

Question	Scheme	Marks	AOs
5(a)	$u_3 = £20000 \times 1.08^2 = (£)23328^*$	B1*	1.1b
		(1)	
(b)	$20\,000 \times 1.08^{n-1} > 65\,000$	M1	1.1b
	$1.08^{n-1} > \frac{13}{4} \Rightarrow n-1 > \frac{\ln(3.25)}{\ln(1.08)}$ or e.g. $1.08^{n-1} > \frac{13}{4} \Rightarrow n-1 > \log_{1.08} \left(\frac{13}{4} \right)$	M1	3.1b
	Year 17	A1	3.2a
		(3)	
(c)	$S_{20} = \frac{20000(1-1.08^{20})}{1-1.08}$	M1	3.4
	Awrt (£) 915 000	A1	1.1b
		(2)	
(6 marks)			
Notes			

(a)

B1*: Uses a correct method to show that the Profit in Year 3 will be £23 328. Condone missing units

E.g. $£20\,000 \times 1.08^2$ or $£20\,000 \times 108\% \times 108\%$

This may be obtained in two steps. E.g. $\frac{8}{100} \times 20000 = 1600$ followed by $\frac{8}{100} \times 21600 = 1728$ with the calculations $21600 + 1728 = 23328$ seen.

Condone calculations seen as 8% of $20000 = 1600$.

This is a show that question and the method must be seen.

It is not enough to state Year 1 = £21 600, Year 2 = £ 23 328

(b)

M1: Sets up an inequality or an equation that will allow the problem to be solved.

Allow for example N or n for $n - 1$. So award for $20\,000 \times 1.08^{n-1} > 65\,000$,
 $20\,000 \times 1.08^n = 65\,000$ or $20\,000 \times (108\%)^n \geq 65\,000$ amongst others.

Condone **slips** on the 20 000 and 65 000 but the 1.08 o.e. must be correct

M1: Uses a correct strategy involving logs in an attempt to solve a type of equation or inequality of the form seen above. It cannot be awarded from a sum formula

The equation/inequality must contain an index of $n - 1$, N , n etc.

Again condone **slips** on the 20 000 and 65 000 but additionally condone an error on the 1.08, which may appear as 1.8 for example

$$\text{E.g. } 20\,000 \times 1.08^n = 65\,000 \Rightarrow n \log 1.08 = \log \frac{65\,000}{20\,000} \Rightarrow n = \dots$$

$$\text{E.g. } 20\,000 \times 1.8^n = 65\,000 \Rightarrow \log 20\,000 + n \log 1.8 = \log 65\,000 \Rightarrow n = \dots$$

A1: Interprets their decimal value and gives the correct year number. Year 17

The demand of the question dictates that solutions relying entirely on calculator technology are not acceptable, BUT allow a solution that appreciates a **correct term** formula or the entire set of

calculations where you may see the numbers as part of a larger list

E.g. Uses, or implies the use of, an acceptable calculation and finds value(s)

for M1: $(n = 16) \Rightarrow P = 20\,000 \times 1.08^{15} = \text{awrt } 63\,400$ or $(n = 17) \Rightarrow P = 20\,000 \times 1.08^{16} = \text{awrt } 68\,500$

M1: $(n = 16) \Rightarrow P = 20\,000 \times 1.08^{15} = \text{awrt } 63\,400$ and $(n = 17) \Rightarrow P = 20\,000 \times 1.08^{16} = \text{awrt } 68\,500$

A1: 17 years following correct method and both M's

(c)

M1: Attempts to use the model with a **correct** sum formula to find the total profit for the 20 years.

You may see an attempt to find the sum of 20 terms via a list. This is acceptable provided there are 20 terms with $u_n = 1.08 \times u_{n-1}$ seen at least 4 times and the sum attempted.

Condone a slip on the 20 000 (e.g appearing as 2 000) and/or a slip on the 1.08 with it being the same "r" as in (b) . Do not condone 20 appearing as 19 for instance

A1: awrt £915 000 but condone missing unit

The demand of the question dictates that all stages of working should be seen. An answer without working scores M0 A0