Question Number	Scheme	Marks
5 (a)	Attempts $30\,000\times r^3 = 34\,000$	M1
	$r^3 = \dfrac{17}{15} \Rightarrow r = 1.0426$ Hence $p = 4.26$	A1 A1ft
		[3]
(b)	Attempts $30\,000\times(1.0426)^{"N"} = 75\,000$ or with > or < etc throughout.	M1
	$(1.0426)^{"N"} = \dfrac{5}{2}$	A1
	Takes logs $"N" = \dfrac{\log\left(\frac{5}{2}\right)}{\log 1.0426}$ (= awrt 21.96)	M1 A1
	$N = 22$	B1
		[5]
		(8 marks)

(a)

M1 Attempts to find the common ratio by use of $30\,000\times r^3 = 34\,000$ or $30\,000\times r^2 = 34\,000$. Must involve taking a root. It may be called *p.* Condone slips on the 30000 or 34000.

A1 For awrt 1.04. It may be called *p*

A1ft $p = 4.26$ or follow through on a correct percentage to 2 d.p. for their *r* if the method has been earned (usually 6.46). Note it must be 2d.p. for this mark.

(b)

M1 States/uses $30\,000\times("r")^{"N"} = 75\,000$ or $30\,000\times("r")^{"N-1"} = 75\,000$ with their ratio *r,* but not if their percentage is used. E.g. follow through on their 1.0426 but not 4.26

A1 "Correct" intermediate statement $("r")^{"N"} = \dfrac{5}{2}$ or $("r")^{"N-1"} = \dfrac{5}{2}$

Accept $r =$ awrt 1.04 or $r =$ awrt 1.06 if r^2 was used in (a)

M1 Uses logs correctly $"N" = \dfrac{\log\left(\frac{5}{2}\right)}{\log"1.0426"}$ or $"N-1" = \dfrac{\log\left(\frac{5}{2}\right)}{\log"1.0426"} =$ or $"N" = \log_{"1.0426"}\left(\dfrac{5}{2}\right) =$

Award for the correct solution of any index equation using logs (correctly). The equation may be from incorrect work, e.g having used S_n but must be a solvable equation (ie positive base and operand)

A1 Correct expression for *N* or $N =$ awrt 21.96 following correct work

B1 Depends on $r =$ awrt 1.04 and ar^N used. It is for 22 or f.t. their "*N*" rounded up to nearest integer providing the only errors have been due to rounding. E.g. For $r = 1.04$ this will be for $N = 24$

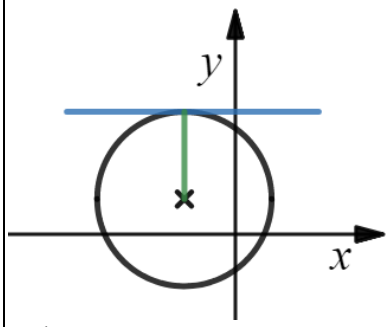
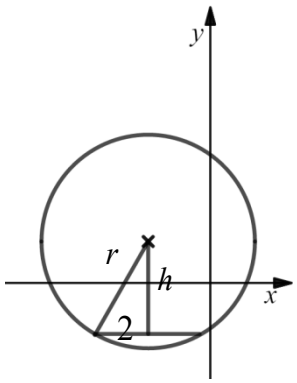
Note: Accept answers in (b) using inequalities and don't be concerned about the inequalities.

S.C. If power $N - 1$ is used then $N = 22.962$ will be reached if all is correct. If they then round down to 22 then the final A and B can be recovered (it is correct work).

SC For trial and improvement M1 Tries $30\,000\times("r")^N$ with *N* either side of 22 or appropriate value for their *r* (eg 15 for 1.0646) with A1 correct values found either side of 75000 for $r =$ awrt 1.04 or 1.06

M1 Values for *N* directly either side of 75000 found for their *r*. A1 Must be using $r = 1.0426$. Finds $30\,000\times(1.0426)^{21} = 72043$ and $30\,000\times(1.0426)^{22} = 75112$.

B1 Deduces 22 or f.t. $N = 24$ for $r = 1.04$.

Question Number	Scheme	Marks
6.(a)	$x^2+y^2+6x-4y-14=0$	
	Attempts $(x\pm3)^2+(y\pm2)^2$ .....$(=0)$	M1
	(i) Centre $(-3,2)$	A1
	(ii) Radius $\sqrt{27}$ or $3\sqrt{3}$	A1 **(3)**
(b)	 Attempts $y/k="2"\pm"3\sqrt{3}"$	M1
	Both $k=2+3\sqrt{3}$ and $k=2-3\sqrt{3}$	A1 **(2)**
	Alt:	
	$y=k\Rightarrow x^2+6x+k^2-4k-14=0$	
	$\Rightarrow b^2-4ac=0\Rightarrow 6^2-4\times1\times\left(k^2-4k-14\right)=0$	
	$\Rightarrow 4k^2-16k-92=0\Rightarrow k=...$	M1
	$k=2\pm3\sqrt{3}$ (oe)	A1 **(2)**
(c)	 Attempts Pythagoras to find h $h^2=r^2-2^2$	M1
	Attempts $p=2-h$ $p=2-\sqrt{23}$ (oe)	dM1 A1 **(3)**
	Alt1: chord touches circle when $x=-1$ (or -5) or need $(x+3)=\pm2$	M1
	$\Rightarrow 2^2+(y-2)^2=27\Rightarrow y=...$ or $(-1)^2+y^2+6(-1)-4y-14=0\Rightarrow y=...$	dM1
	$p=2-\sqrt{23}$	A1 **(3)**
	Alt2: Sets $y=p$ and applies difference of roots to be 4	
	$\Rightarrow x^2+6x+p^2-4p-14=0\Rightarrow x=\dfrac{-6\pm\sqrt{36-4(p^2-4p-14)}}{2}$	M1
	$\Rightarrow 2\sqrt{23+4p-p^2}=4$	dM1
	$\Rightarrow p^2-4p-19=0\Rightarrow p=...$	A1
	$p=2-\sqrt{23}$	**(3)** **(8 marks)**