Mind Curve Mid-Term Test Series 2025-26

Class X | Test 05 – Answer Key

Chapters 1–8: Real Numbers, Polynomials, Pair of Linear Equations, Quadratic Equations, Arithmetic Progression, Similar Triangles, Coordinate Geometry, Introduction to Trigonometry & Applications of Trigonometry

Q.No	Step-by-Step Solution	Marks per Step
	SECTION – A (Q1–20, 1 mark each)	
1	**Q1** $2^{x-y} = 8 = 2^3 \Rightarrow x - y = 3$ $2^{x+y} = 64 = 2^6 \Rightarrow x + y = 6$ Adding the two equations: $2x = 9 \Rightarrow x = \frac{9}{2}$ Subtracting: $2y = 3 \Rightarrow y = \frac{3}{2}$ **Answer: (a)** $\frac{9}{2}, \frac{3}{2}$	*1 mark for the correct option.*
2	**Q2** Two consecutive natural numbers differ by 1, and any common factor of p and $p+1$ must divide their difference, which is 1 So the only common factor is 1 **Answer: (c) 1**	*1 mark for the correct option.*
3	**Q3** Writing both lines as $3x + 2ky - 2 = 0$ and $2x + 5y + 1 = 0$ For parallel lines: $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ $\frac{3}{2} = \frac{2k}{5} \Rightarrow 2k = \frac{15}{2} \Rightarrow k = \frac{15}{4}$ **Answer: (c)** $\frac{15}{4}$	*1 mark for the correct option.*
4	**Q4** $(\sec\theta + \tan\theta)(\sec\theta - \tan\theta) = \sec^2\theta - \tan^2\theta = 1$ Since $\sec\theta + \tan\theta = x$, this gives $\sec\theta - \tan\theta = \frac{1}{x}$ Subtracting from $\sec\theta + \tan\theta = x$: $2\tan\theta = x - \frac{1}{x} = \frac{x^2-1}{x}$ $\tan\theta = \frac{x^2-1}{2x}$ **Answer: (c)** $\frac{x^2-1}{2x}$	*1 mark for the correct option.*
5	**Q5** Check option (d): $\sqrt{3} \times \sqrt{12} = \sqrt{36} = 6$, which is rational Both $\sqrt{3}$ and $\sqrt{12}$ are individually irrational, so this is the required pair (For comparison: $\sqrt{3} \times \sqrt{6} = \sqrt{18} = 3\sqrt{2}$, still irrational, and $\sqrt{25}, \sqrt{4}$ are themselves rational (5 and 2), so option (b) is not a pair of irrationals at all) **Answer: (d)** $\sqrt{3}, \sqrt{12}$	*1 mark for the correct option.*

Q.No	Step-by-Step Solution	Marks per Step
6	**Q6** $2x+3y-8=0$ and $16x+24y-64=0$ $\frac{a_1}{a_2}=\frac{2}{16}=\frac{1}{8}, \frac{b_1}{b_2}=\frac{3}{24}=\frac{1}{8}, \frac{c_1}{c_2}=\frac{8}{64}=\frac{1}{8}$ All three ratios are equal, so the lines are coincident, i.e. overlapping **Answer: (c) overlapping**	*1 mark for the correct option.*
7	**Q7** In $\triangle DPC$ and $\triangle LPB$: $\angle DPC=\angle LPB$ (vertically opposite angles) Since $DC \parallel AB$ (opposite sides of the parallelogram), $\angle PDC=\angle PLB$ and $\angle PCD=\angle PBL$ (alternate angles) So $\triangle DPC \sim \triangle LPB$ (AA similarity), giving $\frac{DP}{PL}=\frac{PC}{PB}=\frac{DC}{BL}$ **Answer: (b)** $\frac{DP}{PL}=\frac{DC}{BL}$	*1 mark for the correct option.*
8	**Q8** It is a standard identity that $(1-\tan\theta+\sec\theta)(1-\cot\theta+\operatorname{cosec}\theta)=2$ for all valid θ Verifying at $\theta=45°$: $\tan\theta=1,\ \sec\theta=\sqrt{2},\ \cot\theta=1,\ \operatorname{cosec}\theta=\sqrt{2}$ $(1-1+\sqrt{2})(1-1+\sqrt{2})=\sqrt{2}\times\sqrt{2}=2$ **Answer: (d) 2**	*1 mark for the correct option.*
9	**Q9** $\sin x+\operatorname{cosec} x=\sin x+\frac{1}{\sin x}\geq 2$ by AM-GM, with equality only when $\sin x=1$ Since $\sin x+\operatorname{cosec} x=2$ exactly, we must have $\sin x=1$ and so $\operatorname{cosec} x=1$ $\sin^{19}x+\operatorname{cosec}^{20}x=1^{19}+1^{20}=1+1=2$ **Answer: (c) 2**	*1 mark for the correct option.*
10	**Q10** D and E are midpoints of AB and AC, so by the Midsegment Theorem $DE \parallel BC$ and $DE=\frac{1}{2}BC$ $DE=\frac{1}{2}\times 6=3$ cm **Answer: (b) 3**	*1 mark for the correct option.*
11	**Q11** The least number divisible by all of 1 to 10 is $\mathrm{LCM}(1,2,\ldots,10)$ $\mathrm{LCM}=2^3\times 3^2\times 5\times 7=8\times 9\times 5\times 7=2520$ **Answer: (d) 2520**	*1 mark for the correct option.*
12	**Q12** Two consecutive even numbers can be written as $2k$ and $2k+2=2(k+1)$ $\mathrm{HCF}(2k,\ 2(k+1))=2\times\mathrm{HCF}(k,k+1)=2\times 1=2$, since consecutive integers $k, k+1$ are always coprime **Answer: (c) 2**	*1 mark for the correct option.*

Q.No	Step-by-Step Solution	Marks per Step
13	**Q13** Let the number be $10a + b$ with $a + b = 9$ Reversed number $= 10b + a$; given $(10a + b) + 27 = 10b + a$ $9a - 9b = -27 \Rightarrow a - b = -3 \Rightarrow b - a = 3$ Solving $a + b = 9$ and $b - a = 3$: $b = 6,\ a = 3$, so the number is 36 **Answer: (d) 36**	*1 mark for the correct option.*
14	**Q14** $p = ab^2 = a^1b^2, q = a^2b = a^2b^1$ $\mathrm{LCM}(p, q) = a^{\max(1,2)}b^{\max(2,1)} = a^2b^2$ **Answer: (d)** a^2b^2	*1 mark for the correct option.*
15	**Q15** For $3x^2 + 8x + k$: product of zeroes $= \frac{k}{3}$ For reciprocal zeroes, product $= 1$, so $\frac{k}{3} = 1 \Rightarrow k = 3$ **Answer: (a) 3**	*1 mark for the correct option.*
16	**Q16** A.P.: $3, 1, -1, -3, \ldots$ has common difference $d = 1 - 3 = -2$ Next term after -3 is $-3 + (-2) = -5$ **Answer: (c) –5**	*1 mark for the correct option.*
17	**Q17** For $6x^2 - bx + 2 = 0$: Discriminant $= b^2 - 4(6)(2) = b^2 - 48$ Given $D = 1$: $b^2 - 48 = 1 \Rightarrow b^2 = 49 \Rightarrow b = \pm 7$ **Answer: (c)** ± 7	*1 mark for the correct option.*
18	**Q18** For $18, x, y, -3$ in A.P. (4 terms), common difference $d = \frac{-3 - 18}{3} = -7$ $x = 18 + d = 11, \quad y = 18 + 2d = 18 - 14 = 4$ $x + y = 11 + 4 = 15$ **Answer: (b) 15**	*1 mark for the correct option.*
19	**Q19** $\sqrt{2}(5 - \sqrt{2}) = 5\sqrt{2} - 2$, which is irrational (a rational number cannot equal an irrational one) — Assertion (A) is TRUE Reason (R), "the product of two irrational numbers is always irrational", is FALSE in general — e.g. $\sqrt{2} \times \sqrt{2} = 2$, which is rational **Answer: (c) Assertion is true but the Reason is false.**	*1 mark for the correct option.*
20	**Q20** Point $(0, -8)$ has x-coordinate 0, so it lies on the y-axis — Assertion (A) is TRUE Reason (R) correctly states the general fact that every point on the y-axis has x-coordinate 0, and this is exactly why (A) is true	*1 mark for the correct option.*

Q.No	Step-by-Step Solution	Marks per Step
	Answer: (a) Both Assertion and Reason are correct, and Reason is the correct explanation for Assertion.	
	SECTION – B (Q21–25, 2 marks each)	
21	**Q21** $\text{LHS} = \tan^2\theta + \cot^2\theta + 2 = \tan^2\theta + 2\tan\theta\cot\theta + \cot^2\theta$ (since $\tan\theta\cot\theta = 1$) $= (\tan\theta + \cot\theta)^2$ $\tan\theta + \cot\theta = \dfrac{\sin\theta}{\cos\theta} + \dfrac{\cos\theta}{\sin\theta} = \dfrac{\sin^2\theta + \cos^2\theta}{\sin\theta\cos\theta} = \dfrac{1}{\sin\theta\cos\theta}$ $\text{LHS} = \dfrac{1}{\sin^2\theta\cos^2\theta} = \sec^2\theta \cdot \text{cosec}^2\theta = \text{RHS}$ **Answer: Identity proved.**	*1 mark for reducing LHS to* $(\tan\theta + \cot\theta)^2$ *; 1 mark for completing the proof.*
22	**Q22** **(A)** $a = 2$; 20th term $= a + 19d = 59 \Rightarrow 19d = 57 \Rightarrow d = 3$ 6th term from the end $=$ 15th term from the start $= a + 14d$ (since $20 - 6 + 1 = 15$) $= 2 + 14(3) = 2 + 42 = 44$ **Answer: 44** **(B)** Given $d = 7$ and $a_{22} = a + 21d = 149 \Rightarrow a = 149 - 147 = 2$ $S_{22} = \dfrac{22}{2}[2a + 21d] = 11[4 + 147] = 11 \times 151$ $= 1661$ **Answer: 1661**	*1 mark for finding* d *(or* a*); 1 mark for the final answer.*
23	**Q23** For $x^2 - 3x - k$: sum of zeroes $\alpha + \beta = 3$, product $\alpha\beta = -k$ Given $\alpha - \beta = 1$ $(\alpha+\beta)^2 - (\alpha-\beta)^2 = 4\alpha\beta \Rightarrow 9 - 1 = 4\alpha\beta \Rightarrow \alpha\beta = 2$ $-k = 2 \Rightarrow k = -2$ **Answer:** $k = -2$	*1 mark for forming the equation in* α, β*; 1 mark for the value of* k*.*
24	**Q24** In parallelogram ABCD, the diagonals AC and BD bisect each other, so midpoint of AC = midpoint of BD Midpoint of AC $= \left(\dfrac{-2+8}{2}, \dfrac{3+3}{2}\right) = (3,3)$ Let $D = (x, y)$. Midpoint of BD $= \left(\dfrac{6+x}{2}, \dfrac{7+y}{2}\right) = (3,3)$ $6 + x = 6 \Rightarrow x = 0; \quad 7 + y = 6 \Rightarrow y = -1$ **Answer: D = (0, –1)**	*1 mark for equating the midpoints; 1 mark for the coordinates of D.*
25	**Q25** **(A)** Suppose, to the contrary, that $\sqrt{5}$ is rational	*1 mark for the correct assumption/setup; 1 mark for reaching the contradiction.*

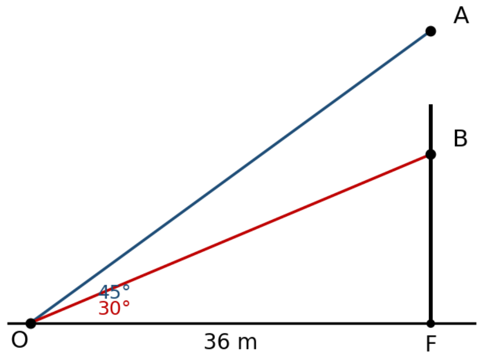
Q.No	Step-by-Step Solution	Marks per Step
	Then $3\sqrt{5}$ is rational (rational $\times$ rational), so $17+3\sqrt{5}$ would also be rational This contradicts the given fact that $17+3\sqrt{5}$ is irrational So our assumption is wrong, and $\sqrt{5}$ is irrational **Answer: Proved by contradiction.** **(B)** $(\sqrt{2}+\sqrt{3})^2 = 2+3+2\sqrt{6} = 5+2\sqrt{6}$ Suppose, to the contrary, that $5+2\sqrt{6}$ is rational, say $\frac{p}{q}$ $(q \neq 0)$ Then $\sqrt{6} = \frac{1}{2}\left(\frac{p}{q}-5\right)$, which is rational This contradicts the given fact that $\sqrt{6}$ is irrational, so $(\sqrt{2}+\sqrt{3})^2$ is irrational **Answer: Proved by contradiction.**	
SECTION – C (Q26–31, 3 marks each)		
26	**Q26** In $\triangle DEM$ and $\triangle CBM$: $DM = CM$ (M is the midpoint of CD) $\angle DME = \angle CMB$ (vertically opposite angles) and $\angle MDE = \angle MCB$ (alternate angles, $AD \parallel BC$, transversal DC) So $\triangle DEM \cong \triangle CBM$ (ASA), giving $EM = BM$ and $DE = CB$ Since $CB = AD$ (opposite sides of the parallelogram) and $DE = CB$, we get $DE = AD$, i.e. D is the midpoint of AE Now in $\triangle ALB$ and $\triangle CLM$: $\angle ALB = \angle CLM$ (vertically opposite) and $\angle LAB = \angle LCM$ (alternate angles, $AB \parallel DC$, transversal AC) So $\triangle ALB \sim \triangle CLM$ (AA), giving $\frac{LB}{LM} = \frac{AB}{CM} = \frac{AB}{AB/2} = 2$ (since $CM = \frac{1}{2}CD = \frac{1}{2}AB$) So $LM = \frac{1}{2}LB$, and $BM = BL + LM = BL + \frac{1}{2}BL = \frac{3}{2}BL$ Since $EM = BM$: $EL = EM + ML = \frac{3}{2}BL + \frac{1}{2}BL = 2BL$ **Answer: EL = 2BL (proved).**	*1 mark for $\triangle DEM \cong \triangle CBM$; 1 mark for $\triangle ALB \sim \triangle CLM$; 1 mark for combining to get EL = 2BL.*
27	**Q27** Writing the equations as $2x-3y-7=0$ and $(a+b)x-(a+b-3)y-(4a+b)=0$ For infinitely many solutions: $\frac{2}{a+b} = \frac{3}{a+b-3} = \frac{7}{4a+b}$ From the first pair: $2(a+b-3) = 3(a+b) \Rightarrow -6 = a+b \Rightarrow a+b=-6$ From the outer pair: $2(4a+b) = 7(a+b) \Rightarrow 8a+2b = 7a+7b \Rightarrow a = 5b$ Solving $a+b=-6$ with $a=5b$: $6b=-6 \Rightarrow b=-1,\ a=-5$ **Answer: a = –5, b = –1**	*1 mark for setting up the ratio condition; 1 mark for one equation in a, b; 1 mark for the values of a and b.*
28	**Q28** **(A)** Let $y = \frac{2x+3}{x-3}$. The equation becomes $2y - \frac{25}{y} = 5 \Rightarrow 2y^2-5y-25=0$ $y = \frac{5 \pm \sqrt{25+200}}{4} = \frac{5 \pm 15}{4} \Rightarrow y = 5$ or $y = -\frac{5}{2}$	*1 mark for setting up the quadratic; 1 mark for solving it; 1 mark for the final answer(s).*

Q.No	Step-by-Step Solution	Marks per Step
	Case $y = 5$: $2x + 3 = 5(x - 3) \Rightarrow 2x + 3 = 5x - 15 \Rightarrow x = 6$ Case $y = -\frac{5}{2}$: $2(2x + 3) = -5(x - 3) \Rightarrow 4x + 6 = -5x + 15 \Rightarrow x = 1$ **Answer: x = 6 or x = 1** **(B)** Let the two parts be x and $29 - x$ $x^2 + (29 - x)^2 = 425 \Rightarrow 2x^2 - 58x + 841 = 425$ $x^2 - 29x + 208 = 0$ $D = 29^2 - 4(208) = 841 - 832 = 9,\ \sqrt{D} = 3$ $x = \frac{29 \pm 3}{2} \Rightarrow x = 16 \text{ or } x = 13$ **Answer: The two parts are 13 and 16.**	
29	**Q29** The required number divides $(398 - 7) = 391$, $(436 - 11) = 425$ and $(540 - 13) = 527$ exactly So the required number $= \mathrm{HCF}(391, 425, 527)$ $391 = 17 \times 23, \quad 425 = 17 \times 25, \quad 527 = 17 \times 31$ $\mathrm{HCF} = 17$ **Answer: 17**	*1 mark for reducing the numbers; 1 mark for prime factorisation; 1 mark for the final HCF.*
30	**Q30** Let the line $x + 2y = 5$ divide the segment joining $(1, -3)$ and $(4, 5)$ in the ratio $k : 1$ Point of division $= \left(\frac{4k+1}{k+1}, \frac{5k-3}{k+1}\right)$ Substituting into $x + 2y = 5$: $\frac{4k+1}{k+1} + \frac{2(5k-3)}{k+1} = 5$ $14k - 5 = 5(k + 1) \Rightarrow 14k - 5 = 5k + 5 \Rightarrow 9k = 10 \Rightarrow k = \frac{10}{9}$ So the ratio is $10 : 9$ $x = \frac{4(10/9) + 1}{(10/9) + 1} = \frac{49/9}{19/9} = \frac{49}{19}, \quad y = \frac{5(10/9) - 3}{(10/9) + 1} = \frac{23/9}{19/9} = \frac{23}{19}$ **Answer: Ratio = 10 : 9; point of division** $= \left(\frac{49}{19}, \frac{23}{19}\right)$	*1 mark for the section-formula setup; 1 mark for the ratio; 1 mark for the coordinates.*
31	**Q31** **(A)** For $f(x) = 25x^2 - 15x + 2$: $\alpha + \beta = \frac{15}{25} = \frac{3}{5}, \quad \alpha\beta = \frac{2}{25}$ New zeroes: $\frac{1}{2\alpha}, \frac{1}{2\beta}$. Sum $= \frac{\alpha + \beta}{2\alpha\beta} = \frac{3/5}{4/25} = \frac{15}{4}$ Product $= \frac{1}{4\alpha\beta} = \frac{1}{8/25} = \frac{25}{8}$ Required polynomial: $k\left[x^2 - \frac{15}{4}x + \frac{25}{8}\right]$; taking $k = 8$: $8x^2 - 30x + 25$ **Answer:** $8x^2 - 30x + 25$ **(B)**	*1 mark for sum & product (or factorisation); 1 mark for the new sum & product; 1 mark for the final polynomial.*

Q.No	Step-by-Step Solution	Marks per Step
	$2x^2 - 7x - 15 = 2x^2 - 10x + 3x - 15 = 2x(x-5) + 3(x-5) = (2x+3)(x-5)$ Zeroes: $x = 5$ or $x = -\frac{3}{2}$ Reciprocals: $\frac{1}{5}$ and $-\frac{2}{3}$. Sum $= \frac{1}{5} - \frac{2}{3} = -\frac{7}{15}$, Product $= -\frac{2}{15}$ Required polynomial: $k\left[x^2 + \frac{7}{15}x - \frac{2}{15}\right]$; taking $k = 15$: $15x^2 + 7x - 2$ **Answer: Zeroes 5, $-\frac{3}{2}$; required polynomial** $= 15x^2 + 7x - 2$	
SECTION – D (Q32–35, 5 marks each)		
32	**Q32** **(A)** Since $XM \parallel AB$: in the two transversals TBC and TMN cutting the parallel lines AB and XM from common point T, $\triangle TBN \sim \triangle TXM$ $\Rightarrow \frac{TB}{TX} = \frac{TN}{TM} \quad \ldots(i)$ Since $XN \parallel AC$: similarly $\triangle TCM \sim \triangle TXN$ $\Rightarrow \frac{TC}{TX} = \frac{TM}{TN} \quad \ldots(ii)$ Multiplying (i) and (ii): $\frac{TB}{TX} \times \frac{TC}{TX} = \frac{TN}{TM} \times \frac{TM}{TN} = 1$ $\frac{TB \times TC}{TX^2} = 1 \Rightarrow TX^2 = TB \times TC$ **Answer: $TX^2 = TB \times TC$ (proved).** **(B)** Produce AD to E so that $AD = DE$, and join CE In $\triangle ABD$ and $\triangle ECD$: $AD = DE$, $BD = DC$ (AD is a median), $\angle ADB = \angle EDC$ (vertically opposite) So $\triangle ABD \cong \triangle ECD$ (SAS), giving $AB = EC$ Similarly, producing PM to N with $PM = MN$ and joining RN gives $\triangle PQM \cong \triangle RNM$, so $PQ = RN$ Given $\frac{AB}{PQ} = \frac{AC}{PR} = \frac{AD}{PM}$; since $AB = EC,\ PQ = RN,\ AE = 2AD,\ PN = 2PM$, this ratio equals $\frac{EC}{RN} = \frac{AC}{PR} = \frac{AE}{PN}$ So $\triangle AEC \sim \triangle PNR$ (SSS), which gives $\angle 1 = \angle 2$ (angles between the medians and the sides) Combining with the earlier congruences: $\angle BAD = \angle QPM$ and $\angle DAC = \angle MPR$; adding, $\angle BAC = \angle QPR$ Now in $\triangle ABC$ and $\triangle PQR$: $\frac{AB}{PQ} = \frac{AC}{PR}$ (given) and $\angle BAC = \angle QPR$ (just shown) So $\triangle ABC \sim \triangle PQR$ (SAS similarity) **Answer: $\triangle ABC \sim \triangle PQR$ (shown).**	*Up to 5 marks for a complete, correctly-justified similarity proof with all steps shown.*
33	**Q33** Let the speed of the stream be x km/hr. Upstream speed $= 11 - x$, downstream speed $= 11 + x$	*1 mark for the equation in x; 2 marks for simplifying to the quadratic; 1 mark for solving; 1 mark for*

Q.No	Step-by-Step Solution	Marks per Step
	Total time $= 2$ hr 45 min $= \frac{11}{4}$ hr $\frac{12}{11-x} + \frac{12}{11+x} = \frac{11}{4}$ $\frac{12[(11+x)+(11-x)]}{(11-x)(11+x)} = \frac{11}{4} \Rightarrow \frac{264}{121-x^2} = \frac{11}{4}$ $1056 = 11(121-x^2) \Rightarrow 96 = 121 - x^2 \Rightarrow x^2 = 25$ $x = 5$ (rejecting the negative value, since speed cannot be negative) **Answer: Speed of the stream = 5 km/hr**	*rejecting the invalid root and stating the answer.*
34	**Q34** **(A)** $\text{LHS} = \frac{\sin^2\theta}{\cos\theta(\sin\theta - \cos\theta)} + \frac{\cos^2\theta}{\sin\theta(\cos\theta - \sin\theta)}$ (writing $\tan\theta, \cot\theta$ in terms of $\sin\theta, \cos\theta$) $= \frac{1}{\sin\theta - \cos\theta}\left[\frac{\sin^2\theta}{\cos\theta} - \frac{\cos^2\theta}{\sin\theta}\right] = \frac{1}{\sin\theta - \cos\theta} \times \frac{\sin^3\theta - \cos^3\theta}{\sin\theta\cos\theta}$ Using $\sin^3\theta - \cos^3\theta = (\sin\theta - \cos\theta)(1 + \sin\theta\cos\theta)$, the $(\sin\theta - \cos\theta)$ factors cancel $\text{LHS} = \frac{1 + \sin\theta\cos\theta}{\sin\theta\cos\theta} = \frac{1}{\sin\theta\cos\theta} + 1 = \sec\theta \cdot \operatorname{cosec}\theta + 1 = \text{RHS}$ **Answer: Identity proved.** **(B)** Multiply numerator and denominator of LHS by $(\sin\theta + \cos\theta + 1)$ Numerator: $(\sin\theta + 1)^2 - \cos^2\theta = 2\sin^2\theta + 2\sin\theta = 2\sin\theta(\sin\theta + 1)$ Denominator: $(\sin\theta + \cos\theta)^2 - 1 = 2\sin\theta\cos\theta$ $\text{LHS} = \frac{2\sin\theta(\sin\theta+1)}{2\sin\theta\cos\theta} = \frac{\sin\theta + 1}{\cos\theta} = \tan\theta + \sec\theta$ Since $(\sec\theta - \tan\theta)(\sec\theta + \tan\theta) = \sec^2\theta - \tan^2\theta = 1$, we have $\sec\theta + \tan\theta = \frac{1}{\sec\theta - \tan\theta} = \text{RHS}$ **Answer: Identity proved.**	*5 marks for a correctly-justified, step-wise proof.*
35	**Q35** Let the ship's deck be at D, 10 m above the water, and let the foot and top of the hill be B (water level) and T Angle of depression of the base B from D is $30°$: $\tan 30° = \frac{10}{d}$, where d is the horizontal distance $\frac{1}{\sqrt{3}} = \frac{10}{d} \Rightarrow d = 10\sqrt{3}$ m Angle of elevation of the top T from D is $60°$: $\tan 60° = \frac{h-10}{d}$, where h is the height of the hill $\sqrt{3} = \frac{h-10}{10\sqrt{3}} \Rightarrow h - 10 = 10\sqrt{3} \times \sqrt{3} = 30 \Rightarrow h = 40$ **Answer: Distance of the hill from the ship =** $10\sqrt{3} \approx 17.3$ **m; height of the hill = 40 m**	*1 mark for the figure/setup; 2 marks for finding the horizontal distance; 2 marks for finding the height.*
	SECTION – E (Q36–38, 4 marks each)	
36	**Q36**	*(i) 1 mark. (ii)(a)/(b) 1 mark. (iii) 2 marks: 1*

Q.No	Step-by-Step Solution	Marks per Step
	(i) 30th instalment $a_{30} = a + 29d = 10000 + 29(1000)$ $= 39000$ **Answer: ₹39,000** **(ii)(a) Amount paid in 30 instalments** $S_{30} = \frac{30}{2}[2a + 29d] = 15[20000 + 29000]$ $= 15 \times 49000 = 735000$ **Answer: ₹7,35,000** **(ii)(b) [OR] Difference between the 25th and 15th instalments** $a_{25} - a_{15} = (a + 24d) - (a + 14d) = 10d$ $= 10 \times 1000 = 10000$ **Answer: ₹10,000** **(iii) Ratio of 1st instalment to 40th instalment** $a_1 = 10000, \quad a_{40} = a + 39d = 10000 + 39000 = 49000$ Ratio $= 10000 : 49000$ **Answer: 10 : 49**	*mark for both terms; 1 mark for the simplified ratio.*
37	**Q37** **(i) Equations** Batch I: $20x + 5y = 9000 \Rightarrow 4x + y = 1800$ Batch II: $5x + 25y = 26000 \Rightarrow x + 5y = 5200$ **Answer:** $4x + y = 1800$ **and** $x + 5y = 5200$ **(ii)(a) Monthly fee paid by a poor child** From $4x + y = 1800$: $y = 1800 - 4x$ Substitute in $x + 5y = 5200$: $x + 5(1800 - 4x) = 5200 \Rightarrow -19x = -3800$ $x = 200$ **Answer: ₹200** **(ii)(b) [OR] Difference between the fees of a poor and a rich child** With $x = 200$: $y = 1800 - 4(200) = 1000$ Difference $= y - x = 1000 - 200 = 800$ **Answer: ₹800** **(iii) Total fee from batch II if it had 10 poor and 20 rich children** Total $= 10x + 20y = 10(200) + 20(1000)$ $= 2000 + 20000 = 22000$ **Answer: ₹22,000**	*(i) 1 mark for both equations. (ii)(a)/(b) 1 mark. (iii) 2 marks: 1 mark for substitution; 1 mark for the final total.*
38	**Q38** **(i) Diagram**	*(i) 1 mark for a correctly labelled diagram. (ii) 1 mark.*

Q.No	Step-by-Step Solution	Marks per Step
	A vertical tower stands at the foot of the tower (call it F), with A below B on the tower O is on the ground, 36 m from F, with wires OA and OB drawn to the tower, making angles $45°$ (to A) and $30°$ (to B) with the ground at O  **Answer: See figure.** **<u>(ii) Height of point B</u>** In the right triangle formed at O and B: $\tan 30° = \frac{\text{height of B}}{36}$ Height of B $= 36 \times \frac{1}{\sqrt{3}} = \frac{36}{\sqrt{3}} = 12\sqrt{3}$ m **Answer:** $12\sqrt{3} \approx 20.8$ **m** **<u>(iii) Length of wire OA</u>** Height of A: $\tan 45° = \frac{\text{height of A}}{36} \Rightarrow$ height of A $= 36$ m $OA = \frac{36}{\cos 45°} = 36\sqrt{2}$ m (equivalently, $OA = \sqrt{36^2 + 36^2} = 36\sqrt{2}$) **Answer:** $36\sqrt{2} \approx 50.9$ **m** **<u>(iii) [OR] Length of wire OB</u>** $OB = \frac{36}{\cos 30°} = \frac{36}{\sqrt{3}/2} = \frac{72}{\sqrt{3}} = 24\sqrt{3}$ m **Answer:** $24\sqrt{3} \approx 41.6$ **m**	*(iii) 2 marks for either OA or OB (1 mark for the height used; 1 mark for the final length).*