Question	Scheme	Marks	AOs
11(a)	$h=0.5$	B1	1.1b
	$A\approx\frac{1}{2}\times\frac{1}{2}\{0.4805+1.9218+2(0.8396+1.2069+1.5694)\}$	M1	1.1b
	$= 2.41$	A1	1.1b
		(3)	
(b)	$\int(\ln x)^2\ \mathrm{d}x = x(\ln x)^2-\int x\times\frac{2\ln x}{x}\ \mathrm{d}x$	M1 A1	3.1a 1.1b
	$=x(\ln x)^2-2\int\ln x\ \mathrm{d}x = x(\ln x)^2-2\left(x\ln x-\int\mathrm{d}x\right)$ $=x(\ln x)^2-2\int\ln x\ \mathrm{d}x = x(\ln x)^2-2x\ln x+2x$	dM1	2.1
	$\int_2^4(\ln x)^2\ \mathrm{d}x=\left[x(\ln x)^2-2x\ln x+2x\right]_2^4$ $=4(\ln 4)^2-2\times4\ln4+2\times4-\left(2(\ln2)^2-2\times2\ln2+2\times2\right)$ $=4(2\ln2)^2-16\ln2+8-2(\ln2)^2+4\ln2-4$	ddM1	2.1
	$=14(\ln2)^2-12\ln2+4$	A1	1.1b
		(5)	
		(8 marks)	

Notes

(a)

B1: Correct strip width. May be implied by $\frac{1}{2}\times\frac{1}{2}\{....\}$ or $\frac{1}{4}\times\{....\}$

M1: Correct application of the trapezium rule.

Look for $\frac{1}{2}\times"h"\{0.4805+1.9218+2(0.8396+1.2069+1.5694)\}$ condoning slips in the digits.

The bracketing must be correct but it is implied by awrt 2.41

A1: 2.41 only. This is not awrt

(b)

M1: Attempts parts the correct way round to achieve $\alpha x(\ln x)^2-\beta\int\ln x\ \mathrm{d}x$ o.e.

May be unsimplified (see scheme). Watch for candidates who know or learn $\int\ln x\ \mathrm{d}x = x\ln x - x$

who may write $\int(\ln x)^2\ \mathrm{d}x=\int(\ln x)(\ln x)\ \mathrm{d}x=\ln x(x\ln x-x)-\int\frac{x\ln x-x}{x}\ \mathrm{d}x$

A1: Correct expression which may be unsimplified

dM1: Attempts parts again to (only condone coefficient errors) to achieve $\alpha x(\ln x)^2-\beta x\ln x\pm\gamma x$ o.e.

ddM1: Applies the limits 4 and 2 to an expression of the form $\pm\alpha x(\ln x)^2\pm\beta x\ln x\pm\gamma x$, subtracts and applies $\ln 4 = 2\ln 2$ at least once. Both M's must have been awarded

A1: Correct answer

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It is possible to do $\int (\ln x)^2 \, \mathrm{d}x$ via a substitution $u = \ln x$ but it is very similar.

M1 A1, dM1: $\int u^2 \mathrm{e}^u \, \mathrm{d}u = u^2 \mathrm{e}^u - \int 2u \, \mathrm{e}^u \, \mathrm{d}u, = u^2 \mathrm{e}^u - 2u\mathrm{e}^u \pm 2\mathrm{e}^u$

ddM1: Applies appropriate limits and uses $\ln 4 = 2\ln 2$ at least once to an expression of the form $u^2 \mathrm{e}^u - \beta u \mathrm{e}^u \pm \gamma \mathrm{e}^u$ Both M's must have been awarded