Way To Success & Smart Teachers Association

10th Model Public Exam 2022 - 2023 - Mathematics – Answer Key

Part – I

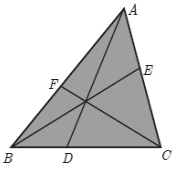
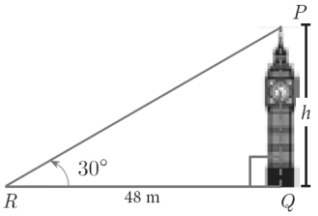
Answer All the questions **14 x 1 = 14**

Q.No	Chapter	Option	Answer	Marks
1	Ex. 1.6 – 4	(B)	2	1
2	Creative 1st Chapter	(C)	$2-4x$	1
3	Ex. 2.10 –7	(D)	11	1
4	Ex. 2.10 –13	(B)	$\frac{1}{27}$	1
5	Ex. 3.20 – 2	(A)	$x=1, y=2, z=3$	1
6	Creative 3rd chapter	(C)	$\lvert ax+b \rvert$	1
7	Ex. 4.5 – 3	(D)	$5\sqrt{2}$ cm	1
8	Ex. 4.5 – 10	(A)	90°	1
9	Ex. 5.5 – 4	(C)	9	1
10	Ex. 5.5 – 3	(B)	parallel to Y axis	1
11	Ex. 6.5 – 8	(C)	2	1
12	Creative – 6th Chapter	(A)	Clinometer	1
13	Ex. 7.5 – 2	(A)	$4\pi r^2$ sq. units	1
14	Ex. 8.5 – 11	(B)	$\frac{7}{10}$	1

Part – II

Answer any 10 questions. Question No.28 is compulsory **10 x 2 = 20**

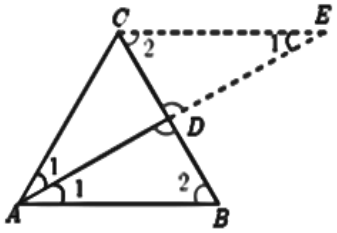
Q.No	Chapter	Answer	Marks
15	Ex. 1.1 – 1 (i)	$A \times B = \{(2,1),(2,-4),(-2,1),(-2,-4),(3,1),(3,-4)\}$ $B \times A = \{(1,2),(1,-2),(1,3),(-4,2),(-4,-2),(-4,3)\}$	1 1
16	Eg.1.22	$f \circ f(k) = f\big(f(k)\big) = 4k-3$ $k=2$	1 1
17	Ex. 2.2 – 4	$13824 = 2^9 \times 3^3$ $a=9, b=3$	1 1
18	Eg.2.26	$a=3, d=3, l=111,$ $n=\left(\frac{l-a}{d}\right)+1$ $n=37$	1 1
19	Ex. 3.4 – 2 (iii)	$\frac{p(x)}{q(x)} = \frac{x^2+6x+8}{x^2+x-2} = \frac{x+4}{x-1}$ for excluded $q(x)=0$ $x=1,-2$	1 1

20	Eg.4.8	$\frac{\text{Area }(\Delta\, ABC)}{Area\ (\Delta\, DEF)} = \frac{BC^2}{EF^2}$ $Area\ (\Delta\, DEF) = 96\ cm^2$	1 1
21	Theorem	 **Statement:** Let ABC be a triangle and let D, E, F be points on lines BC, CA, AB respectively. Then the cevians AD, BE, CF are concurrent if and only if $\frac{BD}{DC} \times \frac{CE}{EA} \times \frac{AF}{FB} = 1$ where the lengths are directed. This also works for the reciprocal of each of the ratios as the reciporcal of 1 is 1.	2
22	Unit Exercise: 5th chapter (Q.No:5)	Slope of $AB = \frac{0+1}{4+2} = \frac{1}{6}$, Slope of $CD = \frac{3-2}{3+3} = \frac{1}{6}$ Slope of $AD = \frac{2+1}{-3+2} = \frac{3}{-1} = -3$, Slope of $BC = \frac{0-3}{4-3} = -\frac{3}{1} = -3$ AB & CD are parallel, AD & BC are parallel ABCD is a parallelogram	1 1
23	Creative 5th Chapter	$m_1 = \frac{3}{5}$, $m_2 = \frac{-5}{3}$ $m_1 \times m_2 = \frac{3}{5} \times \frac{-5}{3} = -1$ $\therefore$ Two straight lines are perpendicular	1 1
24	Eg. 6.19	$\tan 30° = \frac{h}{48}$  height of the tower $= 16\sqrt{3}\ m$	1 1
25	Ex. 7.1 – 1	C.S.A of the cylinder$= 2\pi rh\ sq.units$ $r = 25$ cm , $h = 35$ cm	1 1
26	Creative 7th chapter	Base Area $= \pi r^2 = 1386\ m^2$ TSA of hemisphere $= 3\pi r^2$ TSA of hemisphere $= 4158\ m^2$	1 1
27	Ex. 8.1 – 7	$\sigma = \sqrt{\frac{n^2-1}{12}}$; $n = 21$, $\sigma = 6.05$	1 1
28	Ex. 3.11 – 2 (i)	$a = 2$, $b = -5$, $c = 2$, $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$, $x = \left\{2, \frac{1}{2}\right\}$	1 1

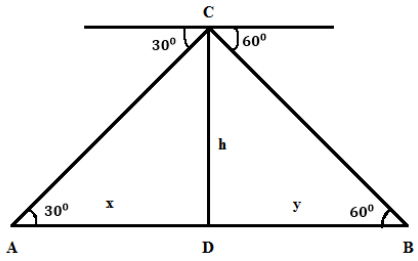
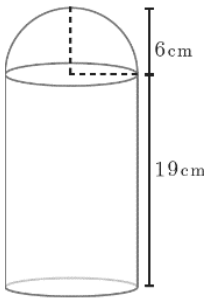
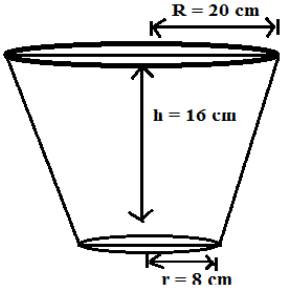
Part – III

Answer any 10 questions. Question No.42 is compulsory **10 x 5 = 50**

Q.No	Chapter	Answer	Marks
29	Ex. 1.4 10 (ii) (iv)	$f(x)=\begin{cases}6x+1; & -5\le x<2 \;;\; x=-5,-4,-3,-2,-1,0,1\\ 5x^2-1; & 2\le x<6 \;;\; x=2,3,4,5\\ 3x-4; & 6\le x\le 9 \;;\; x=6,7,8,9\end{cases}$ (i) $f(7)-f(1),\ x=7\Rightarrow f(x)=3x-4=17$ $x=1\Rightarrow f(x)=6x+1=7$ $\therefore f(7)-f(1)=17-7=10$ (ii) $\frac{2f(-2)-f(6)}{f(4)+f(-2)},\ x=-2, f(x)=6x+1=-11$ $x=6, f(x)=3x-4=14$ $x=4,\ f(x)=5x^2-1=79$ $\frac{2f(-2)-f(6)}{f(4)+f(-2)}=\frac{2(-11)-14}{79+(-11)}=\frac{-22-14}{79-11}=\frac{-36}{68}=-\frac{9}{17}$	1 2 2
30	Eg 2.51	$5+55+555+\cdots$ to n terms $=5(1+11+\cdots$ to n terms$)$ $=\frac{5}{9}(9+99+\cdots$ to n terms$)$ $S_n=a\left[\frac{r^n-1}{r-1}\right]$ $S_n=\frac{50(10^n-1)}{81}-\frac{5n}{9}$	1 1 1 2
31	Ex. 2.9 – 6	$1^2+2^2+\cdots+n^2=\frac{n(n+1)(2n+1)}{6}$ Required area $=10^2+11^2+\cdots+24^2$ $=(1^2+2^2+\cdots+24^2)-(1^2+2^2+3^2+\cdots+9^2)$ Required area $=4615\ cm^2$	1 1 1 2
32	Ex. 3.8 – 3 (i)	$6\quad -5\quad +3$ $6\ \ \cancel{36}\ -60\ +61\ -m\ +n$ $\cancel{36}$ $(-)$ $12\ -5\ \ -\cancel{60}\ +61$ $-\cancel{60}\ +25$ $(+)\quad (-)$ $12-10+3\ \ \cancel{36}\ -m\ +n$ $\cancel{36}\ -30\quad 9$ $(-)\quad (+)\quad (-)$ 0 The given polynomial is perfect square $-m+30=0\Rightarrow -m=-30\Rightarrow\ \boldsymbol{m=30}$ $n-9=0\Rightarrow\ \boldsymbol{n=9}$	1 1 1 1 1

<table>
<tr><td>33</td><td>Eg 3.44</td><td>$a = 1, b = 7, c = 10$
$\alpha + \beta = -\frac{b}{a} = -7, \quad \alpha\beta = \frac{c}{a} = 10$
(i) $\alpha^2 + \beta^2 = 29$
(ii) $\frac{\alpha}{\beta} + \frac{\beta}{\alpha} = \frac{29}{10}$
(iii) $\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha} = \frac{-133}{10}$</td><td>1
1
1
1
1</td></tr>
<tr><td>34</td><td>Theorem</td><td>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
<table><tr><th>No.</th><th>Statement</th><th>Reason</th></tr><tr><td>1.</td><td>$\angle AEC = \angle BAE = \angle 1$</td><td>Two parallel lines cut by a transversal make alternate angles equal.</td></tr><tr><td>2.</td><td>ΔACE is isosceles
$AC = CE$ ..... (1)</td><td>In ΔACE, $\angle CAE = \Delta CEA$</td></tr><tr><td>3.</td><td>$\Delta ABD \backsim \Delta ECD$
$\frac{AB}{CE} = \frac{BD}{CD}$</td><td>By AA similarity</td></tr><tr><td>4.</td><td>$\frac{AB}{AC} = \frac{BD}{CD}$</td><td>From (1) $AC = CE$
Hence proved.</td></tr></table></td><td>2
1
1
1</td></tr>
<tr><td>35</td><td>Ex 4.3
– 8</td><td>In ΔABC, $\quad AC^2 = AB^2 + BC^2$.....(1)
In ΔABD, $\quad AD^2 = AB^2 + BD^2$.....(2)
In ΔABE, $\quad AE^2 = AB^2 + BE^2$.....(3)
$3AC^2 + 5AD^2 = 8AE^2$</td><td>1
1
1
2</td></tr>
<tr><td>36</td><td>Eg 5.6</td><td>Area of the quadrilateral $ABCD$
$= \frac{1}{2}\{(x_1y_2 + x_2y_3 + x_3y_4 + x_4y_1) - (x_2y_1 + x_3y_2 + x_4y_3 + x_1y_4)\}$ sq.units
$= 79$ Sq. units</td><td>2
3</td></tr>
</table>

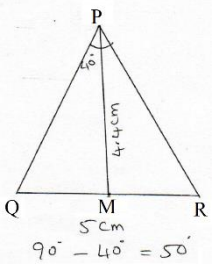
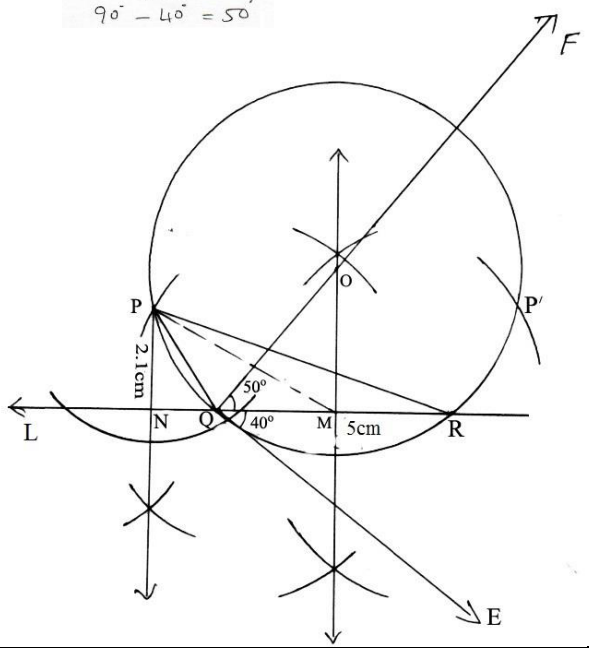
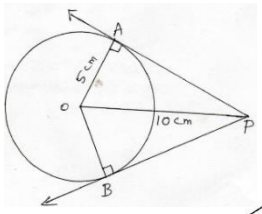
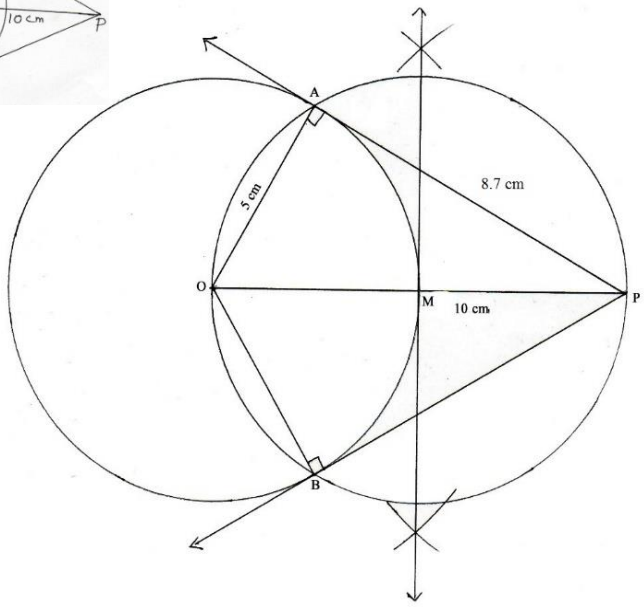
37	Ex. 6.3 – 5	In right angle ΔADC, $\tan 30^\circ = \frac{1}{\sqrt{3}}$ $x = \sqrt{3}h$ In right angle ΔBDC, $\tan 60^\circ = \sqrt{3}$ $y = \frac{h}{\sqrt{3}}$ $x + y = AB = \frac{4h}{\sqrt{3}}$ m 	1 1 1 1 1
38	Eg 7.24	$d = 12\ cm, r = 6\ cm,$ Height of the circle portion = 19 cm T.S.A. = CSA of the cylinder + CSA of the hemisphere + Base area of the cylinder $= 2\pi rh + 2\pi r^2 + \pi r^2$ $= 1056\ cm^2$ 	1 2 2
39	Ex. 7.2 – 10	$R = 20, r = 8, h = 16$ Volume of frustum $= \frac{1}{3}\pi h(R^2 + r^2 + Rr)$ $= 10459.4\ cm^3$ Volume of frustum = 10.4594 litres Required cost = $10.4594 \times 40 \cong$ ₹ 418.38 	1 1 1 1 1
40	Creative 8th chapter	$\bar{x} = \frac{\sum x}{n}$ $\bar{x} = \frac{18+20+15+12+25}{5} = \frac{90}{5} = 18$ $\sigma = \sqrt{\frac{\sum d^2}{n}} = \sqrt{\frac{98}{5}} = \sqrt{19.6} = 4.427$ C.V $= \frac{\sigma}{\bar{x}} \times 100\%$ $= \frac{4.427}{18} \times 100$ $= \frac{442.7}{18} = 24.59$	1 1 1 1 1

x	$d = x - \bar{x}$	d^2
18	0	0
20	2	4
15	−3	9
12	−6	36
25	7	49
		$\sum d^2 = 98$

41	Ex. 8.4 – 9	Three unbiased coins are tossed, $S = \{HHH, HHT, HTH, HTT, THH, THT, TTH, TTT\}$ $n(S) = 8$ i) Let A be the event of getting atmost 2 tails. $A = \{HHH, HHT, HTH, THH, TTH, HTT, THT\}$ $n(A) = 7$ $\therefore P(A) = \frac{n(A)}{n(S)} = \frac{7}{8}$ ii) Let B be the event of getting atleast two heads, $B = \{HHT, HTH, THH, HHH\}$ $n(B) = 4$ $P(B) = \frac{n(B)}{n(S)} = \frac{4}{8}$ $A \cap B = \{HHH, HHT, HTH, THH\}$ $n(A \cap B) = 4$ $P(A \cap B) = \frac{n(A \cap B)}{n(S)} = \frac{4}{8}$ $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ $= \frac{7}{8} + \frac{4}{8} - \frac{4}{8}$ $P(A \cup B) = \mathbf{\frac{7}{8}}$	1 1 1 1 1
42	Creative 1st chapter	$A = \{x \in W \mid 0 < x < 5\} = \{1, 2, 3, 4\}$, $B = \{x \in W \mid 0 \leq x \leq 2\} = \{0, 1, 2\}$, $C = \{x \in W \mid x < 3\} = \{0, 1, 2\}$ $B \cap C = \{0, 1, 2\} \cap \{0, 1, 2\} = \{0, 1, 2\}$ $A \times (B \cap C) = \{1, 2, 3, 4\} \times \{0, 1, 2\}$ $= \{(1,0), (1,1), (1,2), (2,0), (2,1), (2,2), (3,0), (3,1), (3,2), (4,0), (4,1), (4,2)\}$... (1) $A \times B = \{1, 2, 3, 4\} \times \{0, 1, 2\}$ $= \{(1,0), (1,1), (1,2), (2,0), (2,1), (2,2), (3,0), (3,1), (3,2), (4,0), (4,1), (4,2)\}$ $A \times C = \{1, 2, 3, 4\} \times \{0, 1, 2\}$ $= \{(1,0), (1,1), (1,2), (2,0), (2,1), (2,2), (3,0), (3,1), (3,2), (4,0), (4,1), (4,2)\}$ $(A \times B) \cap (A \times C)$ $= \{(1,0), (1,1), (1,2), (2,0), (2,1), (2,2), (3,0), (3,1), (3,2), (4,0), (4,1), (4,2)\}$ $\cap \{(1,0), (1,1), (1,2), (2,0), (2,1), (2,2), (3,0), (3,1), (3,2), (4,0), (4,1), (4,2)\}$ $= \{(1,0), (1,1), (1,2), (2,0), (2,1), (2,2), (3,0), (3,1), (3,2), (4,0), (4,1), (4,2)\}$ ...(2) From (1) and (2), $A \times (B \cap C) = (A \times B) \cap (A \times C)$ is verified.	1 1 1 1 1

Part – IV

Answer the following questions **2 x 8 = 16**

43 a	Exercise 4.2-12 Rough diagram  Fair diagram  	2 6
43b	Exercise 4.4 - 13 Rough diagram  Fair Diagram  Verification: $PA = \sqrt{OP^2 - OA^2} = \sqrt{10^2 - 5^2} \simeq 8.7\ cm$	2 5 1

44 a

Example 3.52

$y = 2x^2$

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

$y = 2x^2$

$0 = 2x^2 - x - 6 \quad (-)$

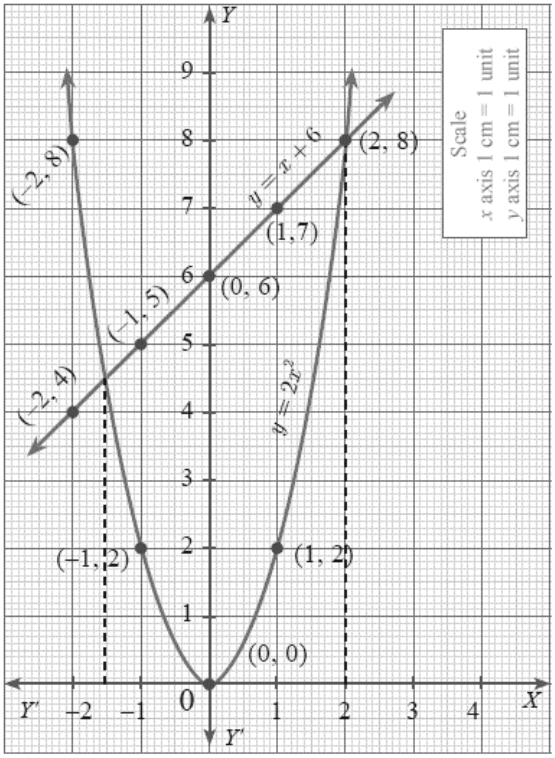
$y = x + 6$

$y = x + 6$

x	-2	-1	0	1	2
y	4	5	6	7	8

Points of intersection
$(-1.5, 4.5)$ and $(2, 8)$

Diagram



2

Scale-2

1

1

2

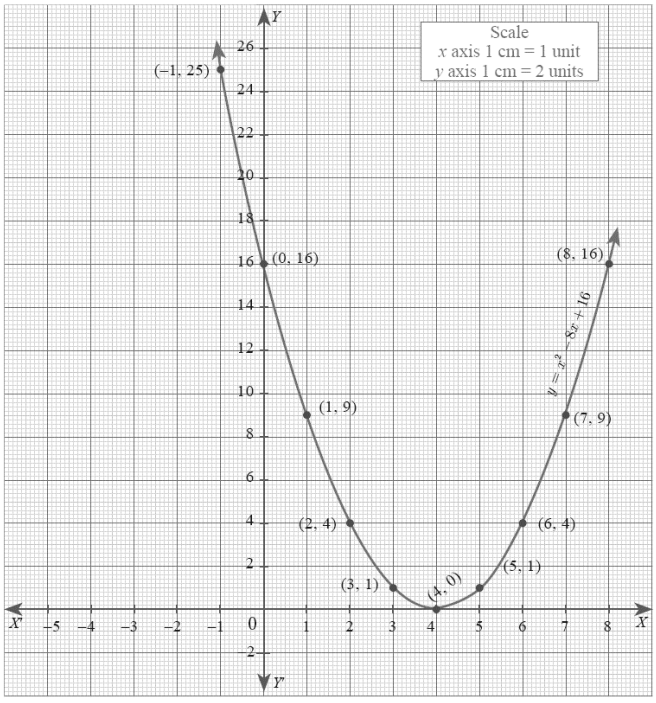
44 b

Example 3.51-(ii)

$y = x^2 - 8x + 16$

x	-1	0	1	2	3	4	5	6	7	8
y	25	16	9	4	1	0	1	4	9	16

Diagram



Nature of solution: The roots are Real and Equal

2

Scale-2

3

1