Question	Scheme	Marks	AOs
2(a)	$h = 0.05$	B1	1.1a
	$= \frac{1}{2}(0.05)\{11.1 + 24.5 + 2(13.5 + 16.4 + 20.1)\}$	M1	1.1b
	$= 3.39$	A1	1.1b
		(3)	

Notes

Condone spurious integral signs used in the trapezium rule.

B1: States or uses $h = 0.05$ oe e.g. $h = \frac{1}{20}$ which may be implied by their attempt at the trapezium rule e.g. $\frac{1}{40}(...)$ or $0.025(...)$

M1: Correct application of the trapezium rule with their $h \neq 1$

Look for $\frac{\text{their } h}{2}\{11.1 + 24.5 + 2(13.5 + 16.4 + 20.1)\}$ You can condone copying slips of the values from the table but there must be the correct number of values.

Note that $\frac{\text{their } h}{2}11.1 + 24.5 + 2(13.5 + 16.4 + 20.1)$ scores M0 unless the missing brackets are recovered or implied by their final answer even if a correct formula is quoted.

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

$\frac{\text{their } h}{2}\{11.1 + 13.5\} + \frac{\text{their } h}{2}\{13.5 + 16.4\} + \frac{\text{their } h}{2}\{16.4 + 20.1\} + \frac{\text{their } h}{2}\{20.1 + 24.5\}$

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

A1: For 3.39 oe e.g. $\frac{339}{100}$ Apply isw once the correct answer is seen.

A **correct** answer with no working scores B1M1A1

Bracketing and "*h*" errors for reference:

1. Unrecovered bracketing error:

$$\frac{1}{2}(0.05)11.1 + 24.5 + 2(13.5 + 16.4 + 20.1) \Rightarrow 124.7775 \quad \textbf{B1M0A0}$$

2. Using $h = 0.04$ or $\frac{1}{25}$ from using $\frac{0.8 - 0.6}{5}$ instead of $\frac{0.8 - 0.6}{4}$:

$$\frac{1}{2}(0.04)\{11.1 + 24.5 + 2(13.5 + 16.4 + 20.1)\} \Rightarrow 2.712 \text{ or } \frac{339}{125} \quad \textbf{B0M1A0}$$

3. Using $h = 0.04$ or $\frac{1}{25}$ **and** bracketing error:

$$\frac{1}{2}(0.04)11.1 + 24.5 + 2(13.5 + 16.4 + 20.1) \Rightarrow 124.722 \quad \textbf{B0M0A0}$$

2(b)	$\int\left(5x^{\frac{3}{2}}+3\right)\mathrm{d}x=2x^{\frac{5}{2}}+3x\left(+c\right)$	B1	1.1b
	$\int_{0.6}^{0.8}\left(\mathrm{f}(x)+5x^{\frac{3}{2}}+3\right)\,\mathrm{d}x=\int_{0.6}^{0.8}\mathrm{f}(x)\,\mathrm{d}x+\int_{0.6}^{0.8}\left(5x^{\frac{3}{2}}+3\right)\,\mathrm{d}x$ $\int_{0.6}^{0.8}\mathrm{f}(x)\,\mathrm{d}x+\left[2x^{\frac{5}{2}}+3x\right]_{0.6}^{0.8}$ $\text{"3.39"}+2\left(0.8\right)^{\frac{5}{2}}+3\left(0.8\right)-\left(2\left(0.6\right)^{\frac{5}{2}}+3\left(0.6\right)\right)=...$	M1	1.1b
	= "3.39" + 1.187… = 4.58	A1ft	1.1b
		(3)	
			(6 marks)

Notes

B1: Correct integration of $5x^{\frac{3}{2}}+3$ in any form. Condone spurious notation e.g.

$\int\left(5x^{\frac{3}{2}}+3\right)\mathrm{d}x=\int 2x^{\frac{5}{2}}+3x\left(+c\right)$ and allow unsimplified e.g. allow $\frac{5x^{\frac{3}{2}+1}}{\frac{3}{2}+1}+3x^{1}$ and ignore any other terms they may attempt to integrate such as their "3.39"

May be implied by e.g. $2\left(0.8\right)^{\frac{5}{2}}+3\left(0.8\right)$ when they substitute limits but not implied by just by a value.

Allow this mark to be implied if they incorrectly combine the 3 with "3.39" to get e.g. $2x^{\frac{5}{2}}+6.39x$ but if this is used it will score M0

M1: Attempts $\int_{0.6}^{0.8}\left(5x^{\frac{3}{2}}+3\right)\,\mathrm{d}x$ to obtain a value **and** adds this to their answer to part (a).

This requires

- an attempt to integrate $5x^{\frac{3}{2}}+3$ to 2 terms with at least $5x^{\frac{3}{2}}\rightarrow...x^{\frac{5}{2}}$ or $3\rightarrow 3x$
  May be implied when they substitute limits as above
- the substitution of the limits 0.6 and 0.8 and the results subtracted either way round to obtain a value which may be implied by their final answer if substitution is not seen so you may need to check (requires correct to 2sf)
- adds this value to their answer to part (a) to obtain a value

Condone missing brackets if the intention is clear e.g. $\text{"3.39"}+2\left(0.8\right)^{\frac{5}{2}}+3\left(0.8\right)-2\left(0.6\right)^{\frac{5}{2}}+3\left(0.6\right)$

A1ft: For awrt 4.58 or for their answer to part (a) + 1.187… allowing for awrt 3sf accuracy.
Apply isw once awrt 4.58 is seen if subsequently rounded incorrectly e.g. = 4.577 = 4.57
Must follow B1 and M1.
Correct or correct ft answer with <u>no</u> working scores no marks.
Note that e.g.:

$\int_{0.6}^{0.8}\left(\mathrm{f}(x)+5x^{\frac{3}{2}}+3\right)\,\mathrm{d}x=\int_{0.6}^{0.8}\left(\text{"3.39"}+5x^{\frac{3}{2}}+3\right)\,\mathrm{d}x=\left[\text{"3.39"}x+2x^{\frac{5}{2}}+3x\right]_{0.6}^{0.8}$

$$\text{"3.39"}(0.8)+2(0.8)^{\frac{5}{2}}+3(0.8)-\left(\text{"3.39"}(0.6)+2(0.6)^{\frac{5}{2}}+3(0.6)\right)$$

Scores B1 for the integration but M0 as the method is incorrect.
Do not allow attempts in (b) that use the trapezium rule again e.g. by adding values of $5x^{\frac{3}{2}}+3$ to the values in the table.

NB substitution of limits may imply a correct method for full marks e.g.

$$\int_{0.6}^{0.8}\left(\mathrm{f}(x)+5x^{\frac{3}{2}}+3\right)\,\mathrm{d}x=\int_{0.6}^{0.8}\mathrm{f}(x)\,\mathrm{d}x+\int_{0.6}^{0.8}\left(5x^{\frac{3}{2}}+3\right)\,\mathrm{d}x$$

$$=\text{"3.39"}+2(0.8)^{\frac{5}{2}}+3(0.8)-\left(2(0.6)^{\frac{5}{2}}+3(0.6)\right)=4.58$$