Question	Scheme	Marks	AOs
2(a)	$x^2+4x-5=(x+2)^2-9$	**B1**	1.1b
		(1)	
(b)	$\int \frac{1}{\sqrt{(x+p)^2-q}}\,dx=\text{arcosh}\left(\frac{x+p}{\sqrt{q}}\right)(+c)$ or $\ln\left(x+p+\sqrt{(x+p)^2-q}\right)(+c)$	**M1**	1.1a
	$=\text{arcosh}\left(\frac{x+2}{3}\right)$ or $\ln\left(x+2+\sqrt{(x+2)^2-9}\right)$ oe	**A1**	2.2a
		(2)	
(c)	Mean $=\frac{1}{13-3}\int_3^{13}\frac{1}{\sqrt{x^2+4x-5}}\,dx$	**B1**	1.2
	$\frac{1}{10}\int_3^{13}\frac{1}{\sqrt{x^2+4x-5}}\,dx=\frac{1}{10}\left(\text{arcosh}\left(\frac{15}{3}\right)-\text{arcosh}\left(\frac{5}{3}\right)\right)$ or $\frac{1}{10}\int_3^{13}\frac{1}{\sqrt{x^2+4x-5}}\,dx=\frac{1}{10}\left(\ln\left(15+\sqrt{216}\right)-\ln\left(5+\sqrt{16}\right)\right)$	**M1**	1.1b
	$=\frac{1}{10}\ln\left(\frac{5+2\sqrt{6}}{3}\right)$ or $\frac{1}{20}\ln\left(\frac{49+20\sqrt{6}}{9}\right)$	**A1**	3.2a
		(3)	
		(6 marks)	

Notes:

(a)

B1: Correct completed square form. Allow 3^2 for 9.

(b)

M1: Achieves a correct form for the integration for their p and q from part (a):

$$\text{arcosh}\left(\frac{x+p}{\sqrt{q}}\right)(+c) \textbf{ or } \ln\left(x+p+\sqrt{(x+p)^2-q}\right)(+c) \textbf{ or e.g. } \ln\left(\frac{x+p}{\sqrt{q}}+\sqrt{\left(\frac{x+p}{\sqrt{q}}\right)^2-1}\right)(+c)$$

where $p\neq 0,\ q\neq 1$

Allow $\cosh^{-1}$ for arcosh

Allow attempts that use substitution following an attempt to complete the square but must be an appropriate substitution e.g. $x+p=\sqrt{q}\cosh u$ leading to a correct form as above.

A1: Correct integration. The "+ c" is not required. Apply isw once a correct expression is seen.

Note that $\ln\left(\frac{x+2}{3}+\sqrt{\left(\frac{x+2}{3}\right)^2-1}\right)(+c)$ is also correct

(c)

B1: Recalls the definition of a mean function accurately. $\frac{1}{13-3}\int_3^{13}\frac{1}{\sqrt{x^2+4x-5}}\,\mathrm{d}x$ seen or implied.

Note that the $\frac{1}{13-3}$ may appear at the end. $\frac{1}{13-3}\int_3^{13}\mathrm{f}(x)\,\mathrm{d}x$ is sufficient as f (x) is defined in the question. Also allow it to be implied by e.g. $\frac{1}{10}\left[\mathrm{g}(x)\right]_3^{13}$ where g(x) is their integrated function.

M1: Applies the correct limits the right way round to whatever they think the answer to part (b) is.

This can be awarded if the $\frac{1}{10}$ is present or not.

A1: Correct answer in correct form. Allow equivalents e.g. $\frac{1}{10}\ln\left(\frac{5}{3}+\frac{2\sqrt{6}}{3}\right)$, $\frac{1}{20}\ln\left(\frac{49}{9}+\frac{20\sqrt{6}}{9}\right)$

And allow if the surd is not simplified e.g. $\frac{1}{10}\ln\left(\frac{5+\sqrt{24}}{3}\right)$, $\frac{1}{20}\ln\left(\frac{49+\sqrt{2400}}{9}\right)$

Apply isw once a correct answer is seen.

The brackets must be present in forms such as $\frac{1}{10}\ln\left(\frac{5}{3}+\frac{2\sqrt{6}}{3}\right)$, $\frac{1}{20}\ln\left(\frac{49}{9}+\frac{20\sqrt{6}}{9}\right)$ but not in

e.g. $\frac{1}{10}\ln\frac{5+\sqrt{24}}{3}$

If extra values are offered then score A0