Question	Scheme	Marks	AOs
5(a)	States or uses $h = 1.5$	B1	1.1a
	Full attempt at the trapezium rule $= \frac{\cdots}{2}\{1.63 + 2.63 + 2\times(2 + 2.26 + 2.46)\}$	M1	1.1b
	= awrt 13.3 or $\frac{531}{40}$	A1	1.1b
		(3)	
(b)(i)	$\int_3^9 \log_3(2x)^{10}\,\mathrm{d}x = 10\times\text{"13.3"} = \text{awrt}\,133$ or e.g. $\frac{531}{4}$	B1ft	2.2a
(ii)	$\int_3^9 \log_3 18x\,\mathrm{d}x = \int_3^9 \log_3(9\times 2x)\,\mathrm{d}x = \int_3^9 2 + \log_3 2x\,\mathrm{d}x$ $= [2x]_3^9 + \int_3^9 \log_3 2x\,\mathrm{d}x = 18 - 6 + \int_3^9 \log_3 2x\,\mathrm{d}x = \ldots$	M1	3.1a
	Awrt 25.3 or $\frac{1011}{40}$	A1ft	1.1b
		(3)	
			(6 marks)

Notes:

(a)

B1: States or uses $h = 1.5$

M1: A full attempt at the trapezium rule.

Look for $\frac{\text{their } h}{2}\{1.63 + 2.63 + 2\times(2 + 2.26 + 2.46)\}$ but condone copying slips

Note that $\frac{\text{their } h}{2}1.63 + 2.63 + 2\times(2 + 2.26 + 2.46)$ scores M0 unless the missing brackets are recovered or implied by their answer. You may need to check.

Allow this mark if they add the areas of individual trapezia e.g.

$\frac{\text{their } h}{2}\{1.63 + 2\} + \frac{\text{their } h}{2}\{2 + 2.26\} + \frac{\text{their } h}{2}\{2.26 + 2.46\} + \frac{\text{their } h}{2}\{2.46 + 2.63\}$

Condone copying slips but must be a complete method using all the trapezia.

A1: awrt 13.3 (Note full accuracy is 13.275) or exact equivalent.

Note that the calculator answer is 13.324 so you must see correct working to award awrt 13.3

Use of $h = -1.5$ leading to a negative area can score B1M1A0 but allow full marks if then stated as positive.

(b)(i)

B1ft: Deduces that $\int_3^9 \log_3(2x)^{10}\,\mathrm{d}x = 10\times\text{"13.3"} = \text{awrt } 133$

FT on their 13.3 look for 3sf accuracy but follow through on e.g. their rounded answer to part (a) so if 13 was their answer to part (a) then allow 130 here **following a correct method**.

A correct method must be seen here but a minimum is e.g. 10 × "13.3" = "133"

Note that $\int_3^9 \log_3(2x)^{10}\,\mathrm{d}x = 133.2414316\ldots$ so a correct method must be seen to award marks.

Attempts to apply the trapezium rule again in any way score M0 as the instruction in the question was to use the <u>answer</u> to part (a).

(b)(ii)

M1: Shows correct log work to relate the given question to part (a)

Must reach as far as e.g. $\left[2x\right]_3^9 + \int_3^9 \log_3 2x \, dx = ...$ with correct use of limits on $\left[2x\right]_3^9$ which may be implied or equivalent work e.g. finds the area of the rectangle as 2×6

A1ft: **Correct working** followed by awrt 25.3 but ft on their 13.3 so allow for 12 + their answer to part (a) **following correct work** as shown.

Note that $\int_3^9 \log_3 18x \, dx = 25.32414...$ **so a correct method must be seen to award marks**.

Some examples of an acceptable method are:

$$\int_3^9 \log_3 18x \, dx = \int_3^9 \log_3 \left(9 \times 2x\right) dx = \int_3^9 2 + \log_3 2x \, dx = 6 \times 2 + "13.3" = 25.3$$

$$\int_3^9 \log_3 18x \, dx = \int_3^9 \log_3 \left(9 \times 2x\right) dx = \int_3^9 2 + \log_3 2x \, dx = 12 + "13.3" = 25.3$$

$$\int_3^9 \log_3 18x \, dx = \int_3^9 \log_3 \left(9 \times 2x\right) dx = \int_3^9 2 + \log_3 2x \, dx = \left[2x\right]_3^9 + \int_3^9 \log_3 2x \, dx = 25.3$$

BUT just $12 + "13.3" = 25.3$ **scores M0**

Attempts to apply the trapezium rule again in any way score M0 as the instruction in the question was to use the <u>answer</u> to part (a).