KENDRIYA VIDYALAYA ERNAKULAM REGION
PRE-BOARD PRACTICE TEST II (2026-27)

CLASS X - MATHEMATICS (BASIC - CODE 241)
DETAILED MARKING SCHEME & SOLUTION KEY

Time Allowed: 3 Hours | Maximum Marks: 80

SECTION A: MULTIPLE CHOICE QUESTIONS (1 Mark Each)

Q. No.	Correct Option	Working / Explanation	Marks
Q1	(b) 4	HCF(96, 404): 96 = 2^5 * 3, 404 = 2^2 * 101 => HCF = 2^2 = 4	1
Q2	(b) -10	f(2) = 2^2 + 3(2) + k = 0 => 4 + 6 + k = 0 => k = -10	1
Q3	(a) ± 0.2	x^2 - 0.04 = 0 => x^2 = 0.04 => x = ± 0.2	1
Q4	(b) 22	a = -3, d = 2.5. a_11 = -3 + 10(2.5) = 22	1
Q5	(c) 10 units	Distance from origin = sqrt((-6)^2 + 8^2) = sqrt(100) = 10	1
Q6	(a) (-4, 2)	Midpoint = ((-2 - 6)/2, (8 - 4)/2) = (-4, 2)	1
Q7	(a) ± 4	(4-1)^2 + p^2 = 25 => 9 + p^2 = 25 => p = ± 4	1
Q8	(a) 6 cm	By BPT, AD/DB = AE/EC => 3/5 = AE/10 => AE = 6 cm	1
Q9	(b) 16 cm	■ABC ~ ■DEF => AB/DE = BC/EF => 1/2 = 8/EF => EF = 16 cm	1
Q10	(a) ■PQR ~ ■CAB	AB/QR = BC/RP = CA/PQ => Vertices map: P->C, Q->A, R->B	1
Q11	(b) ac/(b+c)	■CDE ~ ■CBA => DE/AB = EC/BC => x/a = c/(b+c) => x = ac/(b+c)	1
Q12	(a) 8 cm	Tangent length = sqrt(10^2 - 6^2) = sqrt(64) = 8 cm	1
Q13	(a) 50°	∠AOB = 180° - 80° = 100°. ∠POA = 100° / 2 = 50°	1
Q14	(b) 100°	∠OPQ = 90° - 50° = 40°. In ■OPQ, ∠POQ = 180° - 80° = 100°	1
Q15	(a) 7 cm	Radius r = sqrt(25^2 - 24^2) = sqrt(49) = 7 cm	1
Q16	(a) 25 cm	Arc = (90/360)*2*(22/7)*7 = 11. Perimeter = 11 + 2(7) = 25 cm	1
Q17	(a) 1 : 4	V_new/V_orig = pi*(r/2)^2*h / (pi*r^2*h) = 1/4	1
Q18	(a) 2r	(4/3)pi r^3 = (1/3)pi R^2 r => R^2 = 4r^2 => R = 2r	1
Q19	(a) Both A & R true	(0, 4) lies on y-axis, x-coord is 0. R correctly explains A.	1
Q20	(d) A false, R true	sin θ = 4/3 > 1 is impossible. Assertion is false; Reason is true.	1

SECTION B: SHORT ANSWER QUESTIONS - I (2 Marks Each)

Question 21: Prove that 2 - 5√3 is irrational, given that √3 is irrational.

Assume 2 - 5√3 is rational = a/b (a, b co-prime integers, b ≠ 0). **[0.5 Mark]**
Rearranging: 5√3 = 2 - a/b = (2b - a)/b => √3 = (2b - a) / (5b). **[0.5 Mark]**
Since a, b are integers, RHS is rational, implying √3 is rational. **[0.5 Mark]**
Contradicts irrationality of √3. Hence 2 - 5√3 is irrational. **[0.5 Mark]**

Question 22: Solve 2x + 3y = 11 and 2x - 4y = -24.

Equations: 2x + 3y = 11 --(1) and 2x - 4y = -24 --(2).
Subtracting (2) from (1): 7y = 35 => y = 5. **[1.0 Mark]**
Substituting in (1): 2x + 15 = 11 => 2x = -4 => x = -2. (x = -2, y = 5) **[1.0 Mark]**

Question 22 (OR): Find k for which x + 2y = 3 and 5x + ky + 7 = 0 has no solution.

Condition for no solution: a1/a2 = b1/b2 ≠ c1/c2 => 1/5 = 2/k ≠ -3/7. **[1.0 Mark]**
From 1/5 = 2/k => k = 10. **[1.0 Mark]**

Question 23: Evaluate (sin 30° + tan 45° - cosec 60°) / (sec 30° + cos 60° + cot 45°).

Numerator = 1/2 + 1 - 2/√3 = (3√3 - 4) / (2√3). Denominator = (4 + 3√3) / (2√3). **[1.0 Mark]**
Expression = (3√3 - 4) / (3√3 + 4) = (43 - 24√3) / 11. **[1.0 Mark]**

Question 24: Wheelchair ramp scale 1:20. Model: 3cm, 4cm, 5cm.

Actual support sides = 3×20 = 60 cm, 4×20 = 80 cm, 5×20 = 100 cm. **[1.0 Mark]**
Second support shortest side = 90 cm. Longest side = 100 × (90/60) = 150 cm. **[1.0 Mark]**

Question 25: Area of sector r = 6 cm, θ = 60°.

Area = (60° / 360°) × (22 / 7) × 6² = (1/6) × (22/7) × 36 = 132/7 cm² ≈ 18.86 cm². **[2.0 Marks]**

SECTION C: SHORT ANSWER QUESTIONS - II (3 Marks Each)

Question 26: 96 notebooks and 120 pens to distribute equally.

Students = HCF(96, 120) = HCF(2^5 × 3, 2^3 × 3 × 5) = 2^3 × 3 = 24 students. **[1.5 Marks]**
Notebooks per student = 96 / 24 = 4; Pens per student = 120 / 24 = 5. **[1.5 Marks]**

Question 27: Zeroes of p(x) = 3x² - x - 4 and relationship verification.

3x² - 4x + 3x - 4 = (3x - 4)(x + 1) = 0 => Zeroes α = 4/3, β = -1. **[1.0 Mark]**
Sum = 4/3 - 1 = 1/3 = -b/a (Verified). Product = (4/3)(-1) = -4/3 = c/a (Verified). **[2.0 Marks]**

Question 28: Sum of two numbers is 35 and difference is 13.

Equations: x + y = 35, x - y = 13 => 2x = 48 => x = 24, y = 11. **[3.0 Marks]**

Question 28 (OR): Solve graphically x - y + 1 = 0 and 3x + 2y - 12 = 0.

Table x - y = -1: (0, 1), (1, 2). Table 3x + 2y = 12: (0, 6), (4, 0). **[1.0 Mark]**
Intersection point = (2, 3). Triangle vertices on x-axis: (-1, 0), (4, 0), (2, 3). **[2.0 Marks]**

Question 29: Trigonometric Identity tan θ / (1 - cot θ) + cot θ / (1 - tan θ).

Convert to sin θ, cos θ => (sin³ θ - cos³ θ) / [sin θ cos θ (sin θ - cos θ)] **[1.5 Marks]**
Using a³ - b³ identity => (1 + sin θ cos θ) / (sin θ cos θ) = 1 + sec θ cosec θ. **[1.5 Marks]**

Question 30: Solid toy: cone on hemisphere, r = 1 cm, h = 1 cm.

Volume = V_cone + V_hemisphere = (1/3)π r² h + (2/3)π r³ = (1/3 + 2/3)π = π cm³. **[3.0 Marks]**

Question 31: Prove lengths of tangents from external point are equal.

In ■OAP and ■OBP: ∠OAP = ∠OBP = 90°, OA = OB = r, OP = OP. **[1.5 Marks]**
By RHS Congruence, ■OAP ≅ ■OBP => PA = PB (CPCT). **[1.5 Marks]**

SECTION D: LONG ANSWER QUESTIONS (5 Marks Each)

Question 32: Motor boat speed = 18 km/h, distance = 24 km, upstream +1 hr.

24/(18-x) - 24/(18+x) = 1 => 48x = 324 - x² => x² + 48x - 324 = 0 **[2.5 Marks]**
(x + 54)(x - 6) = 0 => x = 6 km/h (Speed of stream). **[2.5 Marks]**

Question 33: State and Prove Basic Proportionality Theorem (Thales Theorem).

Statement: Parallel line to one side divides other two sides in same ratio. **[1.0 Mark]**
Given, To Prove, Construction, and Diagram. **[1.0 Mark]**
Proof using Area(■ADE)/Area(■BDE) and Area(■ADE)/Area(■DEC) => AD/DB = AE/EC. **[3.0 Marks]**

Question 34: Prove (sin θ - cos θ + 1) / (sin θ + cos θ - 1) = 1 / (sec θ - tan θ).

Divide by cos θ => (tan θ + sec θ - 1) / (tan θ - sec θ + 1). **[1.5 Marks]**
Substitute 1 = sec² θ - tan² θ => Factorize and simplify to sec θ + tan θ = 1 / (sec θ - tan θ). **[3.5 Marks]**

Question 35: Circus tent: Cylinder (h = 2.1m, r = 2m) + Cone (l = 2.8m).

Canvas Area = 2π rh + π rl = π r(2h + l) = (22/7) × 2 × (4.2 + 2.8) = 44 m². **[2.5 Marks]**
Total Cost = 44 m² × ■500 = ■22,000. **[2.5 Marks]**

SECTION E: CASE-BASED INTEGRATED QUESTIONS (4 Marks Each)

Question 36: Case Study 1 - Athletic Academy 400m Timing AP

(i) AP: 70, 68, 66, ... First term a = 70, Common difference d = -2. **[1.0 Mark]**
(ii) Target 50s: 50 = 70 + (n-1)(-2) => n = 11 days. **[1.0 Mark]**
(iii) Total time first 10 days: $S_{10} = (10/2)[2(70) + 9(-2)] = 5(122) = 610$ seconds. **[2.0 Marks]**
(iii-OR) Day for 56s: 70 + (n-1)(-2) = 56 => n = 8th day. **[2.0 Marks]**

Question 37: Case Study 2 - School Sports Day Coordinates & Distance

(i) Niharika P(2, 25), Preet Q(8, 20). **[1.0 Mark]**
(ii) Distance PQ = $\text{sqrt}[(8-2)^2 + (20-25)^2] = \sqrt{61}$ m. **[1.0 Mark]**
(iii) Rashmi midpoint = $((2+8)/2, (25+20)/2) = (5, 22.5)$ => 5th line at 22.5 m. **[2.0 Marks]**
(iii-OR) Joy section formula 1:3 ratio = $((8+6)/4, (20+75)/4) = (3.5, 23.75)$. **[2.0 Marks]**

Question 38: Case Study 3 - Tower & Flagstaff Trigonometry

(i) Labelled diagram with tower (h), flagstaff (H), point A (20m away). **[1.0 Mark]**
(ii) Tower height: $\tan 30° = h / 20 \Rightarrow h = 20 / \sqrt{3} \approx 11.55$ m. **[1.0 Mark]**
(iii) Flagstaff height: $\tan 60° = (h + H) / 20 \Rightarrow h + H = 20\sqrt{3} \Rightarrow H = 40 / \sqrt{3} \approx 23.09$ m. **[2.0 Marks]**
(iii-OR) Distance top of flagstaff to point A: $\cos 60° = 20 / d \Rightarrow d = 40$ m. **[2.0 Marks]**