



5.17H Sector Areas and Arc Lengths: Higher Tier Practice

EDEXCEL Edexcel 1MA1 · Calculator allowed · about 65 minutes

Total Marks

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** Work out the area of a sector of a circle with radius 8 cm and centre angle 45 degrees.

(Total for Question 1 is 2 marks)

- 2** Find the arc length of a sector with radius 10 m and central angle 72 degrees. Give your answer in metres, correct to 3 significant figures.

(Total for Question 2 is 2 marks)

- 3** The area of a sector of a circle is 50 cm^2 and the radius is 7 cm. Work out the size of the centre angle, in degrees. Give your answer correct to 1 decimal place.

(Total for Question 3 is 3 marks)

- 4** A circle of radius 12 cm has a sector with centre angle 100 degrees. A triangle is formed by the two radii and the chord joining the sector ends. Calculate the area of the shaded segment (the area of the sector minus the area of the triangle). Give your answer to 1 decimal place.

(Total for Question 4 is 4 marks)

- 5 A sector has radius 3 m and arc length 5 m. Calculate the perimeter of the sector (arc plus the two radii). Give your answer correct to 3 significant figures.

(Total for Question 5 is 2 marks)

- 6 Show that for a sector of a circle the area A and the arc length s satisfy $A = \frac{1}{2} r s$ when the angle is measured in radians. You must show the steps that lead to this result.

(Total for Question 6 is 3 marks)

- 7 A sector has arc length 15 cm and area 90 cm^2 . Find the radius of the circle. Give your answer correct to 3 significant figures.

(Total for Question 7 is 4 marks)

- 8 Two concentric circles have radii 10 cm and 6 cm. A sector of the larger circle with centre angle 60 degrees is shaded, and the corresponding sector of the smaller circle is not shaded. Calculate the area of the shaded region between the two sectors. Give your answer in terms of π and also as a decimal correct to 1 decimal place.

(Total for Question 8 is 4 marks)

Mark scheme · 5.17H Sector Areas and Arc Lengths: Higher Tier Practice

Question 1

- **M1** use area = $\pi r^2 \times \text{angle}/360$ or equivalent method
- **A1** $8\pi \text{ cm}^2$ cao
- **Answer: $8\pi \text{ cm}^2$ (approximately 25.133 cm²)**

Question 2

- **M1** use arc length = $2\pi r \times \text{angle}/360$ or $r \times \theta$ in radians
- **A1** $4\pi \text{ m} = 12.566\dots$ so 12.6 m awrt
- **Answer: 12.6 m**

Question 3

- **M1** use area = $\pi r^2 \times \text{angle}/360$ and rearrange to angle = $360 \times \text{area} / (\pi r^2)$
- **M1** substitute numbers: angle = $360 \times 50 / (\pi \times 49)$
- **A1** 116.9 degrees awrt
- **Answer: 116.9 degrees**

Question 4

- **M1** area sector = $\pi r^2 \times \text{angle}/360 = \pi \times 144 \times 100/360 = 40\pi$
- **M1** area triangle = $1/2 \times r^2 \times \sin(\theta)$ with θ in degrees, so $1/2 \times 144 \times \sin(100 \text{ degrees})$
- **A1** compute triangle area = $72 \times \sin(100 \text{ degrees}) = 70.9\dots \text{ cm}^2$ awrt
- **A1** segment area = $40\pi - 72 \sin(100 \text{ degrees}) = 54.8 \text{ cm}^2$ awrt
- **Answer: 54.8 cm²**

Question 5

- **M1** perimeter = arc + $2r = 5 + 2 \times 3 = 11$
- **A1** 11.0 m cao
- **Answer: 11.0 m**

Question 6

- **M1** state area = $1/2 r^2 \theta$ and arc length $s = r \theta$ or equivalent
- **M1** substitute $\theta = s/r$ into area formula or eliminate θ
- **A1** conclude $A = 1/2 r^2 \times (s/r) = 1/2 r s$ cao
- **Answer: $A = 1/2 r s$**

Question 7

- **M1** use relationship $A = 1/2 r s$ (from Q6) or area = $1/2 \times r \times \text{arc}$
- **M1** substitute $A = 90$ and $s = 15$ to get $90 = 1/2 \times r \times 15$
- **M1** solve for r : $r = 90 \times 2 / 15 = 12$
- **A1** 12.0 cm cao
- **Answer: 12.0 cm**

Question 8

- **M1** area large sector = $\pi \times 10^2 \times 60/360 = 100\pi \times 1/6 = 50\pi/3$
- **M1** area small sector = $\pi \times 6^2 \times 60/360 = 36\pi \times 1/6 = 6\pi$
- **A1** subtract to get $50\pi/3 - 6\pi = (50\pi - 18\pi)/3 = 32\pi/3$
- **A1** decimal = $32\pi/3 = 33.5$ awrt
- **Answer: $32\pi/3$ (approximately 33.5)**