BANGALORE SAHODAYA SCHOOLS COMPLEX ASSOCIATION

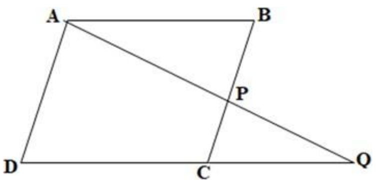
QUESTION PAPER (2023-24)MATHEMATICS (Code – 241)

MARKING SCHEMECLASS X –SET 2

Q.NO	SECTION - A	Marks
1	(b)	1
2	(c)	1
3	(c)	1
4	(c)	1
5	(c)	1
6	(a)	1
7	(d)	1
8	(a)	1
9	(b)	1
10	(b)	1
11	(c)	1
12	(a)	1
13	(b)	1
14	(a)	1
15	(b)	1
16	(a)	1
17	(c)	1
18	(b)	1
19	(c)	1
20	(a)	1
	SECTION - B	
21	LCM of 180, 72, 108 = 1080 $\frac{1080}{60} = 18$ $\therefore$ Bulbs will glow again at 7.18pm	1 ½ ½
22	$\Delta APE \sim \Delta ABD$(By AAsimilarity) $\therefore \frac{PE}{BD} = \frac{AE}{AD}$ Similarly $\frac{AE}{AD} = \frac{EQ}{CD}$	½ ½ ½

	$\therefore$ From (1) and (2) PE = EQ (BD=CD)	½
23	$2(2)^2 + x.\frac{3}{4} - \frac{3}{4}\times\frac{1}{3} = 10$ $8 + \frac{3}{4}x - \frac{1}{4} = 10$ $\frac{3}{4}x = \frac{9}{4}$ x = 3 OR $5\sin^2\theta + 5\cos^2\theta + 4\sin^2\theta = 6$ $4\sin^2\theta = 1$ $\sin^2\theta = \frac{1}{4}$ $\sin\theta = 1/2, \theta = 30^\circ$ $\cot\theta = \sqrt{3}$	1 ½ ½ ½ ½ ½ ½
24	$\angle BCA = 90^\circ$ (angle substended by diameter BA) Join OC $\angle PCO = 90^\circ$ (radius $\perp$ to tangent) $\therefore$ $\angle$OCA = $110^\circ - 90^\circ = 20^\circ$ $\therefore$ $\angle$CAO=20° (Isosceles Δ) $\therefore$ In Δ CAB $\Rightarrow$ $90^\circ + 20^\circ + \angle CBA = 180^\circ$ $\therefore$ $\angle$CBA=70°	½ ½ ½ ½
25	Area of segment = area of sector - area of triangle $= \frac{90}{360}\times\frac{22}{7}\times 28\times 28 - \frac{1}{2}\times 28\times 28$ = 616 – 392 = 224cm^2 Alternate method $= \frac{\pi r^2}{4} - \frac{1}{2}r^2$ $= \frac{r^2}{2}\left(\frac{\pi}{2} - 1\right)$ $= \frac{28\times 28}{2}\left(\frac{22}{7}\times\frac{1}{2} - 1\right)$ $= 14\times 28\times\left(\frac{4}{7}\right) = 224\, cm^2$	½ 1 ½ 1 ½ ½

	OR	½
	Interior angle of hexagon = 120^0	½
	Area of shaded region = 6 × area of sector	
	$= 6\times\frac{120}{360}\times 3.14\times 5\times 5$	1
	$= 50\times 3.14 cm^2 = 157 cm^2$	
	SECTION - C	
26	Let present age of father - x and son's age = y	½
	$x + y = 60$ ------(1)	
	Six years ago	
	Father's age = $x-6$, son's age = y-6	1
	(x-6) = 5(y-6)	
	x-5y = -24 --------(2)	
	Solving 1 and 2	1
	y = 14 years	
	Six years later son's age = 20 years	½
	OR	
	Condition for infinite solutions	
	$\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$	1
	$\frac{2}{p+q}=\frac{3}{2p-q}=\frac{9}{3(p+q+1)}$	
	$\therefore 4p-2q=3p+3q$	½
	p -5q=0 ⟶ (1)	
	And $2p-q=p+q+1$	
	$p-2q=1$ ⟶ (2)	½
	Solving 1 and 2	
	p= $\frac{5}{3}$ q= $\frac{1}{3}$	1
27	Let us assume that $\sqrt{3}-1$ is a rational number.	
	$\sqrt{3}-1=\frac{a}{b}$, $b\neq 0$, a, b are coprime	
	$\sqrt{3}=\frac{a}{b}+1$	1
	a, b, 1 are rational	

	$\therefore$ RHS is rational $\therefore$ $\sqrt{3}$ is rational If possible Let $\sqrt{3}$ be a rational number $\Rightarrow \sqrt{3} = \frac{p}{q}$ (squaring both sides) $\Rightarrow p^2 = 3q^2$ $p = 3m$ 3 | p² hence 3 | p $\rightarrow$ (3) $\Rightarrow p^2 = 9m^2$ $\Rightarrow 3q^2 = 9m^2$ $\Rightarrow q^2 = 3m^2$ $\Rightarrow$ 3 | q² hence 3 | q $\rightarrow$ (4) From (3) and (4) 3 divides both p and q Which contradicts our assumption Hence our assumption is wrong $\therefore$ $\sqrt{3}$ is irrational $\therefore \sqrt{3}-1$ irrational	2
28	$\frac{PM}{PQ} = \frac{PN}{PR} = \frac{MN}{QR}$ (CSST) $\angle MNQ = \angle QNR$ (given) $\angle MNQ = \angle NQR$ (AIA) $\Rightarrow \angle QNR = \angle NQR$ $\Rightarrow$QR = NR $\frac{PM}{PQ} = \frac{MN}{QR} = \frac{5}{\frac{40}{3}} = \frac{3}{8}$ PM : PQ = 3 : 8 **OR**  In ΔABP and ΔDAQ $\angle B = \angle D$ (opp $\angle$s of parallellogram)	½ ½ ½ ½ ½ ½ ½ 1 ½

	$\angle BAP = \angle DQA$ (AIA)	
	$\therefore \Delta ABP \sim \Delta QDA$ (AA)	½
	$\frac{AB}{DQ} = \frac{BP}{DA}$	
	$\frac{AB}{DQ} = \frac{BP}{BC}$ (DA = BC)	½
	$BP \times DQ = AB \times BC$	
29	LHS = $\frac{\cos\theta - \sin\theta + 1}{\cos\theta + \sin\theta - 1} = \frac{\cot\theta - 1 + \cos ec\theta}{\cot\theta + 1 - \cos ec\theta}$ dividing by $\sin\theta$	½
	$= \frac{(\cot\theta + \cos ec\theta) - 1}{\cot\theta - \cos ec\theta + 1} = \frac{(\cot\theta + \cos ec\theta) - (\cos ec^2\theta - \cot^2\theta)}{\cot\theta - \cos ec\theta + 1}$	½ + ½
	$= \frac{(\cot\theta + \cos ec\theta) - (\cos ec\theta - \cot\theta)(\cos ec\theta + \cot\theta)}{\cot\theta - \cos ec\theta + 1}$	½
	$= \frac{(\cot\theta + \cos ec\theta)(1 - \cos ec\theta + \cot\theta)}{\cot\theta - \cos ec\theta + 1}$	½
	$= \cot\theta + \cos ec\theta = RHS$	½
30	p(x) = $(m^2-24)\ x^2 + 65x + 2m$ or	
	Let α, β be the zeroes of p(x)	½
	$\alpha\beta = 1$ or $\alpha = \frac{1}{\beta}$	1
	$\alpha\beta = \frac{c}{a} = \frac{2m}{m^2 - 24} = 1$	½
	$m^2 - 24 = 2m$ or $m^2 - 2m - 24 = 0$	½
	$(m-6)\ (m+4) = 0$	
	$\Rightarrow\ m = 6$ 0r $m = -4$	½
31	(table below)	Table 1½

Adjusted CI	f	Cf
24.5 – 29.5	4	4
29.5 – 34.5	14	18
34.5 – 39.5	22	40
39.5 – 44.5	16	56
44.5 – 49.5	6	62
49.5 – 54.5	5	67
54.5 – 59.5	3	70

Median class = 34.5 – 39.5

Median = $l + \left(\frac{\frac{n}{2} - cf}{f}\right)h$ ½

= 34.5 + $\left(\frac{35 - 18}{22}\right) \times 5$ ½

= 34.5 + $\frac{85}{22}$

= 34.5 + 3.86 ½

= 38.36 yrs

	SECTION - D	
32	Fraction = $\frac{x}{2x+1}$	½
	$\frac{x}{2x+1}+\frac{2x+1}{x}=2\frac{16}{21}$	½
	$\frac{x^2+(2x+1)^2}{x(2x+1)}=\frac{58}{21}$	½
	$21(5x^2+4x+1)=58(2x^2+x)$	½
	$105x^2+84x+21=116x^2+58x$	
	$-11x^2+26x+21=0$	½
	$11x^2-26x-21=0$	1
	$11x^2-33x+7x-21=0$	
	$(x-3)(11x+7)=0$	½
	$x=3$ or $x=\frac{-7}{11}$	½
	Rejecting $\frac{-7}{11}$ as fraction cannot be negative	
	Fraction is $\frac{3}{7}$	½
	OR	
	Let one pipe take 'x' minutes to fill the tank completely	1
	Then other takes x + 5	
	Together they fill tank in $11\frac{1}{9}$ minutes	½
	$\therefore \frac{1}{x}+\frac{1}{x+5}=\frac{9}{100}$	
	$\frac{x+5+x}{x^2+5x}=\frac{9}{100}$	1
	$100(2x+5)=9(x^2+5x)$	
	$200x+500=9x^2+45x$	
	$9x^2-155x-500=0$	1
	$9x^2-180x+25x-500=0$	
	$9x(x-20)+25(x-20)=0$	½
	$x=20$ $x=\frac{-25}{9}$ (rejected as time cannot be –ve)	
	$\therefore$ one pipe takes 20 minutes and other takes 25 minutes	1

33	(a) Given, to prove , figure, construction (b) proof BP = 27 BQ = 27 $\Rightarrow$ CQ = 38 – 27 = 11 CR = 11, $\Rightarrow$ DR = 25 – 9 = 14 DS = 14cm $\Rightarrow$ r = 14cm (RDSO is a square)	1½ 1½ ½ + ½ ½ ½
34	(a) Volume of the tank = volume of cylinder + volume of hemisphere $1440\pi = \pi r^2 h + \frac{2}{3}\pi r^3$ $= \pi r^2\left(h + \frac{2}{3}r\right)$ $1440 = 144\left(h + \frac{2}{3}(12)\right)$ $10 = h + 8$ $h = 2m$ (b) SA of tent = CSA of cylinder + CSA of cone ht of conical part = 21 – 5 = 16m ; r = 63m $l = \sqrt{r^2 + h^2} = 65m$ SA = $2\pi rh + \pi rl$ $= \pi r(2h+l)$ $= \frac{22}{7} \times 63(10+65) = 14850m^2$ **OR** Volume of water remaining in the cylinder = Volume of cylinder – Volume of toy $= \pi r^2 h - \left[\frac{1}{3}\pi r^2 h_1 + \frac{2}{3}\pi r^3{}_2\right]$ $= \pi r^2 h_2 - \left[\frac{1}{3}\pi r^2 (h_1 + 2r)\right]$ $= \pi r^2\left[h_2 - \frac{1}{3}[h_1 + 2r]\right]$ $= \frac{22}{7} \times 21 \times 21\left[90 - \frac{1}{3}(60+42)\right]$ $= \frac{22}{7} \times 21 \times 21\left[90 - \frac{102}{3}\right]$. $= \frac{22}{7} \times 21 \times 21[90 - 34]$	½ ½ ½ ½ ½ ½ ½ ½ 1 ½ 1 ½ ½ ½ ½ ½

$= 22 \times 3 \times 21 [56]$ ½

$= 77616 \text{ cm}^3$ ½

Alternative method

V of toy = V of cone + V of hemisphere

$= \frac{1}{3}\pi r^2 h + \frac{2}{3}\pi r^3$ ½ ½

$= \frac{\pi r^2}{3}(h + 2r)$

$= 47124 \text{ cm}^3$ 1

V of cylinder = $\pi r^2 h$ ½

$= \frac{22}{7} \times 21 \times 21 \times 90$ ½

$= 124740 \text{cm}^3$ ½

V of water removing = V (Cylinder – toy) ½

$= 124740 - 47124$ ½

$= 77616 \text{ cm}^3$ ½

35

Mode = $l + \frac{(f_1 - f_0)}{(2f_1 - f_0 - f_2)} .h$ ½

$45 = 40 + \left(\frac{y - x}{2y - x - 6}\right) 20$

$\frac{5}{20} = \left(\frac{y - x}{2y - x - 6}\right)$ 1

$2y - x - 6 = 4y - 4x$

$3x - 2y = 6$ (1)

$18 + x + y = 40$

$x + y = 22$ (2)

Solving (1) and (2) 1

$x = 10$, $y = 12$

CI	**f_i**	**x_i**	**$f_i x_i$**
0 - 20	8	10	80
20 - 40	10	30	300
40 - 60	12	50	600
60 - 80	6	70	420
80 -100	4	90	360
	$\Sigma f = 40$		$\Sigma fx = 1760$

1 ½

$\bar{x} = \frac{\Sigma fx}{\Sigma f} = \frac{1760}{40} = 44$ 1

	SECTION E	
36	1. 3, 5, 7……… 2. There are 49 gaps of 2cm between the first and the 50th string. ∴ Distance between them = 49 x 2 = 98cm 3. The wooden beads used in the strings form an AP 1, 2, 3, …..50 ∴ Number of wooden beads required = $\frac{50\times51}{2}$ = 1275 **OR** Out of 50 strings, only 25 strings contains blue beads. The blue beads used in the strings form an AP . 2, 4, 6 ……. Total blue beads = 25 x 26 (n (n +1) = 650 Required number of blue beads = 650 – 250 = 400	1 1 ½ 1 ½ ½ 1 1 1 ½
37	(i) E (-10, 0) (ii) A (-1, 0) B (7, 6) $AB = \sqrt{(7+1)^2 + (6)^2}$ $= \sqrt{8^2 + 6^2}$ $= \sqrt{100}$ AB = 10 units A (-1 , 0) C (-10, y) $AB = \sqrt{(-10+1)^2 + y^2}$ $10 = \sqrt{9^2 + y^2}$ $100 = 81 + y^2$ $y^2 = 19$ $y = 19$ $\therefore C(-10, \sqrt{19})$ **OR** A(-1, 0) B (7,6) $AB = \sqrt{(7+1)^2 + (6)^2}$	1 ½ 1 ½ ½ ½ 1

	$= \sqrt{8^2 + 6^2}$ $= \sqrt{100}$ AB = 10 units (-2 , 0) , (-10, y) $10 = \sqrt{(-10+2)^2 + (y)^2}$ $10 = \sqrt{8^2 + y^2}$ $100 = 64 + y^2$ $y^2 = 36$ y = 6 $\therefore$The coordinates of the point where the other end of the ladder touches is (-10, 6) (iii) $0 = \frac{7m_1 - m_2}{m_1 + m_2}$ $7m_1 = m_2$ $\frac{m_1}{m_2} = \frac{1}{7}$ The ratio = 1:7	½ ½ ½ ½ ½ ½
38	(a) $\tan 30^\circ = \frac{\text{Height of the Vidhana soudha}}{\frac{107\sqrt{3}}{2}}$ $\therefore$Height of the Vidhana Soudha $= \frac{107\sqrt{3}}{2} \times \frac{1}{\sqrt{3}}$ = 53.5 m (b) $\tan 45^\circ = \frac{BC}{24}$ BC = 24m $\tan 60^\circ = \frac{AC}{24}$ $AC = 24\sqrt{3}$ $\therefore AB = 24\sqrt{3} - 24$ $= 24\left(\sqrt{3} - 1\right)m$ **OR**	½ ½ ½ ½ ½ ½

	$\cos 60^\circ = \frac{24}{AD} = \frac{1}{2}$	½
	$\therefore AD = 48m$	
	$\cos 45^\circ = \frac{24}{BD} = \frac{1}{\sqrt{2}}$	½
	$\therefore BD = 24\sqrt{2}m$	½
	(c) $\tan\theta = \frac{24}{8\sqrt{3}}$	½
	$= \frac{3}{\sqrt{3}}$	
	$\tan\theta = \sqrt{3}$	½
	$\Rightarrow \theta = 60^\circ$	½