Question Number	Scheme	Marks
6	$2\log_4(x+1)=\log_4(x+1)^2$	B1
	e.g. $\log_4(12-2x)-\log_4(x+1)^2=\log_4\dfrac{12-2x}{(x+1)^2}$	M1
	$\dfrac{12-2x}{(x+1)^2}=16$	A1
	$\Rightarrow 8x^2+17x+2=0\Rightarrow x=...$	M1
	$x=-\dfrac{1}{8}$ oe e.g. –0.125	A1
		(5)
		Total 5

B1: For $2\log_4(x+1)=\log_4(x+1)^2$ seen or implied.

M1: **Correct** attempt to combine two log terms.

E.g. $2+\log_4(x+1)^2=\log_4 16+\log_4(x+1)^2=\log_4 16(x+1)^2$

Condone if they make a slip **before** combining as long as they are combining two log terms correctly.

e.g.

$$\log_4(12-2x)=2+\log_4(x+1)^2\Rightarrow\log_4(12-2x)+\log_4(x+1)^2=2\Rightarrow\log_4(12-2x)(x+1)^2=...$$

or e.g.

$$\log_4(12-2x)=2+\log_4(x+1)^2=\log_4 2+\log_4(x+1)^2=\log_4 2(x+1)^2$$

A1: Obtains this equation in any form not involving logs **from correct work so must follow B1M1**.

M1: Solves a 3TQ by any acceptable method including a calculator to obtain at least one **real** value for *x*. May be implied by their value(s) and may follow incorrect log work **but the B1 must have been scored**. You may need to check.

Note that we are allowing the use of a calculator to solve the 3TQ here. This means that correct work leading to e.g.:

$$\frac{12-2x}{(x+1)^2}=16\Rightarrow 16x^2+34x+4=0$$

Followed by

$$\Rightarrow(8x+1)(x+2)=0\Rightarrow x=-\frac{1}{8}$$

Is acceptable for full marks as long as it is preceded by correct log work.

A1: This value only from correct work and all previous marks scored.
The other value (–2) must clearly be rejected or omitted.

Special Case: Beware incorrect log work which leads to the correct answer:

$$2\log_4(x+1) = \log_4(x+1)^2$$

$$\log_4(12-2x) - \log_4(x+1)^2 = \frac{\log_4(12-2x)}{\log_4(x+1)^2}$$

$$\frac{12-2x}{(x+1)^2} = 16$$

$$\Rightarrow 8x^2 + 17x + 2 = 0 \Rightarrow x = ...$$

$$x = -\frac{1}{8}$$

This scores B1M0A0M1A0

Allow this SC if no combination of logs is shown at all, but the correct quadratic is produced.

e.g. $\log_4(12-2x) = 2 + 2\log_4(x+1) \Rightarrow \frac{12-2x}{(x+1)^2} = 16$ etc.

or e.g.

$\log_4(12-2x) = \log_4 16 + \log_4(x+1)^2 \Rightarrow 12-2x = 16(x+1)^2$ etc.

Could both score B1M0A0M1A0

Special Case: Beware incorrect work removing logs which leads to the correct answer:

$$2\log_4(x+1) = \log_4(x+1)^2$$

$$\log_4(12-2x) - \log_4(x+1)^2 = \log_4 \frac{12-2x}{(x+1)^2} = 2$$

$$\frac{12-2x}{(x+1)^2} = 2^4 = 16$$

$$\Rightarrow 8x^2 + 17x + 2 = 0 \Rightarrow x = ...$$

$$x = -\frac{1}{8}$$

This scores B1M1A0M1A0

<u>Alternative:</u>

$$\log_4(12-2x) = 2 + 2\log_4(x+1)$$

$$\Rightarrow 4^{\log_4(12-2x)} = 4^{2+2\log_4(x+1)} = 4^{2+\log_4(x+1)^2}$$

$$= 4^2 \times 4^{\log_4(x+1)^2}$$

$$\Rightarrow 12-2x = 16(x+1)^2 \text{ etc.}$$

Score as:

B1: $2\log_4(x+1) = \log_4(x+1)^2$

M1: Uses correct index law e.g. $4^{a+b} = 4^a \times 4^b$

Then follow main scheme.

Question Number	Scheme	Marks
7(a)	$(u_{100}=)20+99(0.5)=(£)69.50*$	B1*
		(1)
(b)	$S_{300}=\frac{1}{2}(300)\{2\times 20+299(0.5)\}=...$ **or** $S_{300}=\frac{1}{2}(300)\{20+169.50\}=...$	M1
	$=(£)28425$	A1
		(2)
(c)	$20\times r^{299}=250\Rightarrow r=\sqrt[299]{\frac{250}{20}}\,(=1.008483032...)$	M1
	$S_{300}=\frac{20(1-r^{300})}{1-r}=(27362.948...)$ $28425-27362.948...$	M1
	(£)1060	A1
		(3)
		Total 6

(a)

B1*: Correct method shown e.g. $20+99(0.5)=69.50$ is sufficient.

Note that the £ symbol is not required but $20+99(0.5)=69.5$ scores B0

Condone attempts to work backwards e.g.

$69.5=20+(n-1)\times 0.5\Rightarrow 49.5=(n-1)\times 0.5\Rightarrow n=100$ hence true

Note that 69.5 can be used in this case but a (minimal) conclusion is required.

(b)

M1: Attempts $\frac{1}{2}n(2\times a+(n-1)d)$ with n = 300, a = 20 and d = 0.5

or e.g. $\frac{1}{2}n(a+l)$ with n = 300, a = 20 and l = 169.5(0) (or an attempt at $20+299\times 0.5$)

A1: Correct value. The £ symbol is not required.