

Question number	Scheme	Marks
1.	(a) $k = 3$ (b) $(2^2)^x = (2^3)^{2-x}$ (A1 for $2x$ and $3(2-x)$) $2x = 3(2-x)$ $5x = 6$ $x = 1.2$	B1 (1) M1 A1 M1 A1 (4) (5 marks)
2.	(a) $8 + 4\sqrt{7} - 2\sqrt{7} - 7 = 1 + 2\sqrt{7}$ (b) $\frac{2+\sqrt{7}}{4+\sqrt{7}} \times \frac{4-\sqrt{7}}{4-\sqrt{7}} = \frac{1+2\sqrt{7}}{16-7}$ $c = \frac{1}{9}$ $d = \frac{2}{9}$	M1 A1 (2) M1 A1 ft A1 (3) (5 marks)
3.	(a) $\frac{dy}{dx} = 10 \times \frac{3}{2} x^{\frac{1}{2}} \left(= 15x^{\frac{1}{2}} \right)$ (b) $7x + 4x^{\frac{5}{2}} + C$	M1 A1 (2) M1 A2(1,0) (3) (5 marks)
4.	(a) $(x+k)^2 - 7 - k^2 = 0$ $(x+k)^2$ (LHS) $\Rightarrow (x+k)^2 = 7 + k^2 = 0 \quad \therefore x+k = (\pm) \sqrt{7+k^2}$ $\therefore x = -k \pm \sqrt{7+k^2}$ (b) $7 + k^2 > 0$ (or discriminant > 0) $\therefore$ roots are real and distinct (c) $k = \sqrt{2} \Rightarrow x = -\sqrt{2} \pm \sqrt{7+2}$ $x = -\sqrt{2} + 3$ or $-\sqrt{2} - 3$	M1 A1 M1 (no need for $\pm$) A1 (both) (4) M1 A1 (2) M1 A1 (both) (2) (8 marks)

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5. (a)		B1 B1 B1 (3)
(b)	$-\frac{1}{4}x = 2x - 3$ $\frac{9}{4}x = 3$ $x = \frac{4}{3}$ $y = -\frac{1}{3}$	M1 A1 A1 (3)
(c)	Perp. to l_1 : $m = 4$ $y + \frac{1}{3} = 4(x - \frac{4}{3})$ $12x - 3y - 17 = 0$	B1 M1 A1 (3)
		(9 marks)
6. (a)	$a + (n - 1)d = 500 + 39 \times 50 = \text{£}2450$	M1 A1 (2)
(b)	$\frac{1}{2}n(a + 1) = 20(500 + 2450) = \text{£}59000$	M1 A1 ft (2)
(c)	Brian: $20(1780 + 39d) = (b)$	M1 A1 ft
	Solve: $d = 30$	M1 A1 (4)
		(8 marks)

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7.	(a) $\frac{5 - (-3)}{8 - 2} = \frac{4}{3}$ (b) $M: \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) \quad (5, 1)$ Gradient of CM is $-\frac{3}{4}$ Equation of CM: $y - 1 = -\frac{3}{4}(x - 5)$ $(4y = -3x + 19)$ (c) When $x = 4$, $y = \frac{7}{4}$ (d) Radius = $\sqrt{(4 - 2)^2 + \left(\frac{7}{4} + 3\right)^2}$ $= \sqrt{4 + \frac{361}{16}} = \sqrt{\frac{425}{16}} = \sqrt{\frac{25}{16}} \sqrt{17} = \frac{5\sqrt{17}}{4}$	M1 A1 (2) M1 A1 B1 ft M1 A1 (5) M1 A1 ft (2) M1 A1 ft * M1 A1 (4) (13 marks)
8.	(a) $2r^2h = 1030, \quad h = \frac{515}{x^2}$ (b) $A = 4x^2 + 6xh$ $A = 4x^2 + \frac{3090}{x}$	M1, A1 (2) B1 * M1 A1 (3) (5 marks)