	$\{x =\}$ 56.789..., 123.21... $\Rightarrow$ awrt 56.8, awrt 123.2 A1: One of awrt 57 or 123 (may be others in the $0 < x < 180^\circ$ range) A1: Both awrt 56.8 and 123.2 and no others in the range or multiples of 45. No degrees symbol required. Ignore labelling. A marks require a correct 3TQ & correct roots seen. Answers only is 0/4	**A1** **A1**
		(4)
		(Total 9 marks)

Question Number	Scheme	Notes	Marks
9	**"In this question you must show all stages of your working. Solutions relying entirely on calculator technology are not acceptable."**		
(a)	$\int \frac{11}{2x+5}+4\mathrm{e}^{x-3}\ \mathrm{d}x=\frac{11}{2}\ln(2x+5)+4\mathrm{e}^{x-3}\quad(+c)$ M1: Integrates to the form $\pm A\ln(2x+5)\pm B\mathrm{e}^{x-3}\ \ A,B\neq 0$ Terms may be seen separately. A1: Correct integration. Terms together. Constant not required. May be unsimplified Condone missing brackets i.e., $\frac{11}{2}\ln 2x+5+4\mathrm{e}^{x-3}$		**M1** **A1**
			(2)
(b)	$y=a-\lvert bx-1\rvert\Rightarrow\left(\frac{1}{b},\ a\right)$ B1: Either correct coordinate **d**B1: Both correct coordinates Accept coordinates as "$x=...,\ y=...$" Allow SC B1dB0 if just $\left(a,\ \frac{1}{b}\right)$		**B1** **dB1**
			(2)
(c)	$(0,\ 9)\Rightarrow 9=a-1\Rightarrow a=10$	Correct value for a. No other values	**B1**
	$x=3\Rightarrow\{y=\}\frac{11}{2\times 3+5}+4\mathrm{e}^{3-3}\quad\{=5\}$	Any correct expression or value seen or implied for the y-coordinate of intersection point. May be on diagram. Implied by $b=2$ if no clearly incorrect work	**M1**
	$5=10-3b+1\Rightarrow b=2$	Correct value for b. No other values	**A1**
			(3)
(d)	If (a) was omitted allow marks for (a) to be scored here. If reattempted, an answer to (a) takes priority for the marks for (a) but allow access to all the marks in (d)		
	$\left(\frac{11}{2}\ln(2\times 3+5)+4\mathrm{e}^{3-3}\right)-\left(\frac{11}{2}\ln(5)+4\mathrm{e}^{-3}\right)\ \left\{=\frac{11}{2}\ln\frac{11}{5}+4-\frac{4}{\mathrm{e}^3}\right\}$ or $17.1888424...-9.05105...\ \{=8.137367\}$.. Substitutes in 3 and 0, subtracts the **right** way round and obtains a numerical expression or positive difference of two values. Minimum working is a subtraction of two values, unless the correct 8.137... is seen along with the correct integrated function (which may just be in (a)). However, this can also be implied by a final answer of awrt 14.4 provided there is no wrong working and the correct integrated function is seen (which may just be in (a)). Allow slips but must be a recognisable attempt at the f(3) - f(0) with $f(0)\neq 0$. Requires an integrated function of the form $...\ln(f(x))\pm...\mathrm{e}^{g(x)}$. If restated/redone in (d) the work in (d) takes precedence. This work may be seen as part of a correct or incorrect overall method.		**M1**
	Crosses the x-axis at $\frac{11}{2}$	Correct x-intercept seen (may be on diagram) or implied Note that work in the main answer space takes precedence over work on the diagram	**B1**
	$\frac{1}{2}\times"5"\times\left("\frac{11}{2}"-3\right)+"8.137..."\left\{=\frac{25}{4}+"8.137..."\right\}=...,\qquad 14.387867...\approx\text{awrt}14.4$ **d**M1: A full attempt to find the shaded area, i.e., adds any correct ft numerical expression (or value) for the triangle area with their y-coordinate of the intersecction and their x-coordinate of the x-axis intercept to their positive (not a corrected		**dM1** **A1**

	negative) area under the curve and obtains a value, provided 0 < their "5" < 9 and their $"\frac{11}{2}" > 3$. A1: awrt 14.4 **See note overleaf if integration is used for the triangle area**.	
		(4)
		(Total 11 marks)

9(d) Note: integration for triangle	Note: If integration of $y = a - \lvert bx - 1 \rvert \left(= a - bx + 1 \text{ for } x \geqslant 1\right)$ is used for the triangle they must obtain a numerical expression or value that is correct for their values and appropriate to the information given in the question. This requires: $\int_3^{"\frac{11}{2}"} \left("10" - "2"x + 1\right) \mathrm{d}x$ where $"\frac{11}{2}" > 3$, "10" (their a) $\geqslant 10$ & "2" (their b) > 0 and $a, b \in \mathbb{Z}$ $\left[-x^2 + 11x\right]_3^{"\frac{11}{2}"} = -\frac{121}{4} + \frac{121}{2} - \left(-9 + 33\right) = \frac{121}{4} - 24 = \frac{25}{4}$ $\Rightarrow "\frac{25}{4}" + "8.137..." = ..., \quad 14.387867... \approx \text{awrt} 14.4$	
	If points are used to find the equation of the line they must be in appropriate relative positions so they do not contradict information given in the question and implied by the diagram. So if using the maximum $\left("\frac{1}{2}", "10"\right)$, $0 < "\frac{1}{2}" < 3$ and "10" > 9 If using the intersection $\left(3, "5"\right)$ then $3 < "5" < "\frac{11}{2}"$ If using the x-axis intercept $\left("\frac{11}{2}", 0\right)$ then $"\frac{11}{2}" > 3$ The work must be consistent with their a and b e.g., $y - "5" = \frac{"5" - 0}{"\frac{11}{2}" - 3}\left(x - 3\right) \Rightarrow y = -2x + 11 \Rightarrow \left[-x^2 + 11x\right]_3^{"\frac{11}{2}"} = -\frac{121}{4} + \frac{121}{2} - \left(-9 + 33\right) = \frac{121}{4} - 24 = \frac{25}{4}$ $\Rightarrow "\frac{25}{4}" + "8.137..." = ..., \quad 14.387867... \approx \text{awrt} 14.4$	