Question	Scheme	Marks	AOs
1(a)	$h = 0.5$	B1	1.1a
	$A \approx \frac{0.5}{2}\{0.5774 + 0.8452 + 2(0.7071 + 0.7746 + 0.8165)\}$	M1	1.1b
	= awrt 1.50	A1	1.1b
	For reference: **The integration on a calculator gives 1.511549071** **The full accuracy for *y* values gives 1.504726147** **The accuracy from the table gives 1.50475**		
		(3)	

(b)	$3 \times$ their (a)
	If (a) is correct, allow awrt 4.50 or awrt 4.51 even with no working.
	Only allow 4.5 if (a) is correct and working is shown e.g. 3×1.5
	
	If (a) is incorrect allow $3 \times$ their (a) given to at least 3sf but do not be too concerned about the accuracy (as they may use rounded or rounded value from (a))
		B1ft	2.2a

	For reference the integration on a calculator gives 4.534647213		
		(1)	
(c)	**<u>This mark depends on the B1 having been awarded in part (b) with awrt 4.5</u>** Look for a sensible comment. Some examples: • The answer is accurate to 2 sf or one decimal place • Answer to (b) is accurate as $4.535 \approx 4.50$ • Very accurate as 4.535 to 2 sf is 4.5 • $4.51425 < 4.535$ so my answer is underestimate but not too far off • It is an underestimate but quite close • It is a very good estimate • High accuracy • (Quite) accurate • It is less than 1% out • $4.535 - 4.5 = 0.035$ so not far out But **not** just "it is an underestimate" or Calculates percentage error correctly using awrt 4.50 or awrt 4.51 or 4.5 (No comment is necessary in these cases although one may be given) Examples: $\left\|\frac{4.535-4.50}{4.535}\right\| \times 100 = 0.77\%$ or $\left\|\frac{4.535-4.51}{4.535}\right\| \times 100 = 0.55\%$ or $\left\|\frac{4.535-4.51425}{4.535}\right\| \times 100 = 0.46\%$ or $\left\|\frac{4.50}{4.535}\right\| \times 100 = 99\%$ In these cases don't be too concerned about accuracy e.g. allow 1sf. **This mark should be withheld if there are any contradictory statements**	B1	3.2b
		(1)	
			(5 marks)

<u>Notes:</u>

(a)

B1: States or uses $h = 0.5$. May be implied by $\frac{1}{4}\times\{\ldots$ below.

M1: Correct attempt at the trapezium rule.

Look for $\frac{1}{2}h\times\left\{0.5774+0.8452+2\left(0.7071+0.7746+0.8165\right)\right\}$ condoning slips on the terms but must use all y values with no repeats.

There must be a clear attempt at $\frac{1}{2}h\times$(first y + last y + $2\times$"sum of the rest")

Give M0 for $\frac{1}{2}\times\frac{1}{2}0.5774+0.8452+2\left(0.7071+0.7746+0.8165\right)$ unless the missing brackets are implied.

NB this incorrect method gives 5.85…

May be awarded for separate trapezia e.g.

$$\frac{1}{4}\left(0.5774+0.7071\right)+\frac{1}{4}\left(0.7071+0.7746\right)+\frac{1}{4}\left(0.7746+0.8165\right)+\frac{1}{4}\left(0.8165+0.8452\right)$$

May be awarded for using the function e.g. $\frac{1}{2}h\times\left\{\sqrt{\frac{0.5}{1+0.5}}+\sqrt{\frac{2.5}{1+2.5}}+2\left(\sqrt{\frac{1}{1+1}}+\sqrt{\frac{1.5}{1+1.5}}+\sqrt{\frac{2}{1+2}}\right)\right\}$

A1: Awrt 1.50 (Apply isw if necessary)

Correct answers with no working – send to review

(b)

B1ft: See main scheme. Must be considering 3 × (a) and not e.g. attempting trapezium rule again.

(c)

B1: See scheme