Question	Scheme	Marks	AOs
10	$2\log_3(x+1)=1+\log_3(x+7)$		
	$2\log_3(x+1)=\log_3(x+1)^2$	B1	1.1a
	$\log_3\dfrac{(x+1)^2}{x+7}=1$	M1	1.1b
	$\dfrac{(x+1)^2}{x+7}=3$	A1	1.1b
	$(x+1)^2=3(x+7)\Rightarrow x^2-x-20=0\Rightarrow x=...$	M1	1.1b
	$x=5$ only	A1	2.3
		(5)	
			(5 marks)

Notes:

B1: For $2\log_3(x+1)=\log_3(x+1)^2$ oe e.g. $2\log_3(x+1)=\log_3(x^2+2x+1)$

M1: Uses the subtraction law of logs following the above $\log_3\dfrac{(x+1)^2}{x+7}$

Alternatively uses the addition or subtraction law following use of $1=\log_3 3$

i.e., $1+\log_3(x+7)=\log_3(3(x+7))$

They must be combining the given terms and not e.g. $\log_3(x+7)=\log_3 x+\log_3 7=\log_3 7x$

A1: **Correct** equation obtained with logs removed following correct work.

Allow equivalent **correct** equations e.g. $(x+1)^2=3(x+7)$

M1: **Depends on the B mark.**

Simplifies to a 3TQ = 0 and attempts a correct method to solve their quadratic = 0 (usual rules) to obtain a value for x which may be via a calculator (you may need to check) and the "= 0" may be implied.

A1: cso $x=5$ only. If seen, -4 must have been rejected or $x=5$ clearly selected.

There is no requirement to justify why the -4 has been rejected and any comments can be ignored whether correct or otherwise.

See below for some specific examples.

Examples with marking guidelines

$$2\log_3(x+1) = 1 + \log_3(x+7)$$
$$\Rightarrow \log_3(x+1)^2 = 1 + \log_3(x+7)$$
$$\Rightarrow \frac{(x+1)^2}{(x+7)} = 3$$

Scores B1M1A1 then follow the main scheme.

$$2\log_3(x+1) = 1 + \log_3(x+7)$$
$$\Rightarrow \log_3(x+1)^2 = 1 + \log_3(x+7)$$
$$\Rightarrow \frac{(x+1)^2}{(x+7)} = 1$$
$$(x+1)^2 = x+7 \Rightarrow x^2 + x - 6 = 0 \Rightarrow x = \ldots$$

Scores B1M0A0M1A0

$$2\log_3(x+1) = 1 + \log_3(x+7)$$
$$\Rightarrow \log_3(x+1)^2 = 1 + \log_3(x+7)$$
$$\Rightarrow \log_3(x+1)^2 + \log_3 3 = \log_3(x+7)$$
$$\Rightarrow \log_3 3(x+1)^2 = \log_3(x+7)$$
$$3(x+1)^2 = x+7 \Rightarrow$$

Scores B1M1A0 then apply the scheme

Beware incorrect log work which leads to the correct answer:

$$2\log_3(x+1) = 1 + \log_3(x+7)$$
$$\log_3(x+1)^2 = 1 + \log_3(x+7)$$
$$\log_3(x+1)^2 - \log_3(x+7) = 1$$
$$\frac{\log_3(x+1)^2}{\log_3(x+7)} = 1 \Rightarrow \frac{(x+1)^2}{(x+7)} = 3$$
$$(x+1)^2 = 3(x+7) \Rightarrow x^2 - x - 20 = 0 \Rightarrow x = 5$$

Scores B1M0A0M1A0