Question Number	Scheme	Marks
1 (a)	$h = 3$	B1
	Area $\approx \frac{3}{2}\{2 + 4.81 + 2\times(3.32 + 4 + 4.46)\}$	M1
	= awrt 45.6	A1
		(3)
(b)(i)	States or uses $\log_2 4x^2 = 2\log_2 2x$	M1
	Hence $\int_2^{14} \frac{\log_2 4x^2}{5}\,dx = \frac{2}{5}\times(a) =$ awrt 18.2	A1 ft
(ii)	Attempts to identify $\log_2 2x$ e.g $\log_2 \frac{2}{x} = \log_2 4 - \log_2 2x = 2 - \log_2 2x$	M1
	Hence $\int_2^{14} \log_2 \frac{2}{x}\,dx = \int_2^{14} (2 - \log_2 2x)\,dx = 24 - 45.6 =$ awrt -21.6	A1ft
		(4)
		(7 marks)

(a)

B1 For $h = 3$ This is implied by sight of $\frac{3}{2}$ in front of the bracket

M1 For a correct bracket condoning slips (e.g 4.18 instead of 4.81). Look for {first + last + 2(sum of three terms}), but repeated terms scores M0. Must all be *y* values. Condone "invisible" outside brackets for the M1.

A1 awrt 45.6 An answer of 45.6 can imply the B and M mark if no contrary working is seen and the M may be recovered from "incorrect bracketing" if the answer implies correct bracketing is used..

(b) (i)

M1 States or uses $\log_2 4x^2 = 2\log_2 2x$ (oe)

A1ft For calculating $\frac{2}{5}\times(a) =$ awrt 18.2 but following through on their answer for (a)

(b)(ii)

M1 Attempts to write equation in terms of $\log_2 2x$ using the subtraction rule work to be able to apply (a).

Should be $\log_2 \frac{2}{x} = \log_2 a - \log_2 2x \left(= 2 - \log_2 2x\right)$ but allow eg. $\log_2 \frac{2}{x} = \log_2 \frac{2x}{x^2} = \log_2 2x - \log_2 x^2$ for M1.

A1ft For calculating $24 -$ their (a) = awrt -21.6 but following through on their answer for (a) and isw if later made positive.

Do not allow for answers that evaluate an integral by calculator (so use of $\log_2 2x - \log_2 x^2$ will likely score M1A0).

Note that trapezium rule used again in (b) is M0 in both parts unless the relevant log work has been seen. Watch out for these as they give the same answers as those in the scheme to 1 dp.

Working must be seen in part (b) to gain credit.

Alt for (b)(ii) $\int_2^{14} \log_2 \frac{2}{x}\,dx = \int_2^{14} (\log_2 2 - \log_2 x)\,dx = 12 - \int_2^{14} \log_2 x\,dx$ and $\int_2^{14} \log_2 2x\,dx = \int_2^{14} (\log_2 2 + \log_2 x)\,dx = 12 + \int_2^{14} \log_2 x\,dx$ solved simultaneously scores the M when the $\log_2 x$ terms are eliminated.

Question Number	Scheme	Marks
2. (a)	For correct term ${}^6C_4 3^2 (ax)^4$	M1
	Sets $15\times 3^2 a^4 = 540$	A1
	$a^4 = 4 \Rightarrow a = \pm\sqrt{2}$	dM1 A1 **(4)**
(b)	$\frac{1}{81}\times 3^6 + a^6$	M1 A1
	$=17$	A1 **(3)** **(7 marks)**

(a)

M1 For an attempt at the correct term of the binomial expansion which may be embedded within a full expansion.

Accept ${}^6C_4 3^2 (ax)^4, \frac{6!}{4!2!}3^2 (ax)^4, \binom{6}{4}3^2(ax)^4, 135(ax)^4$ etc but must have correct coefficient and correct powers of 3 and x. Allow equivalents such as ${}^6C_2 3^2 (ax)^4$ and condone a missing bracket for this mark ie. $135ax^4$.

You may condone a slip on the 3 if the rest of an expansion is correct.

A1 For a correct equation in a. Allow $15\times 3^2 a^4 = 540$ or $15\times 3^2 (ax)^4 = 540x^4$ The coefficient must be evaluated for this mark

dM1 For $"135"a^4 = 540 \Rightarrow a = \ldots$ Condone slips on the 540 or errors simplifying an initially correct coefficient, but must be attempting a fourth root. This is implied by a =1.41

A1 $a = \pm\sqrt{2}$ must be exact. Accept $\pm\sqrt[4]{4}$ oe

(b)

M1 For identifying two terms independent of x. Allow if the power of 3 is incorrect but it is clear the correct terms are meant, so $\frac{1}{81}\times$constant term from $(3+ax)^6$ and $a^6x^6 \times \frac{1}{x^6} = a^6$ extracted.

A1 Both terms correct and added, ie. $\frac{1}{81}\times 3^6 + a^6$ with a or following through on their value of a but allow if terms are initially correct individually but slips when evaluating.

A1 17 Allow recovery to 17 from use of decimals but 17.0 is A0.