Question Number	Scheme	Marks
2.(a)	$a+5d=2$ and $\frac{10}{2}\{2a+9d\}=-80$	B1 B1
	Solves simultaneously $\Rightarrow d=20, a=-98$	M1 A1 **(4)**
(b)	Attempts $\frac{n}{2}\{2\times-98+(n-1)\times 20\}...8000$	M1
	$5n^2-54n-4000...0 \Rightarrow n=(34.2)$	dM1
	$n=35$	A1 **(3)** **(7 marks)**

(a)

B1: One of $a+5d=2$ or $\frac{10}{2}\{2a+9d\}=-80$

B1: Both equations correct. May be un-simplified (isw after correct equations seen).

M1: Solves their two equations in a and d (one of which must be correct) and finds at least a or d. There may be slips, but score for any attempt that reaches a value provided at least one equation was correct and both attempted. Implied by correct answers following correct equations stated.

A1: For $d=20, a=-98$

Alt

B1: Correct formula in d only using 6th and 10th term $\frac{10}{2}\left((2-5d)+(2+4d)\right)=-80$

B1: $d = 20$

M1: Attempts to find a using $a + 5d = 2$

A1: Correct a

(b)

Note: allow all marks in (b) with any equality or inequality used throughout.

M1: Attempts to use $\frac{n}{2}\{2\times-98+(n-1)\times 20\}...8000$ with their a and d. Accept if set equal to 8001. NB If 800 or 80000 is used, allow the M (misread).

dM1: Sets up and **solves** a 3 term quadratic equation in n. Accept if just the positive root is given, but at least one positive root must be obtained.
Allow use of calculator /formulae (may need to check values if no method shown).
May be implied by a rounded or truncated positive integer value following a suitable equation having been set up.

FYI the correct equation is $5n^2-54n-4000...0$

A1: $(n=)35$ stated following a correct equation formed (allowing for incorrect inequality).

Alt by trial and improvement

M1: Attempts to use $\frac{n}{2}\{2\times-98+(n-1)\times 20\}$ with their a and d and integer values of n either side of the sum being 8000

dM1: Two consecutive values for n giving results either side of 8000 attempted.

A1: $n=35$ stated following correct working with both n=34 and n= 35 having been seen.

Question Number	Scheme	Marks
3 (i)	$2\log_2(2-x)=4+\log_2(x+10)$	
	One correct log law $2\log_2(2-x)\to\log_2(2-x)^2$ or $4\to\log_2 16$	B1
	Correct attempt to combine two terms	M1
	Correct equation (not involving logs) E.g. $(2-x)^2=16(x+10)$	A1
	$x^2-20x-156=0$ $(x+6)(x-26)=0$	M1
	$x=-6$ only	A1
		(5)
(ii)	12	B1
		(1)
		(6 marks)

(i)

B1: One correct log law seen or used in relation to the equation e.g. $2\log_2 ...\to\log_2 ...^2$ or $4\to\log_2 16$ (which may appear as $\log_2 2^4$ or $\log_2 4^2$). May be seen anywhere and allow if on incorrect terms.

M1: **Correct** attempt to combine two of the **original** terms, condoning a slip with the 16.
E.g. $4+\log_2(x+10)=\log_2 16+\log_2(x+10)=\log_2 16(x+10)$
Do not allow if e.g. they incorrectly divide by 2 first and attempt to combine $\log_2(2-x)-\log_2(x+10)$

A1: Correct equation (not involving logs) from fully correct log work E.g.
$(2-x)^2=16(x+10)$ or $\dfrac{(2-x)^2}{x+10}=16$

M1: Correct attempt to solve a 3TQ in x achieving a real root (may be by calculator). B1 must have been scored but not all log work need be correct.

A1: $x=-6$ only following the award of all previous marks (all log work must have been correct). The $x = 26$ solution must be rejected if seen.

SC Allow max B1M0A0M1A0 for e.g. $\dfrac{\log_2(2-x)^2}{\log_2(x+10)}=4\to(2-x)^2=16(x+10)$ etc.

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

(ii)

B1: 12 clearly identified as the answer. Condone a =12 as long as 12 is clearly the answer being offered.