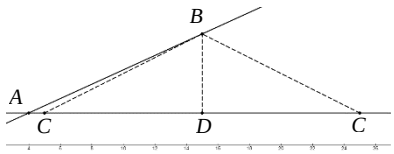
Question	Scheme	Marks
9(a)	$m = \frac{7-2}{15-4}\left(=\frac{5}{11}\right)$	M1
	$y-2=\frac{5}{11}(x-4)$ or $y-7=\frac{5}{11}(x-15)$ or $y=\frac{5}{11}x+c \Rightarrow 2=\frac{5}{11}\times 4+c \Rightarrow c=...\left(\frac{2}{11}\right)$	M1
	$5x-11y+2=0$	A1
		(3)
(a) ALT	$y=mx+c \Rightarrow \begin{matrix}2=4m+c\\7=15m+c\end{matrix}$	M1
	$\begin{matrix}2=4m+c\\7=15m+c\end{matrix} \Rightarrow m=...\left(\frac{5}{11}\right),\quad c=...\left(\frac{2}{11}\right)$	M1
	$5x-11y+2=0$	A1
(b)	$(15-x)^2+(7-2)^2=\left(5\sqrt{5}\right)^2$ or e.g. $\sqrt{(15-x)^2+(7-2)^2}=5\sqrt{5}$ or e.g. $\left(5\sqrt{5}\right)^2=5^2+CD^2$ oe 	M1
	Way 1: $(15-x)^2+25=125 \Rightarrow (15-x)^2=100 \Rightarrow x=...$ or e.g. Way 2: $125=25+CD^2 \Rightarrow CD^2=100 \Rightarrow CD=10 \Rightarrow x=...$	M1
	$(5,\ 2)$ **or** $(25,\ 2)$	A1
	$(5,\ 2)$ **and** $(25,\ 2)$	A1
		(4)
(c)	Area $=\frac{1}{2}("5"-4)\times 5$	M1
	$=\frac{5}{2}$	A1
		(2)
		Total 9

Notes:

(a)

M1: Correct method for the gradient

M1: For a correct straight line method using their gradient and point *A* or point *B* with *x* and *y* correctly placed. Alternatively uses $y = mx + c$ and reaches $c = \ldots$

Note that $\frac{y-2}{7-2}=\frac{x-4}{15-4}$ scores both M marks.

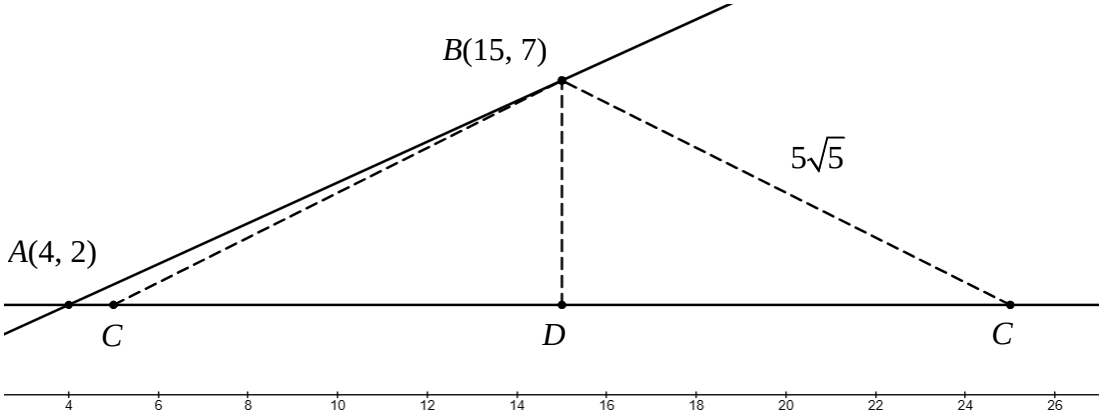
A1: Correct equation in the required form including the "= 0". Allow any integer multiple of this equation.

ALT

M1: Substitutes $x = 4$, $y = 2$ and $x = 15$, $y = 7$ into the general equation $y = mx + c$ to obtain 2 equations in *m* and *c*.

M1: Solves 2 equations of the form $\alpha = m\beta + c$ to find values for *m* and *c*.

A1: Correct equation in the required form including the "= 0". Allow any integer multiple of this equation.



(b)

M1: Correct application of Pythagoras for triangle *BCD* (see diagram above)

The statements shown are sufficient for this mark but condone missing brackets e.g. $5\sqrt{5}^2$ for $\left(5\sqrt{5}\right)^2$ as long as the intention is clear.

M1: A complete, correct and full method to obtain at least **one** *x* coordinate for *C*.

For **Way 1** this mark is for processing an equation of the form: $(15-x)^2+\alpha^2=\left(5\sqrt{5}\right)^2$ where $0<\alpha^2<125$ to obtain at least one value for *x*.

For **Way 2** this mark is for processing an equation of the form: $\left(5\sqrt{5}\right)^2=CD^2+\alpha^2$ where $0<\alpha^2<125$ to obtain at least one value for *CD* and then attempts at least one value of *x* either 15 – *CD* or 15 + *CD*. Condone the use of *x* (or any other letter) for *CD*.

The work for this mark must be correct so e.g. $\sqrt{(15-x)^2+(7-2)^2}=5\sqrt{5}\Rightarrow(15-x)+(7-2)=5\sqrt{5}$

or e.g. $\left(5\sqrt{5}\right)^2=CD^2+\alpha^2\Rightarrow 5\sqrt{5}=CD+\alpha$ scores M0. If a 3TQ is being solved, the usual rules apply.

A1: At least one correct position for *C*.
May be seen as a coordinate pair with or without brackets or as e.g. $x = 5,\ y = 2$

A1: Both correct pairs of coordinates.
May be seen as coordinate pairs with or without brackets or as e.g. $x = 5,\ y = 2$

Note that some candidates think the equation for l_2 is $y = 4$ rather than $y = 2$
This scores a maximum of 1 mark in part (b) and will look like this:

$$(15-x)^2+(7-4)^2=\left(5\sqrt{5}\right)^2\Rightarrow(15-x)^2+(7-4)^2=125-9=116$$

$$(15-x)=\pm 2\sqrt{29}\Rightarrow x=15\pm 2\sqrt{29}$$

or

$$\left(5\sqrt{5}\right)^2=3^2+CD^2\Rightarrow CD^2=116\Rightarrow CD=2\sqrt{29}$$

$$\Rightarrow x=15\pm 2\sqrt{29}$$

This scores M0M1A0A0

(c)

M1: Applies a correct triangle area for one of their points of the form (*k*, 2), $k \neq 15$. May be implied.

This mark is for e.g. $\frac{1}{2}(k-4)\times 5$ where *k* is one of their calculated *x* coordinates from part (b)

or for $\frac{1}{2}(11\pm CD)\times 5$ where *CD* is their calculated value from part (b)

May see shoelace method: $\frac{1}{2}\begin{vmatrix}4 & 15 & "5" & 4\\ 2 & 7 & 2 & 2\end{vmatrix}=\frac{1}{2}\left|4\times 7+15\times 2+"5"\times 2-2\times 4-7\times "5"-2\times 15\right|$

Allow other correct methods for the area e.g. using trigonometry.
Their *C* must be of the form (*k*, 2) and a correct formula used or implied.

A1: Correct minimum area. Must be 2.5 **not** awrt 2.5 (e.g. if they use trigonometry and get an inexact answer)

Question	Scheme	Marks
10(a)	$f'(4)=6(4)-\frac{7\times14}{4}=-\frac{1}{2}$	B1
	$m_T=-\frac{1}{2}\Rightarrow m_N=\frac{-1}{-1/2}$	M1
	$y-12=2(x-4)$ or $y=mx+c\Rightarrow y=2x+c\Rightarrow 12=2(4)+c\Rightarrow c=...$	M1 (A1 on ePen)
	$y=2x+4$	A1
		(4)
(b)	$...\frac{(2x-1)(3x+2)}{2\sqrt{x}}=...\frac{6x^2+x-2}{2\sqrt{x}}=...3x^{\frac{3}{2}}+\frac{1}{2}x^{\frac{1}{2}}-x^{-\frac{1}{2}}$	M1
	$f(x)=\frac{6x^2}{2}-\frac{6}{5}x^{\frac{5}{2}}-\frac{1}{3}x^{\frac{3}{2}}+2x^{\frac{1}{2}}(+c)$ or e.g. $f(x)=\frac{6x^2}{2}-\frac{3}{5/2}x^{\frac{5}{2}}-\frac{1/2}{3/2}x^{\frac{3}{2}}+\frac{x^{\frac{1}{2}}}{1/2}(+c)$ or e.g. $f(x)=\frac{6x^2}{2}-\left(\frac{3}{5/2}x^{\frac{5}{2}}+\frac{1/2}{3/2}x^{\frac{3}{2}}-\frac{x^{\frac{1}{2}}}{1/2}\right)(+c)$	M1A1A1
	$12=\frac{6(4)^2}{2}-\frac{6}{5}(4)^{\frac{5}{2}}-\frac{1}{3}(4)^{\frac{3}{2}}+2(4)^{\frac{1}{2}}+c\Rightarrow c=...$	M1
	$(f(x)=)3x^2-\frac{6}{5}x^{\frac{5}{2}}-\frac{1}{3}x^{\frac{3}{2}}+2x^{\frac{1}{2}}+\frac{16}{15}$	A1
		(6)
		Total 10

Notes:

(a)

B1: Correct gradient at *P* (may be implied)

M1: Attempts to use the perpendicular gradient rule to find the normal gradient.

Look for e.g. $m_N=\frac{-1}{m_T}$ or e.g. $m_T\times m_N=-1\Rightarrow -\frac{1}{2}m_N=-1\Rightarrow m_N=...$

May be implied by their normal gradient.

M1(A1 on Epen): Attempts the equation of the normal using a "changed" gradient with $x = 4$ and $y = 12$ correctly placed.

Alternatively uses $y = mx + c$ with a "changed" gradient with $x = 4$ and $y = 12$ to find a value for c.

A1: Correct equation in the required form