



**COMMON PRE-BOARD EXAMINATION
MATHEMATICS (STANDARD)–Code No. 041**
CLASS-X-(2025-26)



SET: 2

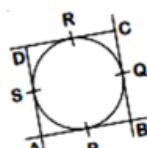
Time allowed: 3 Hrs

Marking Scheme

Maximum Marks: 80

(Section A) Section A consists of 20 questions of 1 mark each.		
1.	(D) $\sqrt{5}$	1
2.	(A) 1 : 2	1
3.	(C) rational number	1
4.	(B) 6	1
5.	(A) 2AB	1
6.	(A) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$	1
7.	(C) $10k^2$	1
8.	(C) 3	1
9.	(C) 8 cm	1
10.	(B) $\frac{4}{35}$	1
11.	(C) 7	1
12.	(C) 13	1
13.	(C) $\frac{\sqrt{b^2-a^2}}{b}$	1
14.	(D) $\frac{41}{40}$	1
15.	(C) 83°	1
16.	(A) $6\pi cm^2$	1
17.	(A) $R_1 + R_2 = R$	1
18.	(B) $\frac{1}{2}$	1

(Section – C)
Section C consists of 6 questions of 3 marks each.

26.	<p>Let $(2 + 5\sqrt{3})$ be rational</p> $\Rightarrow 2 + 5\sqrt{3} = \frac{p}{q}, \text{ where } p \text{ & } q \text{ are integral co-primes & } q \neq 0$ $\Rightarrow 5\sqrt{3} = \frac{p}{q} - 2$ $\Rightarrow \sqrt{3} = \frac{1}{5} \left(\frac{p}{q} - 2 \right)$ <p>Here, <i>LHS</i> is irrational but <i>RHS</i> is rational</p> <p>This is a contradiction</p> <p>Therefore, our assumption is wrong</p> <p>Hence, $(2 + 5\sqrt{3})$ is irrational</p>	$\frac{1}{2}$ $\frac{1}{2}$ 1 $\frac{1}{2}$ $\frac{1}{2}$
27.	$\alpha + \beta = 10 \Rightarrow \frac{5}{a} = 10 \Rightarrow a = \frac{1}{2}$ $\alpha\beta = 10 \Rightarrow \frac{c}{a} = 10 \Rightarrow c = 5$	$1\frac{1}{2}$ $1\frac{1}{2}$
28.	<p>Total number of numbers = $(123 - 11) + 1 = 113$</p> <p>(i) $P(\text{perfect square}) = \frac{8}{113}$</p> <p>(ii) $P(\text{multiple of 7}) = \frac{16}{113}$</p> <p>(OR)</p> <p>(i) $P(\text{non-face card}) = \frac{52-12}{52} = \frac{40}{52} = \frac{10}{13}$</p> <p>(ii) $P(\text{a black king}) = \frac{2}{52} = \frac{1}{26}$</p> <p>(iii) $P(\text{neither a red nor a jack}) = \frac{52-28}{52} = \frac{24}{52} = \frac{6}{13}$</p>	1 1 1 (OR) 1 1 1 1
29.	<p>Since, Tangents from the same external point are equal in length.</p> $AP = AS \rightarrow (1) \quad BP = BQ \rightarrow (2) \quad CR = CQ \rightarrow (3) \quad DR = DS \rightarrow (4)$ <p>Adding equations (1 + 2 + 3 + 4)</p> $AP + BP + CR + DR = AS + BQ + CQ + DS$ $AB + CD = AD + BC$ $6 + 8 = AD + 9 \Rightarrow AD = 14 - 9 = 5 \text{ cm}$	 1 1 1
30.	$\text{LHS} = \sqrt{\frac{(1 + \sin A) \times (1 + \sin A)}{(1 - \sin A) \times (1 + \sin A)}} = \sqrt{\frac{(1 + \sin A)^2}{1 - \sin^2 A}} = \sqrt{\frac{(1 + \sin A)^2}{\cos^2 A}} = \frac{1 + \sin A}{\cos A}$ $= \frac{1}{\cos A} + \frac{\sin A}{\cos A} = \sec A + \tan A = \text{RHS}$	$\frac{1}{2} \text{ each}$ $\frac{1}{2} + \frac{1}{2}$

31.	<p>Assuming speeds as x km/hr and y km/hr, Distance = Speed \times Time, we get $16 = (2x + 2y) \Rightarrow x + y = 8 \rightarrow (1)$ Similarly, $16 = (8x - 8y) \Rightarrow x - y = 2 \rightarrow (2)$ Solving, $x = 5$ and $y = 3$ The walking speeds are 5km/h and 3km/h</p> <p>(OR)</p> <p>For no solutions, $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2} \Rightarrow \frac{k}{3} = \frac{k-2}{1} \neq \frac{1}{5}$ $\Rightarrow k = 3$ and $\frac{1}{1} \neq \frac{1}{5}$</p> <p>Since $1 \neq \frac{1}{5}$, the condition for no solutions is satisfied for $k = 3$.</p>	$\frac{1}{2}$ 1 1 $\frac{1}{2}$ $\frac{1}{2} + 1$ 1 $\frac{1}{2}$
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(Section – D)
Section D consists of 4 questions of 5 marks each

32.	<p>Diameter of base = 3.5m, radius = $7/4$m, Height of the cylindrical part = $14/3$ m</p> <p>(i) Volume of vessel = $\pi r^2 h + \frac{2}{3} \pi r^3 = \pi r^2 \left(h + \frac{2}{3} r \right)$ $= \frac{22}{7} \times \frac{7}{4} \times \frac{7}{4} \left(\frac{14}{3} + \frac{2}{3} \times \frac{7}{4} \right) = \frac{2695}{48} = 56.15 \text{ m}^3$</p> <p>(ii) CSA of vessel = $2\pi r h + 2\pi r^2 = 2\pi r(h + r)$ $= 2 \times \frac{22}{7} \times \frac{7}{4} \times \left(\frac{14}{3} + \frac{7}{4} \right) = \frac{847}{12} = 70.58 \text{ m}^2$</p>	1 $1+1$ 1 1
33.	<p>Statement : If a line is drawn parallel to one side of a triangle to intersect the other two sides at distinct points, then the line divides the two sides in the same ratio.</p> <p>Given: Trapezium ABCD, $AB \parallel CD$, diagonals AC and BD intersect at O.</p> <p>To prove: $\frac{DP}{PA} = \frac{CQ}{BQ}$</p> <p>Construction: Draw $PQ \parallel AB$ through O to meet AD and BC at P and Q respectively</p> <p>Proof: $PQ \parallel AB$ and $AB \parallel CD \Rightarrow PQ \parallel CD$</p> <p>In $\triangle DAB$, $PO \parallel AB \therefore \frac{DP}{PA} = \frac{DO}{BO}$ (BPT) —(1)</p> <p>Similarly, in $\triangle BCD$, $OQ \parallel CD$</p> <p>$\Rightarrow \frac{BQ}{QC} = \frac{BO}{DO} \Rightarrow \frac{QC}{BQ} = \frac{DO}{BO}$ —(2)</p> <p>from (1) & (2), $\frac{DP}{PA} = \frac{QC}{BQ}$</p> <p>Hence the result.</p>	1 $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ 1 $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
34.	<p>Let the unit digit of the number be y and the tens digit of this number be x. So, the number is $10x + y$ and the number interchanging the digits = $10y + x$</p> <p>Given $xy = 12 \dots(1)$</p> <p>Also, $(10x + y) + 36 = 10y + x \Rightarrow x = (y - 4) \dots(2)$</p> <p>On substituting the value of x in equation (1), we get, $y \cdot (y - 4) = 12 \Rightarrow y^2 - 4y - 12 = 0 \Rightarrow y = 6 \text{ or } -2$</p>	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ 1 1

<p>But the unit digit of the two-digit number cannot be negative. $\Rightarrow y = 6 \Rightarrow x = 6 - 4 \Rightarrow x = 2$ $\Rightarrow 10x + y = 10 \times 2 + 6 = 26$ Hence the number is 26.</p>	<p>(OR)</p>	<p>For the first equation, $x^2 + kx + 64 = 0$: The discriminant is $\Delta_1 = k^2 - 4(1)(64) = k^2 - 256$ For real roots, we must have $k^2 - 256 \geq 0 \Rightarrow k^2 \geq 256$ $\Rightarrow k \leq -16$ or $k \geq 16$ Since the problem asks for positive values of k, we consider $k \geq 16 \rightarrow (1)$</p>	<p>(OR)</p>
<p>For the second equation, $x^2 - 8x + k = 0$: The discriminant is $\Delta_2 = (-8)^2 - 4(1)(k) = 64 - 4k$ For real roots, we must have $64 - 4k \geq 0$ $\Rightarrow 64k \geq 4k \Rightarrow 16 \geq k \rightarrow (2)$</p>	<p>For the second equation, $x^2 - 8x + k = 0$: The discriminant is $\Delta_2 = (-8)^2 - 4(1)(k) = 64 - 4k$ For real roots, we must have $64 - 4k \geq 0$ $\Rightarrow 64k \geq 4k \Rightarrow 16 \geq k \rightarrow (2)$</p>	<p>The only value that satisfies both inequalities is when k is exactly equal to 16. The positive value of k for which both equations will have roots is 16.</p>	<p>1</p>
<p>35.</p>	<p>The average performance of all countries from the graph is</p>	$\frac{10 \times 13 + 30 \times 19 + 50 \times 6 + 70 \times 4}{13 + 19 + 6 + 4} = \frac{130 + 570 + 300 + 280}{42} = \frac{1280}{42} = 30.48\%.$ <p>\Rightarrow Japan performed better than the average performance.</p>	<p>2+1+1 1</p>
<p>(OR)</p>	<p>Cf values $\rightarrow p, p+15, p+40, p+60, p+q+60, p+q+68, p+q+78$ $\Rightarrow p + q + 78 = 90 \Rightarrow p + q = 12$ $\frac{N}{2} = \frac{90}{2} = 45$</p>	<p>(OR)</p>	<p>1 1 ½</p>
<p>Median = $L + \frac{\left(\frac{N}{2} - c.f.\right)}{f} \cdot h \Rightarrow 50 = 50 + \frac{45 - (p + 40)}{20} \cdot 10$</p>	<p>$\Rightarrow 0 = \frac{(5 - p)}{2} \Rightarrow 5 - p = 0 \Rightarrow p = 5$</p>	<p>$Now q = 12 - p = 12 - 5 \Rightarrow q = 7$</p>	<p>½ + 1 ½ ½</p>

(Section – E)

Section E consists of 3 case study-based questions of 4 marks each.

36.	<p>(i) $a_1 = 20 + 4(1)a_1 = 20 + 4a_1 = 24$ The number on the first spot is 24. (This is also the first term, a).</p>	1
	<p>(ii) Let $a_n = 112 \Rightarrow 20 + 4n = 112$ $4n = 92 \Rightarrow n = 23$</p>	$\frac{1}{2} + 1 + \frac{1}{2}$
	<p>The spot numbered as 112 is the 23rd spot.</p>	
	<p>(OR)</p> $S_n = \frac{n}{2}[2a + (n - 1)d] \Rightarrow S_{10} = \frac{10}{2}[2(24) + (10 - 1)4]$ $S_{10} = 5[48 + 36] \Rightarrow S_{10} = 420$	(OR)

	<p>(iii) $a_n = 20 + 4n \Rightarrow a_{n-2} = 20 + 4(n-2)$ $a_{n-2} = 20 + 4n - 8 \Rightarrow a_{n-2} = 12 + 4n$ The number on the $(n-2)^{\text{th}}$ spot is $12 + 4n$.</p>	1
37.	<p>(i) 4 m (ii) $\sin(60^\circ) = \frac{BD}{BC} \Rightarrow \frac{\sqrt{3}}{2} = \frac{4}{L}$ $L = \frac{8}{\sqrt{3}} = \frac{8\sqrt{3}}{3}$ m The length of the ladder should be $\frac{8\sqrt{3}}{3}$ m (iii) $\tan(60^\circ) = \frac{BD}{DC} \Rightarrow \sqrt{3} = \frac{4}{x} \Rightarrow x = \frac{4}{\sqrt{3}} = \frac{4\sqrt{3}}{3}$ m Using the approximate value $\sqrt{3} \approx 1.732$: $x \approx \frac{4 \times 1.732}{3} \approx \frac{6.928}{3} \approx 2.309$ m The foot of the ladder should be placed $\frac{4\sqrt{3}}{3}$ m (or approximately 2.31 m) away from the foot of the pole. (OR) <ul style="list-style-type: none"> Height to be reached (BD): 4 m (Opposite side) Distance from the foot of the pole (DC): 4 m (Adjacent side) Ladder length (BC): Hypotenuse (L'). Using the Pythagorean theorem: $L'^2 = (BD)^2 + (DC)^2 \Rightarrow L'^2 = (4)^2 + (4)^2 \Rightarrow L' = 4\sqrt{2}$ m The length of the ladder is $4\sqrt{2}$ m </p>	1 1 2 2
38.	<p>(i) distance formula: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ <ul style="list-style-type: none"> School S(3, 4) $\rightarrow (x_1, y_1)$ Coaching Centre C(-2, 8) $\rightarrow (x_2, y_2)$ $d = \sqrt{(-2 - 3)^2 + (8 - 4)^2} \Rightarrow d = \sqrt{(-5)^2 + (4)^2} \Rightarrow d = \sqrt{25 + 16} d \Rightarrow = \sqrt{41}$ The shortest distance between her school and coaching centre is $\sqrt{41}$ units.</p> <p>(ii) • A(-2, 4) $\rightarrow (x_1, y_1)$ <ul style="list-style-type: none"> B(3, 4) $\rightarrow (x_2, y_2)$ D(1, 4) $\rightarrow (x, y)$ Ratio = k: 1 Using the section formula for the x-coordinate: $x = \frac{kx_2 + x_1}{k+1} \Rightarrow 1 = \frac{k(3) + 1(-2)}{k+1}$ $(k+1) = 3k - 2 \Rightarrow 3 = 2k \Rightarrow k = \frac{3}{2}$ (iii) The area covered by the perpendicular lines from points A and B to the x-axis, the line segment AB, and the x-axis itself forms a rectangle with <ul style="list-style-type: none"> Length $l = 5$ units Width $w = 4$ units Area = $l \times w = 5 \times 4 = 20$ sq. units </p> <p>(OR)</p>	1 1 2 2

<p>The mid-point of AB, $M = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2} \right)$ $M = \left(\frac{-2+3}{2}, \frac{4+4}{2} \right) \Rightarrow M = \left(\frac{1}{2}, 4 \right)$ Image of M with respect to X axis = $\left(\frac{1}{2}, -4 \right)$</p>	2
End of the Marking Scheme	