frac{x+2}{4y} \times \frac{12\,y\,y}{(x-3)(x+2)}$ $= \frac{\mathbf{3y}}{\mathbf{x-3}}$
19.	**Here,** $a = 2,\ b = -1,\ c = -1$ $\Delta = b^2 - 4ac$ $= (-1)^2 - 4(2)(-1)$ $\Delta = 9 > 0$ The roots are real and unequal.

20.	$AB = 10$ cm. $AC = 14$ cm $BC = 6$ cm. Let $BD = x$ $DC = 6 - x$  By Angle biossector therorem,, $\frac{AB}{AC} = \frac{BD}{DC}$ $\frac{10}{14} = \frac{x}{6-x}$ $x = 2.5$ · $BD = x = 2.5$ cm and $DC = 6 - x = 3.5$ cm
21.	$(x_1, y_1) = (-6, -4)$ $(x_2, y_2) = (5, 11)$ The equation $\frac{y - y_1}{y_2 - y_1} = \frac{x - x_1}{x_2 - x_1}$ $\frac{y-(-4)}{11-(-4)} = \frac{x-(-6)}{5-(-6)}$ $15x - 11y + 46 = 0$
22.	Slope of the equation $ax + by + c = 0$ is, $m = \frac{-a}{b}$ Slope of the equation $(p+3)x + 12y - 12 = 0$ is, $m_1 = \frac{-(p+3)}{12}$ Slope of the equation $12x - 7y - 16 = 0$ is $m_2 = \frac{-12}{-7} = \frac{12}{7}$ If two straight lines are perpendicular to each other, the product of their slopes is -1. That is, $m_1 \text{x}\, m_2 = -1$ $\frac{-(p+3)}{12}$ x $\frac{12}{7} = -1$ $p = 4$
23.	$\frac{sec\theta}{sin\theta} - \frac{sin\theta}{cos\theta} = \frac{\frac{1}{cos\theta}}{sin\theta} - \frac{sin\theta}{cos\theta}$ $= \frac{1 - sin^2\theta}{sin\theta\, cos\theta}$ $= \frac{cos^2\theta}{sin\theta\, cos\theta}$ $= cot\theta$
24.	Slant height, $l = \sqrt{r^2 + h^2} = \sqrt{7^2 + 24^2} = \sqrt{625} = 25$ m CSA of the tent $= \pi rl = \frac{22}{7}$ x 7 x 25 = 550 Sq.m Here, Area of the canvas = CSA of the tent l x 4 = 550 $l = 137.5$ m

25.	Ratio of the Volumes of two spheres $= \frac{4}{3}\pi {r_1}^3 : \frac{4}{3}\pi {r_2}^3$ $= \frac{\frac{4}{3}\pi(4)^3}{\frac{4}{3}\pi(7)^3}$ $= \frac{64}{343}$ $= 64 : 343$
26.	Largest Value, $L = 125$ Smallest Value, $S = 63$ Range $= L - S = 125 - 63 = 62$ Co-efficient of Range $= \frac{L-S}{L+S} = \frac{125-63}{125+63} = \frac{31}{94} = \frac{62}{188} = 0.33$
27.	$P(A) = 0.5$ $P(A \cap B) = 0.3$ $P(A \cup B) \leq 1$ $P(A) + P(B) - P(A \cap B) \leq 1$ $0.5 + P(B) - 0.3 \leq 1$ $P(B) \leq 0.8$
28.	p^2 x q^1 x r^4 x $s^3 = 3^2$ x 7^1 x 5^4 x 2^3 $\Rightarrow p = 3\,,\ q = 7\,,\ r = 5\,,\ s = 2$

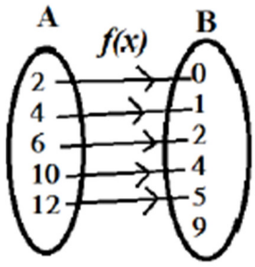
PART– III

[Qn.No.. 42 – COMPULSORY]

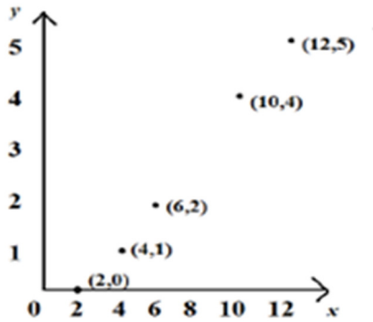
Qn.No.	KEY ANSWERS
29.	$f(x) = \frac{x}{2} - 1$ $f(2) = 0\,, f(4) = 1, f(6) = 2\,, f(10) = 4\,, f(12) = 5$ **(i)** Set of ordered pairs:- $f(x) = \{(2,0), (4,1), (6,2), (10,4), (12,5)\}$ **(ii)** A table:-

x	2	4	6	10	12
$f(x)$	0	1	2	4	5

(iii) An arrow diagram:-



(iv) A graph:-



30. Let Senthil's house number be x.

Given,

$1 + 2 + 3 + \cdots + (x-1) = (x+1) + (x+2) + \cdots + 49$

$= (1 + 2 + 3 + \cdots + 49) - (1 + 2 + 3 + \cdots + x)$

Here,	Here,	Here,
$a = 1$	$a = 1$	$a = 1$
$l = x - 1$	$l = 49$	$l = x$
$n = x - 1$	$n = 49$	$n = x$
$S_n = \frac{n}{2}(a + l)$	$S_n = \frac{n}{2}(a + l)$	$S_n = \frac{n}{2}(a + l)$

$$\frac{x-1}{2}(1 + x - 1) = \frac{49}{2}(1 + 49) - \frac{x}{2}(1 + x)$$

$$x = 35$$

Senthil's house number = 35

31. $S_n = 5 + 55 + 555 + \cdots n$ terms

$= 5(1 + 11 + 111 + \cdots n$ terms$)$

$= 5 \text{ x } \frac{9}{9}(1 + 11 + 111 + \cdots n$ terms$)$

$= \frac{5}{9}(9 + 99 + 999 + \cdots n$ terms$)$

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

WKT, $S_n = \frac{a(r^n-1)}{r-1}$ Here, $a = 10,\ r = 10$

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

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

(OR)

$$= \frac{50(10^n - 1)}{81} - \frac{5n}{9}$$

32. $2x - 3y = -20 \quad \rightarrow (1)$

$3y - 4z = -10 \quad \rightarrow (2)$

$y + 3z = 105 \quad \rightarrow (3)$

$x + y + z = 90 \quad \rightarrow (4)$

(Use any three of the above equations to find the solution)

$x = 35\ , \quad y = 30\ , \quad z = 25$

33.

$$AB = \begin{pmatrix} 5 & 2 & 9 \\ 1 & 2 & 8 \end{pmatrix} \times \begin{pmatrix} 1 & 7 \\ 1 & 2 \\ 5 & -1 \end{pmatrix} = \begin{pmatrix} 52 & 30 \\ 43 & 3 \end{pmatrix}$$

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

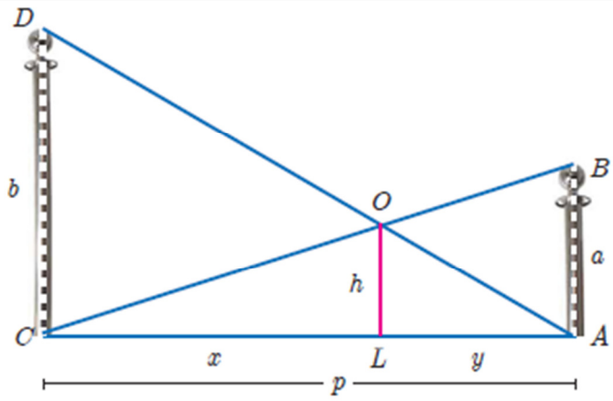
$$B^T = \begin{pmatrix} 1 & 1 & 5 \\ 7 & 2 & -1 \end{pmatrix} \text{ and}$$

$$A^T = \begin{pmatrix} 5 & 1 \\ 2 & 2 \\ 9 & 8 \end{pmatrix}$$

$$B^T A^T = \begin{pmatrix} 1 & 1 & 5 \\ 7 & 2 & -1 \end{pmatrix} \times \begin{pmatrix} 5 & 1 \\ 2 & 2 \\ 9 & 8 \end{pmatrix} = \begin{pmatrix} 52 & 43 \\ 30 & 3 \end{pmatrix} \rightarrow \textbf{(2)}$$

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

34.



By AA similarity, $\Delta ABC \sim \Delta LOC$

$$\frac{CA}{CL} = \frac{AB}{LO}$$

$$\frac{p}{x} = \frac{a}{h}$$

$$\frac{ph}{a} = x$$

$$x = \frac{ph}{a} \longrightarrow (1)$$

By AA similarity, $\Delta ALO \sim \Delta ACD$

$$\frac{AL}{AC} = \frac{OL}{DC}$$

$$\frac{y}{p} = \frac{h}{b}$$

$$y = \frac{ph}{b} \longrightarrow (2)$$

(1) + (2):

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

$$p = ph\left(\frac{1}{a} + \frac{1}{b}\right)$$

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

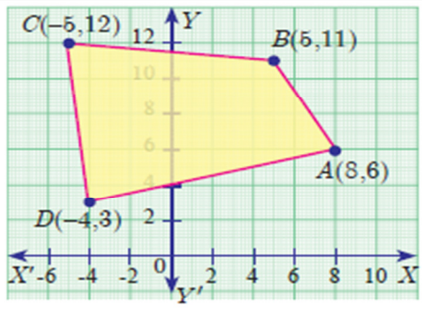
Required height $= \frac{ab}{a+b}$ metre.

35.

Statement
Figure
Given, To Prove, Construction
Proof
Note:- If No figure then only marks allotted for statement.

36.

$(x_1, y_1) = (8, 6)$
$(x_2, y_2) = (5, 11)$
$(x_3, y_3) = (-5, 12)$
$(x_4, y_4) = (-4, 3)$



Area of the quadrilateral $= \frac{1}{2}\begin{Bmatrix} x_1 & x_2 & x_3 & x_4 & x_1 \\ y_1 & y_2 & y_3 & y_4 & y_1 \end{Bmatrix}$

$= \frac{1}{2}\begin{Bmatrix} 8 & 5 & -5 & -4 & 8 \\ 6 & 11 & 12 & 3 & 6 \end{Bmatrix}$

$= \frac{1}{2}(88 + 60 - 15 - 24 - 30 + 55 + 48 - 24)$
$= 79$ Sq.units.

37.

$7x - 3y + 12 = 0$ and $x - 2y + 3 = 0$

Point of intersection, $(x, y) = \left(\frac{-15}{11}, \frac{9}{11}\right)$

WKT, The equation of line parallel to X axis is $y = b$

It passes through $\left(\frac{-15}{11}, \frac{9}{11}\right)$

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

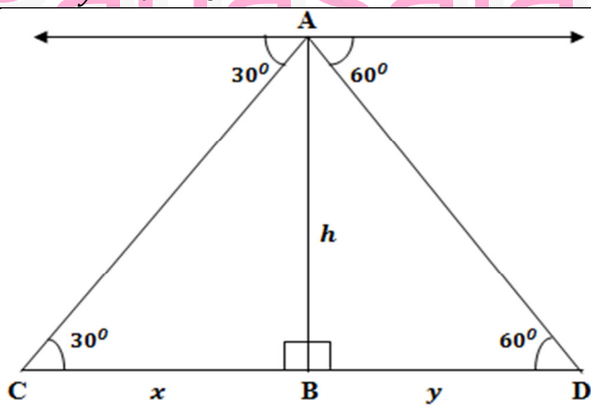
The equation of the line is

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

$11y = 9$

$11y - 9 = 0$

38.



In the right angle ΔABC,

$tan30^o = \frac{AB}{BC}$

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

$x = h\sqrt{3}$

In the right angle ΔABD,

$tan60^o = \frac{AB}{BD}$

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

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

The distance between the two ships,

	$x + y = h\sqrt{3} + \frac{h}{\sqrt{3}} = \frac{4h}{\sqrt{3}}\ m$
39.	Let the radius be $r = 5x$ and the height be $h = 7x$ $2\pi rh = 5500$ $2 \text{ x } \frac{22}{7} \text{ x } 5x \text{ x } 7x = 5500$ $x = 5$ Radius of the Cylinder $= 5x = 5 \text{ x } 5 = 25$ cm Height of the Cylinder $= 7x = 7 \text{ x } 5 = 35$ cm
40.	Total base area of the tent , $\pi r^2 = 600$ Volume of air required for one person $= 40$ cu.m Total volume of air required for 150 persons $= 6000$ cu.m $\pi r^2 h + \frac{1}{3}\pi r^2 H = 6000$ cu.m $H = 6$ m Height of the tent, $= 6$ m
41.	Sample Space, $S = \{(1,1),(1,2),(1,3),(1,4),(1,5),(1,6),$ $(2,1),(2,2),(2,3),(2,4),(2,5),(2,6),$ $(3,1),(3,2),(3,3),(3,4),(3,5),(3,6),$ $(4,1),(4,2),(4,3),(4,4),(4,5),(4,6),$ $(5,1),(5,2),(5,3),(5,4),(5,5),(5,6),$ $(6,1),(6,2),(6,3),(6,4),(6,5),(6,6)\}$ $\therefore n(S) = 36$ (i) $A = \{(1,1),(2,2),(3,3),(4,4),(5,5),(6,6)\}$ $n(A) = 6$ $P(A) = \frac{n(A)}{n(S)} = \frac{6}{36} = \frac{1}{6}$ (ii) $B = \{(1,2),(1,3),(1,5),(2,1),(3,1),(5,,1)\}$ $n(B) = 6$ $P(B) = \frac{n(B)}{n(S)} = \frac{6}{36} = \frac{1}{6}$ (iii) $C = \{(1,1),(1,2),(1,4),(1,6),(2,1),(2,3),(2,5),$ $(3,2),(3,4),(4,1),(4,3),(5,2),(5,6),(6,1),(6,5)\}$ $n(C) = 15$ $P(C) = \frac{n(C)}{n(S)} = \frac{15}{36} = \frac{5}{12}$ (iv) $D = \{\ \}$ $n(D) = 0$ $P(D) = \frac{n(D)}{n(S)} = 0$
42.	$A = \{0,1,2\}$ $B = \{2,3,4,5\}$ $C = \{3,5,7\}$

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

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

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

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

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

$\therefore$ from (1) and (2), $A \times (B \cup C) = (A \times B) \cup (A \times C)$

PART – IV	
Qn.No.	KEY ANSWERS
43.a)	Rough Diagram Drawing first circle Drawing the second circle Drawing the two tangents Length of tangent $= 10.2$ (or) 10.1 (or) 10.3 cm.
	(OR)
b)	Rough Diagram Drawing a line segment Drawing circle Marking angle bisector Construction of ΔABC
44.a)	X axis , Y axis Scale Type of variation : Direct Variation Equation : $y = kx$ $y = (3.1)x$ Plot the points and draw the straight line. If $x = 6$ then, $y = 18.6$ The diameter of the circle is 6 cm while the circumference of the circle is 18.6 cm.
	(OR)
b)	X axis , Y axis Scale $y = x^2 - 5x - 6$ (Any 5 points)

x	-2	-1	0	1	2	3	4	5	6	7
y	8	0	-6	-10	-12	-12	-10	-6	0	8

Plot the points and draw the parabola.

$y = 8$

x	-2	-1	0	1	2
y	8	8	8	8	8

Plot the points and draw the straight line

Solution: $x = \{-2, 7\}$