

SECTION A (Fundamentals)

Q1 [Marks: 10] Given $3x - 2y = 7$ and $2x + y = 4 \Rightarrow y = 4 - 2x$. Substitute into first: $3x - 2(4 - 2x) = 7 \Rightarrow 3x - 8 + 4x = 7 \Rightarrow 7x = 15 \Rightarrow x = 15/7$. Then $y = 4 - 2(15/7) = (28 - 30)/7 = -2/7$.

Answer: $(x, y) = (15/7, -2/7)$. (Setup 2, substitution 3, solve 3, verify 2)

Q2 [Marks: 8] $2x^2 - 5x - 3 = 0 \Rightarrow$ Discriminant $\Delta = (-5)^2 - 4 \cdot 2 \cdot (-3) = 25 + 24 = 49$. Roots = $(5 \pm \sqrt{49})/(2 \cdot 2) = (5 \pm 7)/4 \Rightarrow x_1 = 3, x_2 = -1/2$. (Δ 2, formula 3, simplification 3)

Q3 [Marks: 10] $s = (7 + 9 + 10)/2 = 13$. Area = $\sqrt{[s(s-a)(s-b)(s-c)]} = \sqrt{[13 \cdot 6 \cdot 4 \cdot 3]} = \sqrt{936} = 6\sqrt{26} \approx 30.594$. Answer: $6\sqrt{26}$ sq.units (≈ 30.594). (s 2, substitute 4, simplify 4)

Q4 [Marks: 8] $\sin(75^\circ) = \sin(45^\circ + 30^\circ) = \sin 45 \cos 30 + \cos 45 \sin 30 = (\sqrt{2}/2)(\sqrt{3}/2) + (\sqrt{2}/2)(1/2) = (\sqrt{6} + \sqrt{2})/4$. Answer: $(\sqrt{6} + \sqrt{2})/4$. (identity 3, values 3, simplify 2)

SECTION B (Applications)

Q5 [Marks: 8] $S_{20} = (20/2)[2 \cdot 7 + (20 - 1) \cdot 3] = 10[14 + 57] = 10 \cdot 71 = 710$. Answer: 710.
(formula 3, substitute 3, compute 2)

Q6 [Marks: 10] Let A: sum = 9 $\Rightarrow (3,6),(4,5),(5,4),(6,3) \Rightarrow 4$ outcomes. Let B: at least one 5 $\Rightarrow 11$ outcomes. $|\Omega| = 36$. $P(A \cup B) = P(A) + P(B) - P(A \cap B) = 4/36 + 11/36 - 2/36 = 13/36$. Answer: $13/36$. (counting 4, inclusion-exclusion 4, fraction 2)

Q7 [Marks: 12] General: $x^2 + y^2 + Dx + Ey + F = 0$ passes through $(1,2),(3,4),(5,2)$. Solve for $D,E,F \Rightarrow D = -6.0, E = -4.0, F = 9.0$. Answer (rounded): $x^2 + y^2 - 6.0x - 4.0y + 9.0 = 0$. Center = $(-D/2, -E/2)$, Radius² = $(D/2)^2 + (E/2)^2 - F$. (setup 4, solve 6, form 2)