Question Number	Scheme	Marks
7(a)	$r = \sqrt{\frac{12.8}{20}} = 0.8*$ or e.g. $20 \times 0.8 \times 0.8 = 12.8$ so $r = 0.8*$	B1*
		(1)
(b)	$a = 20 \div 0.8^2$	M1
	$= 31.25$	A1
		(2)
(c)	$\frac{31.25\left(1-0.8^n\right)}{1-0.8} > 156$	M1
	Eg $1-0.8^n > 0.9984$ $\Rightarrow 0.8^n < 0.0016$	dM1
	$0.8^n < 0.0016 \Rightarrow n > \frac{\log\left(0.0016\right)}{\log(0.8)}$ or $0.8^n < 0.0016 \Rightarrow n > \log_{0.8} 0.0016$	M1
	$n = 29$	A1
		(4)
		Total 7

(a)

B1* Correctly demonstrates $r = 0.8$ oe with no incorrect working seen. If they use 0.8 within their solution there must be either some preamble or concludes $r = 0.8$

Minimum acceptable is an expression for r which is not 0.8 or an equation involving r with all values substituted in. At some point we must see r being linked with 0.8 either as part of an equation or e.g. with a conclusion $r = 0.8$

May all be in fractions instead eg $20 \times \frac{4}{5} \times \frac{4}{5} = \frac{64}{5} \Rightarrow r = \frac{4}{5}$ is B1

Note that $ar^5 = 12.8,\ ar^3 = 20 \Rightarrow r = \sqrt{\frac{12.8}{20}} = 0.8$ is B0

(b) Work seen in (a) must be used or stated in (b) to score.

M1 Correct method for the first term. Score for the expression $12.8 \div 0.8^4$ or $20 \div 0.8^2$ oe

May be seen as $\frac{64}{5} \div \left(\frac{4}{5}\right)^4$ (Do not penalise invisible brackets for this mark).

If a candidate has stated incorrectly $ar^5 = 12.8$ or $ar^3 = 20$ in (a) then allow M1 if they use this correctly to find a for their equation.

A1 31.25 or $\frac{125}{4}$ or $31\frac{1}{4}$ with no incorrect working seen

(c) Note on EPEN this is M1A1M1A1 but we are marking this M1M1M1A1

M1 Attempts to set up an equation or inequality using their first term and $r = 0.8$ in the sum formula.

Score for $\dfrac{"31.25"\left(1-0.8^n\right)}{1-0.8}...156$ (Allow any inequality or =)

May be seen as $\dfrac{"\frac{125}{4}"\left(1-\left(\frac{4}{5}\right)^n\right)}{1-\frac{4}{5}}...156$

dM1 Rearranges to $A\times 0.8^n...B$ where A could be 1 and B could be unsimplified (Allow any inequality or =). Do not be concerned by the mechanics of their rearrangement. It is dependent on the first method mark. May be implied by further work if logarithms are used correctly.

M1 Attempts to find n by solving $0.8^n...\text{their } 0.0016$ **using logarithms** correctly. (May appear as $0.8^n...\text{their}\dfrac{1}{625}$ or even $0.8^{-n}...\text{their}\,625$. Cannot be scored from an unsolvable equation. (Allow any inequality or =).

This can also be scored for solving an equation or inequality involving a term rather than the sum such as $0.8^{n-1}=...$

A1 29 cso (It must have come from a correct equation (although allow any inequality)).

All three Ms must have been earned.

Examples for the last two marks in (c)

e.g. 1 $0.8^n < 0.0016 \Rightarrow n = 29$ scores M0A0 (no method seen)

e.g. 2 $0.8^n < 0.0016 \Rightarrow n = 28.85 = 29$ scores M0A0 (no method seen)

e.g. 3 $0.8^n < 0.0016 \Rightarrow n < \dfrac{\log(0.0016)}{\log(0.8)} \Rightarrow n = 29$ scores M1A1 (condoning the incorrect inequality sign in intermediate work)

Note: Methods relying on trial and improvement or the equation solver will usually only score a maximum M1dM1M0A0 for setting up the equation or inequality to $A\times 0.8^n...B$

Question Number	Scheme	Marks
8(i)	$5\sin\left(3x+0.1\right)+2=0$ $\Rightarrow 5\sin\left(3x+0.1\right)=-2$ $\Rightarrow \sin\left(3x+0.1\right)=-\frac{2}{5}$	M1
	$\sin\left(3x+0.1\right)=-\frac{2}{5}$ $\Rightarrow 3x+0.1=\sin^{-1}\left(-\frac{2}{5}\right)$ $\Rightarrow x=\frac{\sin^{-1}\left(-\frac{2}{5}\right)-0.1}{3}$	dM1
	$x=-0.94,\ -0.17,\ 1.15,\ 1.92$	A1A1
		(4)
(ii)	$2\tan\theta\sin\theta=\cos\theta+5$ $\Rightarrow 2\sin^2\theta=\cos^2\theta+5\cos\theta$	M1
	$\Rightarrow 2\left(1-\cos^2\theta\right)=\cos^2\theta+5\cos\theta$	M1
	$\Rightarrow 3\cos^2\theta+5\cos\theta-2=0$	A1
	$\cos\theta=\frac{1}{3}\left(,-2\right)$ $\Rightarrow \theta=\cos^{-1}\left(\frac{1}{3}\right)=...$	M1
	$\left(\theta=\right)\ 70.5°,\ 289.5°$	A1
		(5)
		Total 9

Answers with no working score 0 marks

(i)

M1 For ±2 and then dividing by 5 to reach $\sin(3x+0.1)=\pm\frac{2}{5}$ oe

May be implied by $3x+0.1=\pm0.411...$ or allow a different variable to be used such that $y=3x+0.1\ \Rightarrow\sin(y)=\pm\frac{2}{5}$.

Condone $3x+0.1=\pm23.57...$ if they have incorrectly worked in degrees for this mark only.