Question Number	Scheme	Marks
9a	$0.72 = OP \times 0.6 \Rightarrow OP = 1.2$ **or** $\frac{0.72}{0.6} = 1.2$ **or** $0.72 = 1.2 \times 0.6 \Rightarrow OP = 1.2$ *	B1*
		(1)
b	$\frac{1}{2} \times (x+1.2)^2 \times 0.6$	B1
	$\frac{1}{2} \times (x+1.2)^2 \times 0.6 - \frac{1}{2} \times 1.2^2 \times 0.6 = 90 \Rightarrow 5x^2 + 12x - 1500 = 0$ *	M1A1*
		(3)
c	$x =$ awrt 16.2 $\left(= \frac{-6 + 4\sqrt{471}}{5} \right)$	B1
	Perimeter $= 0.72 + "16.2" + "16.2" + 0.6 \times ("16.2" + 1.2) =$ awrt 43 / awrt 44 m (see notes)	M1A1
		(3)
		(7 marks)

(a)

B1*: Either

- forms an equation using $l = r\theta$ with $l = 0.72$ and $\theta = 0.6$ and concludes $OP = 1.2$ e.g. $0.72 = r \times 0.6 \Rightarrow r = 1.2$
- states $\frac{0.72}{0.6} = 1.2$
- forms the equation using $0.72 = 1.2 \times 0.6$ and concludes that $OP = 1.2$

Condone the use of *r* or any other variable instead of *OP*. Condone lack of units or incorrect units.

Allow the angle to be in degrees instead or attempts to find the diameter first, but they must not round the value at any point in their working.

e.g. $0.72 = \frac{\frac{0.6}{\pi} \times 180}{360} \pi d \Rightarrow d = 2.4 \Rightarrow r = 1.2$ scores B1 (exact angle used)

e.g. $\frac{0.72}{\left(\frac{34.4}{360}\right)} = 2\pi r \Rightarrow r = 1.2$ scores B0 (34.4 is a rounded angle)

(b)

B1: Correct expression for the area of sector *OPQRSO*

$\frac{1}{2} \times (x+1.2)^2 \times 0.6$ Missing brackets may be implied by further work.

May appear within an equation e.g. $\frac{1}{2} \times 0.6\left[(x+1.2)^2 - 1.2^2\right] = 90$

Condone incorrect equations i.e. $\frac{1}{2} \times (x+1.2)^2 \times 0.6 = 90$

M1: Proceeds from an equation of the form $...(x \pm 1.2)^2 \times 0.6 - ... \times 1.2^2 \times 0.6 = 90$ or equivalent, (i.e. both should be positive but may be missing e.g. ½) and attempts to multiply out the brackets. Condone slips and invisible brackets.

A1*: Achieves the given answer with no errors seen including invisible brackets. They must have multiplied out any brackets before proceeding to the given answer to score this mark.
e.g. $\frac{54}{125}+\frac{18}{25}x+\frac{3}{10}x^2-0.432=90 \Rightarrow 5x^2+12x-1500=0$ is acceptable as a final step to score A1*

(c)

B1: $x=$ awrt 16.2 $\left(=\frac{-6+4\sqrt{471}}{5}\right)$ (ignore the negative root) May be seen on the diagram or next to the quadratic in the question. It may also be implied in their working to find the perimeter. It cannot be for the values embedded in the quadratic formula.

M1: A correct method to find the perimeter using their value for x which must be positive. They must proceed as far as a value for the perimeter to score this mark. Do not condone the lengths 0.72 and 1.2 to be rounded, but condone for example their "16.2" to be "16".
May see exact values used in the expression e.g. $2\left(\frac{-6+4\sqrt{471}}{5}\right)+0.72+\left(\frac{12\sqrt{471}}{25}\right)=...$

A1: awrt 43 m or awrt 44 m, **including units**, **following a correct method. Typically look for 43.4…m or 43.5…m**
Note some incorrect methods lead to awrt 43 which is maximum B1M0A0.
e.g. $"16.2"\times 0.6+"16.2"+"16.2"+0.72=42.7$ which is B1M0A0 (uses 16.2 instead of 16.2+1.2)
e.g. $"16.2+1.2"\times 0.6+"16.2"+"16.2"=42.8$ which is B1M0A0 (missing arc *PS*)

Question Number	Scheme	Marks
10ai	$(n=)\ 3$	B1
ii	1080	B1
		(2)
b	$(1620,\ -3)$	B1B1
		(2)
c	e.g. $k=\frac{1}{2}\left(\frac{12}{5}-\frac{3}{5}\right)=\frac{9}{10}$	M1A1
		(2)
		(6 marks)

Note: answers may appear next to questions or on the diagram.
If there is a contradiction between the answer by the question/on the diagram and the main body of the work then the answer in the main body of the work takes precedence.

(a)

(i)

B1: $(n=)\ 3$

(ii)

B1: 1080 (must be in degrees). Do not accept e.g. (1080, 3)

(b)

B1: One of the two coordinates $(1620,\ -3)$ Condone missing brackets. Allow *x*=… , *y* = ….
Condone 9π instead of 1620 for this mark and condone the coordinates to be the wrong way round e.g. $(-3,\ 1620)$ scores B1B0

B1: Both coordinates $(1620,\ -3)$ Condone missing brackets. Allow *x* =… , *y* = ….

(c)

M1: Attempts to find a value for *k* by either

- attempting to find $k=\frac{1}{2}\left(\frac{12}{5}-\frac{3}{5}\right)=...$.
- attempting to find $k=\frac{12}{5}-\frac{1}{2}\left(\frac{12}{5}+\frac{3}{5}\right)=...$ or $k=-\frac{3}{5}+\frac{1}{2}\left(\frac{12}{5}+\frac{3}{5}\right)=...$
- forming two **correct** simultaneous equations and eliminating sin *a* (may be labelled as a different variable, condone *a* for sin *a*)
  $2\sin(a)+k=\frac{12}{5},\ -2\sin(a)+k=-\frac{3}{5}\Rightarrow k=...$ scores M1
  They must have correctly used $\sin(-a)=-\sin(a)$. If they eliminate *k* instead, they must proceed to find *a* or $\sin a$ and then substitute back into one of the equations to find a value for *k*
  i.e. $4\sin a=3\Rightarrow a=48.59...\Rightarrow 2\sin(48.59...)+k=\frac{12}{5}\Rightarrow k=...$

A1: $\frac{9}{10}$ or 0.9 (this is not awrt 0.9 so if they achieve a rounded value e.g. 0.899… and round to 0.9 then M1A0)