Question Number	Scheme	Marks
1.(a)	Sets $\frac{1}{2}r^2 \times 1.25 = 15 \Rightarrow r^2 = 24$	M1
	$\Rightarrow r = \sqrt{24}$ or $2\sqrt{6}$ (only)	A1 **(2)**
(b)	Attempts $s = r\theta = 2\sqrt{6} \times 1.25$	M1
	Attempts $P = 2r + r\theta = 2 \times 2\sqrt{6} + 2\sqrt{6} \times 1.25$	dM1
	$= \frac{13\sqrt{6}}{2}$ oe	A1 **(3)** **(5 marks)**

(a)

M1 Uses $A = \frac{1}{2}r^2\theta$ in an attempt to find r

A1 $r = \sqrt{24}$ or $2\sqrt{6}$ only (oe) (isw after a correct answer is seen) Withhold the A if $r = \pm 2\sqrt{6}$ is given.

(b)

M1 Uses the formula $s = r\theta$ with their r and $\theta = 1.25$ in an attempt to find the arc length.

dM1 For applying $P = 2r + r\theta$ their r and $\theta = 1.25$ in an attempt to find the perimeter.

A1 $\frac{13\sqrt{6}}{2}$ (isw after a correct answer is seen). Accept $6.5\sqrt{13}$ (oe simplest forms)

Question Number	Scheme	Marks
2. (a)	$1.85 = 2a + b$ and $3.45 = 7a + b$	M1 A1
	Solves simultaneously to get $a = 0.32, b = 1.21$ (oe)	dM1 A1 **(4)**
(b)	States 1.21 m or 121 cm (oe)	B1ft **(1)** **(5 marks)**

(a)

M1 For either $1.85 = 2a + b$ or $3.45 = 7a + b$

A1 For both $1.85 = 2a + b$ and $3.45 = 7a + b$

dM1 Solves simultaneously to get a value for a and a value for b

A1 $a = 0.32, b = 1.21$ or equivalent fractions. May be seen in the equation.

(b)

B1 ft States 1.21 m or 121 cm (oe including units). Correct answer or follow through on their **positive** b

Alt part (a)

M1 Attempts $\frac{3.45 - 1.85}{7 - 2}$ Allow from attempts at use of arithmetic series, or from incorrect indexing. So E.g. $1.85 = 3a + b, 3.45 = 8a + b \Rightarrow a = ...$ or $a_n = a + (n-1)d, a_1 = 1.85, a_6 = 3.45 \Rightarrow a = ...$ gain this mark.

A1 $a = 0.32$ (may be called d if using AS)

dM1 Full correct method to find b E.g substitutes their $a = 0.32$ into either **correct** equation (with correct indexing), or in "$a_n = a + (n-1)d$" finds "a"$(= 1.53)$ and expands to find $b =$ "a"$-$"d".

A1 $a = 0.32, b = 1.21$

Question Number	Scheme	Marks
3. (a)	$x^2-5x+13=(x-2.5)^2-2.5^2+13=(x-2.5)^2+6.75$	M1 A1
	Coordinates $M=(2.5,6.75)$	A1
		(3)
(b)	Attempts the equation of l using their M $y=\frac{6.75}{2.5}x$ $(y=2.7x)$	M1
	Attempts to solve their $y=2.7x$ with $y=x^2-5x+13$	
	$\Rightarrow 2.7x=x^2-5x+13\Rightarrow x^2-7.7x+13=0\Rightarrow(x-2.5)(x-5.2)=0$	M1
	$x=5.2$ oe	A1
	Coordinates $N=(5.2,14.04)$	dM1 A1
		(5)
(c)	States two of $y<x^2-5x+13,\ y>2.7x,\ 0\leqslant x<2.5$	M1
	States all three of $y<x^2-5x+13,\ y>2.7x,\ 0\leqslant x<2.5$	A1ft
		(2)
		(10 marks)

(a)

M1 For attempting to complete the square. Look for $(x-2.5)^2$

A1 $(x-2.5)^2+6.75$ or for correctly extracting $x = 2.5$ as the x coordinate.

A1 $M=(2.5,6.75)$ or $\left(\frac{5}{2},\frac{27}{4}\right)$

(b)

M1 Uses their M to find an equation for l. Look for a correct attempt at the gradient, so $y=\frac{"6.75"}{"2.5"}x$ or $y-"6.75"=\frac{"6.75"}{"2.5"}(x-"2.5")$

M1 Depends on having made an attempt (not necessarily correct) to use O and M to find the equation of l. Attempts to solve their equation for l with $y=x^2-5x+13$ Look for a full attempt leading to x = ...

Correct answers following a correct simplified quadratic is fine for the method.

A1 $x=5.2$ or equivalent such as $x=\frac{26}{5}$

dM1 Depends on second M mark. Substitutes their $x=5.2$ into either equation to find y = ... If a y value follows an x value with no clearly incorrect working, then allow as an attempt.

A1 Coordinates $N=(5.2,14.04)$ oe such as $\left(\frac{26}{5},\frac{351}{25}\right)$. Allow this to be written separately.

(c)

M1 States any two of $y<x^2-5x+13,\quad y>"2.7"x,\quad 0\leqslant x<b$ where $"2.5"\leqslant b\leqslant"5.2"$

Also allow the first two combined, or with loose inequalities, e.g $"2.7"x\leqslant y\leqslant x^2-5x+13$

Also allow either $\leqslant$ or $<$ on the left hand end of $0\leqslant x<2.5$ due to the y- axis.

Use of *R* instead of *y* is M0

A1ft States all three inequalities. Same conditions as above, follow through on their $2.7x$ from (b) and 2.5

.....

Allow part (a) to be attempted via finding minimum point

M1 For setting $\frac{dy}{dx}=ax+b=0$ and finding a value for x, or for stating $x_{min}=-b/2a=\ldots$

A1 $x=2.5$

A1 $M=(2.5,6.75)$ Note: Answer with no working score M0A0A0