Worksheet - Circles: circumference and area

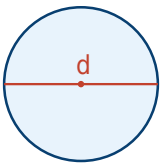
Year: Year 8 · 20

Show your working.

Question 1

Question 1 – Parts of a circle and circumference *(Section A · Skills practice)*

A circle has radius 7 cm. Use the π button on your calculator, and give each answer to 1 decimal place.



a. Write down the diameter of the circle.
b. Work out the circumference using $C = \pi d$.
c. Work out the circumference using $C = 2\pi r$ and confirm that you get the same answer.
d. Leave the circumference in terms of π.

Question 2

Question 2 – Circumference practice *(Section A · Skills practice)*

Find the circumference of each circle. Give each answer to 1 decimal place.

a. radius 3 cm
b. diameter 20 cm
c. radius 4.5 m
d. diameter 12.6 mm

Question 3

Question 3 – Area of a circle *(Section A · Skills practice)*

Find the area of each circle. Give each answer to 1 decimal place. Remember to use the radius, not the diameter.

a. radius 5 cm
b. radius 2.5 m
c. diameter 14 cm
d. diameter 9 mm

Question 4

Question 4 – Answers in terms of pi *(Section A · Skills practice)*

Give each answer in terms of π, with no decimals.

a. The area of a circle with radius 6 cm.
b. The circumference of a circle with radius 6 cm.
c. The area of a circle with diameter 10 m.
d. The circumference of a circle with diameter 10 m.

Question 5

Question 5 – Working backwards *(Section A · Skills practice)*

Use $\pi = 3.14$ in this question.

a. A circle has circumference 31.4 cm. Find its diameter and its radius.
b. A circle has circumference 62.8 m. Find its radius.
c. A circle has area 78.5 cm². Find r^2, then the radius.
d. A circle has area 49π cm². Find its diameter.

Question 6

Question 6 – Semicircles and quarter circles *(Section A · Skills practice)*

Each shape is part of a circle with radius 10 cm. Give each answer to 1 decimal place.

a. Find the area of a semicircle.
b. Find the perimeter of the semicircle (the curved edge and the straight edge).
c. Find the area of a quarter circle.
d. Find the perimeter of the quarter circle (the curved edge and the two straight edges).

Question 7

Question 7 – The bicycle wheel *(Section B · Real-life practice)*

Chloe's bicycle wheel has a diameter of 66 cm.

a. Find the circumference of the wheel in centimetres, to 1 decimal place.
b. How far does the bike travel in one complete turn of the wheel? Give your answer in metres to 2 decimal places.
c. How many complete turns does the wheel make on a 1 km journey to school? Give your answer to the nearest whole number.
d. Chloe cycles 3.2 km to the swimming pool. How many turns is that, to the nearest 100?

Question 8

Question 8 – Pizza prices *(Section B · Real-life practice)*

A pizza restaurant sells round pizzas in three sizes.

Size	Diameter	Price
Small	20 cm	£6.00
Medium	28 cm	£9.50
Large	36 cm	£14.00

a. Work out the area of each pizza, to the nearest cm².
b. Work out the cost per cm² of each pizza, in pence, to 2 decimal places.
c. Which size is the best value? Explain.
d. Priya says that the large pizza is twice as big as the small pizza because 36 is nearly twice 20. Is she right? Use the areas to decide.

Question 9

Question 9 – The garden pond *(Section B · Real-life practice)*

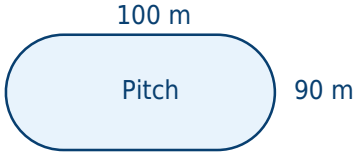
Mr Singh digs a circular pond of diameter 3 m in his garden. He builds a circular path of width 1 m all the way round the pond.

a. What is the radius of the pond?
b. Find the area of the pond, to 2 decimal places.
c. What is the radius of the pond and path together?
d. Find the area of the path alone, to 1 decimal place.
e. Paving slabs for the path cost £18 per square metre. Find the cost, to the nearest £.

Question 10

Question 10 – The running track *(Section B · Real-life practice)*

The school running track is shown below: two straight sides of 100 m with a semicircle at each end. The width of the pitch is 90 m.



a. The two semicircles make a full circle. What is its diameter?
b. Find the length of the curved part of the track, to 1 decimal place.
c. Find the total length of one lap, to the nearest metre.
d. Aliyah wants to run 5 km. How many complete laps is that?

Question 11

Question 11 – Tablecloths and edging *(Section B · Real-life practice)*

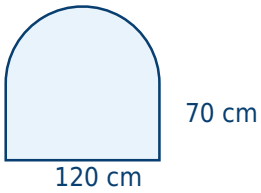
A café has round tables of diameter 80 cm. The owner buys fabric tablecloths that hang 15 cm over the edge all the way round.

a. What is the diameter of the tablecloth?
b. Find the area of fabric needed for one cloth, in cm², to the nearest whole number.
c. Fabric costs £12 per square metre. Find the cost of one cloth, to the nearest penny.
d. The owner also sews lace edging round the outside of each cloth. Find the length of lace for one cloth, to the nearest cm.

Question 12

Question 12 – Window design *(Section B · Real-life practice)*

An architect designs a window in the shape of a rectangle with a semicircle on top. The rectangle is 120 cm wide and 70 cm high.



a. What is the radius of the semicircle?
b. Find the area of the rectangle.
c. Find the area of the semicircle, to 1 decimal place.
d. Find the total area of glass in cm² and in m² (to 2 decimal places).
e. Window frame costs £35 per metre. The frame goes round the whole outside edge (not along the bottom). Find the frame length and cost.

Question 13

Question 13 – Tin of beans *(Section B · Real-life practice)*

A cylindrical tin of beans has diameter 7.4 cm and height 10.2 cm. The paper label goes once round the curved surface with no overlap.

a. Find the circumference of the tin, to 1 decimal place.
b. Find the area of the label, to the nearest cm².
c. Find the area of the circular top, to 1 decimal place.
d. The company says the label covers more than 200 cm². Is this true?

Question 14

Question 14 – The clock face *(Section B · Real-life practice)*

The town hall clock has a minute hand 1.2 m long.

a. How far does the tip of the minute hand travel in 1 hour? Give your answer in metres to 1 decimal place.
b. How far does it travel in 15 minutes?
c. The clock face has a radius of 1.5 m. Find its area, to 1 decimal place.
d. What fraction of the face does the minute hand sweep through in 20 minutes, and what area is that for the full 1.2 m hand length (as a sector)?

Question 15

Question 15 – Designing a running ring *(Section C · Problem solving)*

A park has a circular lawn of radius 8 m surrounded by a flower border of width 2 m. The lawn is to be re-seeded and the border to be planted with flowers.

a. Find the area of the lawn, to 1 decimal place.
b. Find the radius of the lawn and border together, and its area.
c. Find the area of the flower border.
d. Lawn seed costs £1.40 per m^2 and flowers cost £6.50 per m^2. Find the total cost, to the nearest £.
e. The gardener says the border covers less than half the area of the lawn. Is he right?

Question 16

Question 16 – Best value cake tins *(Section C · Problem solving)*

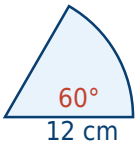
Daniel is choosing a cake tin. Tin A is a circle of diameter 24 cm. Tin B is a square of side 21 cm. His recipe needs a base of at least 450 cm^2.

a. Find the area of the base of Tin A, to the nearest cm^2.
b. Find the area of the base of Tin B.
c. Which tins are big enough for the recipe?
d. Daniel wants to decorate the edge of the cake with a ribbon. Which tin needs the longer ribbon? Show your calculations.

Question 17

Question 17 – Sector of a pie *(Section C · Problem solving)*

A pie chart is drawn as a circle of radius 12 cm. One sector has an angle of 60°.



a. What fraction of the circle is the sector?

b. Find the area of the whole circle, to 1 decimal place.
c. Find the area of the sector.
d. Find the length of the curved arc of the sector.
e. Find the perimeter of the sector.

Question 18

Question 18 – Wheels and gears *(Section C · Problem solving)*

A tractor has large back wheels of diameter 1.8 m and small front wheels of diameter 0.9 m. The tractor drives 100 m across a field.

Wheel	Diameter
Back	1.8 m
Front	0.9 m

a. Find the circumference of each type of wheel, to 2 decimal places.
b. How many turns does a back wheel make over 100 m? Give your answer to 1 decimal place.
c. How many turns does a front wheel make?
d. What do you notice about the two answers? Explain why.

Question 19

Question 19 – Composite shape: the sports hall *(Section C · Problem solving)*

The floor of a school sports hall is a rectangle 30 m by 20 m with a semicircular alcove of diameter 20 m added at one end.

a. Find the area of the rectangle.
b. Find the area of the semicircular alcove, to 1 decimal place.
c. Find the total floor area.
d. A coat of floor varnish covers 8 m² per litre. How many litres are needed? Round up to the next litre.
e. Varnish is sold in 5-litre tins at £22 each. How much does it cost?

Question 20

Question 20 – Challenge: a circle inside a square *(Section D · Challenge)*

A circular badge of radius r is cut from a square piece of metal of side $2r$, so the circle touches all four sides of the square.

a. Write the area of the square in terms of r.
b. Write the area of the circle in terms of r and π.
c. What fraction of the square is the circle? Give a decimal to 3 decimal places.
d. Work out the area of metal wasted when $r = 6$ cm, to 1 decimal place.
e. Four circles of radius 6 cm are cut from a large square of side 24 cm instead.

What fraction of the large square is used?