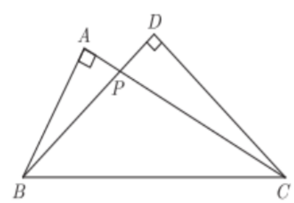
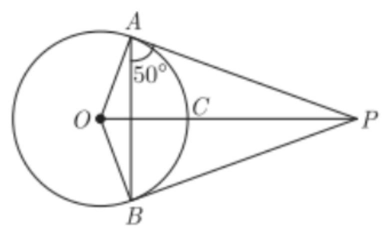
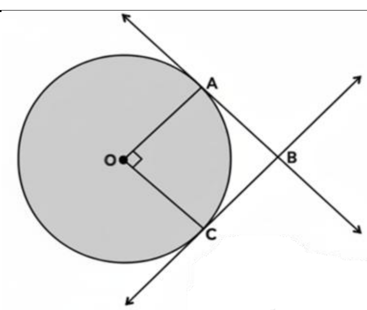
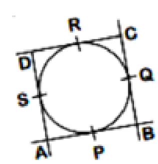
COMMON PRE-BOARD EXAMINATION
MATHEMATICS (STANDARD)–Code No. 041
CLASS-X-(2025-26)

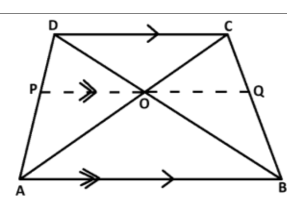
SET: 1

Time allowed: 3 Hrs **Marking Scheme** **Maximum Marks: 80**

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

19.	(C) Assertion (A) is true but reason (R) is false	1
20.	(D) Assertion (A) is false but reason (R) is true	1
	(Section – B) **Section B consists of 5 questions of 2 marks each.**	
21.	Since the terms are in A.P., $(2x+1)-(x+3)=(x-7)-(2x+1)$ $\Rightarrow x-2=-x-8 \Rightarrow 2x=-6 \Rightarrow \boldsymbol{x=-3}$ **(OR)** Given $a_{17}=a_{10}+7$ i.e. $a+16d=a+9d+7$ $\Rightarrow 16d-9d=7 \Rightarrow 7d=7 \Rightarrow \boldsymbol{d=1}$	1 1 **(OR)** 1 ½ ½
22.	In ΔBAP and ΔCDP we have $\angle BAP=\angle CDP=90°$ $\angle BPA=\angle CPD$ (vertical opposite angles) $\angle BAP \sim \angle CDP$(AA similarity) Therefore $\frac{BP}{PC}=\frac{AP}{PD}$ (corresponding parts of similar triangles) $AP\times PC=BP\times PD$ Hence proven  	Fig ½ Proof (1) Criteria ½
23.	$\angle OAP=90°$ (r ⊥ t) $\angle OAB=\angle OAP-\angle BAP=90°-50°=40°$ Since OA and OB are radii, we have $\angle OAB=\angle OBA=40°$(angles opp. to equal sides) Now, $\angle AOB+\angle OAB+\angle OBA=180°$ (angle sum property) $\Rightarrow \angle AOB+40°+40°=180°$ $\Rightarrow \angle AOB=100°$  **(OR)**	½ ½ ½ ½ **(OR)**
	$\angle OAB=90°$ and $\angle OCB=90°$(r ⊥ t) $\angle AOC=90°$ (given) $\Longrightarrow \angle ABC=90°$(angle sum in a quadrilateral) *Since all four interior angles of the quadrilateral OABC are **90°**, it is a **rectangle** *Now OA = OC (radii of the same circle) i.e., OABC is a rectangle with adjacent sides OA and OC equal$\Longrightarrow$ *It is* a **square**.  	½ ½ ½ ½
24.	$2(2)^2+x\left(\frac{\sqrt{3}}{2}\right)^2-\frac{3}{4}\left(\frac{1}{\sqrt{3}}\right)^2=10 \Rightarrow 8+\frac{3x}{4}-\frac{1}{4}=10 \Rightarrow \boldsymbol{x=3}$	Each value ½ each Final answer ½

25.	$A = \frac{1}{2} lr \;\Rightarrow 54\pi = \frac{1}{2} l \cdot 36$ $\Rightarrow 54\pi = 18l \;\Rightarrow l = 3\pi = 3 \times \frac{22}{7} = \frac{66}{7} = 9.42cm$	½+½ 1
(Section – C) **Section C consists of 6 questions of 3 marks each.**		
26.	Let $(2+5\sqrt{3})$ be rational $\Rightarrow 2+5\sqrt{3} = \frac{p}{q}$, where $p \,\&\, q$ are integral co- primes & $q \neq 0$) $\Rightarrow 5\sqrt{3} = \frac{p}{q} - 2$ $\Rightarrow \sqrt{3} = \frac{1}{5}\left(\frac{p}{q} - 2\right)$ Here, LHS is irrational but RHS is rational This is a contradiction Therefore, our assumption is wrong Hence, $(2+5\sqrt{3})$ is irrational	½ ½ 1 ½ ½
27.	$\alpha + \beta = 10 \;\Rightarrow\; \frac{5}{a} = 10 \;\Rightarrow \boldsymbol{a = \frac{1}{2}}$ $\alpha\beta = 10 \;\Rightarrow\; \frac{c}{a} = 10 \Rightarrow \boldsymbol{c = 5}$	1½ 1½
28.	Assuming speeds as x km/hr and y km/hr, Distance = Speed × Time, we get $16 = (2x + 2y) \Rightarrow \boldsymbol{x + y = 8} \rightarrow (1)$ Similarly, $16 = (8x - 8y) \;\Rightarrow \boldsymbol{x - y = 2} \rightarrow (2)$ Solving, x = 5 and y = 3 The walking speeds are **5km/h** and **3km/h** **(OR)** For no solutions, $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2} \;\Rightarrow\; \frac{k}{3} = \frac{k-2}{1} \neq \frac{1}{5}$ $\Rightarrow k = 3 \text{ and } \frac{1}{1} \neq \frac{1}{5}$ Since $1 \neq \frac{1}{5}$, the condition for no solutions is satisfied for $k = 3$.	½ 1 1 ½ **(OR)** ½ +1 1 ½
29.	*Since*, Tangents from the same external point are equal in length. AP = AS → (1) BP = BQ → (2) CR = CQ → (3) DR = DS → (4) Adding equations (1 + 2 + 3 + 4) AP + BP + CR + DR = AS + BQ + CQ + DS AB + CD = AD + BC 6 + 8 = AD + 9 ⇒ AD = 14 − 9 = **5 cm**  	1 1 1
30.	$\text{LHS} = \sqrt{\frac{(1+\sin A)}{(1-\sin A)} \times \frac{(1+\sin A)}{(1+\sin A)}} = \sqrt{\frac{(1+\sin A)^2}{1-\sin^2 A}} = \sqrt{\frac{(1+\sin A)^2}{\cos^2 A}} = \frac{1+\sin A}{\cos A}$ $= \frac{1}{\cos A} + \frac{\sin A}{\cos A} = \sec A + \tan A = \text{RHS}$	½ each ½ + ½

31.	Total number of numbers = (123 – 11) + 1= 113 (i) $P(\text{perfect square}) = \frac{8}{113}$ (ii) $P(\text{multiple of } 7) = \frac{16}{113}$ **(OR)** (i) P (non-face card) = $\frac{52-12}{52} = \frac{40}{52} = \frac{10}{13}$ (ii)P (a black king) = $\frac{2}{52} = \frac{1}{26}$ (iii) P (neither a red nor a jack) = $\frac{52-28}{52} = \frac{24}{52} = \frac{6}{13}$	1 1 1 **(OR)** 1 1 1
	(Section – D) **Section D consists of 4 questions of 5 marks each**	
32.	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 $= 10y + x$ Given $xy = 12$ …(1) Also, $(10x + y) + 36 = 10y + x \Rightarrow x = (y - 4)$ …(2) On substituting the value of x in equation (1), we get, $y \cdot (y - 4) = 12 \Rightarrow y^2 - 4y - 12 = 0 \Rightarrow y = 6 \;\; or - 2$ 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. **(OR)** 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 $\boldsymbol{k \geq 16}$**→(1)** 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 $64 - 4k \geq 0$ $\Rightarrow 64k \geq 4k \Rightarrow \boldsymbol{16 \geq k}$**→ (2)** 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**.	½ ½ ½ 1 1 ½ ½ ½ **(OR)** ½ ½ 1 ½ ½ ½ ½ 1
33.	**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. Given: Trapezium ABCD, $AB \parallel CD$, diagonals AC and BD intersect at O. To prove: $\frac{DP}{PA} = \frac{CQ}{BD}$ Construction: Draw $PQ \parallel AB$ through O to meet AD and BC at P and Q respectively  	1 ½ ½ ½

	Proof: $PQ \parallel AB$ and $AB \parallel CD \Rightarrow PQ \parallel CD$ In $\triangle DAB$, $PO \parallel AB$ $\therefore \frac{DP}{PA} = \frac{DO}{BO}$ (BPT) —(1) Similarly, in $\triangle BCD$, $OQ \parallel CD$ $\Rightarrow \frac{BQ}{QC} = \frac{BO}{DO} \Rightarrow \frac{QC}{BQ} = \frac{DO}{BO}$ —(2) from (1) & (2), $\frac{DP}{PA} = \frac{QC}{BQ}$ Hence the result.		½ 1 ½ ½
34.	Diameter of base = 3.5m, radius = $7/4$m, Height of the cylindrical part = $14/3$ m (i) Volume of vessel = $\pi r^2 h + \frac{2}{3}\pi r^3 = \pi r^2\left(h + \frac{2}{3}r\right)$ $= \frac{22}{7} \times \frac{7}{4} \times \frac{7}{4}\left(\frac{14}{3} + \frac{2}{3} \times \frac{7}{4}\right) = \frac{2695}{48} = 56.15$ m^3 (ii) CSA of vessel = $2\pi rh + 2\pi r^2 = 2\pi r(h + r)$ $= 2 \times \frac{22}{7} \times \frac{7}{4} \times \left(\frac{14}{3} + \frac{7}{4}\right) = \frac{847}{12} = 70.58$ m^2		1 1+1 1 1
35.	The average performance of all countries from the graph is $\frac{10\times13+30\times19+50\times6+70\times4}{13+19+6+4} = \frac{130+570+300+280}{42} = \frac{1280}{42}$ =30.48 %. ⇒Japan performed better than the average performance. **(OR)** Cf values →p, p+15, p+40, p+60, p+q+60, p+q+68, p+q+78 $\Longrightarrow p + q + 78 = 90 \Longrightarrow p + q = 12$ $\frac{N}{2} = \frac{90}{2} = 45$ Median $= L + \frac{\left(\frac{N}{2} - c.f.\right)}{\text{f}} \cdot h \Longrightarrow 50 = 50 + \frac{45 - (p + 40)}{20} \cdot 10$ $\Longrightarrow 0 = \frac{(5 - p)}{2} \Longrightarrow 5 - p = 0 \Longrightarrow \boldsymbol{p = 5}$ $Now\ q = 12 - p = 12 - 5 \Longrightarrow \boldsymbol{q = 7}$		2+1+1 1 **(OR)** 1 1 ½ ½ +1 ½ ½
	(Section – E) **Section E consists of 3 case study-based questions of 4 marks each.**		
36.	(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). (ii) $Let\ a_n = 112 \Longrightarrow 20 + 4n = 112$ $4n = 92 \Longrightarrow n = 23$ The spot numbered as 112 is the 23rd **spot**. **(OR)** $S_n = \frac{n}{2}[2a + (n-1)d] \Longrightarrow S_{10} = \frac{10}{2}[2(24) + (10-1)4]$ $S_{10} = 5[48 + 36] \Longrightarrow S_{10} = 420$ The sum of all the numbers on the first 10 spots is **420**.		1 ½ +1+½ **(OR)** ½ +1+½

	(iii) $a_n = 20 + 4n \implies a_{n-2} = 20 + 4(n-2)$ $a_{n-2} = 20 + 4n - 8 \implies a_{n-2} = 12 + 4n$ The number on the $(n-2)^{\text{th}}$spot is $12 + 4n$.	1
37.	**(i) distance formula**: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ • School $\mathrm{S}(3,4) \to (x_1, y_1)$ • Coaching Centre $\mathrm{C}(-2,8) \to (x_2, y_2)$ $d = \sqrt{(-2-3)^2 + (8-4)^2} \implies d = \sqrt{(-5)^2 + (4)^2} \implies d = \sqrt{25+16}\ d \implies= \sqrt{41}$ The shortest distance between her school and coaching centre is $\sqrt{41}$ **units**.	1
	(ii) • $\mathrm{A}(-2,4) \to (x_1, y_1)$ • $\mathrm{B}(3,4) \to (x_2, y_2)$ • $\mathrm{D}(1,4) \to (x, y)$ • Ratio $= k:1$ Using the **section formula** for the x-coordinate: $x = \frac{\mathrm{k}x_2 + x_1}{\mathrm{k}+1} \implies 1 = \frac{k(3)+1(-2)}{k+1}$ $(k+1) = 3k - 2 \implies 3 = 2k \implies k = \frac{3}{2}$	1
	(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 • Length $l = 5$ units • Width $w = 4$ units Area $= l \times w = 5 \times 4 = 20$ sq. units	2
	(OR) The mid-point of AB, $\mathrm{M} = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$ $\mathrm{M} = \left(\frac{-2+3}{2}, \frac{4+4}{2}\right) \implies \mathrm{M} = \left(\frac{1}{2}, 4\right)$ Image of M with respect to X axis $= \left(\frac{1}{2}, -4\right)$	**(OR)** 2
38.	(i) 4 m	1
	(ii) $\sin(60°) = \frac{\mathrm{BD}}{\mathrm{BC}} \implies \frac{\sqrt{3}}{2} = \frac{4}{L}$ $L = \frac{8}{\sqrt{3}} = \frac{8\sqrt{3}}{3}$ m The length of the ladder should be $\frac{8\sqrt{3}}{3}$ m	1
	(iii) $\tan(60°) = \frac{\mathrm{BD}}{\mathrm{DC}} \implies \sqrt{3} = \frac{4}{x} \implies x = \frac{4}{\sqrt{3}} = \frac{4\sqrt{3}}{3}$ 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.	2
	(OR)	**(OR)**

	• 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: ${L'}^2 = (\text{BD})^2 + (\text{DC})^2 \Rightarrow {L'}^2 = (4)^2 + (4)^2 \Rightarrow L' = 4\sqrt{2}$ m The length of the ladder is $4\sqrt{2}$ m	2
	End of the Marking Scheme	