Question	Scheme	Marks	AOs
2	Sets $f(-2)=0 \Rightarrow (-2-4)\,\left(\left(-2\right)^2-3\times-2+k\right)-42=0$	M1	3.1a
	$-6\,(k+10)=42 \Rightarrow k=...$	M1	1.1b
	$k=-17$	A1	1.1b
		(3)	
			(3 marks)
Notes:			

M1: Attempts $f(-2)=0$ leading to an equation in *k*. So $(-2-4)\,\left(\left(-2\right)^2-3\times-2+k\right)-42=0$ is fine

Condone slips but expect to see a first bracket of $(-2-4)$.

"-42" must not be omitted but could appear as +42 with a sign slip.

There may have been attempts to expand $f(x)=(x-4)(x^2-3x+k)-42$ before attempting to set $f(-2)=0$. This is acceptable and condone slips/errors in the expansion, but the 42 must be present. FYI the expanded (and simplified) $f(x)=x^3-7x^2+(12+k)x-4k-42$

M1: Solves a **linear** equation in *k* as a result of setting $f(\pm 2)=0$.

The ± 42 must be there at some point when the substitution is made.

Allow minimal evidence here. A linear equation leading to a solution is fine.

If $f(x)$ is expanded then it is dependent upon being a cubic which contains a *kx* term and a '42'

A1: $k=-17$ correct answer following correct work but allow recovery from invisible brackets

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Answers of $k=-17$ may appear with very little or no working, perhaps via trial and improvement. If so, then marks can only be allocated if evidence is shown.

E.g. $k=-17 \Rightarrow f(x)=(x-4)\,(x^2-3x-17)-42$

$f(-2)=(-6)\times(-7)-42=0$. Hence $\left(x+2\right)$ is a factor.

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More difficult alternative methods may be seen

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Alt I : You may see attempts via division / inspection

$$x+2\overline{\big)x^3-7x^2+(12+k)x-4k-42}\quad\text{quotient } x^2-9x+(k+30)$$

Then sets remainder $-6k-102=0 \Rightarrow k=-17$

$$\underline{\overline{-6k-102}}$$

M1: For dividing their cubic by (x+2) which has both an x and a constant coefficient in k, leading to a quadratic quotient and a linear remainder in k which is then set = 0

M1: Solves a equation resulting from setting a linear remainder in k equal to 0 . It is dependent on the first M via this route

A1: Completely correct with $k=-17$

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Alt II: You may also see a grid or an attempt at factorisation via inspection

	x^2	$-9x$	$-2k-21$
x	x^3	$-9x^2$	$(-2k-21)x$
$+2$	$2x^2$	$-18x$	$-4k-42$

OR $x^3-7x^2+(12+k)x-4k-42 \equiv (x+2)\left(x^2-9x-2k-21\right)$

which should be followed by equating the x terms to form an equation in k

$$12+k=-18-2k-21 \Rightarrow 3k=-51 \Rightarrow k=-17$$

OR $x^3-7x^2+(12+k)x-4k-42 \equiv (x+2)\left(x^2-9x+k+30\right)$

which should be followed by equating the constant terms to form an equation in k

$$-4k-42=2\left(k+30\right) \Rightarrow 6k=-102 \Rightarrow k=-17$$

The above are examples. There may be other correct attempts so look at what is done.

M1: For an attempt at factorising E.g. $x^3-7x^2+(12+k)x-4k-42 \equiv (x+2)\left(x^2+bx+c\right)$ and attempting to set up three equations in b, c and k. E.g $2+b=-7,\ 2b+c=12+k,\ 2c=-4k-42$

The expanded f(x) must be a cubic which contains both a kx term and a '42'

M1: Solves the equations set up from an allowable equation to find k. It is dependent via this route.

A1: Completely correct with $k=-17$

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