



KS3.M-G11 Circles: Circumference and Area

AQA KS3.M-G11 · Calculators not allowed · about 70 minutes

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** Write down the definition of the circumference of a circle.

(1)

- 2** State the value of π that you should use in calculations to 2 decimal places.

(1)

- 3** A circular plate has radius 10 cm. Calculate its circumference. Give your answer to 1 decimal place.

(2)

- 4** A circular pond has diameter 14 m. Work out its area. Give your answer to 1 decimal place.

(2)

- 5** Calculate the area of a semicircle with radius 6 cm. Give your answer in terms of π and as a decimal to 1 decimal place.

(2)

- 6** A tyre has outer radius 32 cm. A small sticker on the tyre travels once around the tyre. How far does the sticker travel? Give your answer in metres to 1 decimal place.

(2)

- 7** A circular flower bed has area 314 cm^2 . Calculate its radius in cm, correct to 1 decimal place. Use $\pi = 3.14$.

(2)

- 8** Find the circumference of a circle whose area is $50\pi \text{ cm}^2$. Give your answer in terms of π .

(2)

- 9** A circular clock face has radius 12 cm. Draw a semicircular arc on the face and shade the semicircle. Calculate the perimeter of the shaded semicircle including the straight edge. Give your answer to 1 decimal place.

(3)

- 10** A circular coaster has area 78.5 cm^2 . A smaller circle is cut out from its centre with radius 2 cm. Find the area of the remaining ring, giving your answer to 1 decimal place. Use $\pi = 3.14$.

(3)

- 11** A circular sign has radius 25 cm. A border of width 3 cm is painted around the outside. Find the area of the painted border. Give your answer to the nearest whole cm^2 . Use $\pi = 3.14$.

(3)

- 12** A semicircular placemat has diameter 10 cm. Find (a) the area of the semicircle, giving your answer in terms of π , and (b) the perimeter of the semicircle including the straight edge. Give decimal answers to 1 decimal place.

(a) Find the area of the semicircle in terms of π .

(1)

(b) Give the area as a decimal to 1 decimal place and find the perimeter including the straight edge to 1 decimal place.

(2)

- 13** A square of side 8 cm has a quarter-circle of radius 4 cm removed from one corner (the quarter circle sits exactly in the corner). Find the area of the remaining shape. Give your answer to 1 decimal place. Use $\pi = 3.14$.

(4)

- 14** A circular running track has circumference 157 m. Calculate the radius of the track in metres. Give your answer to 1 decimal place. Use $\pi = 3.14$.

(2)

- 15** Two identical semicircles each with radius 7 cm are joined along their diameters to make an oval shape. Find the perimeter of this oval to 1 decimal place.

(3)

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- 16** Find the area of the ring between two concentric circles. The outer radius is 10 cm and the inner radius is 6 cm. Give your answer to 1 decimal place. Use $\pi = 3.14$.

(3)

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- 17** A semicircular window sits on top of a rectangle. The rectangle is 6 m wide and 4 m high. The semicircle has diameter equal to the width of the rectangle. Find the total area of the window to 1 decimal place. Use $\pi = 3.14$.

(4)

18 A school wants to fill a pool formed by a rectangle 20 m long and 8 m wide with a semicircular shallow end whose diameter is the width of the rectangle. The pool will be painted at a cost of 1.80 pounds per square metre. Calculate the total area to be painted and the total cost. Give the area to 1 decimal place and the cost to the nearest penny. Use $\pi = 3.14$.

(a) Find the area of the rectangular part of the pool. (1)

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(b) Find the area of the semicircular end (diameter 8 m). (1)

.....

(c) Find the total area to be painted and give it to 1 decimal place. (1)

.....

(d) Calculate the total cost to paint the pool at 1.80 pounds per square metre. (2)
Give the cost to the nearest penny.

.....

Mark scheme · KS3.M-G11 Circles: Circumference and Area

Question 1

- **B1** statement that the circumference is the distance around the outside of a circle, oe
- Answer: **The distance around the outside of a circle**

Question 2

- **B1** $\pi = 3.14$ cao
- Answer: **3.14**

Question 3

- **M1** use of circumference = $2 \times \pi \times r$ or $\pi \times d$ with $r = 10$
- **A1** 62.8 cm cao
- Answer: **62.8 cm**

Question 4

- **M1** use of area = $\pi \times r^2$ with $r = 7$ m
- **A1** 153.9 m² cao
- Answer: **153.9 m²**

Question 5

- **M1** correct method: area semicircle = $(1/2) \times \pi \times r^2$ with $r = 6$
- **A1** 18pi cm² and 56.5 cm² cao
- Answer: **18pi cm²; 56.5 cm²**

Question 6

- **M1** method: circumference = $2 \times \pi \times 32$ cm
- **A1** 2.0 m cao
- Answer: **2.0 m**

Question 7

- **M1** use of area = πr^2 and rearrangement $r = \sqrt{\text{area}/\pi}$;
- **A1** 10.0 cm cao
- Answer: **10.0 cm**

Question 8

- **M1** find r from area = πr^2 so $r^2 = 50$, $r = \sqrt{50}$
- **A1** circumference = $2\pi r = 2\pi \sqrt{50} = 10\pi \sqrt{2}$ cm oe
- Answer: **$10\pi \sqrt{2}$ cm**

Question 9

- **M1** recognise perimeter = half circumference + diameter = $\pi r + 2r$
- **M1** substitute $r = 12$ to get $\pi \times 12 + 24$
- **A1** 61.7 cm cao
- Answer: **61.7 cm**

Question 10

- **M1** find area of small circle = $\pi \times 2^2 = 4\pi = 12.56$ cm² using $\pi = 3.14$
- **M1** subtract from total area: 78.5 - 12.56
- **A1** 65.9 cm² cao
- Answer: **65.9 cm²**

Question 11

- **M1** area outer circle with $r = 28$: $\pi \times 28^2 = 2461.76$ approx
- **M1** area inner circle with $r = 25$: $\pi \times 25^2 = 1962.5$ approx; subtract
- **A1** 499 cm^2 cao ($2461.76 - 1962.5 = 499.26 \rightarrow 499$ rounded to nearest whole)
- **Answer: 499 cm^2**

Question 12

- (a) **M1** use of area formula for semicircle = $(1/2) \times \pi \times r^2$ with $r = 5$
- (a) **Answer: $12.5\pi \text{ cm}^2$**
- (b) **M1** convert 12.5π to decimal using $\pi = 3.14$
- (b) **A1** area = 39.3 cm^2 and perimeter = 25.7 cm cao
- (b) **Answer: 39.3 cm^2 ; 25.7 cm**

Question 13

- **M1** find area of square = $8 \times 8 = 64 \text{ cm}^2$
- **M1** find area of quarter circle = $(\pi \times 4^2)/4 = 4\pi$
- **M1** subtraction: $64 - 4\pi$
- **A1** 51.4 cm^2 cao
- **Answer: 51.4 cm^2**

Question 14

- **M1** use $r = \text{circumference} / (2\pi)$
- **A1** 25.0 m cao
- **Answer: 25.0 m**

Question 15

- **M1** recognise that joining two semicircles along diameters gives full circle circumference
- **M1** calculate circumference = $2\pi r = 2 \times 3.14 \times 7$
- **A1** 44.0 cm cao
- **Answer: 44.0 cm**

Question 16

- **M1** find outer area = $\pi \times 10^2 = 314.0$ and inner area = $\pi \times 6^2 = 113.04$
- **M1** subtract inner from outer
- **A1** 201.0 cm^2 cao
- **Answer: 201.0 cm^2**

Question 17

- **M1** find area of rectangle = $6 \times 4 = 24$
- **M1** find area of semicircle with $r = 3$: $(1/2) \times \pi \times 3^2 = 4.5\pi$
- **M1** convert semicircle area to decimal using $\pi = 3.14$
- **A1** 38.1 m^2 cao
- **Answer: 38.1 m^2**

Question 18

- (a) **M1** rectangle area = $20 \times 8 = 160 \text{ m}^2$
- (a) Answer: **160 m²**
- (b) **M1** semicircle area = $(1/2) \times \pi \times r^2$ with $r = 4$
- (b) Answer: **8pi m²**
- (c) **M1** add rectangle and semicircle areas: $160 + 8\pi$
- (c) Answer: **185.1 m²**
- (d) **M1** multiply area 185.12 by 1.80
- (d) **A1** £333.22 cao
- (d) Answer: **£333.22**