



3.16H Area and Circumference of Circles: Higher Tier Practice

EDEXCEL Edexcel 1MA1 · Calculator allowed · about 75 minutes

Total Marks

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** Work out the circumference of a circle with radius 7 cm. Give your answer in terms of π .

(Total for Question 1 is 2 marks)

- 2** A circular badge has diameter 10 cm. Work out the area of the badge. Give your answer in terms of π .

(Total for Question 2 is 3 marks)

- 3** A sector of a circle has radius 9 cm and angle 120 degrees. Work out the length of the arc of the sector. Give your answer in terms of π .

(Total for Question 3 is 4 marks)

- 4 A sector has radius 6 cm and central angle 150 degrees. Work out the area of the sector. Give your answer in terms of π .

(Total for Question 4 is 5 marks)

- 5 A small playing surface is made from a rectangle of length 20 cm and width 14 cm with a semicircle attached to one width so that the diameter of the semicircle equals the width. Find the perimeter of the whole shape (the outer boundary). Give your answer in terms of π .

(Total for Question 5 is 6 marks)

- 6 Show that the length of the chord where the line $y = 3$ intersects the circle $x^2 + y^2 = 49$ is $4\sqrt{10}$. Give clear working.

(Total for Question 6 is 8 marks)

- 7 A circle has centre O and radius 12 cm. A chord of the circle has length 16 cm. Find the area of the isosceles triangle formed by the two radii to the chord endpoints and the chord. Give your answer exactly in simplest surd form.

(Total for Question 7 is 12 marks)

Mark scheme · 3.16H Area and Circumference of Circles: Higher Tier Practice

Question 1

- **M1** use circumference = $2 \pi r$ or πd
- **A1** 14π cm cao
- **Answer:** 14π cm

Question 2

- **M1** use area = πr^2 with $r = 5$
- **A1** 25π cao
- **B1** include units: cm^2
- **Answer:** $25 \pi \text{ cm}^2$

Question 3

- **M1** method: arc length = $(\text{angle}/360) \times \text{circumference} = (\text{angle}/360) \times 2 \pi r$
- **M1** substitute angle = 120, $r = 9$ to get $(120/360) \times 2 \pi \times 9$
- **A1** 6π cao
- **B1** units: cm
- **Answer:** 6π cm

Question 4

- **M1** use sector area = $(\text{angle}/360) \times \pi r^2$
- **M1** substitute angle = 150, $r = 6$ so $(150/360) \times \pi \times 36$
- **A1** 15π cao
- **B1** simplification shown: $(150/360) = 5/12$ and $36 \times 5/12 = 15$
- **B1** units: cm^2
- **Answer:** $15 \pi \text{ cm}^2$

Question 5

- **M1** identify which sides are on the outer boundary: two lengths 20, one width 14 and semicircular arc
- **M1** find semicircle arc length = half circumference = $(1/2) \times 2 \pi r = \pi r$ with diameter 14 so $r = 7$
- **M1** compute semicircle arc = 7π
- **M1** sum the straight sides: $20 + 20 + 14 = 54$
- **A1** final exact perimeter $54 + 7 \pi$ cao
- **B1** units: cm
- **Answer:** $54 + 7 \pi$ cm

Question 6

- **dM1** substitute $y = 3$ into $x^2 + y^2 = 49$ to obtain $x^2 + 9 = 49$ or $x^2 = 40$
- **M1** take square root to find $x = \pm \sqrt{40}$
- **A1** simplify $\sqrt{40} = 2 \sqrt{10}$
- **dM1** chord length = difference between x-coordinates = $2x$ where $x = 2 \sqrt{10}$
- **M1** compute chord length = $2x = 4 \sqrt{10}$
- **A1** $4 \sqrt{10}$ cao
- **B1** clear statement linking substitution to chord length
- **B1** correct final presentation, no units required
- **Answer:** $4 \sqrt{10}$

Question 7

- **M1** identify relationship: chord length $c = 2 R \sin(\theta/2)$; substitute $c = 16$, $R = 12$ to get $\sin(\theta/2) = 16/(2 \times 12) = 16/24 = 2/3$
- **M1** state $\theta/2$ satisfies $\sin(\theta/2) = 2/3$ and so $\cos(\theta/2) = \sqrt{1 - (2/3)^2} = \sqrt{5}/3$
- **M1** use double-angle identity $\sin \theta = 2 \sin(\theta/2) \cos(\theta/2)$
- **M1** substitute values to get $\sin \theta = 2 \times (2/3) \times (\sqrt{5}/3) = 4\sqrt{5}/9$
- **M1** use triangle area formula for two sides R and included angle θ : $\text{area} = (1/2) R^2 \sin \theta$
- **M1** substitute $R = 12$ and $\sin \theta = 4\sqrt{5}/9$ to get $\text{area} = 1/2 \times 144 \times (4\sqrt{5}/9)$
- **A1** simplify: $72 \times (4\sqrt{5}/9)$ cao
- **A1** further simplification: $(288\sqrt{5})/9$ cao
- **A1** reduce fraction: $32\sqrt{5}$ cao
- **B1** show exact surd form and state units cm^2
- **B1** clear logical sequence linking chord to area (AO3 communication)
- **A1** final answer $32\sqrt{5} \text{ cm}^2$ cao
- **Answer: $32\sqrt{5} \text{ cm}^2$**