	Give 1 mark for each •	Illustration(s) for awarding each mark
1(a)	**ans: $a = 1$; $b = 4$, $c = -29$** **(4 marks)**	
	•[1] finds gradient of BD	•[1] $m_{BD} = 4$ [from equation]
	•[2] finds gradient of AC	•[2] $m_{AC} = -\frac{1}{4}$
	•[3] subs into $y - b = m(x - a)$ and rearranges	•[3] $y - 8 = -\frac{1}{4}(x+3); x + 4y - 29 = 0$
	•[4] states values of a, b and c	•[4] $a = 1$; $b = 4$, $c = -29$
(b)	**ans: E(5, 6)** **(3 marks)**	
	•[1] knows to use system of equations	•[1] evidence of equating one variable
	•[2] solves for x and y	•[2] $x = 5$; $y = 6$
	•[3] states coordinates of E	•[3] E(5, 6)
(c)	**ans: C(13, 4)** **(2 marks)**	
	•[1] appropriate method	•[1] evidence of 'stepping out' or other method
	•[2] answer	•[2] C(13, 4)
2(a)	**ans: proof** **(3 marks)**	
	•[1] knows to substitute	•[1] evidence of sub. one function in other
	•[2] substitutes correctly	•[2] $f\left(\frac{1}{x-1}\right) = \frac{4}{x-1} + 1$
	•[3] clearly simplifies to answer	•[3] $\frac{4 + x - 1}{x-1} = \frac{x+3}{x-1}$
(b)	**ans: $p = 2$** **(4 marks)**	
	•[1] substitute for x	•[1] $\frac{\sqrt{5}+3}{\sqrt{5}-1}$
	•[2] knows to multiply by conjugate surd	•[2] $\frac{\sqrt{5}+3}{\sqrt{5}-1} \times \frac{\sqrt{5}+1}{\sqrt{5}+1}$
	•[3] multiplies and simplifies	•[3] $\frac{5 + 4\sqrt{5} + 3}{4} = \frac{8 + 4\sqrt{5}}{4} = 2 + \sqrt{5}$
	•[4] states value of p	•[4] $p = 2$

	Give 1 mark for each •	Illustration(s) for awarding each mark
3(a)	**ans: P(1, 0); Q(– 2, 27) (5 marks)**	
	•[1] knows derivative = 0 at S.P.	•[1] $f'(x) = 0$ at SP [stated or implied]
	•[2] takes derivative and factorises	•[2] $6x^2 + 6x - 12 = 0$; $6(x+2)(x-1) = 0$
	•[3] solves for x and chooses appropriate value	•[3] $x = -2$ or 1
	•[4] substitutes to find y – coordinate	•[4] $f(-2) = 2(-2)^3 + 3(-2)^2 - 12(-2) + 7 = 27$
	•[5] states coordinates of P and Q	•[5] P(1, 0); Q(– 2, 27)
(b)	**ans: 40·5 units^2 (4 marks)**	
	•[1] sets up integral	•[1] $\int_{-2}^{1} 2x^3 + 3x^2 - 12x + 7\, dx$
	•[2] integrates expression	•[2] $\left[\frac{x^4}{2} + x^3 - 6x^2 + 7x\right]_{-2}^{1}$
	•[3] substitutes values	•[3] $\left(\frac{(1)^4}{2} + (1)^3 - 6(1)^2 + 7(1)\right) - \left(\frac{(-2)^4}{2} + (-2)^3 - 6(-2)^2 + 7(-2)\right)$
	•[4] evaluates	•[4] 40·5 units^2
4	**ans: 30°,150°,270°. (5 marks)**	
	•[1] Re-arranges equation	•[1] $2\sin^2 x + \sin x - 1 = 0$
	•[2] factorises	•[2] $(2\sin x - 1)(\sin x + 1)$
	•[3] states solution for sinx	•[3] $\sin x = \frac{1}{2}$, AND $\sin x = -1$
	•[4] finds two solutions	•[4] $x = 30°$ and $150°$
	•[5] finds further solution	•[5] $x = 270°$

	Give 1 mark for each •	Illustration(s) for awarding each mark
5(a)	**ans: proof** **(2 marks)**	
	•1 substitutes U_0 and finds U_1	•1 $U_1 = \frac{a}{4} \times 16 + 12 = 4a + 12$
	•2 substitutes U_1 and finds U_2	•2 $U_1 = \frac{a}{4}(4a+12) + 12 = a^2 + 3a + 12$
(b)	**ans: $a = 3$** **(3 marks)**	
	•1 equates U_2 to 30	•1 $a^2 + 3a + 12 = 30$
	•2 collects terms to LHS and factorises	•2 $a^2 + 3a - 18 = 0; (a+6)(a-3) = 0$
	•3 solves for x and discards	•3 $a = -6, 3;\ a = 3$
(c)	**ans: 48** **(3 marks)**	
	•1 knows condition for limit	•1 limit exists since $-1 < \frac{3}{4} < 1$
	•2 knows how to find limit	•2 $L = \frac{12}{1 - 0 \cdot 75} = \frac{12}{0 \cdot 25}$
	•3 answer	•3 48
6(a)	**ans: $y = 2x$** **(3 marks)**	
	•1 finds midpoint of QR	•1 midpoint of QR = (2, 4)
	•2 finds gradient of PA	•2 $m_{PA} = \frac{4+6}{2+3} = 2$
	•3 substitutes in $y - b = m(x - a)$	•3 $y - 4 = 2(x - 2);\ y = 2x$
(b)	**ans: C(7, 14)** **(4 marks)**	
	•1 knows to substitute line into circle	•1 $x^2 + (2x)^2 - 10x - 20(2x) + 105 = 0$
	•2 multiplies and simplifies	•2 $5x^2 - 50x + 105 = 0$
	•3 factorises and solves	•3 $5(x-3)(x-7) = 0$
	•4 chooses appropriate value for x and subs	•4 $x = 3, 7;\ x = 7,\ y = 14$
(c)	**ans: $(x - 7)^2 + (y - 14)^2 = 5$** **(3 marks)**	
	•1 finds radius of larger circle	•1 radius (large) = $\sqrt{25 + 100 - 105} = \sqrt{20}$
	•2 finds radius of smaller circle	•2 radius (small) = $\sqrt{5}$
	•3 subs into $(x - a)^2 + (y - b)^2 = r^2$	•3 $(x - 7)^2 + (y - 14)^2 = 5$

	Give 1 mark for each •	Illustration(s) for awarding each mark
7(a)	**ans: $k = 2$** **(3 marks)**	
	●[1] knows to use synthetic division ●[2] makes remainder = 0 ●[3] solves for k	●[1] evidence ●[2] $8 - 4k = 0$ ●[3] $k = 2$
(b)	**ans: $p = -3$** **(3 marks)**	
	●[1] equates function to 35 ●[2] collect terms to LHS and equates to 0 ●[3] uses synthetic division to find root	●[1] $p^3 - 2p^2 - 16p + 32 = 35$ ●[2] $p^3 - 2p^2 - 16p - 3 = 0$ ●[3] $p = -3$
(c)	**ans: 98^o** **(2 marks)**	
	●[1] finds gradient of AB ●[2] takes $\tan^{-1}$ and states angle	●[1] $m_{AB} = \dfrac{35-0}{-3-2} = -7$ ●[2] $\tan^{-1}(7) = 82°$; angle $= 98^o$
8	**ans: $a = 3$** **(4 marks)**	
	●[1] evaluates integral ●[2] finds derivative ●[3] makes integral = derivative ●[4] factorises and solves	●[1] $\left[x^2\right]_0^a = a^2$ ●[2] $\dfrac{d}{da} = 6a - 9$ ●[3] $a^2 = 6a - 9$; $a^2 - 6a + 9 = 0$ ●[4] $(a-3)(a-3) = 0$; $a = 3$
		Total: 60 marks