Question Number	Scheme	Marks
1.		

a	*b*	*c*	*abc*
2	**15**	**3**	**90**
3	**9**	**8**	**216**
4	**1**	**15**	**60**
All values of *abc* are multiples of 6			

One correct set *a*, *b* & *c* — B1

Two correct rows — M1

Fully correct + statement — A1

(3 marks)

Main method: Numerical answer finding all known solutions

B1: Any correct set of values for *a*, *b* and *c*. You can ignore any attempt at the product *abc*

M1: Any two fully correct rows including the correct calculations for the products.
Condone any extra or incorrect rows

A1: Fully correct. The solution must have

- the three correct rows with correct calculations for *abc*
- any extra (or incorrect) rows that may be present must be deleted or somehow excluded
- a minimal statement showing that they are aware that 90, 216 and 60 are multiples of 6.
  E.g they are all divisible by 6, use of a tick ✓, proven, QED, calculations such as $\frac{90}{6}=15$. They can be divided by 6 (on its own) is insufficient without further clarification such as "to give whole numbers"
- no incorrect calculations. E.g if their attempt to prove that 90 being a multiple of 6 includes $\frac{90}{6}=10$ then it is A0

Algebraic solution or solutions that rely on explanations: These will be rare and unlikely to lead to completely correct solutions.

Example of an attempt that has some merit based upon odds and evens

If *a* is even
Then $a=2n$, leading to $c=4n^2-1=(2n+1)(2n-1)$ and $b=21-4n^2-2n$
giving $abc=2n(21-4n^2-2n)(2n+1)(2n-1)$

If *a* is odd.
Then $a=2n+1$, leading to $c=4n^2+4n=4n(n+1)$ and $b=19-4n^2-6n$
giving $abc=(2n+1)(19-4n^2-6n)4n(n+1)$

B1: Attempts both odd and even and achieves correct algebraic expressions for *a*, *b* and *c* in both cases.
M1: Correct products with attempts when $n=1, 2$ and achieves two fully correct rows
A1: Fully correct with no additional rows

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)