Question number	Scheme	Marks
6 (a)	$f(3) = 27 + 9p + 9 - 30 + q = 0$	M1 A1
	$9p + q + 6 = 0$ *	A1 cso
		(3)
(b)	$f(-p) = -p^3 + p^2(p+1) + 10p + q = 0$	M1 A1
	$p^2 + 10p + q = 0$ *	A1 cso
		(3)
(c)	$p^2 + 10p - 9p - 6 = 0$	M1
	$p^2 + p - 6 = 0$	A1
	$(p+3)(p-2) = 0$	M1
	$p = 2 \quad q = -24$	A1 A1
		(5)
(d)	$(x+a)(x-3)(x+2)$	
	So $-3 \times 2 \times a = -24 \quad a = 4$	M1
	$(x+4)(x-3)(x+2)$	A1
		(2)
		Total 13 marks

Part	Mark	Guidance
General guidance for marking parts (a) and (b) • For the award of full marks in parts (a) and/or (b) you **must** see = 0 used in a line of working **before** the final answer. • If a candidate does not use = 0 in either parts (a) or (b) [except in the final line – which is a given answer] deduct the M mark (and the subsequent A marks) in only the **first** occurrence of the absence.		
(a)	**M1**	For using $f(\pm 3) = 0$ in the given equation set = 0
	A1	For obtaining the correct unsimplified expression: $27 + 9p + 9 - 30 + q = 0$
	A1 cso	For obtaining the given equation $9p + q + 6 = 0$ * **Note: This is a show question. There must be no errors seen.**
(b)	**M1**	For use of $f(\pm p) = 0$ in the given equation set = 0
	A1	For obtaining the correct unsimplified expression: $-p^3 + p^2(p+1) + 10p + q = 0$

	A1 cso	For obtaining the correct given equation $p^2+10p+q=0$ * **Note: This is a show question. There must be no errors seen.**
(c)	**M1**	For attempting to solve the given two equations simultaneously to achieve a 3TQ in either p or q only. E.g. substitutes $q=\mp 9p\mp 6$ or $\left[p=\frac{\mp q\mp 6}{9} \text{ and } p^2=\frac{(\mp q\mp 6)^2}{81}\right]$ into $p^2+10p+q=0$ This mark may be implied by the correct 3TQ
	A1	For the correct 3TQ $p^2+p-6=0$ or $q^2+3q-504=0$
	M1	For an attempt to solve their 3TQ in either p or q using factorisation, use of the formula or completing the square. See general guidance for the definition of an attempt. For example: $(p+3)(p-2)=0\Rightarrow p=...$ or $(q+24)(q-21)=0\Rightarrow q=...\ ,\ ...$ If a candidate uses their calculator to solve their 3TQ, the final values must be correct for the award of this mark unless a valid method is seen.
	A1	For either the correct value of p OR the correct value of q $p=2$ or $q=-24$ Condone the presence $p=-3$, and/or $q=21$
	A1	For both the correct value of p (= 2) AND the correct value of q (= –24) Must reject $p=-3$, and/or $q=21$ if seen.
(d)	**M1**	[f(x) = $(x+a)(x-3)(x+'2')$] For attempting to find the value of a $-3\times'2'\times a='-24'\Rightarrow a=...$ OR For an attempt using division with their values of p and q $x^2-x-6\overline{)x^3+3x^2-10x-24}$ $\quad x+4$ or $x-3\overline{)x^3+3x^2-10x-24}$ $\quad x^2+6x+8$ Allow a quotient of $x+b$ or x^2+6x+b where b is a constant.
	A1	For the correct factorised expression $(x+4)(x-3)(x+2)$ which must be written out in full on one line.