Question Number	Scheme	Marks
4 (a)	$\dfrac{a\left(1-r^3\right)}{1-r}=70.2$, $\dfrac{a}{1-r}=75$	B1, B1
	Sub (2) in (1) $\quad 75\left(1-r^3\right)=70.2 \Rightarrow r^3=\left(0.064\right)$	M1
	$r=0.4$	A1
		(4)
(b)	Substitutes $r=0.4$ into $\dfrac{a}{1-r}=75$ and finds a	M1
	$a=45$	A1
		(2)
		(6 marks)

(a)

B1: One correct equation. Most of the time it is one of

- $\dfrac{a}{1-r}=75$
- $\dfrac{a\left(1-r^3\right)}{1-r}=70.2$, $a+ar+ar^2=70.2$ o.e.

B1: Two different equations that allow the problem to be solved.

Another more complicated option that can be used (with either of the above bullets) is

$\dfrac{a}{1-r}-\dfrac{a\left(1-r^3\right)}{1-r}=4.8$

M1: Combines both necessary equations (condoning numerical slips e.g. 72.0 for 70.2) and proceeds to an equation of the form $\delta r^3=\beta$. Also condone the equations of the same form with sign slips

$\dfrac{a}{r-1}=75$

Working is necessary here so candidates cannot just write down the equations and the solution without sight of the line $\delta r^3=\beta$ or $\delta r^3-\beta=0$.

A more complicated method involves substituting $a=75-75r$ into $a-ar^3=70.2(1-r)$ to produce a simplified quartic equation in *r*. FYI the correct simplified equation is $75r^4-75r^3-4.8r+4.8\left(=0\right)$.

If they achieve a simplified quartic equation in *r* and write down a value for r $\left(r\neq 1, r\in \mathbb{R}\right)$ that solves their equation they can score M1. So, if they write down the correct simplified equation followed by $r=0.4$ from their calculator they can score M1, A1.

If you spot a method that does not proceed via one of these two methods and you feel deserves credit, then please send to review

A1: $r=0.4$ only, following award of the method mark.

(b)

M1: Substitutes their value of $r, \left|r\right|<1$, found in part (a) into one of their correct equations and find a value for *a*.

Candidates cannot just make up a value. It must follow a value in *r* found from an equation in just *r*.

A1: $a=45$ Can only be awarded if two correct equations are written down and $r=0.4$

Part (b) can be done via substituting $r = 1 - \frac{a}{75}$ into $a + ar + ar^2 = 70.2$ for example, to produce an equation in just a, FYI $\frac{a^3}{5625} - \frac{a^2}{25} + 3a - 70.2 = 0$ This can score M1for setting up and solving a cubic with A1 for the correct cubic with $a = 45$

Question Number	Scheme	Marks
5 (a)	$\mathrm{f}(x)=3x^3+ax^2-10x+b$	
	$\mathrm{f}\left(\frac{4}{3}\right)=0\Rightarrow 3\times\left(\frac{4}{3}\right)^3+a\left(\frac{4}{3}\right)^2-10\left(\frac{4}{3}\right)+b=0$	M1
	$\frac{64}{9}+\frac{16}{9}a-\frac{40}{3}+b=0\Rightarrow 64+16a-120+9b=0\ \ \Rightarrow 16a+9b=56$ *	A1*
		(2)
(b)	$\mathrm{f}(2)=b\Rightarrow 3\times(2)^3+a(2)^2-10(2)+b=b$ leading to an equation in just a	M1
	$4a=-4\Rightarrow a=-1$	A1
	Substitutes $a=\text{'}-1\text{'}$ in $-16+9b=56\Rightarrow b=...$	M1
	$\Rightarrow b=8$	A1
		(4)
(c)	$\mathrm{f}(x)=3x^3-x^2-10x+8=(3x-4)(x^2+x-2)$	M1, A1
	$=(3x-4)(x+2)(x-1)$	A1
		(3)
		(9 marks)

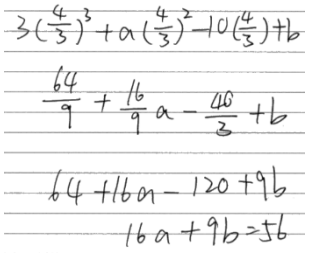
(a)

M1: Sets $\mathrm{f}\left(\frac{4}{3}\right)=0$ producing an equation in a and b. Condone slips but the intention must be clear.

For example, $3\times\frac{4^3}{3}+a\times\frac{4^2}{3}-10\times\frac{4}{3}+b=0$ is incorrect but the intention is clear and scores M1, A0

Finding a simplified $\mathrm{f}\left(\frac{4}{3}\right)=\frac{64}{9}+\frac{16}{9}a-\frac{40}{3}+b=\frac{16}{9}a-\frac{56}{9}+b$ before setting it equal to 0 is acceptable

Candidates who find $\mathrm{f}\left(\frac{4}{3}\right)$ and proceed to a correct equation without ever stating $\mathrm{f}\left(\frac{4}{3}\right)=0$ or setting their expression for $\mathrm{f}\left(\frac{4}{3}\right)$ equal to 0 can be awarded M1, A0 by implication.



Example of M1 A0*:

Candidate attempts $\mathrm{f}\left(\frac{4}{3}\right)$ which they then simplify (and then multiply by 9)

The final line implies $9\times\mathrm{f}\left(\frac{4}{3}\right)=0$ and so implies $\mathrm{f}\left(\frac{4}{3}\right)=0$

Setting $\mathrm{f}\left(-\frac{4}{3}\right)=0$ is M0

A1*: Shows that $16a+9b=56$. This is a given answer so there must be no incorrect lines (no recovery) or working. You do not explicitly need to see the $\text{'f}\left(\frac{4}{3}\right)\text{'}$ just its result, see below.

It is acceptable to have just one correct intermediate line with either collected terms or non-fractional coefficients between $3\times\left(\frac{4}{3}\right)^3+a\left(\frac{4}{3}\right)^2-10\left(\frac{4}{3}\right)+b=0$ and $16a+9b=56$

For example: $3\times\left(\frac{4}{3}\right)^3+a\left(\frac{4}{3}\right)^2-10\left(\frac{4}{3}\right)+b=0\Rightarrow\frac{16}{9}a+b-\frac{56}{9}=0\Rightarrow 16a+9b=56$ scores M1 A1