



- 1 A circle has radius 6 cm.

- a. Work out the circumference of the circle. Give your answer correct to 1 decimal place.
b. Work out the area of the circle. Give your answer correct to 1 decimal place.

(3 marks)

Circumference is the distance around the circle; area is the space inside it. The radius runs from the centre to the edge, and the diameter is twice the radius. Use the calculator's π key and round only the final answers

$$\text{Circumference} = 2\pi r = 2 \times \pi \times 6 = 37.699... = 37.7 \text{ cm (1 dp)}$$

$$\text{Area} = \pi r^2 = \pi \times 36 = 113.097... = 113.1 \text{ cm}^2 \text{ (1 dp)}$$

- 2 A circle has diameter 18 cm.

- a. Work out the circumference of the circle. Give your answer in terms of π .
b. Work out the area of the circle. Give your answer in terms of π .

(3 marks)

$$\text{Circumference} = \pi d = 18\pi \text{ cm}$$

$$\text{Radius} = 18 \div 2 = 9 \text{ cm, so area} = \pi r^2 = \pi \times 81 = 81\pi \text{ cm}^2$$

- 3 The circumference of a circle is 14π cm.

Work out the area of the circle. Give your answer in terms of π .

(4 marks)

$$\text{Circumference} = 2\pi r, \text{ so } 2\pi r = 14\pi \text{ and } r = 7 \text{ cm}$$

$$\text{Area} = \pi r^2 = \pi \times 7^2 = 49\pi \text{ cm}^2$$

$$\boxed{49\pi \text{ cm}^2}$$

4

A circle of radius 5 cm is drawn inside a square with sides of length 10 cm, so that the circle touches all four sides of the square.

The region inside the square but outside the circle is shaded.

Work out the shaded area. Give your answer correct to 1 decimal place.

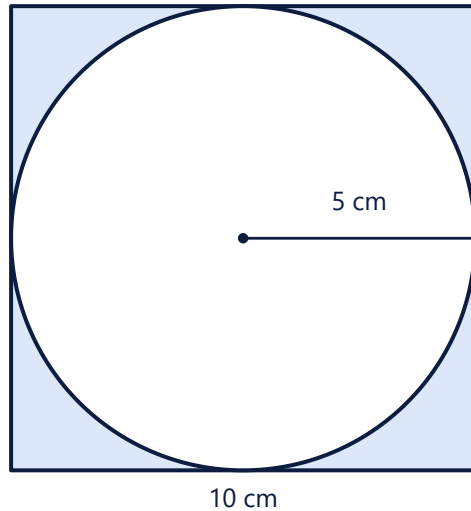


Diagram NOT accurately drawn

(4 marks)

$$\text{Area of the square} = 10 \times 10 = 100 \text{ cm}^2$$

$$\text{Area of the circle} = \pi \times 5^2 = 25\pi = 78.539... \text{ cm}^2$$

$$\text{Shaded area} = 100 - 78.539... = 21.460... = 21.5 \text{ cm}^2 \text{ (1 dp)}$$

$$\boxed{21.5 \text{ cm}^2}$$

5

A rectangle is 15 cm long and 8 cm wide. A circle of radius 3 cm is drawn completely inside the rectangle and is cut out.

The rest of the rectangle is shaded.

Work out the shaded area as a percentage of the area of the rectangle. Give your answer correct to 1 decimal place.

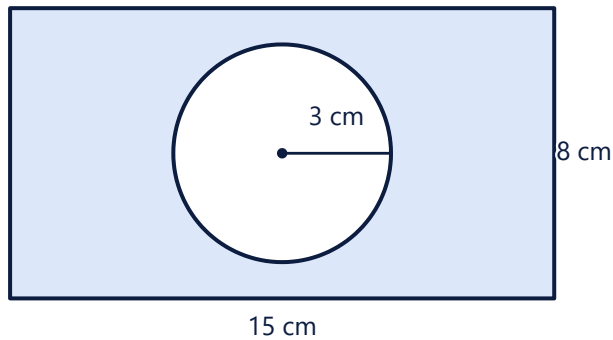


Diagram NOT accurately drawn

(4 marks)

$$\text{Area of the rectangle} = 15 \times 8 = 120 \text{ cm}^2$$

$$\text{Area of the circle} = \pi \times 3^2 = 9\pi = 28.274... \text{ cm}^2$$

$$\text{Shaded area} = 120 - 28.274... = 91.725... \text{ cm}^2$$

$$\text{Percentage} = 91.725... \div 120 \times 100 = 76.438... = 76.4\% \text{ (1 dp)}$$

76.4%

6

The diagram shows a square $OABC$ with sides of length 6 cm. A quarter circle, centre O and radius 6 cm, is drawn inside the square from A to C .

The region between the quarter circle and the corner B is shaded.

Show that the shaded area is more than 21% of the area of the square.

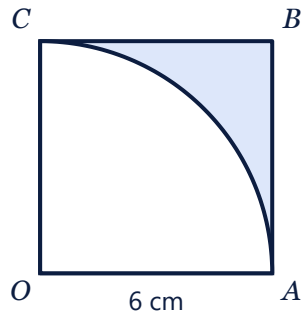


Diagram NOT accurately drawn

(4 marks)

$$\text{Area of the square} = 6 \times 6 = 36 \text{ cm}^2$$

$$\text{Area of the quarter circle} = \frac{1}{4} \times \pi \times 6^2 = 9\pi = 28.274... \text{ cm}^2$$

$$\text{Shaded area} = 36 - 28.274... = 7.725... \text{ cm}^2$$

$$\text{Percentage} = 7.725... \div 36 \times 100 = 21.46...\%, \text{ which is more than } 21\%$$

7

A circular pond has radius 3 m.

The pond is surrounded by a path of constant width 1 m.

Calculate the area of the path. Give your answer correct to 3 significant figures.

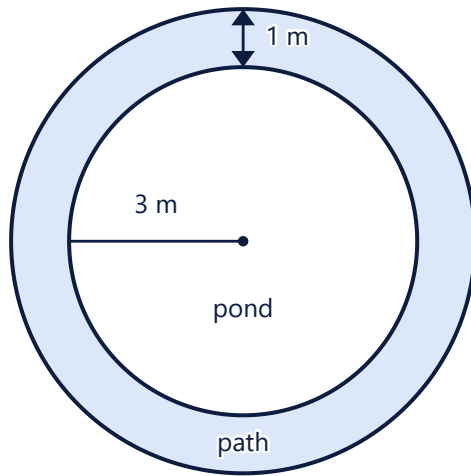


Diagram NOT accurately drawn

(4 marks)

The outer edge of the path is a circle of radius $3 + 1 = 4$ m

Area of the path = $\pi \times 4^2 - \pi \times 3^2 = 16\pi - 9\pi = 7\pi \text{ m}^2$

$7\pi = 21.991\dots = 22.0 \text{ m}^2$ (3 s.f.)

22.0 m²

8

A window is made from a rectangle with a semicircle on top.

The rectangle is 1.2 m high and 0.8 m wide. The semicircle sits exactly on top of the rectangle, so its diameter is 0.8 m.

Glass for the window costs £95 per square metre.

Work out the cost of the glass for the window. Give your answer correct to the nearest penny.

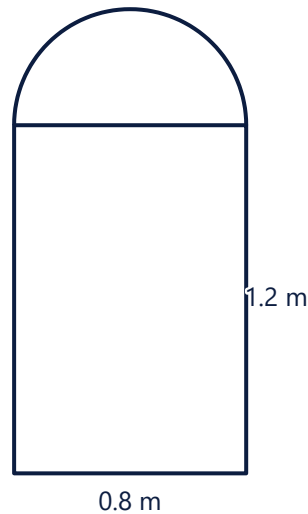


Diagram NOT accurately drawn

(5 marks)

$$\text{Area of the rectangle} = 1.2 \times 0.8 = 0.96 \text{ m}^2$$

$$\text{Radius of the semicircle} = 0.8 \div 2 = 0.4 \text{ m}$$

$$\text{Area of the semicircle} = \frac{1}{2} \times \pi \times 0.4^2 = \frac{1}{2} \times \pi \times 0.16 =$$

$$0.25132... \text{ m}^2$$

$$\text{Total area} = 0.96 + 0.25132... = 1.21132... \text{ m}^2$$

$$\text{Cost} = 1.21132... \times £95 = £115.076... = £115.08 \text{ (nearest penny)}$$

£115.08

9

A quarter circle has radius r cm.

The area of the quarter circle is $9\pi \text{ cm}^2$.

a. Work out the value of r .

b. Work out the perimeter of the quarter circle. Give your answer correct to 1 decimal place.

(4 marks)

a)

$$\begin{array}{rcl}
 \frac{1}{4} \times \pi \times r^2 & = & 9\pi \\
 \div \pi & & \div \pi \\
 \frac{1}{4} \times r^2 & = & 9 \\
 \times 4 & & \times 4 \\
 r^2 & = & 36 \\
 \sqrt{} & & \sqrt{} \\
 r & = & 6
 \end{array}$$

b)

$$\text{Curved edge} = \frac{1}{4} \times 2 \times \pi \times 6 = 9.42\dots$$

$$\text{Straight edges} = 6 + 6 = 12$$

$$9.42 + 12 = 21.42\dots$$

$$\boxed{\text{Perimeter} = 21.4 \text{ cm}}$$

10

A square has sides of length 5 cm.

A circle is drawn through all four vertices of the square.

Calculate the circumference of the circle. Give your answer correct to 3 significant figures.

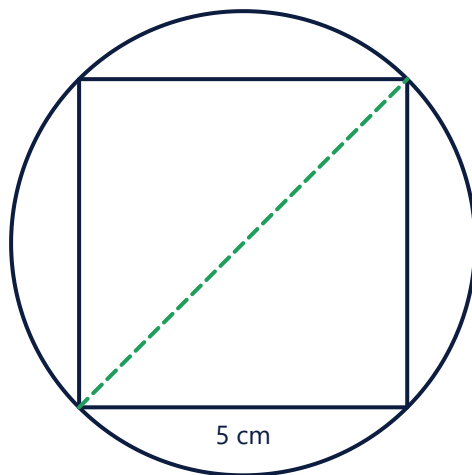


Diagram NOT accurately drawn

(4 marks)

The diameter of the circle is the diagonal of the square

By Pythagoras, $\text{diagonal}^2 = 5^2 + 5^2 = 50$, so $\text{diagonal} = \sqrt{50} = 7.0710... \text{ cm}$

Circumference = $\pi d = \pi \times 7.0710... = 22.214... = 22.2 \text{ cm}$ (3 sf)

22.2 cm

- 11 OAB is a quarter circle with centre O . OA and OB are radii and angle $AOB = 90^\circ$.

The straight line AB has length 10 cm.

Work out the area of the quarter circle. Give your answer in terms of π .

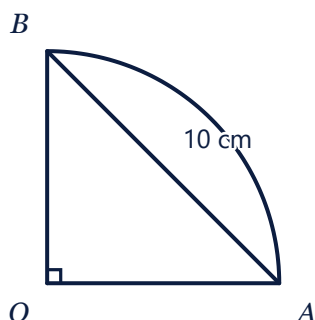


Diagram NOT accurately drawn

(4 marks)

Let the radius be r . Triangle OAB is right-angled at O with $OA = OB = r$

By Pythagoras, $r^2 + r^2 = 10^2$, so $2r^2 = 100$ and $r^2 = 50$

Area of the quarter circle = $\frac{1}{4} \pi r^2 = \frac{1}{4} \times \pi \times 50 = 12.5\pi \text{ cm}^2$

$$\boxed{12.5\pi \text{ cm}^2}$$

- 12 A flower bed is a semicircle with diameter 20 m.

Fencing is to be put around the whole perimeter of the flower bed, including the straight side.

Fencing costs £4.20 per metre and is only sold in whole metres.

Work out the total cost of the fencing.

(5 marks)

$$\text{Curved edge} = \frac{1}{2} \times \pi \times 20 = 10\pi = 31.415... \text{ m}$$

$$\text{Total perimeter} = 31.415... + 20 = 51.415... \text{ m}$$

Fencing is sold in whole metres, so 52 m must be bought

$$\text{Total cost} = 52 \times £4.20 = £218.40$$

$$\boxed{£218.40}$$

- 13 The diagram shows a shape made from a square and a quarter circle.

The square $OABC$ has sides of length 10 cm. The quarter circle has centre O and radius 10 cm, and is joined to the square along the side OC so that the two parts do not overlap.

Work out the total area of the shape. Give your answer correct to 1 decimal place.

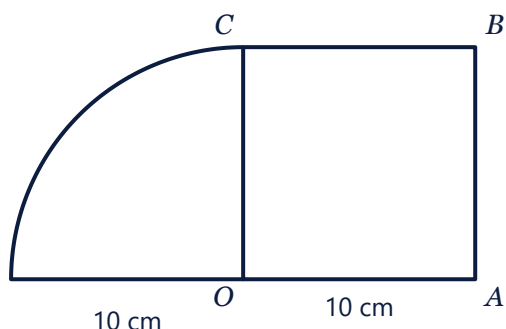


Diagram NOT accurately drawn

(5 marks)

$$\text{Area of the square} = 10 \times 10 = 100 \text{ cm}^2$$

$$\text{Area of the quarter circle} = \frac{1}{4} \times \pi \times 10^2 = 25\pi = 78.539... \text{ cm}^2$$

$$\text{Total area} = 100 + 78.539... = 178.539... = 178.5 \text{ cm}^2 \text{ (1 d.p.)}$$

$$\boxed{178.5 \text{ cm}^2}$$

- 14 A square lawn has sides of length 8 m.

A flowerbed in the shape of a quarter circle of radius 8 m is dug in one corner of the lawn. The centre of the quarter circle is at the corner of the lawn.

The rest of the lawn is covered with turf. Turf costs £4.25 per square metre.

Work out the cost of the turf.

(5 marks)

$$\text{Lawn} = 8 \times 8 = 64 \text{ m}^2$$

$$\text{Flowerbed} = \frac{1}{4} \times \pi \times 8^2 = 16\pi$$

$$\text{Turf area} = 64 - 16\pi = 13.7345... \text{ m}^2$$

$$\text{Cost} = 13.7345... \times 4.25 = 58.371...$$

$$\boxed{\text{Cost} = \text{£}58.37}$$