



eClassroom

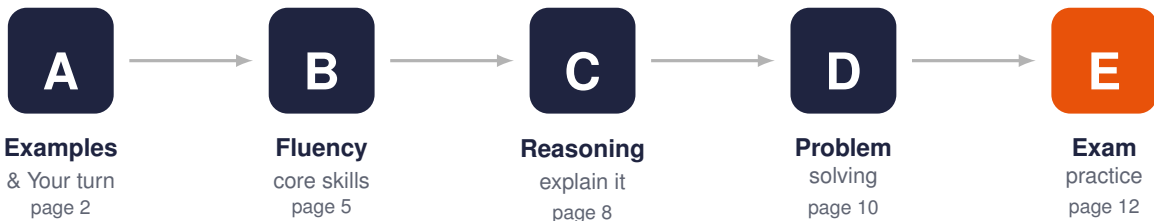
GCSE MATHEMATICS • GEOMETRY

Area and Perimeter

Worksheet

Pearson Edexcel GCSE (1MA1) & International GCSE (4MA1) • Calculator allowed

Free Area and Perimeter worksheet for GCSE and iGCSE Maths, with full worked solutions



Tap a section to jump straight to it

By the end of this worksheet you can: find areas of rectangles, triangles, parallelograms and trapezia • find areas and perimeters of compound shapes • find circumferences and areas of circles and parts of circles • work backwards from an area or perimeter • convert units of area • *Higher:* arcs and sectors, and exact answers in terms of π .

Which questions are for me?

FOUNDATION Everyone starts here. These skills appear on both tiers.

HIGHER Higher only: arc lengths and sector areas, reverse sector problems and exact answers in terms of π . Grades 6 to 9.

Every section has both, clearly labelled. Questions get harder as you go, and every skill in Sections A to D is needed in Section E.

Track your progress

Section	B	C	D	E
Foundation marks	23	10	13	15
Higher marks	16	14	17	15
My score				

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Name

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A

Worked examples & Your turn

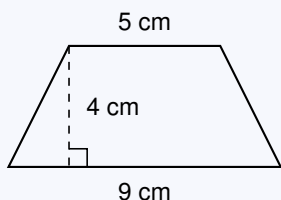
Read each example carefully. Cover it up, then answer the question beside it using the same method.

FOUNDATION

Everyone starts here

Worked example A1

Work out the area of the trapezium.

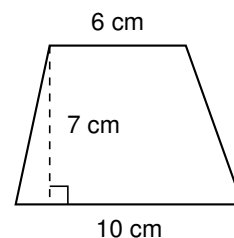


$$\frac{1}{2}(a+b)h = \frac{1}{2}(5+9) \times 4$$

28 cm²

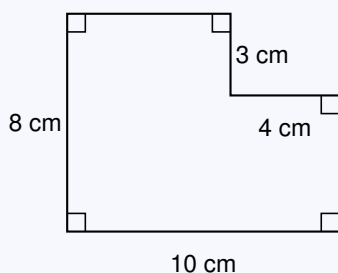
Your turn A1

Work out the area of the trapezium.



Worked example A2

Work out the area and the perimeter.

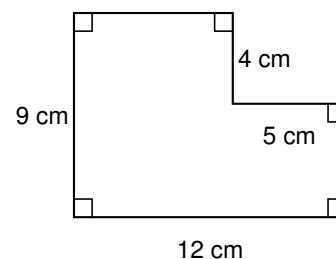


Area: $10 \times 8 - 4 \times 3$. The missing sides are 5 and 6 cm.

68 cm²; 36 cm

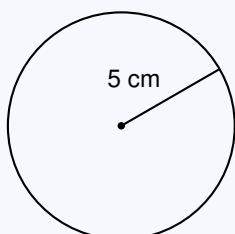
Your turn A2

Work out the area and the perimeter.



Worked example A3

Work out the circumference and the area, to 1 decimal place.

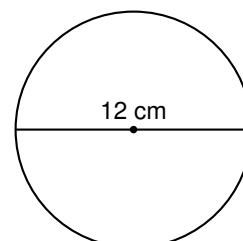


$$C = 2\pi r, A = \pi r^2 \text{ with } r = 5$$

31.4 cm; 78.5 cm²

Your turn A3

Work out the circumference and the area, to 1 decimal place.

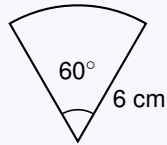


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HIGHER*Higher only: arcs, sectors and exact answers***Worked example A4: arc length**

Work out the arc length, to 3 significant figures.

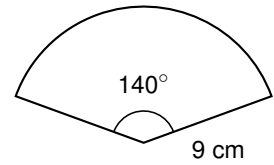


$$\frac{60}{360} \times 2\pi \times 6$$

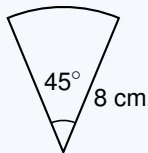
6.28 cm

Your turn A4

Work out the arc length, to 3 significant figures.

**Worked example A5: sector area**

Work out the area of the sector, to 3 significant figures.

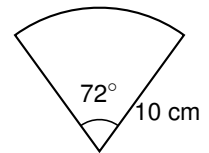


$$\frac{45}{360} \times \pi \times 8^2 = 8\pi$$

25.1 cm²

Your turn A5

Work out the area of the sector, to 3 significant figures.



Worked example A6: finding the angle

A sector of radius 8 cm has area $16\pi \text{ cm}^2$. Work out the angle of the sector. $\frac{\theta}{360} \times 64\pi = 16\pi$, so

$$\frac{\theta}{360} = \frac{1}{4}$$

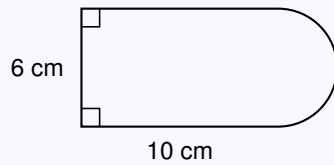
90°

Your turn A6

A sector of radius 6 cm has area $15\pi \text{ cm}^2$. Work out the angle of the sector.

Worked example A7: exact answers

Work out the perimeter of the shape. Give your answer in terms of π .



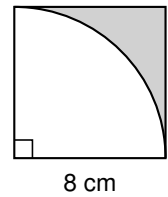
Three straight sides $10 + 6 + 10$, and a semicircle arc

$$\frac{1}{2} \times \pi \times 6$$

$26 + 3\pi \text{ cm}$

Your turn A7

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



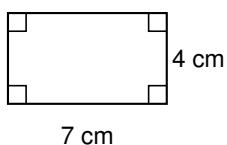
B**Fluency**

Each question is a designed sequence. From one part to the next, ask yourself: what changed, and what did it do to the answer?

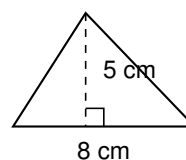
FOUNDATION*Everyone starts here*

B1 Work out the area of each shape.

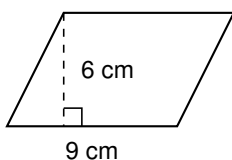
(a)



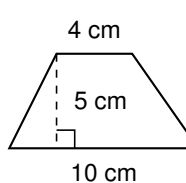
(b)



(c)



(d)



[4 marks]

B2 (a) A rectangle has perimeter 30 cm and length 9 cm. Work out its width.

(b) A square has area 49 cm^2 . Work out its perimeter.

(c) A rectangle has area 60 cm^2 and length 12 cm. Work out its perimeter.

(d) An equilateral triangle has perimeter 27 cm. Work out the length of one side.

[4 marks]

B3 Give each answer to 1 decimal place.

(a) the circumference, radius 3 cm

(b) the area, radius 3 cm

(c) the circumference, diameter 10 cm

(d) the area, diameter 10 cm

[4 marks]

B4 Give each answer to 1 decimal place.

(a) the area of a semicircle of radius 4 cm

(b) the area of a quarter circle of radius 6 cm

(c) the perimeter of a semicircle of diameter 10 cm

(d) the perimeter of a quarter circle of radius 6 cm

[4 marks]



FOUNDATION

continued: units and working backwards

B5 Convert (a) 3 m^2 to cm^2 (b) $45\,000 \text{ cm}^2$ to m^2 (c) 2.5 cm^2 to mm^2 [3 marks]

B6 (a) A triangle has area 24 cm^2 and base 8 cm . Work out its height.

(b) A trapezium has area 45 cm^2 and parallel sides of 7 cm and 11 cm. Work out its height.

(c) A circle has circumference 31.4 cm. Work out its radius, to the nearest whole number.

(d) A circle has area 50.3 cm^2 . Work out its radius, to the nearest whole number. **[4 marks]**

HIGHER

Higher tier only

B7 (a) Work out the arc length of a sector of radius 12 cm and angle 30° , in terms of π .

(b) Work out the arc length of a sector of radius 5 cm and angle 216° , in terms of π

(c) Work out the perimeter of a sector of radius 10 cm and angle 45° , to 3 significant figures

(d) Work out the arc length of a sector of radius 9 cm and angle 80° , in terms of π [4 marks]

B8 Work out the area of each sector in terms of π .

(a) radius 6 cm, 120° (b) radius 4 cm, 225° (c) radius 15 cm, 48° (d) radius 12 cm, 150°

[4 marks]



HIGHER*continued: working backwards and exact answers*

- B9** (a) A sector of radius 10 cm has arc length 5π cm. Work out the angle.
(b) A sector of angle 60° has area 24π cm². Work out the radius.
(c) A sector of angle 110° has arc length 11π cm. Work out the radius.
(d) A sector of radius 10 cm has perimeter $(20 + 4\pi)$ cm. Work out the angle. **[4 marks]**
- B10** Give each answer in terms of π .
(a) the area left when a circle of diameter 10 cm is cut from a square of side 10 cm
(b) the area of a ring between circles of radius 7 cm and 4 cm
(c) the perimeter of a 12 cm by 8 cm rectangle with a semicircle added on each 8 cm side (the 8 cm sides removed)
(d) the area of a square of side 6 cm with a semicircle added on one side **[4 marks]**



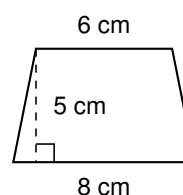
C**Reasoning**

Show your working and explain your thinking. A correct answer without a reason does not score full marks.

FOUNDATION

Everyone starts here

- C1** Tom works out the area of a circle of radius 5 cm as $2 \times \pi \times 5 = 31.4 \text{ cm}^2$. Explain Tom's mistake. [2 marks]
- C2** Sam says a circle of diameter 8 cm has area $\pi \times 8^2$. Explain Sam's mistake. [2 marks]
- C3** Explain why an L-shaped room made by cutting a corner off a rectangle has the same perimeter as the rectangle. [3 marks]
- C4** Show that the area of the trapezium is 35 cm^2



[3 marks]



HIGHER*Higher tier only*

- C5** Explain why the arc length of a sector with angle θ is $\frac{\theta}{360} \times 2\pi r$ [3 marks]
- C6** Explain what happens to the area of a circle when its radius is doubled, and why. [3 marks]
- C7** Sector P has radius 6 cm and angle 80° . Sector Q has radius 4 cm and angle 180° . Show that the two sectors have the same area. [3 marks]
- C8** A sector has radius r cm and angle θ° . The number for its perimeter (in cm) equals the number for its area (in cm^2).
- (a) Show that $r = \frac{720}{\pi\theta} + 2$
- (b) Find r when $\theta = 90$, to 3 significant figures. [5 marks]



D**Problem solving**

You decide the method. Read the whole question first, and show every step.

FOUNDATION

Everyone starts here

- D1** A wall is 5 m wide and 2.4 m high, with a window 1.5 m by 1.2 m. One tin of paint covers 4 m^2 and costs £12

Work out the cost of the paint needed to cover the wall once.

[3 marks]

- D2** A garden is a rectangle with a semicircle at one end. A fence goes all the way round. Fencing is sold in 5 m lengths.

How many lengths are needed?

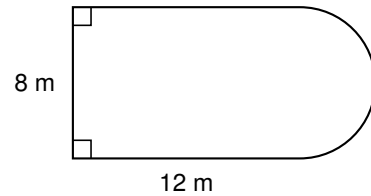


Diagram NOT accurately drawn

[4 marks]

- D3** Work out the area of the shape.

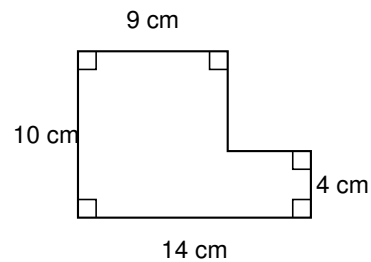


Diagram NOT accurately drawn

[3 marks]

- D4** A bicycle wheel has a diameter of 60 cm. How many complete turns does it make in 1 km?

[3 marks]



HIGHER*Higher tier only*

- D5** A running track has two straights of 100 m and two semicircular ends of diameter 60 m.

- (a) Work out the length of the track.
(b) Work out the area enclosed.

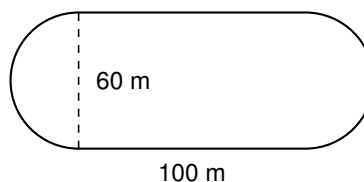


Diagram NOT accurately drawn

[4 marks]

- D6** O is the centre of a quarter circle of radius 8 cm. Work out the shaded area, to 3 significant figures.

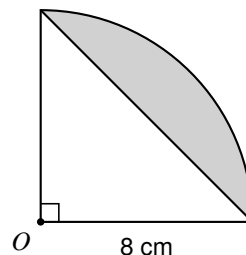


Diagram NOT accurately drawn

[4 marks]

- D7** A piece of wire 40 cm long is bent into a square. Another piece, 40 cm long, is bent into a circle. Which shape has the larger area, and by how much? Give your answer to 1 decimal place.

[4 marks]

- D8** A shape is made from a square of side $2x$ cm with a semicircle on each of two opposite sides. Its area is 100 cm^2

- (a) Show that $x^2(4 + \pi) = 100$

- (b) Work out the perimeter of the shape, to 3 significant figures.

[5 marks]



E**Exam practice**

Exam-style questions. Write your answers in the spaces. Aim for about one minute per mark.

FOUNDATION*Foundation and Higher crossover*

E1 Work out the area of the trapezium.

.....

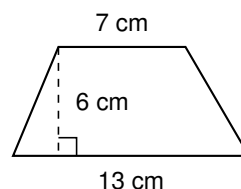


Diagram NOT accurately drawn

(Total for Question E1 is 3 marks)

E2 (a) Work out the circumference of the circle.

.....
(2)

(b) Work out the area of the circle.

.....
(1)

Give your answers to 1 decimal place.

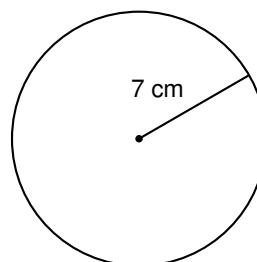


Diagram NOT accurately drawn

(Total for Question E2 is 3 marks)

E3 Work out the area of the shape.

.....

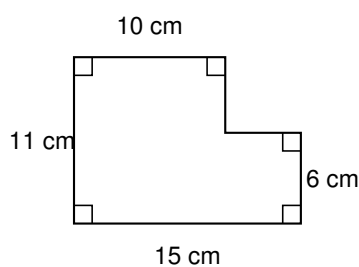


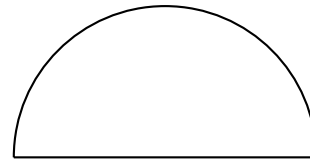
Diagram NOT accurately drawn

(Total for Question E3 is 3 marks)



- E4** The shape is a semicircle. Work out its perimeter, to 1 decimal place.

.....



16 cm

Diagram NOT accurately drawn

(Total for Question E4 is 3 marks)

- E5** A floor is a rectangle 4.5 m by 3.3 m. It is covered with square tiles of side 30 cm, with no gaps. How many tiles are needed?

.....

(Total for Question E5 is 3 marks)

HIGHER

Higher tier only

- E6** Work out the perimeter of the sector, to 3 significant figures.

.....

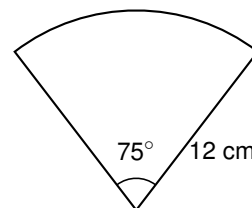


Diagram NOT accurately drawn

(Total for Question E6 is 3 marks)

- E7** A sector of a circle has radius 9 cm and area $27\pi \text{ cm}^2$. Work out the angle of the sector.

.....

(Total for Question E7 is 3 marks)



- E8** The diagram shows a square of side 10 cm and two quarter circles with centres at opposite corners of the square.

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

.....

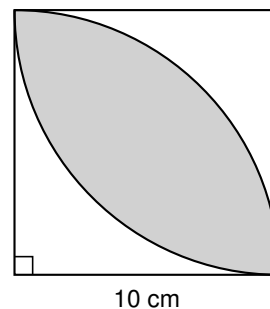


Diagram NOT accurately drawn

(Total for Question E8 is 4 marks)

- E9** A sector has area 30 cm^2 and perimeter 22 cm.

(a) Show that the area of a sector is $\frac{1}{2} \times r \times (\text{arc length})$

(1)

(b) Find the two possible radii of the sector.

.....

(3)

(c) For the larger radius, work out the angle of the sector, to 1 decimal place.

.....

(1)

(Total for Question E9 is 5 marks)

Finished? Mark your work with the **full worked solutions**, fill in your scores on the front page, then keep the skill sharp with unlimited questions on the **Geometry revision engine**.

