KENDRIYA VIDYALAYA SANGATHAN, ERNAKULAM REGION
PREBOARD -1, MATHEMATICS BASIC (241)
MARKING SCHEME
CLASS X (2026 - 2027)
SECTION: A (Solution of MCQs of 1 Mark each, no part marks)

Q. NO.	ANSWER	HINTS/SOLUTION	MARKS
1.	**C**	Given 3 cot A = 4 ⇒ cot A = 4/3. Opposite side = 3, Adjacent side = 4. Hypotenuse = $\sqrt{(3^2 + 4^2)} = 5$. Therefore, cosec A = Hypotenuse / Opposite = 5/3.	**1**
2.	**C**	$2520 = 2^3 \times 3^2 \times 5^1 \times 7^1$. The total number of prime factors in the factorization is the sum of powers = 3 + 2 + 1 + 1 = 7.	**1**
3.	**A**	In ΔABC with DE || BC, by Basic Proportionality Theorem: AD/DB = AE/EC ⇒ 3/6 = 2.5/EC ⇒ 1/2 = 2.5/EC ⇒ EC = 5 cm.	**1**
4.	**B**	tan 30° = Height / 30 ⇒ $1/\sqrt{3} = h/30 \Rightarrow h = 30/\sqrt{3} = 10\sqrt{3}$ m.	**1**
5.	**D**	Area = $(x + 2)^2 = 196 \Rightarrow x + 2 = \sqrt{196} = 14 \Rightarrow x = 12$.	**1**
6.	**C**	tan θ = Height / Shadow Length. Since Shadow = Height, tan θ = 1 ⇒ θ = 45°.	**1**
7.	**B**	$V_1/V_2 = (\pi r_1^2 h_1) / (\pi r_2^2 h_2) = (r_1/r^2)^2 \times (h_1/h_2) = (2/1)^2 \times (1/2) = 4 \times 1/2 = 2/1 = 2:1$.	**1**
8.	**C**	Distance from origin O(0,0) to P(-6,8) = $\sqrt{((-6)^2 + 8^2)} = \sqrt{(36 + 64)} = \sqrt{100} = 10$ units.	**1**
9.	**B**	a = 10, d = 14 - 10 = 4. $a_{15} = a + 14d = 10 + 14(4) = 10 + 56 = 66$ saplings.	**1**
10.	**C**	Height of Pole / Shadow of Pole = Height of Tower / Shadow of Tower ⇒ 9/6 = H/24 ⇒ H = (9 × 24)/6 = 36 m.	**1**
11.	**B**	Distance between two parallel tangents = Diameter of pipe = 14 cm. Radius = 14 / 2 = 7 cm.	**1**
12.	**D**	Maximum number of groups = HCF(108, 180). $108 = 2^2 \times 3^3$, $180 = 2^2 \times 3^2 \times 5$. HCF = $2^2 \times 3^2 = 36$ groups.	**1**
13.	**B**	tan θ = 4/3 ⇒ Opp=4, Adj=3, Hyp=5. sec θ = 5/3, cosec θ = 5/4. sec θ + cosec θ = 5/3 + 5/4 = (20 + 15)/12 = 35/12.	**1**
14.	**B**	a = -3, d = -1/2 - (-3) = 2.5 = 5/2. $a_{11} = a + 10d = -3 + 10(5/2) = -3 + 25 = 22$.	**1**
15.	**A**	cos 60° = Base / Hypotenuse ⇒ 1/2 = x / 10 ⇒ x = 5 m.	**1**
16.	**B**	Graph touches x-axis at exactly 1 point (3,0). Hence it has 1 distinct real zero (2 equal coincident real zeroes at x = 3).	**1**
17.	**A**	Angle in 5 minutes = 30°. Area = (30/360) × (22/7) × 14 × 14 = (1/12) × 22 × 28 = 154/3 cm².	**1**
18.	**B**	$a_1/a_2 \neq b_1/b_2 \Rightarrow k/6 \neq -1/-2 \Rightarrow k/6 \neq 1/2 \Rightarrow k \neq 3$.	**1**
19.	**A**	Assertion: $D = (-4\sqrt{3})^2 - 4(3)(4) = 48 - 48 = 0$ ⇒ real & equal roots (True). Reason: D=0 gives equal roots (True). R explains A.	**1**
20.	**A**	Assertion: ΔOAP ≅ ΔOBP by RHS (True). Reason: Tangents equal & radius ⊥ tangent (True). R explains A.	**1**

Section –B
(This section comprises of solution of very short answer type questions (VSA) of 2 marks Each)

Q. NO.	HINTS/SOLUTION	MARKS
21(A).	Reset interval = LCM (42, 63). $42 = 2 \times 3 \times 7$; $63 = 3^2 \times 7$. LCM = $2 \times 3^2 \times 7 = 126$ seconds = 2 min 6 sec. Next simultaneous reset = 8:00 AM + 2 min 6 sec = 8:02:06 A	**1** ½ ½
	OR	

21(B).	Numbers to be divided completely: (70 - 5) = 65 and (125 - 8) = 117. Required largest number = HCF (65, 117). 65 = 5 × 13, 117 = 9 × 13. HCF = 13.	½ ½ **1**
22.	sin 30° = 1/2, sin 60° = √3/2 sin (30°+60°) = sin 90° = 1. sin 30° + sin 60° = 1/2 + √3/2 = (1+√3)/2 Since 1 ≠ (1+√3)/2, sin(X+Y) ≠ sin X + sin Y.	½ ½ ½ ½
23.	Diagonals of parallelogram bisect each other. Midpoint of AC = Midpoint of BD. ((1+x)/2, (2+6)/2) = ((4+3)/2, (y+5)/2). (1+x)/2 = 7/2 ⇒ x = 6; 4 = (y+5)/2 ⇒ y = 3.	½ ½ ½ + ½
24.	Area of sector = (θ/360°) × π r² = (45/360) × (22/7) × 14 × 14 = (1/8) × 22 × 28 = 77 m².	**1** **1**
25(A).	Let bat = x, ball = y. Equations: 7x + 6y = 3800 and 3x + 5y = 1750. Solving simultaneously: x = 500, y = 50. Cost of 1 bat = ₹500, 1 ball = ₹50.	**1** ½ ½
	OR	
25(B).	2x + 3y = 17 and 3x - y = 9. From 2nd eq: y = 3x - 9. Substitute in 1st eq: 2x + 3(3x - 9) = 17 ⇒ 11x - 27 = 17 ⇒ 11x = 44 ⇒ x = 4, y = 3.	½ ½ ½ + ½
Section – C **(This section comprises of solution short answer type questions (SA) of 3 marks each)**		
26.	Assume 3 + 2√5 is rational = a/b (a, b co-prime, b ≠ 0). 2√5 = a/b - 3 ⇒ √5 = (a - 3b)/(2b). Since a, b are integers, (a - 3b)/(2b) is rational, implying √5 is rational. This contradicts that √5 is irrational. Hence, 3 + 2√5 is irrational.	½ ½ **1** **1**
27.	DE || BC ⇒ AD/DB = AE/EC ⇒ 2x/3x = (x+3)/(x+8) ⇒ 2/3 = (x+3)/(x+8) ⇒ 2x + 16 = 3x + 9 ⇒ x = 7. AD = 14, DB = 21 ⇒ AB = AD + DB = 35 units.	½ **1** **1** ½
28(A).	6x² - 7x - 3 = (2x - 3) (3x + 1) = 0 ⇒ α = 3/2, β = -1/3. Sum = 3/2 - 1/3 = 7/6 = -b/a. Product = (3/2)(-1/3) = -1/2 = c/a. Verified.	½ ½ **1** **1**
	OR	
28(B).	Polynomial = x² - (Sum)x + Product = x² - (-3)x + 2 = x² + 3x + 2. Zeroes: x² + 3x + 2 = (x + 1)(x + 2) = 0 ⇒ x = -1, x = -2.	**1** **1** **1**
29.	Let ∠PTQ = θ. In isosceles ΔTPQ (TP=TQ), ∠TPQ = (180° - θ)/2 = 90° - θ/2. Since OP ⊥ TP, ∠OPT = 90°. ∠OPQ = 90° - (90° - θ/2) = θ/2 ⇒ ∠PTQ = 2 ∠OPQ.	½ **1** **1** ½
30(A).	tan(A+B) = √3 ⇒ A+B = 60°. tan(A-B) = 1/√3 ⇒ A-B = 30°. Adding: 2A = 90° ⇒ A = 45°. B = 60° - 45° = 15°.	**1** **1** ½ + ½
	OR	
30(B).	(5 cos² 60° + 4 sec² 30° - tan² 45°) / (sin² 30° + cos² 30°) = [5(1/2)² + 4(2/√3)² - 1²] / 1 = 5/4 + 16/3 - 1 = (15 + 64 - 12)/12 = 67/12.	**1** **1** **1**
31.	Correct figure, Let O be center, chord AB touch inner circle at P. OP = 5 m (inner radius), OA = 13 m (outer radius). OP ⊥ AB ⇒ AP = √(13² - 5²) = 12 m. AB = 2 AP = 24 m.	**1** **1 + 1**
Section –D **(This section comprises of solution of long answer type questions (LA) of 5 marks each)**		
32(A).	Let stream speed = x km/h.	

	Upstream = 18 - x, Downstream = 18 + x. $24/(18-x) - 24/(18+x) = 1$ $\Rightarrow 24[2x/(324-x^2)] = 1$ $\Rightarrow x^2 + 48x - 324 = 0$ $\Rightarrow (x+54)(x-6) = 0$ $\Rightarrow x = 6$ km/h.	½ **1** **1** **1** **1** ½
	OR	
32(B).	$4x - 4y = 24 \Rightarrow x = y + 6$. $x^2 + y^2 = 468 \Rightarrow (y+6)^2 + y^2 = 468$ $\Rightarrow 2y^2 + 12y - 432 = 0$ $\Rightarrow y^2 + 6y - 216 = 0$ $\Rightarrow (y+18)(y-12) = 0$ $\Rightarrow y = 12$ m, $x = 18$ m	½ **1** **1** **1** ½ ½ + ½
33.	Proof of BPT Theorem. In trapezium ABCD with AB || DC, draw EF || AB through O. In ΔADC: AO/CO = AE/ED. In ΔABD: BO/DO = AE/ED. Hence AO/CO = BO/DO ⇒ AO/BO = CO/DO.	**3.15 Correct proof** ½ **1**
34.	Correct figure Height AB = 75 m. In ΔABD: $\tan 60° = 75/BD$ $\Rightarrow BD = 25\sqrt{3}$ m. In ΔABC: $\tan 30° = 75/BC$ $\Rightarrow BC = 75\sqrt{3}$ m. $CD = BC - BD = 50\sqrt{3}$ m $= 50 \times 1.732 = 86.6$ m.	**1** ½ **1** ½ **1** **1**
35(A).	Volume of toy = Cone + Hemisphere = $(1/3)\pi r^2 h + (2/3)\pi r^3$ $= (1/3)(3.14)(2)^2(2+4) = 25.12$ cm³. Vol of circumscribing cylinder = $\pi R^2 H$ $= 3.14 \times 2^2 \times 4 = 50.24$ cm³ Difference = 50.24 - 25.12 = 25.12 cm³.	**1** **1½** ½ **1** **1**
	OR	
35(B).	Total Area = CSA of Cylinder + CSA of Cone = $2\pi r h + \pi r l = \pi r (2h + l)$ $= (22/7) \times 2 \times (2(2.1) + 2.8)$ $= (44/7) \times 7 = 44$ m². Total Cost = 44 × ₹500 = ₹22,000.	**1** **1** **1½** **1½**
Section –E **(This section comprises solution of 3 case- study/passage-based questions of 4 marks)**		
36.	(i) $a = 20$, $d = 6$. $a_6 = a + 5d = 20 + 5(6) = 50$ units 50 solar panel units were installed in the 6th month. (ii) $a_n = 20 + (n-1)6 = 80 \Rightarrow 6(n-1) = 60 \Rightarrow n - 1 = 10 \Rightarrow n = 11$th month. The enterprise will install 80 solar panel units in the 11th month. (iii a) $S_{12} = (12/2)[2(20) + (11)(6)] = 6[40 + 66] = 6 \times 106 = 636$ units 636 cumulative solar panel units were installed in the first 12 months. OR (iii b) $a_{10} = 20 + 9(6) = 74$ units. Revenue = 74 × ₹15,000 = ₹11,10,000.	½ + ½ ½ + ½ **1 + 1** **1 + 1**
37.	(i) Distance AC = $\sqrt{((8-2)^2 + (3-3)^2)} = \sqrt{(6^2 + 0)} = 6$ meters. (ii) Midpoint = ((2+8)/2, (3+3)/2) = (10/2, 6/2) = (5, 3). (iii a) Midpoint of BD = ((6+4)/2, (7-1)/2) = (5, 3). Since midpoints of AC and BD coincide, diagonals bisect each other ⇒ ABCD is a parallelogram. **OR** (iii b) BD = $\sqrt{[(4 - 6)^2 + (-1 - 7)^2]} = \sqrt{[(-2)^2 + (-8)^2]} = \sqrt{[4 + 64]} = \sqrt{68} = 2\sqrt{17}$ meters. Horizontal diagonal AC lies on line y = 3 with base length AC = 6 meters. Vertical distance from B(6, 7) to line AC (y = 3): $h = \|7 - 3\| = 4$ meters. Area of ΔABC = (1/2) × Base × Height = (1/2) × 6 × 4 = 12 sq meters. Since diagonal AC divides parallelogram into two equal triangles, Total Area = 2 × 12 = 24 sq meters.	**1** **1** **1 + 1** **1** ½ ½ **1**

	(For Visually Impaired Candidates) **(i)** AB = $\sqrt{[(3)^2 + (4)^2]} = \sqrt{[9 + 16]} = \sqrt{25} = 5$ units (ii) Distance AB = 5 units (from part i). BC = $\sqrt{[(7 - 4)^2 + (10 - 6)^2]} = \sqrt{[9 + 16]} = 5$ units. AC = $\sqrt{[(7 - 1)^2 + (10 - 2)^2]} = \sqrt{[36 + 64]} = \sqrt{100} = 10$ units. collinearity condition: AB + BC = 5 + 5 = 10 = AC. AB + BC = AC, points A, B, and C are collinear. (iii a) Using A (1, 2) and C (7, 10): Using mid point formula x = (1 + 7) / 2 = 8 / 2 = 4 y= (2 + 10) / 2 = 12 / 2 = 6 Coordinates of relay unit R = (4, 6) **OR** (iii b) Given A (1, 2), B (4, 6), and ratio m : n = 1:2. x = (1(4) + 2(1)) / (1 + 2) = (4 + 2) / 3 = 6 / 3 = 2 y = (1(6) + 2(2)) / (1 + 2) = (6 + 4) / 3 = 10 / 3 Coordinates of point P = (2, 10/3) or (2, 3.33)	**1** ½ ½ **1½** ½ **1½** ½
38.	(i) CSA = 2 π r H = 2 × (22/7) × 3.5 × 3 = 66 m². (ii) CSA = π r L = (22/7) × 3.5 × 6.5 = 71.5 m². (iii a) Vol = π r² H + (1/3) π r² h = (22/7) (3.5)²(3) + (1/3)(22/7)(3.5)²(2) = 115.5 + 25.67 = 141.17 m³. **OR** (iii b) Total Area = 66 + 71.5 = 137.5 m². Painting Cost = 137.5 × ₹120 = ₹16,500. **(For Visually Impaired Candidates)** (i) Given r = 3 m, H = 7 m, π = 22/7. CSA = 2 × (22 / 7) × 3 × 7 = 2 × 22 × 3 = 132 square meters (ii) Slant Height (l) = $\sqrt{(r^2 + h_cone^2)} = \sqrt{(3^2 + 4^2)}$ = $\sqrt{(9 + 16)} = \sqrt{25} = 5$ m (iii a) Total Capacity = Volume of Cylindrical Portion + Volume of Conical Roof = (π × r² × h) + (1/3 × π × r² × h) = (22 / 7) × 3² × 7 + (1/3) × (22 / 7) × 3² × 4 = 198 + (264 / 7) = (1386 + 264) / 7 = 1650 / 7 m³ ≈ 235.71 m³ **OR** (iii b) Total Outer Surface Area = CSA of Cylinder + CSA of Cone = 2 × π × r × h + π × r × l = 2 × (22 / 7) × 3 × 7 + (22 / 7) × 3 × 5 = 132 + (330 / 7) = (924 + 330) / 7 = 1254 / 7 m² ≈ 179.14 m²	**1** **1** **1** **1** **1** **1** **1** ½ ½ **1** **1** **1** **1**