MIND CURVE — Half Yearly Maths Practice Paper Series 2026-27

CLASS X — TERM 1 — PRACTICE PAPER 01

ANSWER KEY WITH FULL STEP-WISE SOLUTIONS (MM: 80, Time: 3 Hrs)

Section A — MCQs (1 mark each)

Q.No	Answer	Reasoning / Working
1	(c) 2 am	LCM(10,15,24) = 120 min = 2 h. Bells ring together again 2 hours after 12 am, i.e. at 2 am.
2	(d)	Cubic with positive leading coefficient, touches x-axis at $x=1$ (double root) and crosses at $x=-2$ — see graph below.
3	(a) No linear term, constant term negative	Sum of zeroes = $-a$ = root+(-root) = 0 ⇒ $a=0$. Product = $b = -(\text{root})^2 \leq 0$ ⇒ b negative.
4	(b) 2	$a_1/a_2=b_1/b_2\neq c_1/c_2 \Rightarrow 3/(2k-1)=1/(k-1) \Rightarrow 3(k-1)=2k-1 \Rightarrow k=2$. Verified against c-ratio.
5	(d) No solution	$x=0$ and $x=-7$ are distinct parallel vertical lines — never intersect.
6	(c) ad = bc	Discriminant=0 ⇒ $(ac+bd)^2=(a^2+b^2)(c^2+d^2) \Rightarrow (ad-bc)^2=0 \Rightarrow ad=bc$.
7	(b) $x^2 - (p+1)x + p = 0$	Factors of prime p: 1 and p. Sum=$1+p$, product=p.
8	(d) $n = 45$	$a_n=134-3n<0 \Rightarrow n>44.67 \Rightarrow n=45$.
9	(b) $\sqrt{(1+\cot^2\theta)}/\cot\theta$	$\sec^2\theta=1+1/\cot^2\theta=(\cot^2\theta+1)/\cot^2\theta \Rightarrow \sec\theta=\sqrt{(1+\cot^2\theta)}/\cot\theta$.
10	(d) 161/289	$15\cot A=8$ ⇒ sides 8,15,17. $\sin A \cos C-\cos A \sin C=\sin(A-C)=(15/17)^2-(8/17)^2=161/289$.
11	(d) 0	Solving simultaneously gives $x=\cos\theta$, $y=\sin\theta \Rightarrow x^2+y^2-1=0$.
12	(d) r^2	$x^2+y^2+z^2=r^2\sin^2A(\cos^2C+\sin^2C)+r^2\cos^2A=r^2$.
13	(c) 160 cm	Distance in 4s=4.8m. $3.6/(4.8+s)=0.9/s \Rightarrow s=1.6\text{m}=160\text{cm}$.
14	(c) (2,-5)	Midpoint PR = Midpoint QS ⇒ S=(2,-5).
15	(c) 60 cm	AP/PD=BQ/QC=7/3 ⇒ AP=42 ⇒ AD=42+18=60cm.
16	(a) $4x + 3y = 24$	Height=8cm. Half-width at height y: $x=6-3y/4 \Rightarrow 4x+3y=24$ — see figure below.
17	(a) $a + b - c$	Inradius $r=(a+b-c)/2$ ⇒ diameter=$a+b-c$ — see figure below.
18	(b) 10 cm	Tangents from A equal: AC=AB=5. Perimeter of ΔAPQ = AB+AC = 10cm — see figure below.
19	(b) Both true, R not correct explanation	HCF(3x,5x)=x, so HCF=5 only when x=5 (A true). LCM×HCF=product of the two numbers is a true general fact but doesn't explain A.
20	d	$(y+4)^2=36 \Rightarrow y=2$ or -10, so A is false. Ratio 2:7 on given points actually gives (0,-6), so R is true

Q

Section B — 2 marks each

Q21 *[2 marks]* **Speeds of two cars, 100 km apart.**

Solution

Step 1: Let the speeds of the two cars be x km/h and y km/h ($x > y$).

Step 2: Same direction, meet in 5 h: relative speed × time = distance ⇒ $(x-y)\times 5 = 100 \Rightarrow x-y = 20$.

Step 3: Towards each other, meet in 1 h: $(x+y)\times 1 = 100 \Rightarrow x+y = 100$.

Step 4: Adding the two equations: $2x = 120 \Rightarrow x = 60$. Then $y = 40$.

Answer: **Speeds are 60 km/h and 40 km/h.**

Q22 *[2 marks]* **Prove that √7 is irrational.**

Solution

Step 1: Assume, for contradiction, that $\sqrt{7}$ is rational: $\sqrt{7} = p/q$, where p and q are coprime integers, $q \neq 0$.

Step 2: Squaring both sides: $7q^2 = p^2$, so 7 divides p^2 ⇒ 7 divides p. Let $p = 7m$.

Step 3: Substitute: $49m^2 = 7q^2 \Rightarrow q^2 = 7m^2$ ⇒ 7 divides q^2 ⇒ 7 divides q.

Step 4: So 7 divides both p and q — contradicting that p, q are coprime.

Answer: **Hence √7 is irrational. (Proved by contradiction.)**

Q23 *[2 marks]* **Angles of a triangle in AP; smallest is half of greatest.**

Solution

Step 1: Let the angles be $(a-d)$, a, $(a+d)$, which are in AP.

Step 2: Sum of angles = 180° ⇒ $3a = 180° \Rightarrow a = 60°$.

Step 3: Given: smallest = half of greatest ⇒ $(a-d) = (a+d)/2 \Rightarrow 2a-2d = a+d \Rightarrow a = 3d \Rightarrow d = 20°$.

Step 4: So the angles are $a-d = 40°$, $a = 60°$, $a+d = 80°$.

Answer: **The angles are 40°, 60°, and 80°.**

Q24 *[2 marks]* **Ratio in which the y-axis divides A(1,-5) and B(-4,5); find the point.**

Solution

Step 1: Let the y-axis divide AB in the ratio k:1 (from A to B).

Step 2: x-coordinate of division point = 0: $[k(-4)+1(1)]/(k+1) = 0 \Rightarrow -4k+1 = 0 \Rightarrow k = 1/4$, i.e. ratio 1:4.

Step 3: y-coordinate: $[k(5)+1(-5)]/(k+1)$, with $k = 1/4$, gives $(5/4-5)/(5/4) = -3$.

Answer: **Ratio = 1 : 4; point of division = (0, -3).**

OR — Ravi & Raju's points (-1,4) and (-3,-2), divided into three equal parts

Step 1: First point of trisection (ratio 1:2 from (-1,4)): $x = [1(-3)+2(-1)]/3 = -5/3$; $y = [1(-2)+2(4)]/3 = 2$.

Step 2: Second point of trisection (ratio 2:1 from (-1,4)): $x = [2(-3)+1(-1)]/3 = -7/3$; $y = [2(-2)+1(4)]/3 = 0$.

Answer: **The two points are (-5/3, 2) and (-7/3, 0).**

Q25 *[2 marks]* **If cosθ + sinθ = √2 cosθ, show cosθ - sinθ = √2 sinθ.**

Solution

Step 1: From the given relation: $\sin\theta = \sqrt{2}\cos\theta - \cos\theta = (\sqrt{2}-1)\cos\theta$.

Step 2: Rearranging: $\cos\theta = \sin\theta/(\sqrt{2}-1) = \sin\theta(\sqrt{2}+1)$ after rationalising.

Step 3: So $\cos\theta - \sin\theta = \sin\theta(\sqrt{2}+1) - \sin\theta = \sin\theta[(\sqrt{2}+1)-1] = \sqrt{2}\sin\theta$.

Answer: **Hence cosθ - sinθ = √2 sinθ, as required.**

OR — cos(B+C-A) = √3/2, sin(C+A-B) = √3/2, with A+B+C=180°

Step 1: **A+B+C = 180°(Angle sum property of triangles)……………………(i)**

Step 2: $B+C-A = 30°$ ⇒ $C = 30° - B + A$ put in (i) $A = 75°$

Step 3: $C+A-B = 60°$ ⇒ $A = 60° - C + B$ put in (i) $B = 60°$,

Step 4: Testing both cases against $A+B+C=180°$ and both given equations, the consistent solution is $B = 60°$, $C = 45°$.

Answer: **$A = 75°$, $B = 60°$, $C = 45°$.**

Section C — 3 marks each

Q26 *[3 marks]* Least number leaving remainder 8 (÷28) and 12 (÷32).

Solution

Step 1: Notice $28-8 = 20$ and $32-12 = 20$ — the same deficiency in both cases.

Step 2: So $(N+20)$ must be exactly divisible by both 28 and 32, i.e. by LCM(28,32).

Step 3: $28 = 2^2 \times 7$, $32 = 2^5$ ⇒ LCM $= 2^5 \times 7 = 224$.

Step 4: $N + 20 = 224$ ⇒ $N = 204$. Check: $204 = 7(28)+8$ ✓ and $204 = 6(32)+12$ ✓.

Answer: **$N = 204$.**

Q27 *[3 marks]* Zeroes of $p(y) = y^2 - (7/5)y + 1/5$; verify the relations.

Solution

Step 1: Multiply through by 5: $5y^2 - 7y + 1 = 0$.

Step 2: Discriminant $= 49 - 20 = 29$ (not a perfect square, so the zeroes are irrational).

Step 3: $y = (7 \pm \sqrt{29})/10$ ⇒ $\alpha = (7+\sqrt{29})/10$, $\beta = (7-\sqrt{29})/10$.

Step 4: Verify sum: $\alpha+\beta = 14/10 = 7/5 = -$(coefficient of y)/(coefficient of y^2) ✓

Step 5: Verify product: $\alpha\beta = (49-29)/100 = 1/5 =$ constant/(coefficient of y^2) ✓

Answer: **$\alpha = (7+\sqrt{29})/10$, $\beta = (7-\sqrt{29})/10$; both standard relations verified.**

Q28 *[3 marks]* Students standing in rows — find the total number of students.

Solution

Step 1: Let there be r rows of x students each, so total students = rx.

Step 2: 3 extra per row, 1 row less: $(x+3)(r-1) = rx$ ⇒ $3r - x - 3 = 0$ ⇒ $3r - x = 3$ ...(i)

Step 3: 3 less per row, 2 more rows: $(x-3)(r+2) = rx$ ⇒ $2x - 3r - 6 = 0$ ⇒ $2x - 3r = 6$ ...(ii)

Step 4: From (i): $x = 3r-3$. Substituting into (ii): $2(3r-3) - 3r = 6$ ⇒ $3r = 12$ ⇒ $r = 4$, so $x = 9$.

Answer: **Total students = $r \times x = 4 \times 9 = 36$.**

Q29 *[3 marks]* Parallelogram ABCD, AP:PB=3:2, CQ:QD=4:1, PQ meets AC at R. Prove AR=(3/7)AC.

Solution (vector method)

Step 1: Let A be the origin, with AB = b and AD = d. Then C = b+d and D = d.

Step 2: P divides AB in ratio 3:2 ⇒ $P = (3/5)b$.

Step 3: Q divides CD such that CQ:QD = 4:1 ⇒ $Q = C + (4/5)(D-C) = (1/5)b + d$.

Step 4: Let R on AC: $R = t(b+d)$. Also R lies on PQ: $R = P + s(Q-P) = (3/5 - 2s/5)b + s \cdot d$.

Step 5: Comparing coefficients of d: $s = t$. Comparing coefficients of b: $3/5 - 2t/5 = t$ ⇒ $3/5 = 7t/5$ ⇒ $t = 3/7$.

Answer: **$AR = t \cdot AC = (3/7)AC$, as required.**

OR — Two poles of heights a m and b m, p m apart; prove $1/c = 1/a + 1/b$

Step 1: Place pole-a at $x=0$ and pole-b at $x=p$. Line from top of pole-a to foot of pole-b: $y = a(1 - x/p)$.

Step 2: Line from top of pole-b to foot of pole-a: $y = (b/p)x$.

Step 3: Equate the two lines: $a(1-x/p) = (b/p)x \Rightarrow x = ap/(a+b)$.

Step 4: Height at the intersection: $c = (b/p)\cdot x = ab/(a+b)$.

Step 5: Taking reciprocals: $1/c = (a+b)/(ab) = 1/a + 1/b$.

Answer: **Hence $1/c = 1/a + 1/b$, as required.**

Q30 *[3 marks]* Point (x,y) equidistant from (a+b, b-a) and (a-b, b+a). Prove bx = ay.

Solution

Step 1: Equidistant condition: $[x-(a+b)]^2 + [y-(b-a)]^2 = [x-(a-b)]^2 + [y-(b+a)]^2$.

Step 2: Expand both sides fully (the x^2, y^2 terms cancel out).

Step 3: Collecting remaining terms: $-4bx + 4ab + 4ay - 4ab = 0$.

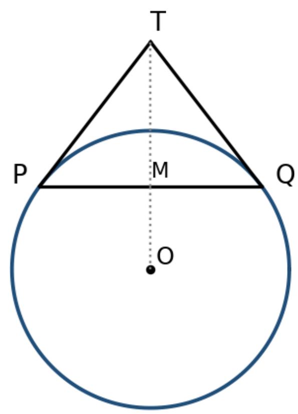
Step 4: Simplify: $-4bx + 4ay = 0 \Rightarrow ay = bx$.

Answer: **Hence bx = ay, as required.**

Q31 *[3 marks]* Chord PQ = 8 cm of a circle of radius 5 cm; tangents at P, Q meet at T. Find TP.

Solution

Chord PQ = 8 cm, radius 5 cm; tangents at P, Q meet at T



Chord PQ, midpoint M, tangents meeting at T

Step 1: $OM \perp PQ$ bisects the chord: PM = 4 cm.

Step 2: In right ΔOMP: $OM = \sqrt{(OP^2-PM^2)} = \sqrt{(25-16)} = 3$ cm.

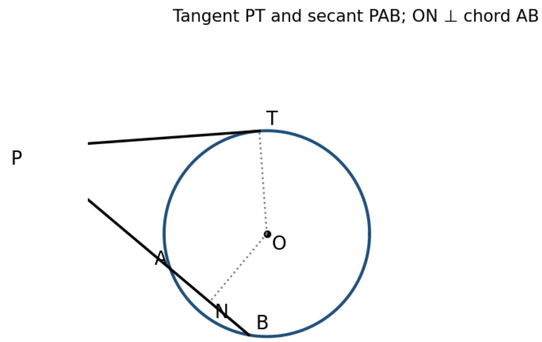
Step 3: In right ΔOPT (right angle at P), PM is the altitude to hypotenuse OT, so $PM^2 = OM \times MT$.

Step 4: $16 = 3 \times MT \Rightarrow MT = 16/3$ cm. So $OT = OM + MT = 3 + 16/3 = 25/3$ cm.

Step 5: $PT = \sqrt{(OT^2 - OP^2)} = \sqrt{(625/9 - 25)} = \sqrt{(400/9)} = 20/3$ cm.

Answer: **TP = 20/3 cm ≈ 6.67 cm.**

OR — Prove $PA \times PB = PN^2-AN^2 = OP^2-OT^2 = PT^2$ (N = midpoint of chord AB)



Tangent PT and secant PAB, with ON ⊥ AB at N

Step 1: Since ON⊥AB, N is the midpoint of AB, so AN = NB. As P, A, N, B are collinear: PA = PN-AN and PB = PN+AN.

Step 2: So $PA \times PB = (PN-AN)(PN+AN) = PN^2 - AN^2$. ...(a)

Step 3: In right ΔOPN (∠N=90°): $PN^2 = OP^2-ON^2$. In right ΔOAN (∠N=90°): $AN^2 = OA^2-ON^2$.

Step 4: Subtracting: $PN^2-AN^2 = OP^2-OA^2 = OP^2-r^2$ (since OA=r). Also OT=r, so $OP^2-r^2 = OP^2-OT^2$. ...(b)

Step 5: In right ΔOPT (tangent ⊥ radius, ∠T=90°): $OP^2-OT^2 = PT^2$. ...(c)

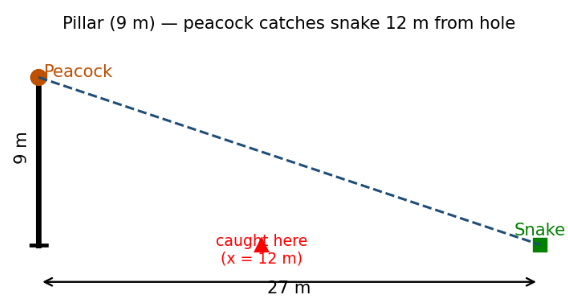
Step 6: Combining (a), (b), (c): $PA \times PB = PN^2-AN^2 = OP^2-OT^2 = PT^2$.

Answer: **Hence $PA \times PB = PT^2$, as required.**

Section D — 5 marks each

Q32 *[5 marks]* Peacock on a 9 m pillar; snake 27 m away; equal speeds — find the catch distance.

Solution



Pillar 9 m; snake starts 27 m away; caught 12 m from the hole

Step 1: Let the snake be caught at a distance x m from the hole (base of the pillar). Then the snake has travelled (27-x) m.

Step 2: The peacock flies straight from the top of the pillar to that point: distance = $\sqrt{9^2 + x^2}$.

Step 3: Since speeds are equal, the time taken is equal ⇒ distances are equal: $\sqrt{81+x^2} = 27-x$.

Step 4: Squaring both sides: $81+x^2 = 729-54x+x^2 \Rightarrow 54x = 648 \Rightarrow x = 12$.

Answer: **The snake is caught 12 m from the hole.**

Q33 *[5 marks]* Prove the Basic Proportionality Theorem; find XY given AZ=3, ZC=2, BM=3, MC=5.

Proof (Basic Proportionality / Thales' Theorem)

Step 1: In ΔABC, let DE ∥ BC meet AB at D and AC at E. Join BE and CD; draw EF⊥AB and DG⊥AC.

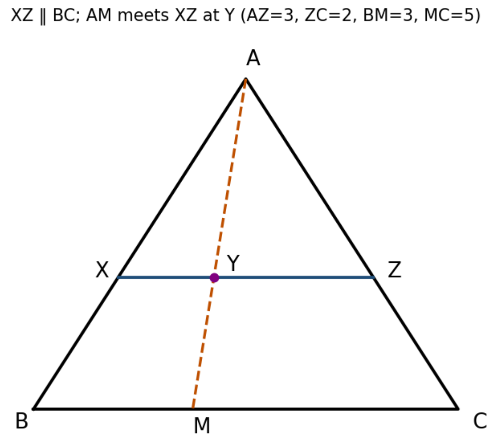
Step 2: ar(ADE) = (1/2)·AD·EF and ar(BDE) = (1/2)·DB·EF ⇒ ar(ADE)/ar(BDE) = AD/DB.

Step 3: Similarly, ar(ADE)/ar(DEC) = AE/EC.

Step 4: ΔBDE and ΔDEC lie on the same base DE and between the same parallels DE, BC ⇒ ar(BDE) = ar(DEC).

Step 5: Therefore AD/DB = AE/EC, which proves the theorem.

Numerical part — XZ ∥ BC; AM is a cevian meeting XZ at Y



AZ=3, ZC=2 (AC=5); BM=3, MC=5 (BC=8); Y = XZ ∩ AM

Step 1: Since XZ ∥ BC, triangle AXZ ~ triangle ABC, with ratio AZ/AC = 3/5.

Step 2: Along cevian AM (meeting XZ at Y), the basic proportionality theorem gives AY/AM = AZ/AC = 3/5.

Step 3: By the same similarity, corresponding segment XY relates to BM in the same ratio: XY/BM = 3/5.

Step 4: XY = (3/5) × BM = (3/5) × 3 = 9/5 cm.

Answer: **XY = 9/5 cm = 1.8 cm.**

Q34 *[5 marks]* Trigonometric identities.

(a) Given $\sin\theta + \sin^2\theta = 1$, find $\cos^{12}\theta + 3\cos^{10}\theta + 3\cos^8\theta + \cos^6\theta - 2\cos^4\theta - 2\cos^2\theta + 2$

Step 1: From $\sin\theta+\sin^2\theta=1$: $\sin\theta = 1-\sin^2\theta = \cos^2\theta$. Let $s = \sin\theta = \cos^2\theta$; also $s^2 = 1-s$.

Step 2: Using $s^2=1-s$ repeatedly: $s^3=2s-1$, $s^4=2-3s$, $s^5=5s-3$, $s^6=5-8s$.

Step 3: Substitute $\cos^{2k}\theta = s^k$ into the expression: $s^6+3s^5+3s^4+s^3-2s^2-2s+2$.

Step 4: Substituting the powers and collecting terms, all s-terms cancel and the constant terms sum to 1.

Answer: **The value of the expression is 1.**

(b) Prove $(\sin A+\operatorname{cosec}A)^2 + (\cos A+\sec A)^2 = 7 + \tan^2A + \cot^2A$

Step 1: Expand LHS: $\sin^2A+2+\operatorname{cosec}^2A+\cos^2A+2+\sec^2A = (\sin^2A+\cos^2A) + 4 + \operatorname{cosec}^2A + \sec^2A$.

Step 2: Use $\sin^2A+\cos^2A=1$, $\operatorname{cosec}^2A=1+\cot^2A$, $\sec^2A=1+\tan^2A$: LHS = $1+4+(1+\cot^2A)+(1+\tan^2A)$.

Step 3: LHS = $7 + \tan^2A + \cot^2A$ = RHS.

OR (a) — $5\sin\theta+3\cos\theta=5$; find $5\cos\theta-3\sin\theta$

Step 1: Let $k = 5\cos\theta-3\sin\theta$. Consider $(5\sin\theta+3\cos\theta)^2 + (5\cos\theta-3\sin\theta)^2$.

Step 2: Expanding, the cross terms cancel: sum = $25(\sin^2\theta+\cos^2\theta)+9(\sin^2\theta+\cos^2\theta) = 25+9 = 34$.

Step 3: So $5^2 + k^2 = 34 \Rightarrow k^2 = 9 \Rightarrow k = \pm3$.

Answer: **$5\cos\theta - 3\sin\theta = \pm3$.**

OR (b) — Prove $[(1-\tan A)/(1-\cot A)]^2 = \tan^2A$

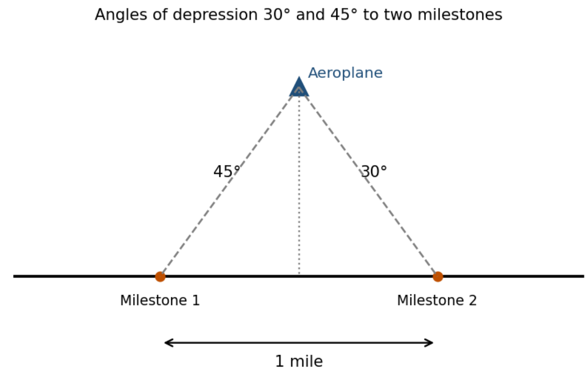
Step 1: Rewrite $1-\cot A = 1-1/\tan A = (\tan A-1)/\tan A = -(1-\tan A)/\tan A$.

Step 2: So $(1-\tan A)/(1-\cot A) = (1-\tan A) \div [-(1-\tan A)/\tan A] = -\tan A$.

Step 3: Squaring both sides: $(-\tan A)^2 = \tan^2A$, which equals the RHS.

Q35 *[5 marks]* Aeroplane over a road; angles of depression 30° and 45° to two consecutive milestones (1 mile apart).

Solution



Angles of depression 45° and 30° to milestones on opposite sides

Step 1: Let the height of the plane be h, and the horizontal distances to the two milestones be d_1 and d_2, with $d_1+d_2 = 1$ mile.

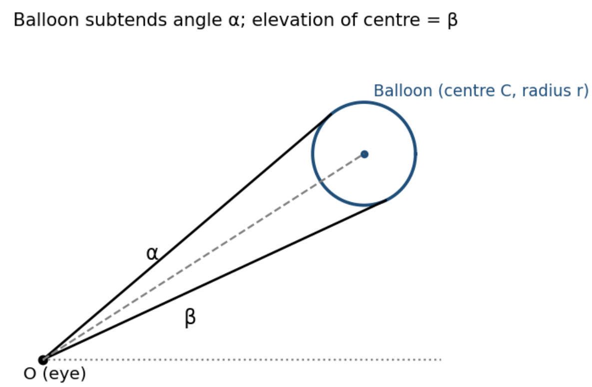
Step 2: From the 45° milestone: $\tan 45° = h/d_2 \Rightarrow d_2 = h$.

Step 3: From the 30° milestone: $\tan 30° = h/d_1 \Rightarrow d_1 = h\sqrt{3}$.

Step 4: $d_1+d_2 = 1 \Rightarrow h\sqrt{3}+h = 1 \Rightarrow h(\sqrt{3}+1) = 1 \Rightarrow h = 1/(\sqrt{3}+1) = (\sqrt{3}-1)/2$ (after rationalising).

Answer: **Height = $(\sqrt{3}-1)/2$ miles ≈ 0.366 miles.**

OR — Balloon of radius r subtends angle α at the eye; elevation of centre = β. Prove height of centre = r sinβ cosec(α/2)



Tangents from the eye make angle α; elevation of centre is β

Step 1: Let O be the observer's eye and C the centre of the balloon. The two tangents from O touch the balloon and make angle α between them, so the half-angle is α/2.

Step 2: In the right triangle formed by O, C, and a point of tangency: $\sin(\alpha/2) = r/OC \Rightarrow OC = r\cdot\operatorname{cosec}(\alpha/2)$.

Step 3: Height of the centre above eye level = $OC\cdot\sin\beta = r\cdot\sin\beta\cdot\operatorname{cosec}(\alpha/2)$.

Answer: **Hence height of centre = r sinβ cosec(α/2), as required.**

Section E — Case-Based Questions (4 marks each)

Q36 *[4 marks]* **Thief on bike (43 m/min, +2 m/min each minute); policeman starts 3 min later (70 m/min, +5 m/min each minute).**

(a) nth term for the thief's speed

Step 1: This is an AP with a=43, d=2 ⇒ $T_n = 43+(n-1)\times 2$.

Answer: $\mathbf{T_n = 2n + 41}$.

(b) Sum of n terms for the policeman

Step 1: This is an AP with a=70, d=5 ⇒ $S_n = n/2\ [2(70)+(n-1)(5)] = n/2\ (5n+135)$.

Answer: $\mathbf{S_n = 5n(n+27)/2}$.

(c) Time for the policeman to catch the thief

Step 1: If the policeman runs for n minutes, the thief (3-minute head start) has run (n+3) minutes.

Step 2: Thief's total distance in (n+3) min = $(n+3)/2\ [2(43)+(n+2)(2)] = (n+3)(n+45)$.

Step 3: Policeman's distance in n min = $5n(n+27)/2$.

Step 4: Equate: $(n+3)(n+45) = 5n(n+27)/2 \Rightarrow 2n^2+96n+270 = 5n^2+135n \Rightarrow 3n^2+39n-270 = 0 \Rightarrow n^2+13n-90 = 0$.

Step 5: Solving: $n = (-13\pm 23)/2 \Rightarrow n = 5$ (rejecting the negative root). Check: both distances = 400 m at n=5 ✓

Answer: **The policeman catches the thief 5 minutes after he starts running (8 minutes after the theft).**

OR (d) — If the policeman runs at a uniform 70 m/min instead

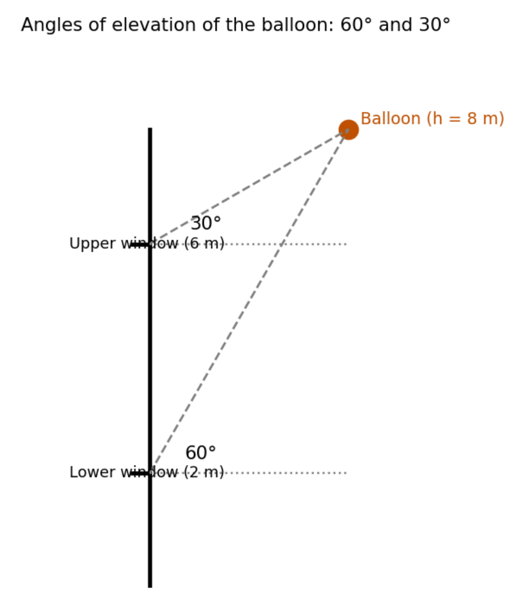
Step 1: Policeman's distance in n min = 70n. Thief's distance in (n+3) min = (n+3)(n+45) as before.

Step 2: Equate: $70n = n^2+48n+135 \Rightarrow n^2-22n+135 = 0$. Discriminant = 484-540 = -56 < 0 — no real solution.

Answer: **With a uniform speed of 70 m/min, the policeman never catches the thief, since the thief keeps accelerating.**

Q37 *[4 marks]* **Lower window at 2 m, upper window 4 m above it (6 m); angles of elevation to a balloon: 60° (lower), 30° (upper).**

Setting up



Balloon height h; angles of elevation 60° (lower window) and 30° (upper window)

Step 1: Let the balloon's height be h and the horizontal distance from the window column be x.

Step 2: From the lower window (2 m): $\tan 60° = (h-2)/x \Rightarrow x = (h-2)/\sqrt{3}$.

Step 3: From the upper window (6 m): $\tan 30° = (h-6)/x \Rightarrow x = (h-6)\sqrt{3}$.

Step 4: Equating: $(h-2)/\sqrt{3} = (h-6)\sqrt{3} \Rightarrow h-2 = 3(h-6) \Rightarrow 2h = 16 \Rightarrow h = 8$. Then $x = 2\sqrt{3}$.

(a) Distance from the lower window

Step 1: $\sin 60° = (h-2)/\text{distance} \Rightarrow \text{distance} = 6/(\sqrt{3}/2) = 4\sqrt{3}$ m.

Answer: **$4\sqrt{3}$ m.**

(b) Distance from the upper window

Step 1: $\sin 30° = (h-6)/\text{distance} \Rightarrow \text{distance} = 2/(1/2) = 4$ m.

Answer: **4 m.**

(c) Height of the balloon above the ground

Step 1: From the setup above, $h = 8$.

Answer: **8 m.**

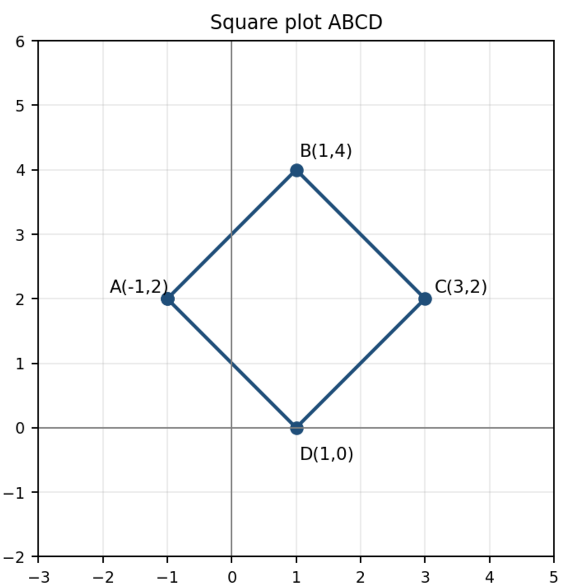
OR (d) Height of the balloon above the lower window

Step 1: $h - 2 = 8 - 2 = 6$.

Answer: **6 m.**

Q38 *[4 marks]* **Square plot ABCD; A(-1,2), C(3,2) are opposite vertices; find B and D.**

Setting up



Square plot with A(-1,2), B(1,4), C(3,2), D(1,0)

Step 1: Midpoint of AC = $((-1+3)/2, (2+2)/2) = (1, 2)$. Length AC = distance between A, C = 4 (horizontal segment).

Step 2: Diagonal BD is equal in length to AC and perpendicular to it, centred at (1,2). Since AC is horizontal, BD is vertical with half-length 2.

Step 3: So B = (1, 4) (top vertex) and D = (1, 0) (bottom vertex), consistent with the order A-B-C-D shown in the figure.

(a) Distance between B and D

Step 1: B(1,4), D(1,0) $\Rightarrow$ distance = $\sqrt{0^2+4^2} = 4$.

Answer: **4 units.**

(b) Distance between C and D

Step 1: C(3,2), D(1,0) $\Rightarrow$ distance = $\sqrt{2^2+2^2} = \sqrt{8} = 2\sqrt{2}$.

Answer: **$2\sqrt{2}$ units.**

(c) Coordinates of B

Answer: **B = (1, 4).**

OR (d) Coordinates of D

Answer: **D = (1, 0).**