Question	Scheme	Marks
3(a)	$\frac{1}{2}\times 3^2\times\alpha = 7.2 \Rightarrow \alpha = ...$ or $\frac{1}{2}\times 3^2\times 1.6 = 7.2 \Rightarrow \alpha = 1.6$ $\alpha = 1.6$*	M1 A1*
		(2)
(b)(i)	Angle $COA = \frac{1}{2}(2\pi - 1.6)(= 2.34...)$ $(\approx 134°)$	M1
	Area $COA = \frac{1}{2}\times 5\times 3\sin("2.34")$ $(= 5.38...)$	M1
	Total Area $= 2\times\frac{1}{2}\times 5\times 3\sin("2.34") + 7.2$	dM1
	= 18 (cm^2) Awrt 18 (cm^2) (Ans = 17.96)	A1
(ii)	Arc $AB = 3\times 1.6(= 4.8)$	B1
	$(AC^2 =)\ 5^2 + 3^2 - 2\times 5\times 3\cos("2.34")$	M1
	Total perimeter $= 2\times\sqrt{5^2 + 3^2 - 2\times 5\times 3\cos("2.34")} + 3\times 1.6$	dM1
	= Awrt 19.6 (cm)	A1
		(8)
Alt (b)(i)	$AB = 2\times 3\sin 0.8$	M1
	$ON = 3\cos 0.8$	M1
	Total Area $= \frac{1}{2}(5 + ON)\times AB + 7.2 - \frac{1}{2}\times 3\cos 0.8\times 2\times 3\sin 0.8$	dM1
	= 18 (cm^2) Awrt 18 (cm^2) (Ans = 17.96)	A1
		(10 marks)

Notes

(a)

M1 Uses a correct sector area formula and 7.2 to find the value for α. They should show the values embedded in the equation and proceed to find a value for α.
Alternatively, substitutes in $\alpha = 1.6$ into the area of a sector formula and achieves 7.2.

A1* Correct proof starting with $\frac{1}{2}\times 3^2\times\alpha = 7.2$ and at least one intermediate line of working and no errors. Eg $\frac{1}{2}\times 3^2\times\alpha = 7.2 \Rightarrow \alpha = \frac{7.2}{4.5} = 1.6$ scores M1A1
Alternatively, they must conclude that $\alpha = 1.6$ or if there is a preamble then there should be some form of completion which could be a tick, QED etc.
If they use a different variable such as θ they must state/link somewhere that $\alpha = 1.6$

(b)(i) **Mark both (i) and (ii) together. If no angle calculation is seen then use what they think is their angle *COA* in bi and bii. Beware of values on the diagram that may imply a method.**

M1 $\frac{1}{2}(2\pi - 1.6)$ Correct method for angle *COA*. Sight of awrt 2.34 is sufficient to score this mark and may be on the diagram. (May also be implied by 134°)

M1 Uses a correct method for the area of triangle *COA* or *COB*. It is sufficient to see the values embedded in the expression such as $\frac{1}{2}\times 5\times 3\sin("2.34")$ (= awrt 5.38 / 5.39). Angle may be in degrees. If they state $\frac{1}{2}ab\sin C$ oe but embed values as $\frac{1}{2}abC$ condone as a slip for M1.

dM1 Fully correct strategy for the area. It is dependent on the previous method mark so allow if their angle *COA* is incorrect. Look for $2\times$ area of triangle $COA + 7.2$. Embedded values are sufficient.

A1 awrt 18 (cm^2) **Must come from a correct method**

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Alt b(i)

M1 Find the length $AB = 2\times 3\sin 0.8$ (awrt 4.30)

M1 Finds the length *ON* where *N* is the midpoint of *AB* (awrt 2.09)

dM1 Fully correct strategy for the area. Look for $7.2 +$ area of triangle *ABC* – area of triangle *AOB*

A1 awrt 18 (cm^2) **Must come from a correct method**

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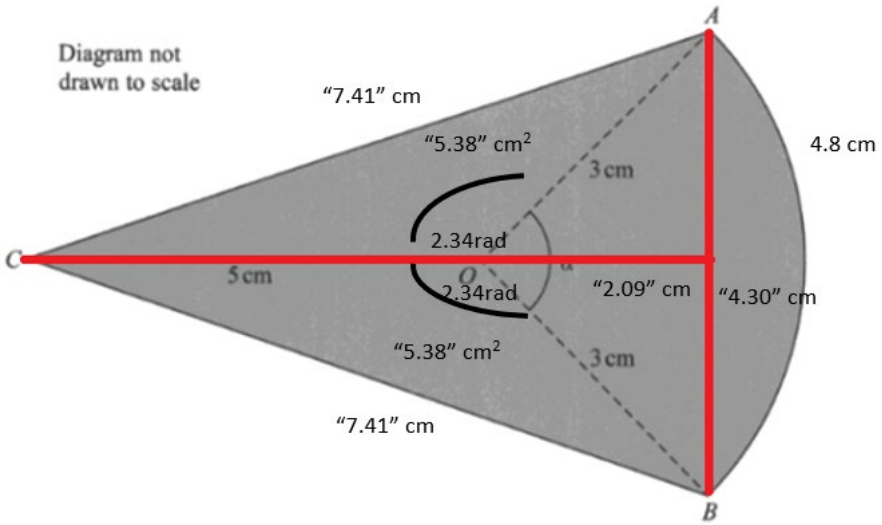
(ii)

B1 Correct expression or value for the arc length (4.8)

M1 Uses a correct method for AC^2, *AC*, CB^2 or *CB*. Embedded values in the associated formula is sufficient or sight of awrt 54.9 or awrt 7.41 would imply this mark. (Angle in degrees $\approx 134°$) For this mark condone candidates confusing AC^2/CB^2 and *AC*/*CB*.

dM1 Total perimeter $= 2\times\sqrt{5^2+3^2-2\times 5\times 3\cos("2.34")}+3\times 1.6$. It is dependent on the B and the M marks and they must have remembered to square root AC^2 or CB^2.

A1 awrt 19.6 (cm) (Ans = 19.619) **Must come from a correct method**



Question	Scheme	Marks
4	$y = 3x + 4 \Rightarrow x^2 + (3x+4)^2 + 6x - 4(3x+4) = 4$ **or** $x = \frac{y-4}{3} \Rightarrow \left(\frac{y-4}{3}\right)^2 + y^2 + 6\left(\frac{y-4}{3}\right) - 4y = 4$	M1
	$5x^2 + 9x - 2\ (=0)$ or $5y^2 - 13y - 46\ (=0)$	M1A1
	$(5x-1)(x+2) = 0 \Rightarrow x = \ldots$ or $(5y-23)(y+2) = 0 \Rightarrow y = \ldots$	dM1
	$x = 0.2,\ x = -2$ or $y = 4.6,\ y = -2$	B1
	Substitutes their x into their $y = 3x + 4$ / Substitutes their y into their $x = \frac{y-4}{3}$	M1
	$x = 0.2\left(\text{or}\frac{1}{5}\right),\ y = 4.6\left(\text{or}\,4\frac{3}{5}\,\text{or}\frac{23}{5}\right)$ **and** $x = -2,\ y = -2$	A1
		(7 marks)

Notes

M1 rearrange the linear equation to $y =\ldots$ or $x =\ldots$ and attempts to fully substitute into the second equation.

M1 Collect terms together to produce a 2 or 3 term quadratic expression = 0. The '= 0' may be implied by later work. Condone slips in their rearrangement of the equation.

A1 Correct quadratic equation in x or y. Condone the absence of "$= 0$"
They may be multiples of the main scheme. Eg $10x^2 + 18x - 4 = 0$ or $10y^2 - 26y - 92 = 0$

dM1 Attempt to factorise and solve or complete the square and solve or uses a correct quadratic formula for a 3 term quadratic and obtains at least one value of x or y. (see general guidance for solving a quadratic). If factorising then their **seen** factorised expression must equal their **seen** 3TQ quadratic expression. If they use the quadratic formula, we must see the values embedded in a correct formula.
Dependent on both previous method marks.
They cannot just write down their calculator values for this mark
Guidance on use of calculators for factorising quadratics and how to score:

$\ldots\ldots \Rightarrow 10x^2 + 18x - 4 = 0 \Rightarrow (5x-1)(x+2) = 0 \Rightarrow x = \frac{1}{5}, -2 \Rightarrow \ldots$ max score M1M1A1 dM0 B1M1 A0

$\ldots\ldots \Rightarrow 10x^2 + 18x - 4 = 0 \Rightarrow (x-\frac{1}{5})(x+2) = 0 \Rightarrow x = \frac{1}{5}, -2 \Rightarrow \ldots$ max score M1M1A1 dM0 B1M1 A0

$\ldots \Rightarrow 10x^2 + 18x - 4 = 0 \Rightarrow x = \frac{1}{5}, -2 \Rightarrow \ldots$ max score M1M1A1 dM0 B1M1 A0