A/A* - Arc length and area of sector

www.bit.do/AgradeArcLenthAreaSector

Question	Maximum Mark	Mark Awarded
1	2	
2	7	
3	6	
4	6	
Total Mark		

EAS
Education Achievement Service
for South East Wales
Gwasanaeth Cyflawni Addysg
i Dde Ddwyrain Cymru

1. In a shot put event, competitors throw the shot from the throwing circle into a landing area. The landing area is part of a sector of a circle of radius 25 m, with its centre at the centre point of the throwing circle. The sector angle is 35°.
A diagram of the throwing circle and landing area is shown below.

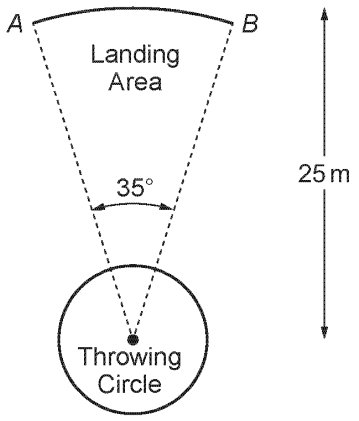

Diagram not drawn to scale

Calculate the length of the arc *AB*. [2]

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2. A sector is removed from a circle of radius 12 cm, as shown below.

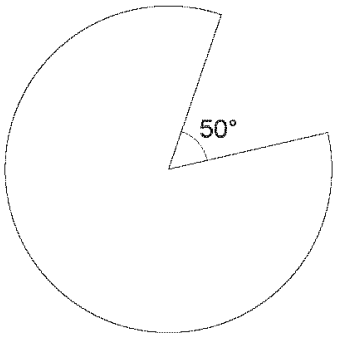

Diagram not drawn to scale

(a) Calculate the area of the **remaining** shape. [3]

(b) What is the perimeter of the **sector that has been removed?** [4]

3. *(a)* A circular flower bed in a town park has a radius of 8 metres.
The perimeter of a major sector of this flower bed is marked out with a thin metal strip, as shown below.

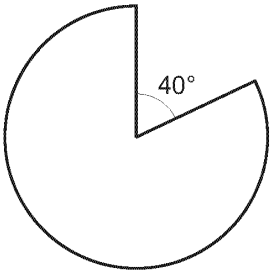

Diagram not drawn to scale

Calculate the total length of the thin metal strip. [3]

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(b) A different circular flower bed has a radius of 12 metres.
The park gardener wants to create a sector AOB of this circle that has a surface area of $93\,m^2$.

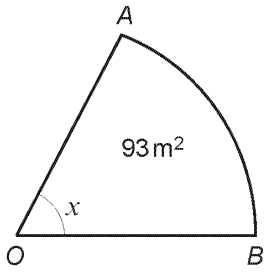

Diagram not drawn to scale

Calculate the size of angle x. [3]

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6

4. A factory produces metal parts for an engine.
One of the parts is a circular shape with a sector removed as shown below.

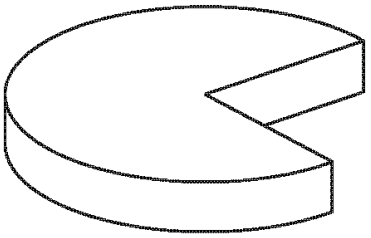

Diagram not drawn to scale

The angle subtended at the centre of the part is 305°.
The radius of the circle is 6 cm.
The thickness of the part is 2 cm.

(a) Calculate the area of the top surface of the part. [2]

(b) The **curved** rim of the part is to be painted red.
Calculate the area that will be painted red. [4]

Marking Scheme

1.

15. To be viewed with diagram. (35/360)×2π×25 = 15.2(...) up to 15.3		M1 A1	Accept an answer of 15 from correct working.

2.

June 2015 **UNIT 1 Higher**	✓	**Mark**	**Comments**
13(a) Use of $310^{(o)}$		B1	Must be used with π.
(Area =) $\frac{360 - 50}{360} \times \pi \times 12^2$		M1	M2 for $\pi 12^2 - \frac{50}{360} \times \pi \times 12^2$
$= 389{\cdot}5(.....)(cm^2)$ or 124π.		A1	Accept answers between 389·35 and 389·75 inclusive. Allow $390(cm^2)$ from correct work. SC1 for $62{\cdot}8(.....)(cm^2)$ or 20π.
13. (b) $\frac{50}{360} \times 2 \times \pi \times 12$	✓	M1	
$= 10{\cdot}4(7..)$(cm) or 10·5(cm) or $10\pi/3$.	✓	A1	
(Perimeter =) $10{\cdot}4(7..) + 24$	✓	M1	F.T. 'their derived 10·4(7..)' + 24. 'Their derived 10·4(7..)' must involve the use of π.
$= 34{\cdot}4(7..)$ (cm)	✓	A1	

3.

(a) $\frac{320}{360} \times 2 \times \pi \times 8$ OR $2\pi \times 8 - \frac{40}{360} \times 2 \times \pi \times 8$	M1	
= 44·68 (m) OR $128\pi / 9$	A1	Accept 44·6 to 44·7 inclusive.
(Length of metal strip =) 60·68(m)	A1	F.T. 'their 44·68' + 16. SC2 for 21·5 to 21·6 (working with 40° and adding 16). SC1 for 5·5 to 5·6 (working with 40°).
(b) $\frac{x}{360} \times \pi \times 12^2 = 93$ or equivalent	M1	
$x = \frac{93 \times 360}{\pi \times 12^2}$	m1	
= 74(°)	A1 6	C.A.O.

4.

November 2015 UNIT 1 Higher	Mark	FINAL MARK SCHEME Comments
14(a) $\frac{305}{360} \times \pi \times 6^2$ OR $\pi \times 6^2 - \frac{55}{360} \times \pi \times 6^2$	M1	
$= 95{\cdot}8(...)(cm^2)$	A1	Accept $30{\cdot}5\pi$ or values between 95·7 and 95·9 inclusive. Allow $96(cm^2)$ from correct work. *M0A0 if 55° used in (a) but allow F.T. if used again in (b).*
(b) $\frac{305}{360} \times 2 \times \pi \times 6$ or equivalent	M1	Allow M1for $305/360 \times 2 \times \pi \times 6$. Ignore (+ 12 or +6) but see below for misread.
$= 31{\cdot}9(...)$	A1	Accept 31·9 to 32 inclusive and $61\pi/6$ or equivalent.
$\times 2$	m1	F.T. 'their 31·9' if M1 gained.
$= 63{\cdot}8(...)(cm^2)$	A1	
		$\frac{305}{360} \times 2 \times \pi \times 6 \times 2$ M2 *$= 63{\cdot}8(...)(cm^2)$ A2*
		Treat painting of one or both straight edges as a misread and penalise −1. E.g. 63·8+12×2 =87·8 or 63·8+6×2 =75·8 is MA1m1A1 −1MR Also e.g $\frac{305}{360} \times 2 \times \pi \times 6 + 12 = 43{\cdot}9$ M1A1 $\times 2$ m1 $= 87{\cdot}8$ A1 −1MR
	6	

Examiner's Comments

1. Candidates generally started their method with the correct fraction of a circle but unsuccessful candidates then either used the area formula for a circle or did not use pi in their calculation.

   *This comment originally referred to question **15** on paper **4353/02 (05/06/2015)***

2. Pleasing to note that fewer candidates than usual were confusing the area formula with the circumference formula.

   In part (b) some forgot to add the 2 × 12 cm to the curved length.

   *This comment originally referred to question **13** on paper **4351/02 (21/05/2015)***

3. (a) Not well answered. Some candidates confused the circumference formula with the area formula.

   (b) Again not well answered. A number of those, few candidates, who were correctly engaging with this area of sector problem made errors in manipulating their equation

   *This comment originally referred to question **12** on paper **4351/02 (09/01/2017)***

4. Pleasing to note that fewer candidates than usual were confusing the area formula with the circumference formula.

   Part (a) was well answered although some doubled their answer, presumably thinking that the 2cm given in the stem of the question had to be used.

   A common error in part (b) was to misread the question (despite the word 'curved' being in bold) and to also include the non-curved parts of the rim.

   *This comment originally referred to question **14** on paper **4351/02 (04/11/2015)***