

Simultaneous Equations (Linear and Non-Linear) Mark Scheme:		
<b>1</b>	$-x + 2 = x^2 + 2x - 1$	[1] Substitution
	$x^2 + 3x - 3 = 0$	[1] Rearrangement into quadratic format
	$x = -3.79, \quad y = 5.79$	[1] One set of correct answers
	$x = 0.791, \quad y = 1.21$	[1] One set of correct answers
<b>2</b>	$x^2 + \frac{(x+1)^2}{4} = 9$	[1] Substitution
	$4x^2 + x^2 + 2x + 1 = 36$ $5x^2 + 2x - 35 = 0$	[1] Rearrangement into quadratic format
	$x = -2.85, \quad y = -0.927$	[1] One set of correct answers
	$x = 2.45, \quad y = 1.73$	[1] One set of correct answers
<b>3</b>	$3x + x^2 + 2x - 3 = -9$	[1] Substitution
	$x^2 + 5x + 6 = 0$	[1] Rearrangement into quadratic format
	$x = -3, \quad y = 0$	[1] One set of correct answers
	$x = -2, \quad y = -3$	[1] One set of correct answers
<b>4</b>	$3x^2 + 2(3x - 1)^2 = 35$	[1] Substituting in for y
	$3x^2 + 2(9x^2 - 6x + 1) = 35$ $21x^2 - 12x - 33 = 0$ $7x^2 - 4x - 11 = 0$	[1] Simplifying
	$(7x - 11)(x + 1) = 0$	[1] Factorising
	$\therefore x = -1 \text{ OR } x = \frac{11}{7}$	[1] Solving for x
	$\therefore y = -4 \text{ OR } y = \frac{26}{7}$	[1] Using $y = 3x - 1$
	$(-1, -4) \text{ OR } (\frac{11}{7}, \frac{26}{7})$	[1] Correct pairings
<b>5(a)</b>	$3x^2 + x(2 - 4x) + 11 = 0$	[1] Substitute in for y
	$3x^2 + 2x - 4x^2 + 11 = 0$ $-x^2 + 2x + 11 = 0$ $x^2 - 2x - 11 = 0$	[1] Rearrangement to correct answer must be shown

Turn over ►

5(b)	$x = \frac{2 \pm \sqrt{(-2)^2 - 4(-11)}}{2}$	[1] Solve using quadratic equation
	$x = \frac{2 \pm \sqrt{48}}{2}$ $x = \frac{2 \pm \sqrt{16 \times 3}}{2}$ $x = \frac{2 \pm 4\sqrt{3}}{2}$	[1] Simplifying
	$\therefore x = 1 + 2\sqrt{3} \text{ OR } x = 1 - 2\sqrt{3}$	[1] Cancelling factor of 2
	$\therefore y = -2 - 8\sqrt{3} \text{ OR } y = -2 + 8\sqrt{3}$	[1] Using $y = 2 - 4x$
	$(1 + 2\sqrt{3}, -2 - 8\sqrt{3}) \text{ OR } (1 - 2\sqrt{3}, -2 + 8\sqrt{3})$	[1] Correct pairings
		<i>Alternative method using complete the square</i>
	$x^2 - 2x - 11 = 0$ $(x - 1)^2 = 12$ $x = 1 \pm 2\sqrt{3}$	[3] Simplify to find x using complete the square
	$\therefore y = -2 - 8\sqrt{3} \text{ OR } y = -2 + 8\sqrt{3}$	[2] Using $y = 2 - 4x$ and $x = 1 \pm 2\sqrt{3}$
	$(1 + 2\sqrt{3}, -2 - 8\sqrt{3}) \text{ OR } (1 - 2\sqrt{3}, -2 + 8\sqrt{3})$	[1] Correct pairings
6	$x^2 + (x - k)^2 - 9 = 0$	[1] Substitute in $y = x - k$
	$2x^2 - 2kx + (k^2 - 9) = 0$	[1] Simplifying quadratic
	Hence solutions given by $\therefore x = \frac{2k \pm \sqrt{(2k)^2 - 4 \times 2 \times (k^2 - 9)}}{4}$	[1] Solving quadratic
	But there is only one. So therefore $\sqrt{(2k)^2 - 4 \times 2 \times (k^2 - 9)} = 0$	[1] Simplifying
	$\therefore (2k)^2 - 4 \times 2 \times (k^2 - 9) = 0$ $4k^2 - 8(k^2 - 9) = 0$ $4k^2 = 72$	[1] Simplifying
	$\therefore k = \pm\sqrt{18} = \pm 3\sqrt{2}$	[1] Getting to final answer with $\pm\sqrt{18}$ as a crucial step

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