Question Number	Scheme	Marks
7(a)	$x^2-9x+14=\left(x-\frac{9}{2}\right)^2+14-\frac{81}{4}=\left(x-\frac{9}{2}\right)^2-\frac{25}{4}$	M1
	$a=-\frac{9}{2},\ b=-\frac{25}{4}$ oe	A1 (2)
(b)	(i) least value of $\mathrm{f}(x)=-\frac{25}{4}$	B1ft
	(ii) least value when $x=\frac{9}{2}$	B1ft (2)
(c)	$x+5=x^2-9x+14$	M1
	$x^2-10x+9=0\Rightarrow(x-9)(x-1)=0$	M1
	Points are $(9,14)$ $(1,6)$	A1A1 (4)
(d)	Area $\int_1^9\left((x+5)-\left(x^2-9x+14\right)\right)\mathrm{d}x=\int_1^9\left(-x^2+10x-9\right)\mathrm{d}x$	M1
	$=\left[-\frac{x^3}{3}+5x^2-9x\right]_1^9$	M1A1
	$=(-243+405-81)-\left(-\frac{1}{3}+5-9\right)=85\frac{1}{3}$	M1A1 (5)
		[13]

Part	Mark	Notes
(a)	M1	For attempting to complete the square to achieve as a minimum $x^2-9x+14=\left(x\pm\frac{9}{2}\right)^2+14-k$ where k is a constant
	A1	For the correct expression $x^2-9x+14=\left(x-\frac{9}{2}\right)^2-\frac{25}{4}$ or $a=-\frac{9}{2},\ b=-\frac{25}{4}$ oe stated
(b)(i)	B1ft	For the correct value $\mathrm{f}(x)=-\frac{25}{4}$ follow through their value of '$-\frac{25}{4}$'
(ii)	B1ft	For the correct value of $x=\frac{9}{2}$ provided they have $\left(x-\frac{9}{2}\right)^2$ …in part (a). Follow through their value of '$\frac{9}{2}$'

(c)	M1	For equating the equation of the line with the equation of C $x+5=x^2-9x+14\Rightarrow x^2-10x+9=0$ **and** attempting to form a 3TQ
	M1	Attempts to solve their 3TQ by any method, provided it is the result of equating the line with C $x^2-10x+9=0\Rightarrow(x-9)(x-1)=0$
	A1	For the correct coordinates of **either** $(9,14)$ or $(1,6)$
	A1	For both correct pairs of coordinates $(9,14)$ and $(1,6)$
(d)	M1	For a correct expression for the required area with both limits correct. (ft their limits from (c)) Award this mark if they have 'curve – line' but otherwise correct. $\int_1^9\left((x+5)-\left(x^2-9x+14\right)\right)\mathrm{d}x=\left[\int_1^9\left(-x^2+10x-9\right)\mathrm{d}x\right]$, accept $\int_1^9\left(x^2-10x+9\right)\mathrm{d}x$ **OR** Area under the trapezium – curve $\frac{1}{2}\times8\times(6+14)-\int_1^9\left(x^2-9x+14\right)\mathrm{d}x$
	M1	For attempting to integrate the equation for the combined expression or the curve only.
	A1	For the correct integrated expression for required area. Ignore limits for this mark – even if they are absent altogether. Area = $=\left[-\frac{x^3}{3}+5x^2-9x\right]_1^9$ accept $\left[\frac{x^3}{3}-5x^2+9x\right]_1^9$ **OR** $\frac{1}{2}\times8\times(6+14)-\left(\frac{x^3}{3}-\frac{9x^2}{2}+14x\right)_1^9$ **OR** $\left(\frac{x^2}{2}+5x\right)_1^9-\left(\frac{x^3}{3}-\frac{9x^2}{2}+14x\right)_1^9$ or $\left(\frac{x^3}{3}-\frac{9x^2}{2}+14x\right)_1^9-\left(\frac{x^2}{2}+5x\right)_1^9$
	M1	For substituting their limits (x – coordinates from part(c)) into their integrated expression. $=(-243+405-81)-\left(-\frac{1}{3}+5-9\right)=\ldots$ **OR** $80-\left[\left(\frac{9^3}{3}-\frac{9\times9^2}{2}+14\times9\right)-\left(\frac{1^3}{3}-\frac{9\times1^2}{2}+14\times1\right)\right]=\ldots$ **OR** $\left[\left(\frac{9^2}{2}+5\times9\right)-\left(\frac{1^2}{2}+5\times1\right)\right]-\left[\left(\frac{9^3}{3}-\frac{9\times9^2}{2}+14\times9\right)-\left(\frac{1^3}{3}-\frac{9\times1^2}{2}+14\times1\right)\right]=\ldots$
	A1	For the correct area of $85\frac{1}{3}$ or $\frac{256}{3}$ If they get a value of $-85\frac{1}{3}$ they must give a **final** value of $85\frac{1}{3}$ for this mark.