Question	Scheme	Marks	AOs
12(a)	Attempts to find the gradient of l: $m = \frac{1.7-0.8}{1.2-0.6} = \frac{0.9}{0.6} = \frac{3}{2}$	M1	1.1b
	$\log_{10} P - 0.8 = \frac{3}{2}(\log_{10} t - 0.6)$ or $\log_{10} P - 1.7 = \frac{3}{2}(\log_{10} t - 1.2)$	dM1	1.1b
	$\log_{10} P = \frac{3}{2}\log_{10} t - 0.1$	A1	1.1b
		(3)	
(b)	Way 1: As $P = at^b$ then $\log_{10} P = \log_{10} a + b\log_{10} t$ Way 2: As $\log_{10} P = \frac{3}{2}\log_{10} t - 0.1$ $P = 10^{\frac{3}{2}\log_{10} t - 0.1}$	M1	2.1
	$\log_{10} a = -0.1$ and $b\log_{10} t = \frac{3}{2}\log_{10} t$ $10^{\frac{3}{2}\log_{10} t - 0.1} \Rightarrow 10^{\log_{10} t^{\frac{3}{2}} - 0.1}$ and $10^{\frac{3}{2}\log_{10} t - 0.1} \Rightarrow 10^{\frac{3}{2}\log_{10} t} 10^{-0.1}$	dM1	1.1b
	(Hence $a = 10^{-0.1}$, $b = \frac{3}{2}$) $\Rightarrow P = 0.794t^{\frac{3}{2}}$	A1	3.3
		(3)	
(c)	a represents the (total) profit (in thousands of pounds) the business made in the first month.	B1	3.4
		(1)	
(d)	Either $0.794 \times 48^{\frac{3}{2}} \{= 264.0\}$ or $0.794 \times 47^{\frac{3}{2}} \{= 255.8\}$	M1	3.1b
	Change in $P = 0.794 \times 48^{\frac{3}{2}} - 0.794 \times 47^{\frac{3}{2}}$ leading to profit of £8208	A1	3.2a
	The model is suitable as 8208 is (relatively) close to 8300.	A1ft	3.5a
		(3)	
(e)	Any valid reason, e.g., • The model predicts that the profit will increase without limit. • The model does not account for any external factors that could affect profit. • It is unlikely that the profit will continue to increase in this manner in the long term.	B1	3.5b
		(1)	
			(11 marks)

Notes:

(a)

M1: Attempts to find the gradient of l_1 using $\frac{\Delta y}{\Delta x}$.

dM1: Uses $y - y_1 = m(x - x_1)$ with either $(0.6, 0.8)$ or $(1.2, 1.7)$ and their $m = "\frac{3}{2}"$

If $y = mx + c$ is used they must proceed as far as $c = \ldots$

Condone the use of *x* and *y* here.

A1: $\log_{10} P = \frac{3}{2}\log_{10} t - 0.1$ or e.g. $\log_{10} P = 1.5\log_{10} t - \frac{1}{10}$. Allow unsimplified values for *m* and *c*.

(b)

M1: Way 1: Uses logs correctly to give a log equation.
Way 2: Uses powers correctly to undo the log equation.

dM1: Correct work leading to values for *a* and *b*. Follow through on their equation for *l*

A1: $P = 0.794t^{\frac{3}{2}}$ or $P = 0.794t^{1.5}$

(c)

B1: Accept equivalent answers, e.g., the profit at $t = 1$

(d) Note: It is acceptable to use the more accurate $10^{-0.1}$ for all marks in this question.

M1: Attempts either $0.794 \times 48^{\frac{3}{2}}$ or $0.794 \times 47^{\frac{3}{2}}$ which may be implied by awrt 264.0, 264.1, 264.2, 255.8, 255.9 or any of these multiplied by 1000.

A1: Answer in range £8208 - £8212

A1ft: The model is suitable as 8208 is (relatively) close to 8300. Requires decision and justification. They must conclude that the model is reasonable/suitable if their answer is in the range £7885 – £8715. Answers outside of £7470 and £9130 should result in the model being deemed unsuitable. They must have scored the M1 and multiplied their answer by 1000.

(e)

B1: As in the main scheme.