X – STD – APRIL -2023 ANSWER KEY
MATHEMATICS

Section - I $\qquad 14 \times 1 = 14$

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

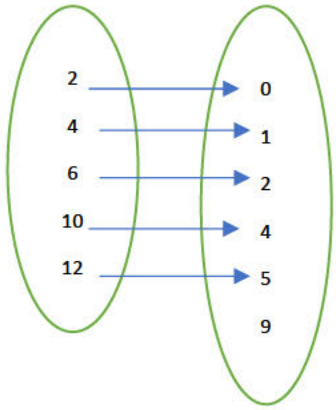
Section - I $\qquad 10 \times 2 = 20$

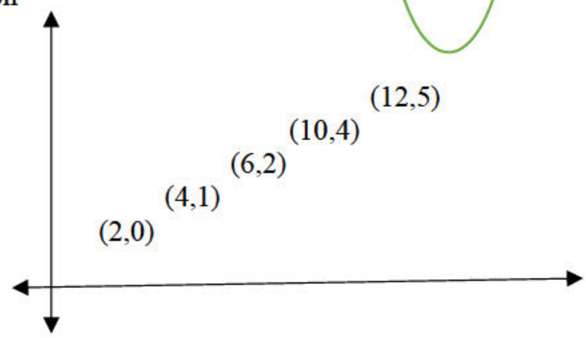
15	A= {3, 4} $B = \{-2,0,3\}$	1 1	2 mark
16	$fof(k) = f[f(k)] \Rightarrow 4k - 3$ $fof(k) = 5 \qquad k = 2$	1 1	2 mark
17	G.P is $x + 6, x + 12, x + 15$ $r = \frac{t_2}{t_1} = \frac{t_3}{t_2} \Rightarrow \frac{x+12}{x+6} = \frac{x+15}{x+12}$ $(x + 12)^2 = x + 6\,(x + 15) \ \Rightarrow x = -\frac{54}{3} \qquad x = -18$	1 1	2 mark
18	$\frac{x+2}{4y} \times \frac{12y^2}{x^2 - x - 6}$ $\frac{x+2}{4y} \times \frac{12y^2}{(x-3)(x+2)} \ \Rightarrow \frac{3y}{x-3}$	1 1	2 mark
19	$2x^2 - x - 1 = 0 \quad a = 2, \quad b = -1, \quad c = -1$ $\Delta = b^2 - 4ac \ \Rightarrow (-1) - 4(2)(-1)$ $= 9$ $\Delta > 0$ *real and unequal roots*	1 1	2 mark
20	$AB = 10\ cm, \quad AC = 14cm, \ BC = 6cm \quad BD = ? \ DC = ?$ BY using ABT $\frac{AB}{AC} = \frac{BD}{DC} \ \Rightarrow \frac{10}{4} = \frac{X}{6-X}$ $x = 2.5\ cm \ \ BD = 2.5\ cm \ \ DC = \ 3.5cm$	1 1	2 mark
21	$A(x_1, y_1)\ B = (5,11)$ $\frac{y - y_1}{y_2 - y_1} = \frac{x - x_1}{x_2 - x_1}$ $\frac{y - (-4)}{11 - (-4)} = \frac{x - (-6)}{5 - (-6)}$ $15x - 11y + 46 = 0$	1 1	2 mark

22	$12y = -(p+3)x + 12 \quad \& \quad 12x - 7y = 16$ $m_1 = -\frac{x}{y} = -\frac{(p+3)}{12} \Rightarrow m_2 = -\frac{x}{y} = \frac{12}{7}$ $m_1 \times m_2 = -1 \Rightarrow p = 4$	1 1	2 mark
23	$\frac{\sec\theta}{\sin\theta} - \frac{\sin\theta}{\cos\theta} = \cot\theta$ $\frac{1/\cos\theta}{\sin\theta} - \frac{\sin\theta}{\cos\theta} \Rightarrow \frac{1-sin^2\theta}{\sin\theta\cos\theta}$ $\frac{1-cos^2\theta}{\sin\theta\cos\theta} = \cot\theta$	1 1	2 mark

24	$r = 7m, \quad h = 24m, \quad l = \sqrt{r^2+h^2} \Rightarrow l = 25m$ $CSA\ of\ the\ conical\ tent = \pi rl\ sq.unit$ $= \frac{22}{7} \times 7 \times 25 = 550m^2$ Length of the canvas $\frac{550}{4} = 137.5m.$	1 1	2 mark
25	Let $r_1\ and\ r_2$ be the radii of the two given sphere $\frac{r_1}{r_2} = \frac{4}{7}$ Radio of their volume $= \frac{\frac{4}{3}\pi r_1^3}{\frac{4}{3}\pi r_2^3} = \frac{r_1^3}{r_2^3}$ $\frac{v_1}{v_2} = \frac{4\times4\times4}{7\times7\times7} = \frac{64}{343}$ Ratio of their volume $64:343$	1 1	2 mark
26	Range $= L - S \Leftrightarrow 125 - 63 = 62$ Coefficient of range $= \frac{L-S}{L+S} = \frac{125-63}{125+63} = \frac{62}{188} \Leftrightarrow 0.33$	1 1	2 mark
27	$P(A) = 0.5 \quad P(A\cap B) = 0.3$ $P(AUB) \le 1$ $P(A) + P(B) - P(A\cap B) \le 1$ $P(B) \le 1 - 0.2$ $P(B) = 0.8$	1 1	2 mark
28	$p^2 \times q^1 \times r^4 \times s^3$ 2 | 315000 2 | 157500 2 | 78750 3 | 39375 5 | 13125 3 | 2625 5 | 875 5 | 175 7 | 35 | 5 $p^2 \times q^1 \times r^4 \times s^3 = 3^2 \times 7^1 \times 5^4 \times 2^3$ $p = 3, \quad q = 7, \quad r = 5, \quad s = 2$	1 1	2 mark

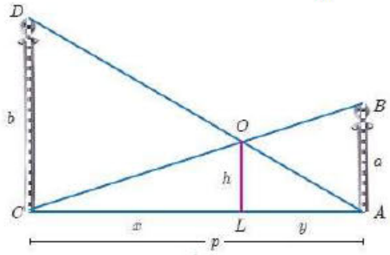
Section - III $\qquad 10 \times 5 = 50$

<table>
<tr><td>29</td><td>
$$f(x) = \frac{x}{2} - 1 \qquad A = \{2,4,6,10,12\}, \qquad B = \{0,1,2,4,5,9\}$$
(i) Set ordered pairs
$$\{(2,0),(4,1),(6,2),(10,4),(12,5)\}$$
(ii) Table
<table>
<tr><td>x</td><td>2</td><td>4</td><td>6</td><td>10</td><td>12</td></tr>
<tr><td>$f(x)$</td><td>0</td><td>1</td><td>2</td><td>4</td><td>5</td></tr>
</table>
(iii) An arrow diagram


Graph


</td><td>1
1
1
1
1</td><td>5
MARK</td></tr>
<tr><td>30</td><td>
Senthil house number be x
$$1 + 2 + 3 + \cdots \ldots + (x-1) = (x+1) + (x+2) + \cdots \ldots + 49$$
$$1 + 2 + 3 + \cdots \ldots + (x-1) = (1 + 2 + 3 + \cdots \ldots + 49) - (1 + 2 + \cdots + x)$$
$$\frac{x-1}{2}[1 + x - 1] = \frac{49}{2}[1 + 49] - \frac{x}{2}[1 + x]$$
$$\frac{x(x-1)}{2} = \frac{49 \times 50}{2} - \frac{x(x+1)}{2}$$
$x^2 - x = 2450 \qquad = x = 35$
</td><td>1
1
1
1
1</td><td>5mark</td></tr>
<tr><td>31</td><td>
$$= 5 + 55 + 555 + \cdots \ldots . + n\ terms$$
$$= \frac{5}{9}(9 + 99 + 999 + \cdots \ldots + n\ terms)$$
$$= \frac{5}{9}[(10-1) + (100-1) + (1000-1) + \cdots . + n\ terms]$$
$$= \frac{5}{9}[(10 + 100 + 1000 + \cdots . + n\ terms) - (1 + 1 + 1 + \cdots .. + n\ terms)]$$
$$= \frac{5}{9}\left[\frac{10(10^n - 1)}{9} - n\right]$$
$$= \frac{50\,(10^n - 1)}{81} - \frac{5n}{9}$$
</td><td>1
1
1
1
1</td><td>5mark</td></tr>
<tr><td>32</td><td>
I   II   III   IV
$$x + 20 = \frac{3y}{2} + 10 = 2z + 5 = 110 - (y + z)$$
I&II $\quad 2x - 3y = -20$ ----------- (1)
I & III $\quad x - 2z = -15$ ---------- (2)
I & IV $\quad x + y + z = 90$ --------- (3)
</td><td>1</td><td></td></tr>
</table>

	$2\times 3 \quad \Rightarrow \quad 2x - 2y + 2z = 180$ $2 \quad\quad\quad x - 2z = -15$ $3x + 2y = 165 - - - - - (4)$ $1 \times 3 \quad \Rightarrow 6x - 9y = -60$ $4 \times 2 \quad \Rightarrow \quad 6x + 4y = 330$ $-13y = -330$ $x = 35, \quad y = 30, \quad z = 25$	1 1 1 1	5mark
33	$A = \begin{pmatrix} 5 & 2 & 9 \\ 1 & 2 & 8 \end{pmatrix} \quad B = \begin{pmatrix} 1 & 7 \\ 1 & 2 \\ 5 & -1 \end{pmatrix}$ L.H.S $AB = \begin{pmatrix} 52 & 30 \\ 43 & 3 \end{pmatrix}$ $AB^T = \begin{pmatrix} 52 & 43 \\ 30 & 3 \end{pmatrix} - - - - - - - - - - (1)$ R.H.S $B^T = \begin{pmatrix} 1 & 1 & 5 \\ 7 & 2 & -1 \end{pmatrix}$ $A^T = \begin{pmatrix} 5 & 1 \\ 2 & 2 \\ 9 & 8 \end{pmatrix}$ $B^T A^T = \begin{pmatrix} 52 & 43 \\ 30 & 3 \end{pmatrix} - - - -(2)$ L.H.S = R.H.S $\quad AB^T = B^T A^T$ hence proved	 1 1 1 1 1	5 mark

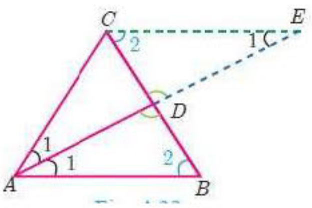
<table>
<tr><td>34</td><td>CL= x, LA = y $x+y = P$
$\Delta ABC,\ \Delta LOC$
$$\frac{CA}{CL}=\frac{AB}{LO} \Rightarrow \frac{p}{x}=\frac{a}{h}$$
$$x=\frac{ph}{a}---(1)$$


$\Delta ALO,\ \Delta ACD$
$$\frac{AL}{AC}=\frac{OL}{DC} \Rightarrow \frac{y}{b}=\frac{h}{b}$$
$$y=\frac{ph}{b}---------(2)$$
Add 1 and 2
$$x+y=\frac{ph}{a}+\frac{ph}{b} \Rightarrow p=ph\left(\frac{1}{a}+\frac{1}{b}\right)$$
$$1=h\left(\frac{a+b}{ab}\right)$$
$$h=\frac{ab}{a+b}$$</td><td>1

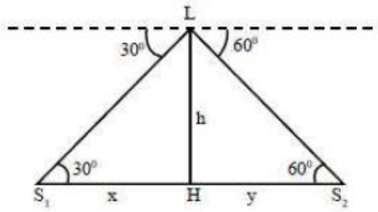
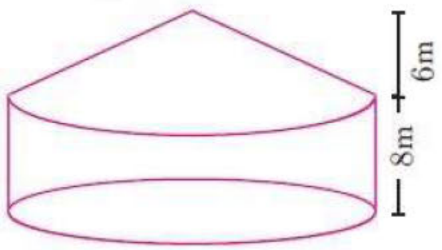
1

1

1

1</td><td>5mark</td></tr>
<tr><td>35</td><td>Statement
Diagram
Given, To prove and construction
Proof
Note: without diagram give 1 marks only for statement
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.


Given : In $\Delta ABC,\ AD$ 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
$$\Delta ACE \text{ is isosceles triangle}$$
$$AC=CE$$
$$\Delta\ ABD \sim \Delta\ ECD$$
$$\frac{AB}{CE}=\frac{BD}{CD}$$
$$\frac{AB}{AC}=\frac{BD}{CD}$$</td><td>1
1
1
2</td><td>5 mark</td></tr>
</table>

	Hence proved		
36	$A(8,6), B(5,11), C(-5,12), D(-4,3)$ $=\frac{1}{2}\begin{bmatrix} x_1 & x_2 & x_3 & x_4 & x_1 \\ y_1 & y_2 & y_3 & y_4 & y_1 \end{bmatrix} sq.units$ $=\frac{1}{2}\begin{bmatrix} 8 & 5 & -5 & -4 & 8 \\ 6 & 11 & 12 & 3 & 6 \end{bmatrix}$ $=\frac{1}{2}\{(88+60-15-24)-(30-55-48+24)\}$ $=\frac{1}{2}(109+49)$ $= 79\ sq.units.$	1 1 1 1 1	5mark
37			
38	In $\Delta\ ABC,\ CB = x,\ BD = y$  $\Delta\ ABC, \tan 30° = \frac{AB}{BC}$ $\frac{1}{\sqrt{3}} = \frac{h}{x}$ $x = \sqrt{3}\,h ------(1)$ $\Delta\ ABD, \tan 60° = \frac{AB}{BD}$ $\sqrt{3} = \frac{h}{y}$ $y = \frac{h}{\sqrt{3}} ----(2)$ From 1 and 2 $x + y = \sqrt{3}\,h + \frac{h}{\sqrt{3}}$ $x + y = \frac{4h}{\sqrt{3}}\ m$	1 1 1 1 1	5mark
39	$r : h = 5 : 7 \Rightarrow r = 5x, \quad h = 7x$ Volume of the cylinder = $2\pi rh\ sq.units$ $5500 = 2 \times \frac{22}{7} \times 5x \times 7x$ $x = 5$ Radius = $r = 5x = 5(5) = 25$ Height = h = $7x = 7 \times 5 = 35$	1 1 1 1 1	5 mark
40	Area for one person = 4 sq.m Total of person = 150  Total base area = 150 × 4 $= \pi r^2 = 600 ----(1)$ One person = 40 m^3	1 1 1	5 mark

	Volume of air required for 150 persons = $150 \times 40 = 6000\ m^3$ $$\pi r^2 h_1 + \frac{1}{3}\pi r^2 h_2 = 6000$$ $$\pi r^2\left(h_1 + \frac{1}{3}h_2\right) = 6000$$ $$600\left(8 + \frac{1}{3}h_2\right) = 6000$$ $$\frac{1}{3}h_2 = 10 - 8 = 2$$ $$h_2 = 6\ m$$ Therefore, the height of the conical tent $$h_2\ is\ 6\ m.$$	1 1	
41	Sample space = S= $\begin{Bmatrix}(1,1),(1,2),(1,3),(1,4),(1,5),(1,6),\\(2,1),(2,2),(2,3),(2,4),(2,5),(2,6),\\(3,1),(3,2),(3,3),(3,4),(3,5),(3,6),\\(4,1),(4,2),(4,3),(4,4),(4,5),(4,6),\\(5,1),(5,2),(5,3),(5,4),(5,5),(5,6),\\(6,1),(6,2),(6,3),(6,4),(6,5),(6,6)\end{Bmatrix}$ $$n(s) = 36$$ 1. A= $\{(1,1),(2,2),(3,3),(4,4),(5,5),(6,6)\}$ $$n(A) = 6$$ $$P(A) = \frac{n(A)}{n(s)} = \frac{6}{36}$$ 2. B= $\{(1,2),(2,1),(1,3),(3,1),(1,5),(5,1)\}$ $$n(B) = 6$$ $$P(B) = \frac{n(B)}{n(s)} = \frac{6}{36}$$ 3. C= $\begin{Bmatrix}(1,1),(1,2),(1,4),(1,6),\\(2,1),(2,3),(2,5),\\(3,2),(3,4),\\(4,1),(4,3),\\(5,2),(5,6),\\(6,1),(6,5)\end{Bmatrix}$ $$n(C) = 15$$ $$P(C) = \frac{n(C)}{n(s)} = \frac{15}{36}$$ 4. $$n(D) = 0$$ $$P(D) = \frac{n(D)}{n(s)} = \frac{10}{36} = 0$$	1 1 1 1 1	5 mark
42	$$A = \{0,1,2\},\quad B = \{2,3,4,5\},\quad C = \{3,5,7\}$$ $$B \cup C = \{2,3,4,5,7\}$$ $$A \times (B \cup C) = \begin{Bmatrix}(0,2),(0,3),(0,4),(0,5),(0,7)\\(1,2),(1,3),(1,4),(1,5),(1,7)\\(2,2),(2,3),(2,4),(2,5),(2,7)\end{Bmatrix} ---(1)$$ $A \times B$ $= \{(0,2),(0,3),(0,4),(0,5),(1,2),(1,3),(1,4),(1,5),(2,2),(2,3),(2,4),(2,5)\}$ $$A \times C = \{(0,3),(0,5),(0,7),\}(1,3),(1,5),(1,7),(2,3),(2,5),(2,7)\}$$	1 1 1 1	5 mark

<table>
<tr><td></td><td>$$(A \times B) \cup (A \times C) = \begin{Bmatrix} (0,2),(0,3),(0,4),(0,5),(0,7) \\ (1,2),(1,3),(1,4),(1,5),(1,7) \\ (2,2),(2,3),(2,4),(2,5),(2,7) \end{Bmatrix} --- (2)$$
From 1 and 2 is verified. $A \times (B \cup C) = (A \times B) \cup (A \times C)$</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>Section - IV $2\times 8 = 16$</td><td></td><td></td></tr>
<tr><td>43 a)</td><td>Rough diagram
First circle
Second circle
Two tangents
Length of the tangents = 10.1 cm (or) 10.2 (or) 10.3 cm</td><td>2
2
2
1
1</td><td>8 mark</td></tr>
<tr><td>b</td><td>Rough diagram
Line segment
Circle
Perpendicular bisector
Draw ΔABC</td><td>2
2
2
1
1</td><td>8 mark</td></tr>
<tr><td>44 a</td><td>X – axis , Y – axis
Scale
Variation : direct variation
Equation: $y = kx$
$$y = (3.1)x$$
$$x = 6 \text{ and } y = 18.6$$</td><td>2
1
1
2

2</td><td>8 mark</td></tr>
<tr><td>b</td><td>X – axis , Y – axis
Scale
$$y = x^2 - 5x - 6$$
<table><tr><td>x</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr><tr><td>y</td><td>8</td><td>0</td><td>-6</td><td>-10</td><td>-12</td><td>-12</td><td>-10</td><td>-6</td><td>0</td><td>8</td></tr></table>
$$y = x^2 - 5x - 6$$
$$0 = x^2 - 5x - 14$$
$$y = 8$$
<table><tr><td>x</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td></tr><tr><td>y</td><td>8</td><td>8</td><td>8</td><td>8</td><td>8</td></tr></table>
Straight line
Solution : $x = \{-2,7\}$</td><td>2
1
2
1
1
1</td><td>8 mark</td></tr>
</table>

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