Question Number	Scheme	Marks
2.(a)	E.g. $64\times\left(-\frac{1}{2}\right)^3=-8$ ✓ *	M1, A1* **(2)**
(b)	Finds the value of a. E.g. $64\div\left(-\frac{1}{2}\right)^2=256$	M1, A1
	Uses $S_\infty=\frac{a}{1-r}=\frac{256}{1-\left(-\frac{1}{2}\right)}=\frac{512}{3}$	M1, A1 **(4)** **(6 marks)**

(a)

M1: Any acceptable attempt to prove the statement.

This usually involves getting to an equation in r…

E.g. I $ar^2=64,\quad ar^5=-8\ \Rightarrow 64r^3=-8$ o.e. such as $ar^2=64,\quad ar^5=-8\ \Rightarrow r^{-3}=-8$

E.g. II $ar^2=64,\quad ar^5=-8\ \Rightarrow \frac{64}{r^2}=\frac{-8}{r^5}$

(the numbers used in the attempt, that is 64 and -8 must be correct)

but could involve using the given answer

E.g. III $64\times\left(-\frac{1}{2}\right)^3$, $64\times-\frac{1}{2}\times-\frac{1}{2}\times-\frac{1}{2}$ or $-8\div\left(-\frac{1}{2}\right)^3$

Condone the following types of slips/errors

E.g. I or II with incorrect indices on terms as long as they differ by 3;

$ar^3=64,\quad ar^6=-8\ \Rightarrow r^3=-\frac{8}{64}$

E.g. III with missing brackets $64\times-\frac{1}{2}^3$

A1*: Fully correct proof. A minimal proof could be $r^3=-\frac{8}{64}\Rightarrow r=-\frac{1}{2}$ o.e

As the result is given a direct proof must have a penultimate line equivalent of $r^3=-\frac{8}{64}$ or $r^{-3}=-8$

If they state $64r^3=-8$ followed by $r=-\frac{1}{2}$ without any intermediate work then it is M1 A0

If they assume the answer then expect to see equivalent to $64\times\left(-\frac{1}{2}\right)^3=-8$ which must be followed by a concluding statement (tick sufficient) is required.

Equivalent work would be $64\xrightarrow{\times-\frac{1}{2}}-32\xrightarrow{\times-\frac{1}{2}}16\xrightarrow{\times-\frac{1}{2}}-8$ ✓

This mark cannot be awarded from incorrect indices on r or missing brackets (that are necessary)

(b) **The marks for the following can only be awarded from work in part (b)**

M1: Uses a suitable method to find the value of *a* allowing $r = \pm\frac{1}{2}$

E,g. Attempts $a \times \left(\pm\frac{1}{2}\right)^2 = 64 \Rightarrow a = ...$

Condone a missing bracket e.g. $a \times -\frac{1}{2}^2 = 64 \Rightarrow a = ...$

A1: States or implies that $a = 256$ via the correct $r = -\frac{1}{2}$.

Stating the value scores the two marks. Note that $a \times \frac{1}{4} = 64 \Rightarrow a = 256$ is M1, A1 (nothing incorrect)

This can be awarded following a missing bracket. (It isn't a proof)

M1: Uses $S_\infty = \frac{a}{1-r}$ with a value of $a \neq 64, -8$ and $r = \pm\frac{1}{2}$

So award $S_\infty = \frac{'a'}{1-\frac{1}{2}} = ...$ or $S_\infty = \frac{'a'}{1-\left(-\frac{1}{2}\right)} = ...$ but if an incorrect formula is stated score it M0

A1: $\frac{512}{3}$ o.e . ISW after a correct answer.

Condone $170.\dot{6}$ but do not allow awrt 170.7 unless the exact correct answer is seen first.

Question Number	Scheme	Marks
	$f(x)=\left(3x^2-4x-5\right)(x-k)-5$	
3 (a)	States -5	B1 **(1)**
(b)	Sets $f(-2)=25\rightarrow\ (3\times4-4\times-2-5)(-2-k)-5=25$	M1
	$15(-2-k)=30\Rightarrow-2-k=2\Rightarrow k=-4$ *	A1* **(2)**
(c)	$\left(3x^2-4x-5\right)(x+4)-5=3x^3+8x^2-21x-25$	B1
	Attempts $3x-1\overline{)3x^3+8x^2-21x-25}$ to achieve quotient of $...x^2+...x+...$ and a remainder that is a constant	M1
	Quotient = x^2+3x-6 OR Remainder = -31	A1ft
	Quotient = x^2+3x-6 AND Remainder = -31	A1 **(4)** **(7 marks)**

(a)

B1: States -5

You may see $f(k)$ or a division sum attempted, which is fine. You are just awarding the sight of -5

Don't be too concerned about what -5 is called. You may see $f(x)$, $f(k)$ or even x

(b)

M1: Sets $f(-2)=25$ to form an equation in k Condone sign slips within the calculations but setting $f(-2)=-25$ or $f(2)=25$ is M0. Some may attempt to substitute -2 into the expanded form of $f(x)=3x^3-(4+3k)x^2+(4k-5)x+5k-5$ which is fine. Condone slips but expect to see linear coefficients for k in each of x^2, x and the constant terms.

Don't be concerned about poor attempts to solve the equation in k for this mark

A1*: Shows sufficient working with no errors to prove that $k=-4$.

The answer must follow a simplified and (easily) solvable equation.

(See scheme for possible route but allow simplified linear equations like $-30-15k=30$)

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M1: Alternatively substitutes $k=-4$ into $f(x)$ to get $\left(3x^2-4x-5\right)(x+4)-5$ and attempt the value of $f(-2)$

A1: Shows that $f(-2)=(12+8-5)(-2+4)-5=15\times2-5=25$ and makes a minimal conclusion e.g. ✓

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