

Question	Scheme	Marks	AOs	
12 (a)	(i) Method to find p Eg. Divides $32000 = Ap^4$ by $50000 = Ap^{11}$ $p^7 = \frac{50000}{32000} \Rightarrow p = \sqrt[7]{\frac{50000}{32000}} = \dots$	M1	3.1a	
	$p = 1.0658$	A1	1.1b	
	(ii) Substitutes their $p = 1.0658$ into either equation and finds A $A = \frac{32000}{'1.0658'^4} \text{ or } A = \frac{50000}{'1.0658'^{11}}$	M1	1.1b	
	$A = 24795 \rightarrow 24805 \approx 24\ 800 *$	A1*	1.1b	
			(4)	
(b)	A / (£)24 800 is the value of the car on 1st January 2001	B1	3.4	
	$p / 1.0658$ is the factor by which the value rises each year. Accept that the value rises by 6.6 % a year (ft on their p)	B1	3.4	
		(2)		
(c)	Attempts $100000 = '24800' \times '1.0658'^t$			
	$'1.0658'^t = \frac{100000}{24800}$	M1	3.4	
	$t = \log_{1.0658} \left(\frac{100000}{24800} \right)$	dM1	1.1b	
	$t = 21.8 \text{ or } 21.9$	A1	1.1b	
	cso 2022	A1	3.2a	
			(4)	

(10 marks)

(a) (i)
M1: Attempts to use both pieces of information within $V = Ap^t$, eliminates A correctly and solves an equation of the form $p^n = k$ to reach a value for p .
 Allow for slips on the 32 000 and 50 000 and the values of t .
A1: $p = \text{awrt } 1.0658$
 Both marks can be awarded from incorrect but consistent interpretations of t . Eg.
 $32000 = Ap^5$, $50000 = Ap^{12}$

(a)(ii)
M1: Substitutes their $p = 1.0658$ into either of their equations and finds A
 Eg $A = \frac{32000}{1.0658^4}$ or $A = \frac{50000}{1.0658^7}$ but you may follow through on incorrect equations from part (i)
A1*: Shows that A is between 24 795 and 24 805 before you see ' $=24\ 800$ ' or ' ≈ 24800 '. Accept with or without units.
 An alternative to (ii) is to start with the given answer.
M1: Attempts $24800 \times '1.0658'^4 = (32000.34)$

A1: 24800×1.0658^4 , achieves a value between 31095 and 32005 followed by $\approx 32\ 000$ hence A must be $\approx 24\ 800$

(b)

B1: States that A is the value of the car on 1st January 2001.

The statement must reference **the car**, its **cost/value**, and **'0' time**

Allow 'it is the initial value of the car' "it is the cost of the car at $t = 0$ " "it is the cars starting value"

B1: States that p is the rate at which the value of the car rises each year.

The statement must reference **a yearly rate** and **an increase in value or multiplier**.

They could reference the 1.0658 Eg "The cars value rises by 6.5 % each year."

Allow " p is the rate the cars value is rising each year" "it is the proportional increase in value of the car each year" "the factor by which the value of the car is rising each year" 'its value appreciates by 6.5% per year' Allow 'the value of the car multiplies by p each year'

Do not allow "by how much the value of the car rises each year" or "it is the rate of inflation"

(c)

M1: Uses the model $100000 = 24800 \times 1.0658^t$ and proceeds to their $1.0658^t = k$

Allow use of any inequality here.

dM1: For the complete method of (i) using the information given with their equation of the model **and** (ii) translating the situation into a correct method to find ' t '

A1: $(t) = \text{awrt } 21.8 \text{ or } 21.9 \text{ or } \log_{1.0658} \left(\frac{100000}{24800} \right) \text{ oe}$

A1: States in the year 2022. A candidate using a GP formula can be awarded full marks

Allow different methods in part (c).

Eg Via GP a formula

M1: $24800 \times 1.0658^{n-1} = 100000 \Rightarrow 1.0658^{n-1} = K$

dM1: Uses a correct method to find n .

A2: 2022

Via (trial and improvement)

M1: Uses the model by substituting integer values of t into their $V = Ap^t$ so that for $t = n, V < 100\ 000$ or $t = n+1, V > 100\ 000$

(So for the correct A and p this would be scored for $t = 21, V \approx \pounds 95\ 000$ or $t = 21, V \approx \pounds 101\ 000$)

dM1: For a complete method showing that this is the least value. So both of the above values

A1: Allow for 22 following correct and accurate results (awrt nearest $\pounds 1000$ is sufficient accuracy)

A1: As before