INDIAN SCHOOL AL WADI AL KABIR

First Rehearsal Examination (2023-24)

Sub: MATHEMATICS STANDARD (041)

Date: 05-12-2023 ***MARKING SCHEME*** Maximum marks: 80

Class: X Time: 3 hours

SECTION A

Section A consists of 20 questions of 1 mark each.

Q.1.	(B) 44.2	**Q.11.**	(C) (0, -11)
Q.2.	(C) ab = 6	**Q.12.**	(B) r^2
Q.3.	(D) 2: 1	**Q.13.**	(D) 40
Q.4.	(A) 45 minutes	**Q.14.**	(B) -5, 0, 7
Q.5.	(B) 45°	**Q.15.**	(A) 30°
Q.6.	(D) $\frac{17}{16}$	**Q.16.**	(C) 250 cm^2
Q.7.	(C) 50°	**Q.17.**	(B) $\frac{5}{12}$
Q.8.	(C) 40	**Q.18.**	(A) Only Anas
Q.9.	(B) 30°	**Q.19.**	(a) Both (A) and (R) are true and (R) is the correct explanation of (A)
Q.10.	(D) ± 3	**Q.20.**	(c) Assertion (A) is true but reason (R) is false.

SECTION B

Section B consists of 5 questions of 2 marks each.

Q.21.

$\tan(A+B) = \sqrt{3} \quad \therefore A + B = 60^0$ ...(1) $(\frac{1}{2})$

$\tan(A-B) = \frac{1}{\sqrt{3}} \quad \therefore A - B = 30^0$ ...(2) $(\frac{1}{2})$

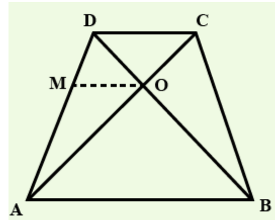
Adding (1) & (2), we get $2A = 90^0 \Longrightarrow A = 45^0$ $(\frac{1}{2})$

	Sub A = 45° in (1), we get B = 15°	$(\frac{1}{2})$
	OR	
	$2\ \text{cosec}^2 30 + x \sin^2 60 - \frac{3}{4}\tan^2 30 = 10$	
	$\Rightarrow\ 2(2)^2 + x\left(\frac{\sqrt{3}}{2}\right)^2 - \frac{3}{4}\left(\frac{1}{\sqrt{3}}\right)^2 = 10$	½
	$\Rightarrow\ 2(4) + x\left(\frac{3}{4}\right) - \frac{3}{4}\left(\frac{1}{3}\right) = 10$	½
	$\Rightarrow\ 8 + x\left(\frac{3}{4}\right) - \frac{1}{4} = 10$	½
	$\Rightarrow\ 32 + x(3) - 1 = 40$	
	$\Rightarrow\ 3x = 9 \Rightarrow x = 3$	½
Q.22.	Maximum value of weight which can measure the weight of the fertilizer exact number of times = HCF (69, 75)	½
	$75 = 3 \times 5 \times 5$	½
	$69 = 3 \times 23$	½
	Maximum weight = 3kg	½
Q.23.	∠PAO = ∠ PBO = 90° (angle b/w radius and tangent)	½
	∠AOB = 105° (By angle sum property of a triangle)	1
	∠AQB = 1/2 x 105° = 52.5° (Angle at the remaining part of the circle is half the angle subtended by the arc at the center)	½
Q.24	Total no. of cards = 52	
	(i) P (not an ace) = $\frac{48}{52} = \frac{12}{13}$	(½ + ½)
	(ii) P (either a king or a queen) = $\frac{8}{52} = \frac{2}{13}$	(½ + ½)

Q.25.	Angle subtended by minute hand in 20 minutes = $\frac{360°}{60} \times 20 = 120°$ r = 14 Area = $\frac{22}{7} \times 14 \times 14 \times \frac{120}{360}$ $= \frac{616}{3}$ or 205.33 ∴ required area is $\frac{616}{3}$ cm^2 or 205.33 cm^2	½ 1 ½
	OR	
	Given area of sector of circle = 54π cm^2 Radius of circle= 36cm Now area of circle= $\pi r^2 \times (\frac{\theta}{360})$ $54\pi = \frac{\theta}{360} \times \pi r^2$ $\frac{\theta}{360} = \frac{54}{36 \times 36}$ ....(1) and length of arc= $2\pi r (\frac{\theta}{360})$ $L = 2\pi \times 36 \times \frac{54}{36 \times 36}$ = 9.428 cm	½ ½ ½ ½
	SECTION C	
	Section C consists of 6 questions of 3 marks each.	
Q.26.	system has infinite number of solutions $\therefore \frac{2}{2a} = \frac{3}{a+b} = \frac{7}{28}$ $\Rightarrow \frac{1}{a} = \frac{1}{4} \Rightarrow a = 4$ and $a + b = 12 \Rightarrow b = 8$	1 1 1
	OR	
	Solution Let the incomes be 9x, 7x and expenditures be 4y, 3y ATQ , $9x - 4y = 2000$ $7x - 3y = 2000$ On solving we get, x = 2000 ⇒monthly incomes are ₹18000 and ₹14000	1/2 1 1 1/2

Q.27.	$\text{LHS} = \dfrac{\cot A - \cos A}{\cot A + \cos A} = \dfrac{\frac{\cos A}{\sin A} - \cos A}{\frac{\cos A}{\sin A} + \cos A}$	½
	$= \dfrac{1-\sin A}{1+\sin A}$	1
	$= \dfrac{(1-\sin A)(1+\sin A)}{(1+\sin A)(1+\sin A)}$	1
	$= \dfrac{1-\sin^2 A}{(1+\sin A)^2} = \dfrac{\cos^2 A}{(1+\sin A)^2}$	½
Q.28.	**Solution** Let us assume that $5+2\sqrt{3}$ is a rational number	
	$5+2\sqrt{3} = \dfrac{p}{q}$; $q \neq 0$ and p, q are integers	1
	$\Rightarrow \sqrt{3} = \dfrac{p-5q}{2q}$	1
	RHS is rational but LHS is irrational ∴ Our assumption is wrong. Hence $5+2\sqrt{3}$ is an irrational	1
Q.29	Given : $\triangle ABC \sim \triangle PQR$ To prove : $\dfrac{AB}{PQ} = \dfrac{AD}{PM}$ It is given that $\triangle ABC \sim \triangle PQR$ $\Rightarrow \dfrac{AB}{PQ} = \dfrac{BC}{QR} = \dfrac{AC}{PR}$	Given, to prove, fig 1m
	$\angle A = \angle P, \angle B = \angle Q, \angle C = \angle R$..	
	$\dfrac{AB}{PQ} = \dfrac{2BD}{2QM} = \dfrac{AC}{PR}$ $\dfrac{AB}{PQ} = \dfrac{BD}{QM} = \dfrac{AC}{PR}$........(1)	½
	Now in $\triangle ABD$ and $\triangle PQM$ $\dfrac{AB}{PQ} = \dfrac{BP}{QM}$........[from (1)]	½
	$\angle B = \angle Q$........[from (A)]	½
	$\Rightarrow \triangle ABD \sim \triangle PQM$ [By SAS	
	$\dfrac{AB}{PQ} = \dfrac{AD}{PM}$ (corresponding parts of similar triangles)	½
	OR	

	Given, to prove, construction fig 1m	



Draw a line OM ∥ AB.

∴ By using basic proportionality theorem, we have

$$\Rightarrow \frac{DM}{MA} = \frac{DO}{OB}$$

Taking reciprocals on both sides,

$$\Rightarrow \frac{AM}{DM} = \frac{OB}{OD} \quad \text{------ (1)}$$

½

It is given that,

$$\Rightarrow \frac{AO}{BO} = \frac{CO}{DO}$$

½

$$\Rightarrow \frac{AO}{CO} = \frac{OB}{OD} \quad \text{---- (2)}$$

½

Comparing (1) and (2), we get

$$\Rightarrow \frac{AM}{DM} = \frac{OA}{OC}$$

∴ By using converse of basic proportionality theorem, we have

OM ∥ DC

But OM ∥ AB [by construction]

⇒ AB ∥ DC

½

⇒ One pair of opposite sides of quadrilateral is parallel.

∴ ABCD is a trapezium.

Q.30.	

Classes	f_i	c.f.
0 - 100	15	15
100 - 200	17	32
200 - 300	f	32 + f
300 - 400	12	44 + f
400 - 500	9	53 + f
500 - 600	5	58 + f
600 - 700	2	60 + f

Table 1m

N = 60 + f

$\Rightarrow \frac{N}{2} = \frac{60+f}{2}$

Median = 240 which lines between class 200 - 300

Median class = 200 - 300 — ½

Median = $l + \left[\frac{\frac{N}{2} - c.f.}{f}\right] \times h$

$240 = 200 + \left[\frac{\frac{60+f}{2} - 32}{f}\right] \times 100$ — ½

$40 = \left[\frac{60+f-64}{2f}\right] \times 100$ — ½

$8f = 10f - 40$

$2f = 40$ — ½

$f = 20$

Q.31.

$p(x) = 2x^2 + 5x + k$

$SOZ = \alpha + \beta = \frac{-5}{2}$

$POZ = \alpha\beta = \frac{k}{2}$ — 1

$\alpha^2 + \beta^2 + \alpha\beta = \frac{21}{4}$

$(\alpha + \beta)^2 - 2\alpha\beta + \alpha\beta = \frac{21}{4}$ — ½

$\left(\frac{-5}{2}\right)^2 - \alpha\beta = \frac{21}{4}$ — ½

$\frac{25}{4} - \frac{21}{4} = \alpha\beta$ — ½

$\alpha\beta = 1$

$\therefore 1 = \frac{k}{2} \Rightarrow k = 2$ — ½

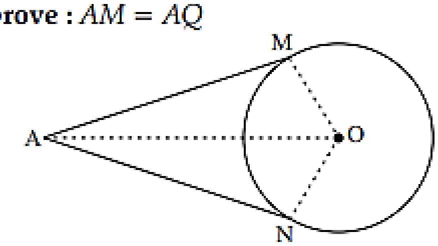
SECTION D

Section D consists of 4 questions of 5 marks each.

Q.32.

Solution : Given, Tangents AM and AN are drawn from point A to a circle with centre O.

To prove : $AM = AQ$



Construction : Join OM, ON and OA — 1 ½

Proof : Since AM is a tangent at M and OM is radius

$\therefore$ $OM \perp AM$

Similarly, $ON \perp AN$ — ½

Now, in ΔOMA and ΔONA.

$OM = ON$ (radii of same circle)

$OA = OA$ (common)

$\angle OMA = \angle ONA = 90°$ — ½

$\therefore$ $\Delta OMA \cong \Delta ONA$ (By RHS congruence) — ½

Hence, $AM = AN$ (By cpct) **Hence Proved.**

PA = PB; CA = CE; DE = DB [Tangents to a circle] — ½

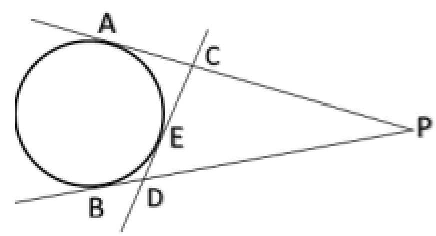
Perimeter of ΔPCD = PC + CD + PD

= PC + CE + ED + PD

= PC + CA + BD + PD

= PA + PB — 1

Perimeter of ΔPCD = PA + PA = 2PA = 2(10) = 20 cm — ½

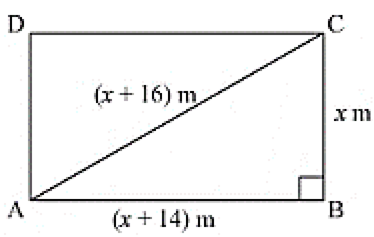


Q.33.

$$\frac{3}{x+1}+\frac{4}{x-1} = \frac{29}{4x-1};\ x \neq 1, -1, \frac{1}{4}$$

$\Rightarrow 3(x-1)(4x-1) + 4(x+1)(4x-1) = 29(x+1)(x-1)$	1
$\Rightarrow 3(4x^2-4x-x+1) + 4(4x^2+4x-x-1) = 29(x^2-1)$	½
$\Rightarrow 12x^2-15x+3+16x^2+12x-4 = 29x^2-29$	½
$\Rightarrow 28x^2-3x-1 = 29x^2-29$	½
$\Rightarrow x^2+3x-28 = 0$	1
$\Rightarrow x^2+7x-4x-28 = 0$	½
$\Rightarrow x(x+7)-4(x+7) = 0$	½
$\Rightarrow (x-4)(x+7) = 0$	
$\Rightarrow x = -7$ or 4.	½

OR



Let the shorter side of the rectangular field be x m.

Then, diagonal of the rectangular field = (x+ 16) m

Also, longer side of the rectangular field = (x +14) m

	In right ΔABC $(AB)^2 + (BC)^2 = (AC)^2$ $\Rightarrow (x+14)^2 + x^2 = (x+16)^2$ $\Rightarrow x^2 + 196 + 28x + x^2 = x^2 + 256 + 32x$ $\Rightarrow x^2 - 4x - 60 = 0$ $\Rightarrow x^2 - 10x + 6x - 60 = 0$ $\Rightarrow x(x-10) + 6(x-10) = 0$ $\Rightarrow x + 6 = 0$ or $x - 10 = 0$ $\Rightarrow x = -6$ or $x = 10$ Since length cannot be negative, so x = 10 therefore, the length of the shorter side = 10 m Length of the diagonal = 10 +16 = 26m Length of the longer side = 10 +14 = 24	1 ½ ½ ½ 1 ½ ½ ½
Q.34.	See tables below	2m

Weight (in grams)	80 - 100	100 - 120	120 - 140	140 - 160	160 - 180	Total
No. of apples	20	60	70	40	60	250

x_i	90	110	130	150	170	
$x_i f_i$	1800	6600	9100	6000	10200	33700

Mean weight = $\frac{33700}{250}$ = 134.8 (½ + ½)

	(ii) Modal class = 120-140 $\text{Mode} = 120 + \frac{(70-60)}{(140-60-40)} \times 20$ $= 125$ Hence modal mass = 125 gm	½ 1 ½
Q.35.	The total surface area of the block = TSA of the Cube + CSA of the Hemisphere − Base area of the hemisphere $= 6 \times a^2 + 2 \times \pi \times r^2 - \pi \times r^2$ $= 6 \times a^2 + \pi \times r^2$ $= 6 \times 6^2 + \frac{22}{7} \times 2.1 \times 2.1$ $= 229.86 \text{cm}^2$ Volume of the block = Volume of the cube + Volume of the hemisphere $= a^3 + \frac{2}{3} \times \pi \times r^3$ $= 6^3 + \frac{2}{3} \times \frac{22}{7} \times 2.1 \times 2.1 \times 2.1$ $= 216 + 2 \times 22 \times 0.3 \times 0.7 \times 2.1$ $= 235.404 \text{ cm}^3$ OR	½ 1 1 ½ 1 1

Total height of the tent above the ground = 27 m

Height of the cylinderical part, h_1= 6 m

Height of the conical part, h_2 = 21 m

Diameter = 56 m

Radius = 28 m — 1

Curved surface area of the cylinder, CSA_1 = $2\pi rh_1 = 2\pi \times 28 \times 6 = 336\pi$

Curved surface area of the cylinder, CSA_2 will be — ½

$\pi rl = \pi r\left(\sqrt{h^2+r^2}\right) = \pi \times 28 \times \left(\sqrt{21^2+28^2}\right) = 28\pi\left(\sqrt{441+784}\right)$ — ½

$= 28\pi \times 35$

$= 980\pi$

Total curved surface area = CSA of cylinder + CSA of cone — ½

= CSA_1 + CSA_2 — 1

$= 336\pi + 980\pi$ — ½

$= 1316\pi$

$= 4136\text{m}^2$ — ½

Thus, the area of the canvas used in making the tent is 4136 m^2 . — ½

Provision for stitching and wastage = 64 m^2

Area of canvas to be purchased = 4136m^2 + 64m^2 = 4200 m^2

Cost of canvas = TSA x Rate = 4200 x 120 = ₹ 5, 04, 000

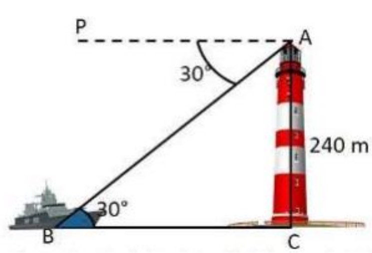
SECTION E

This section comprises 3 case study- based questions of 4 marks each.

Q.36.

Case Study-1

(i)



1m

(ii)

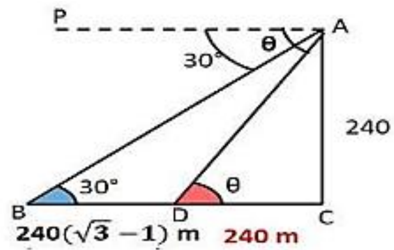
$$\tan 30^\circ = \frac{AC}{BC}$$

$$\frac{1}{\sqrt{3}} = \frac{240}{BC}$$ ½

BC = $240\sqrt{3}$ m

The distance of the boat from the foot of the lighthouse = $240\sqrt{3}$ m ½

(iii a)



½

Given BD = $240(\sqrt{3} - 1)$ m

So, CD = BC – BD = $240\sqrt{3} - 240(\sqrt{3} - 1) = 240$ m ½

$$\tan \theta = \frac{AC}{CD}$$

$$\tan \theta = \frac{240}{240}$$ ½

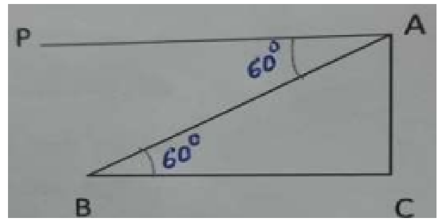
$\tan \theta = 1$

$\therefore \theta = 45^\circ$ ½

the new angle of depression of the boat from the top of the light house = 45^0

OR

(iii b)



When the angle of depression (θ) is 60^0

$\angle ABC = \angle PAB = 60°$ (A;lternate interior angles) ½

$\tan B = \frac{AC}{BC}$

$\tan 60^0 = \frac{240}{BC}$ ½

$\sqrt{3} = \frac{240}{BC}$ ½

$BC = \frac{240}{\sqrt{3}} = \frac{240\times\sqrt{3}}{\sqrt{3}\times\sqrt{3}} = \frac{240\sqrt{3}}{3} = 80\sqrt{3}$

$= 80\times 1.73 = 138.4$ m ½

The distance of the boat from the lighthouse, when the angle of depression is 60^0 = 138.4 m

Q.37.

Case Study-2

Solution: $a = 2, d = 3$

(i) Number of pots in the 10^{th} row

$= a_{10} = a + 9d = 29$ *1*

(ii) $a_5 - a_2 = (a + 4d) - (a + d) = 3d = 9$ *1*

(iii) $S_n = 100 \Rightarrow \frac{n}{2}[2(2) + (n - 1)3] = 100$ *1*

$3n^2 + n - 200 = 0 \Rightarrow (3n + 25)(n - 8) = 0$

$\therefore n = 8 \quad (n = -\frac{25}{3}$ rejected), *1*

OR

(iii) $S_{12} = \frac{12}{2}[2(2) + 11(3)]$ *1*

$= 222$ *1*

Q.38.

Case Study-3

(i) $OC = \sqrt{5^2 + 3^2} = \sqrt{25 + 9} = \sqrt{34}$ units 1m

C is nearest to the office.

(ii) $AC = \sqrt{(5-2)^2 + (3-8)^2} = \sqrt{9 + 25} = \sqrt{34}$ units 1m

	(iii) D = ($\frac{1x7+2x2}{3}$, $\frac{1x7+2x8}{3}$) = ($\frac{11}{3}$, $\frac{23}{3}$)	1 + 1
	OR	
	OA = $\sqrt{(2)^2 + (8)^2}$ = $\sqrt{4+64}$ = $\sqrt{68}$ units	½
	AB = $\sqrt{(7-2)^2 + (7-8)^2}$ = $\sqrt{25+1}$ = $\sqrt{26}$ units	½
	BC = $\sqrt{(5-7)^2 + (3-7)^2}$ = $\sqrt{4+16}$ = $\sqrt{20}$ units	½
	Shortest distance is BC.	½

Set 2		**Set 3**	
Section A (1m each)		***Section A (1m each)***	
Q.1.	(D) $\frac{17}{16}$	**Q.1.**	(D) 2: 1
Q.2.	(C) 50°	**Q.2.**	(A) 45 minutes
Q.3.	(B) 21	**Q.3.**	(B) 45°
Q.4.	(C) ab = 6	**Q.4.**	(D) $\frac{17}{16}$
Q.5.	(D) 2: 1	**Q.5.**	(C) 50°
Q.6.	(A) 45 minutes	**Q.6.**	(A) 27
Q.7.	(C) 30°	**Q.7.**	(C) ab = 6
Q.8.	(C) (0, -11)	**Q.8.**	(D) 40
Q.9.	(B) r^2	**Q.9.**	(B) a^2b^2
Q.10.	(D) 40	**Q.10.**	(C) -36

Q.11.	(D) 4	**Q.11.**	(B) 30°
Q.12.	(B) 30°	**Q.12.**	(C) (0, -11)
Q.13.	(B) k $\leq$ 4	**Q.13.**	(D) ± 3
Q.14.	(B) $\frac{5}{12}$	**Q.14.**	(A) 30°
Q.15.	(B) -5, 0, 7	**Q.15.**	(A) $\frac{1}{12}$
Q.16.	(C) $250\ cm^2$	**Q.16.**	(B) -5, 0, 7
Q.17.	(A) 30°	**Q.17.**	(C) $250\ cm^2$
Q.18.	(A) Only Anas	**Q.18.**	(A) Only Anas
Q.19.	(c)Assertion (A) is true but reason (R) is false.	**Q.19.**	(a) Both (A) and (R) are true and (R) is the correct explanation of (A)
Q.20.	a) Both (A) and (R) are true and (R) is the correct explanation of (A)	**Q.20.**	(c) Assertion (A) is true but reason (R) is false.
Section B (2m each)		***Section B (2m each)***	
Q.21.	Q.24 [Set 1]	**Q.21.**	Q.23 [Set 1]
Q.22.	Q.25 [Set 1]	**Q.22.**	Q.24 [Set 1]
Q.23.	Q.21 [Set 1]	**Q.23.**	Q.25 [Set 1]
Q.24.	Q.22 [Set 1]	**Q.24.**	Q.21 [Set 1]
Q.25.	Q.23 [Set 1]	**Q.25.**	Q.22 [Set 1]
Section C (3m each)		***Section C (3m each)***	
Q.26.	Q.30 [Set 1]	**Q.26.**	Q.28 [Set 1]
Q.27.	Q.31 [Set 1]	**Q.27.**	Q.29 [Set 1]
Q.28.	Q.26 [Set 1]	**Q.28.**	Q.30 [Set 1]
Q.29.	Q.27 [Set 1]	**Q.29.**	Q.31 [Set 1]
Q.30.	Q.28 [Set 1]	**Q.30.**	Q.26 [Set 1]
Q.31.	Q.29 [Set 1]	**Q.31.**	Q.27 [Set 1]

Section D (5m each)		*Section D (5m each)*	
Q.32.	Q.35 [Set 1]	**Q.32.**	Q.34 [Set 1]
Q.33.	Q.34 [Set 1]	**Q.33.**	Q.35 [Set 1]
Q.34.	Q.33 [Set 1]	**Q.34.**	Q.32 [Set 1]
Q.35.	Q.32 [Set 1]	**Q.35.**	Q.33 [Set 1]
Section E (4m each)		*Section E (4m each)*	
Q.36.	Q.37 [Set 1]	**Q.36.**	Q.38 [Set 1] (iii a) D = ($\frac{1x5+2x7}{3}$, $\frac{1x3+2x7}{3}$) = ($\frac{19}{3}$, $\frac{17}{3}$)
Q.37.	Q.38 [Set 1] (iii a) D = ($\frac{1x5+2x7}{3}$, $\frac{1x3+2x7}{3}$) = ($\frac{19}{3}$, $\frac{17}{3}$)	**Q.37.**	Q.36 [Set 1]
Q.38.	Q.36 [Set 1]	**Q.38.**	Q.37 [Set 1]