

Perimeter, area and volume 1

This chapter is about:

- finding the circumference and area of a circle
- calculating the area and volume of regular and compound shapes including cylinders and right prisms
- calculating the surface areas of cubes, cuboids and cylinders

You should already know:

- how to find the perimeter of a square, a rectangle and a triangle
- how to find the area of a square, a rectangle, a triangle, a parallelogram, a rhombus, a kite and a trapezium
- how to find the volume of a cube and cuboid
- how to solve equations
- how to manipulate fractions
- how to use Pythagoras' theorem
- how to use trigonometry
- how to find square roots and cube roots
- how to use the cosine rule
- how to find the area of a triangle that is not right-angled.

Perimeter and area of compound shapes

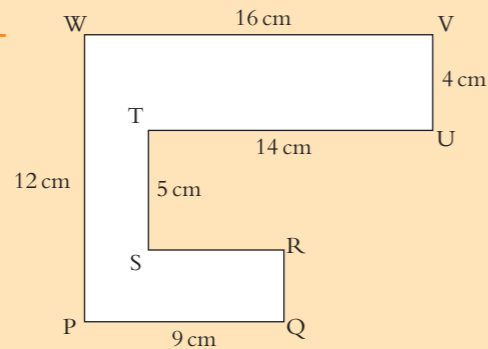
The perimeter is the distance around the outside of a shape.

The area is the space inside a shape.

EXAMPLE 1

For the shape shown, find:

- a the perimeter
- b the area.



SOLUTION

a We must first work out the lengths of QR and SR.

$$WP = 12 \text{ cm}$$

$$VU + ST = 4 + 5 = 9 \text{ cm and so } QR = 3 \text{ cm}$$

$$WV = 16 \text{ cm and } TU = 14 \text{ cm and so the horizontal distance to the left of } SR = 2 \text{ cm}$$

$$PQ = 9 \text{ cm and so } SR = 9 - 2 = 7 \text{ cm}$$

We can now work out the perimeter by adding up all the lengths of the sides.

$$\text{Perimeter} = 12 + 9 + 3 + 7 + 5 + 14 + 4 + 16 = 70 \text{ cm}$$

b We can work out the area by either:

- splitting the compound shape into regular shapes and adding up their areas

or

- finding the area of the surrounding rectangle and subtracting the appropriate rectangles.

Method 1

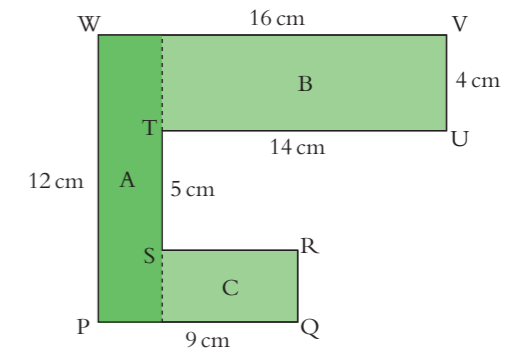
$$\text{Area of a rectangle} = \text{length} \times \text{breadth}$$

$$\text{Area of A} = 2 \times 12 = 24 \text{ cm}^2$$

$$\text{Area of B} = 4 \times 14 = 56 \text{ cm}^2$$

$$\text{Area of C} = 3 \times 7 = 21 \text{ cm}^2$$

$$\text{Total area} = 24 + 56 + 21 = 101 \text{ cm}^2$$



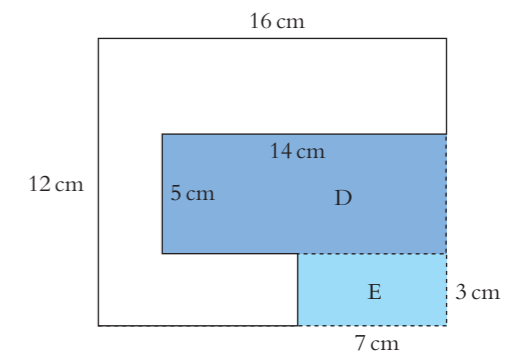
Method 2

$$\begin{aligned} \text{Area of the surrounding rectangle} \\ = 16 \times 12 = 192 \text{ cm}^2 \end{aligned}$$

$$\text{Area of D} = 5 \times 14 = 70 \text{ cm}^2$$

$$\text{Area of E} = 3 \times 7 = 21 \text{ cm}^2$$

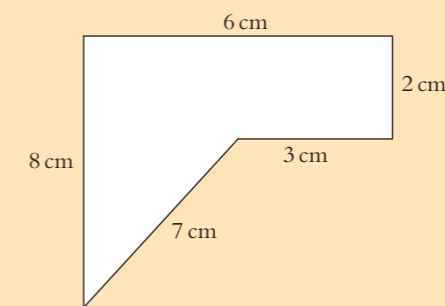
$$\begin{aligned} \text{Area of the compound shape} \\ = 192 - 70 - 21 = 101 \text{ cm}^2 \end{aligned}$$



EXAMPLE 2

For the shape shown, find:

- a the perimeter
- b the area.



SOLUTION

a Perimeter = $8 + 7 + 3 + 2 + 6 = 26$ cm

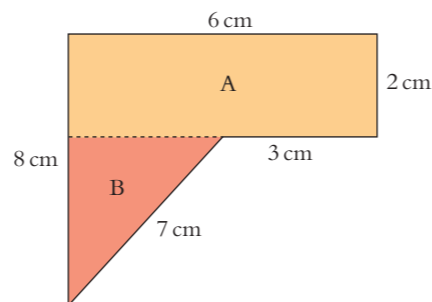
b Using Method 1 we have:

Area of A = $6 \times 2 = 12$ cm²

B is a triangle and the area of a triangle is found using the formula $A = \frac{1}{2} \text{ base} \times \text{height}$.

So area of B = $\frac{1}{2} \times 3 \times 6 = 9$ cm²

Total area = $12 + 9 = 21$ cm²

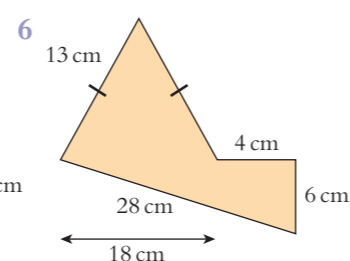
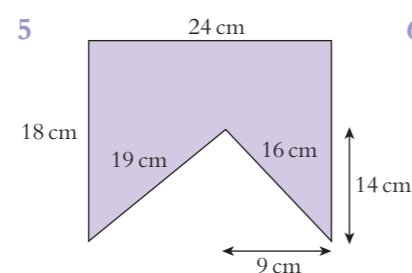
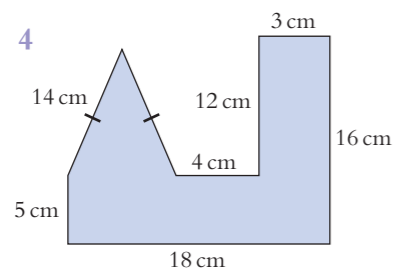
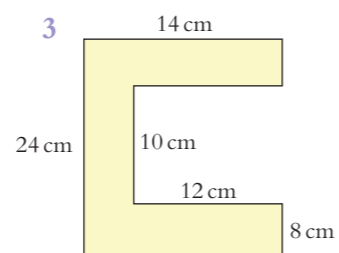
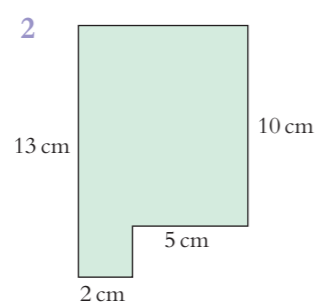
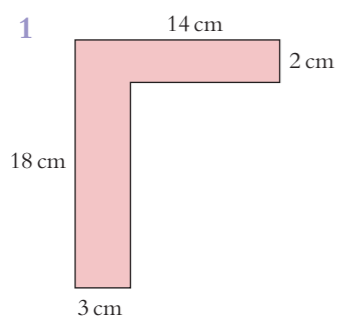


Exercise 37.1

For the shapes in questions 1–6 find:

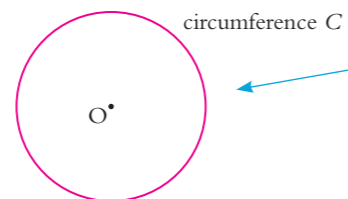
a the perimeter

b the area.



Circumference of a circle

The perimeter of a circle is called its **circumference**.



You met circumference in Chapter 32.

Calculating the circumference

We use the following formula to calculate the circumference, C :

$C = \pi d$ or $C = 2\pi r$

where d = the diameter, r = the radius and π is an irrational number which approximates to 3.14 when rounded to 3 significant figures. A

more exact value (though still only approximate) can be obtained by using the π button on your calculator.

EXAMPLE 3

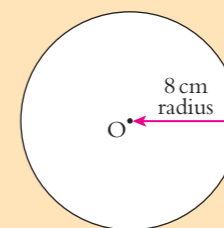
Find the circumference of a circle radius 8 cm. Give your answer in terms of π .

SOLUTION

$C = 2\pi r = 2\pi \times 8 = 16\pi$ cm

EXAMPLE 4

Find the circumference of a circle diameter 9.6 cm to 3 significant figures.

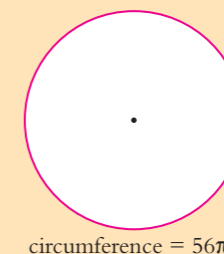


SOLUTION

$C = \pi d = \pi \times 9.6 = 30.15\dots = 30.2$ cm (to 3 significant figures).

EXAMPLE 5

The circumference of a circle is 56π cm. Find its radius.



SOLUTION

$2\pi r = C$

$2\pi r = 56\pi$

$r = \frac{56\pi}{2\pi} = 28$ cm

EXAMPLE 6

The circumference of a circle is 4.86 cm. Find its diameter.

SOLUTION

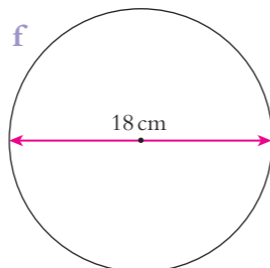
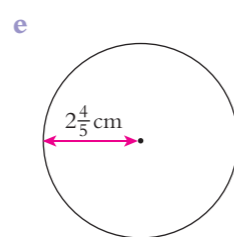
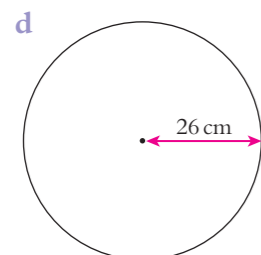
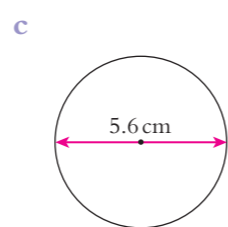
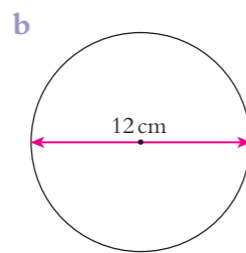
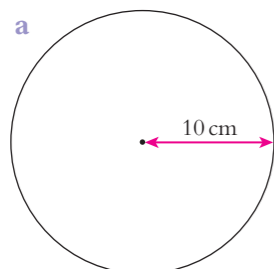
$$\pi d = 4.86$$

$$d = \frac{4.86}{\pi}$$

$$d = 1.55 \text{ cm (to 3 significant figures).}$$

Exercise 37.2

- 1 Find the circumference of each of the following circles. Give your answers in terms of π .



- 2 Find the diameter of the circles with circumference:

a 15π cm b 28π cm c 6.8π cm d $3\frac{2}{3\pi}$ cm

- 3 Find the radius of the circles with circumference:

a 36π cm b 9π cm c 8.4π cm d $2\frac{3}{4\pi}$ cm

Exercise 37.3

- 1 Find the circumference of the circles with:

- a radius 9 cm b diameter 34 cm
c diameter 6.2 cm d radius 1.56 cm
e radius $2\frac{1}{2}$ cm f diameter 11 cm
g diameter 5.46 cm h radius 25 cm
i radius 56 cm j diameter 120 cm

- 2 Find the diameter of the circles with circumference:

a 34 cm b 9.6 cm c 28 cm d 50 cm e 166 cm

- 3 Find the radius of the circles with circumference:

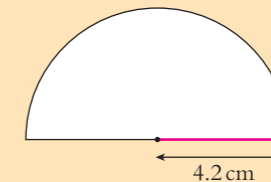
a 48 cm b 2.5 cm c 8.4 cm d 35 cm e 90 cm

Perimeters of shapes involving parts of circles

We can extend this work to find the perimeter of a semicircle or the perimeter of any composite shape involving part of a circle.

EXAMPLE 7

Find the perimeter of a semicircle of radius 8.4 cm.



SOLUTION

We need to find the lengths of the straight part and the curved part separately.

We will then add these together to get the perimeter.

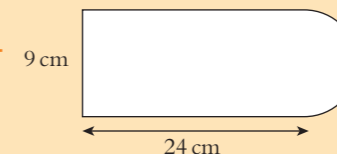
$$\text{Straight part} = 4.2 \times 2 = 8.4 \text{ cm}$$

$$\text{Curved part} = \frac{1}{2}C = \frac{1}{2} \times 2\pi r = \pi r = 4.2\pi = 13.2 \text{ cm}$$

$$\text{Perimeter} = 8.4 + 13.2 = 21.6 \text{ cm}$$

EXAMPLE 8

Find the perimeter of this shape.



SOLUTION

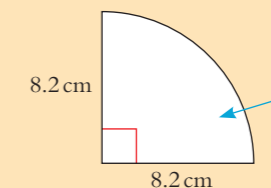
$$\text{Straight part} = 9 + 24 + 24 = 57 \text{ cm}$$

$$\text{Curved part} = \frac{1}{2}C = \frac{1}{2} \times \pi d = \frac{1}{2}\pi \times 9 = 4.5\pi = 14 \text{ cm}$$

$$\text{Perimeter} = 57 + 14 = 71 \text{ cm}$$

EXAMPLE 9

Find the perimeter of this shape.



This shape is called a **quadrant** of a circle.

SOLUTION

$$\text{Straight part} = 8.2 \times 2 = 16.4 \text{ cm}$$

$$\text{Curved part} = \frac{1}{4} \times 2\pi r = 12.9 \text{ cm}$$

$$\text{Perimeter} = 16.4 + 12.9 = 29.3 \text{ cm}$$

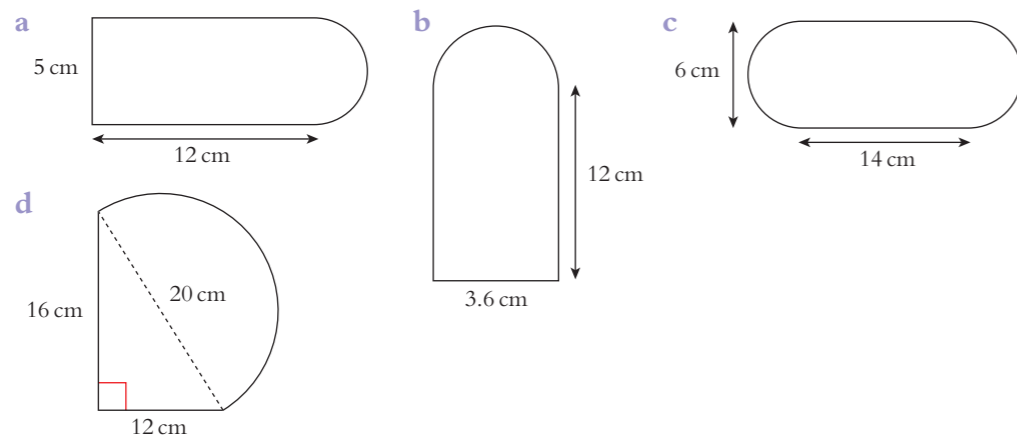




Exercise 37.4

Give your answers correct to 3 significant figures.

- 1 Find the perimeter of a semicircle diameter 4.6 cm.
- 2 Find the perimeter of a semicircle radius 32 cm.
- 3 Find the perimeter of a semicircle radius 5.8 cm.
- 4 Find the perimeter of a semicircle diameter 90 cm.
- 5 Find the perimeter of a quadrant of a circle diameter 1.6 cm.
- 6 Find the perimeter of a quadrant of a circle radius 8 cm.
- 7 Find the perimeter of a quadrant of a circle radius 9.4 cm.
- 8 Find the perimeter of a quadrant of a circle diameter 40 cm.
- 9 Find the perimeter of the following shapes.



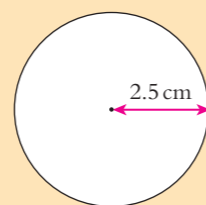
Area of a circle

We use the following formula to calculate the area of a circle:

$$A = \pi r^2$$

EXAMPLE 10

Find the area of a circle with radius 2.5 cm.

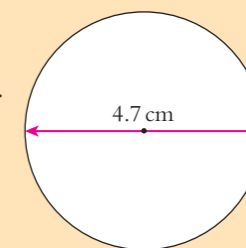


SOLUTION

$$A = \pi \times 2.5^2 = 19.6 \text{ cm}^2$$

EXAMPLE 11

Find the area of a circle with diameter 4.7 cm.



SOLUTION

We must first find the radius.

$$r = \frac{4.7}{2} = 2.35 \text{ cm}$$

$$A = \pi \times 2.35^2 = 17.3 \text{ cm}^2$$

EXAMPLE 12

The area of a circle is 57 cm^2 . Find **a** its radius and **b** its circumference.

SOLUTION

$$\text{a } \pi r^2 = A$$

$$\pi r^2 = 57$$

$$r^2 = \frac{57}{\pi} = 18.1$$

$$r = \sqrt{18.1} = 4.26 \text{ cm}$$

$$\text{b } C = 2\pi r = 2\pi \times 4.26 = 26.8 \text{ cm}$$

Use the value for r you found in part **a**.



Exercise 37.5

Give your answers correct to 3 significant figures.

- 1 Find the area of a circle with radius 6.4 cm.
- 2 Find the area of a circle with diameter 54 cm.
- 3 Find the area of a circle with diameter 2.8 cm.
- 4 Find the area of a circle with radius 14 cm.
- 5 Find the area of a circle with radius 6.9 cm.
- 6 Find the area of a circle with diameter 5.42 cm.
- 7 The area of a circle is 48 cm^2 . Find its radius.
- 8 The area of a circle is 6 cm^2 . Find its radius.
- 9 The area of a circle is 540 cm^2 . Find its diameter.
- 10 The area of a circle is 28 cm^2 . Find its radius.

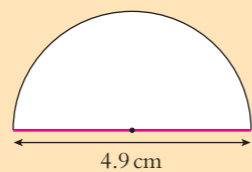
- 11 The area of a circle is 512 cm^2 . Find its diameter.
- 12 The area of a circle is 73 cm^2 . Find its diameter.
- 13 The area of a circle is 9 cm^2 . Find **a** its radius and **b** its circumference.
- 14 The area of a circle is 700 cm^2 . Find **a** its radius and **b** its circumference.
- 15 The area of a circle is 62 cm^2 . Find **a** its radius and **b** its circumference.
- 16 The area of a circle is 183 cm^2 . Find **a** its radius and **b** its circumference.
- 17 The circumference of a circle is 66 cm . Find its area.
- 18 The circumference of a circle is 400 cm . Find its area.
- 19 The circumference of a circle is 3 cm . Find its area.
- 20 The circumference of a circle is 92.6 cm . Find its area.

Areas of shapes involving parts of circles

We can extend this work to find the area of a composite shape involving semicircles and quadrants.

EXAMPLE 13

Find the area of this shape.



SOLUTION

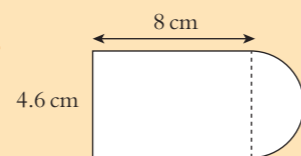
$$r = \frac{4.9}{2} = 2.45 \text{ cm}$$

$$\text{Area of a circle} = \pi r^2$$

$$\text{So the area of the semicircle} = \frac{1}{2} \pi r^2 = \frac{1}{2} \times \pi \times 2.45^2 = 9.43 \text{ cm}^2$$

EXAMPLE 14

Find the area of this shape.



SOLUTION

We need to split the shape into a rectangle and a semicircle.

$$\text{Area of the rectangle} = 8 \times 4.6 = 36.8 \text{ cm}^2$$

$$\begin{aligned} \text{Area of the semicircle} &= \frac{1}{2} \times \pi \times 2.3^2 = 8.31 \\ \text{Total area} &= 36.8 + 8.31 = 45.11 \text{ cm}^2 \end{aligned}$$

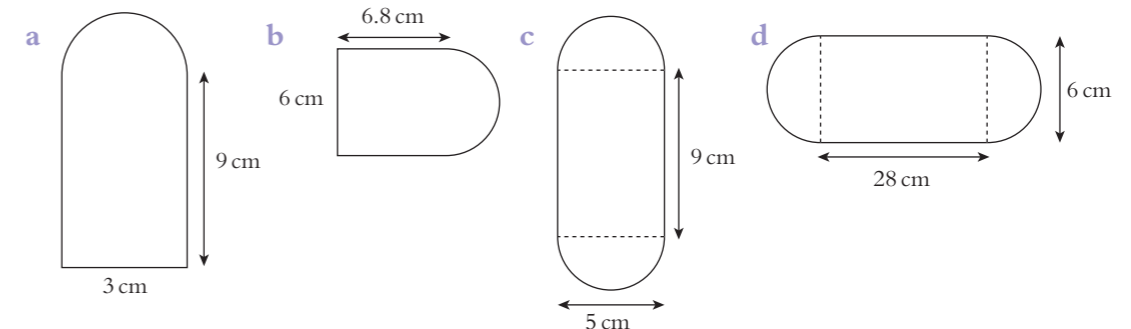
The radius is half the diameter.
 $r = \frac{4.6}{2} = 2.3 \text{ cm}.$



Exercise 37.6

Give your answers correct to 3 significant figures.

- 1 Find the area of a semicircle radius 11 cm .
- 2 Find the area of a semicircle diameter 4 cm .
- 3 Find the area of a semicircle diameter 74 cm .
- 4 Find the area of a semicircle radius 4.9 cm .
- 5 Find the area of a quadrant radius 27 cm .
- 6 Find the area of a quadrant radius 90 cm .
- 7 Find the area of a quadrant radius 5.4 cm .
- 8 Find the area of a quadrant radius 36 cm .
- 9 Find the area of these shapes.



Areas of other shapes

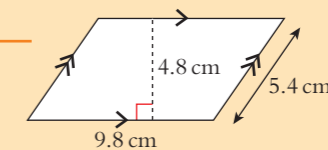
Area of a parallelogram

A parallelogram is a shape with two pairs of parallel sides. The area is given by:

$$\text{Area} = \text{base} \times \text{perpendicular height} \quad \text{or} \quad A = bh$$

EXAMPLE 15

Find the area of this parallelogram.

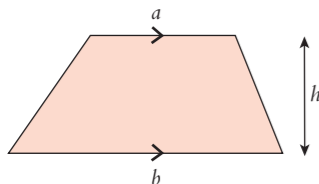


SOLUTION

We must choose the *perpendicular* height, i.e. 4.8 cm.

$$\text{Area} = 9.8 \times 4.8 = 47.04 \text{ cm}^2$$

Area of a trapezium



A trapezium is a quadrilateral with one pair of parallel sides. The area is given by:

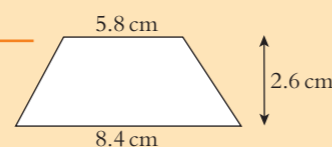
$$\text{Area} = \frac{1}{2}(\text{sum of the parallel sides}) \times \text{perpendicular height}$$

or

$$A = \frac{1}{2}(a + b)h$$

EXAMPLE 16

Find the area of this trapezium.

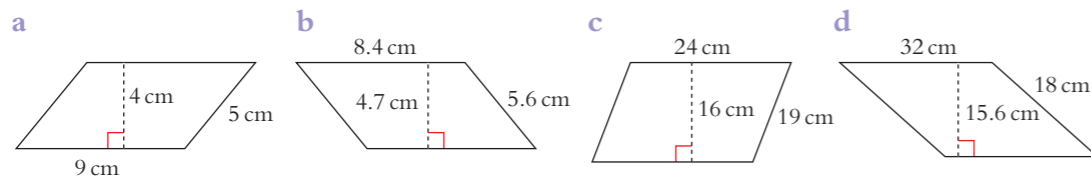


SOLUTION

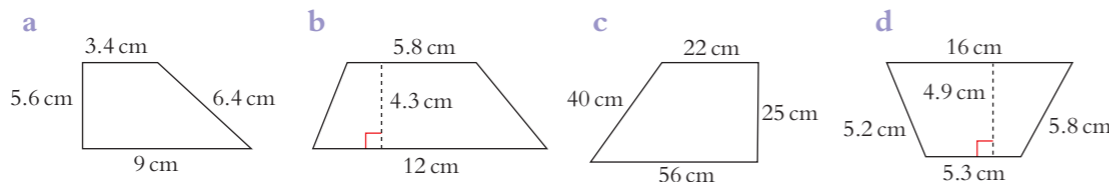
$$\text{Area} = \frac{1}{2}(8.4 + 5.8) \times 2.6 = 18.46 \text{ cm}^2$$

Exercise 37.7

1 Find the area of the parallelograms shown.



2 Find the area of each trapezium.



3 The base of a parallelogram of area 36 cm^2 is 8 cm long. Find the perpendicular height.

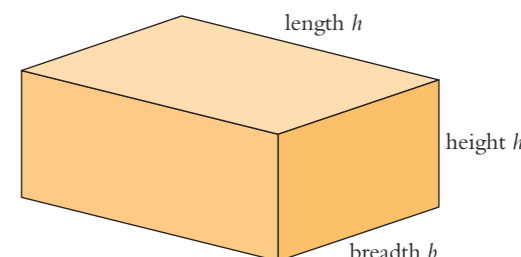
- The parallel sides of a trapezium of area 68 cm^2 are 5.8 cm and 4.2 cm long. Find the perpendicular height.
- The perpendicular height of a parallelogram of area 171 cm^2 is 18 cm. Find the length of the base.
- The base of a parallelogram of area 84 cm^2 is 25 cm long. Find the perpendicular height.

Surface area and volume

Surface area and volume of a cuboid

A cuboid has six surfaces:

- the top and bottom (each of area lb).
- the front and back (each of area lh)
- the left and right sides (each of area bh).



Thus the total surface area is given by:

$$A = 2lb + 2lh + 2bh$$

The cuboid has a cross-sectional area of lb (the base) and its height is h . So the volume is given by:

$$V = lbh$$

EXAMPLE 17

A cuboid has length 6 cm, breadth 4 cm and height 3 cm. Find **a** the surface area and **b** the volume.

SOLUTION

- a** $l = 6 \text{ cm}$ $b = 4 \text{ cm}$ $h = 3 \text{ cm}$
 $A = 2 \times 6 \times 4 + 2 \times 6 \times 3 + 2 \times 4 \times 3$
 $= 48 + 36 + 24$
 $= 108 \text{ cm}^2$
- b** $V = lbh = 6 \times 4 \times 3 = 72 \text{ cm}^3$

Substitute in the formula
 $A = 2lb + 2lh + 2bh.$

EXAMPLE 18

A cuboid has volume 64.8 cm^3 . Its length and height are 9 cm and 5 cm. Find **a** its breadth and **b** its total surface area.

SOLUTION

a $lbh = V$

So $9 \times b \times 5 = 64.8$

$45b = 64.8$

$b = \frac{64.8}{45} = 1.44 \text{ cm}$

The breadth is 1.44 cm.

b $A = 2 \times 9 \times 1.44 + 2 \times 9 \times 5 + 2 \times 1.44 \times 5$
 $= 25.92 + 90 + 14.4$
 $= 130.32 \text{ cm}^2$

The total surface area is 130.32 cm^2 (to 2 decimal places).

Exercise 37.8

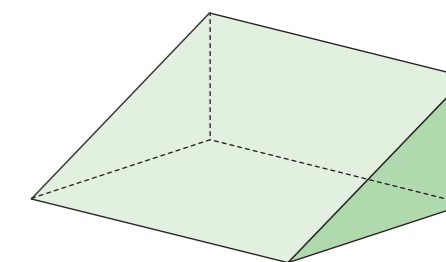
- Find the **a** the surface area and **b** the volume of a cuboid with length 8 cm, breadth 7 cm and height 4 cm.
- Find the **a** the surface area and **b** the volume of a cuboid with length 14 cm, breadth 11 cm and height 9 cm.
- Find the **a** the surface area and **b** the volume of a cuboid with length 24 cm, breadth 17 cm and height 23 cm.
- Find the **a** the surface area and **b** the volume of a cuboid with length 7.6 cm, breadth 4.5 cm and height 3.9 cm.
- A cuboid has volume 94 cm^3 . Its length and breadth are 5 cm and 4 cm.
Find **a** its height and **b** its total surface area.
- A cuboid has volume 512 cm^3 . Its length and height are 10 cm and 8 cm.
Find **a** its breadth and **b** its total surface area.
- A cuboid has volume 169.344 cm^3 . Its breadth and height are 8.4 cm and 3.6 cm.
Find **a** its length and **b** its total surface area.
- A cuboid has volume 3136 cm^3 . Its length is 16 cm and the breadth and height are equal.
Find **a** its breadth and **b** its total surface area.
- The total surface area of a cuboid of length 4.5 cm and breadth 3.8 cm is 103.92 cm^2 .
Find **a** the height and **b** the volume.
- The total surface area of a cuboid of length 35 cm and height 16 cm is 3262 cm^2 .
Find **a** the breadth and **b** the volume.
- The total surface area of a cuboid of breadth 7.5 cm and height 6.2 cm is 356.04 cm^2 .
Find **a** the length and **b** the volume.



- The total surface area of a cuboid is 550 cm^2 . The length is three times the height. The breadth is double the height.
Find **a** the height and **b** the volume.
- The length, breadth and height of a cuboid are $6x$, $3x$ and $2x$. Show that the volume, V , and the total surface area, A , satisfy the equation $A = \frac{2V}{x}$.

Surface area and volume of a prism

A prism is a three-dimensional shape with a constant cross-section. A cuboid is a rectangular prism. The wedge in the diagram is a triangular prism. The volume of a prism is given by:



Volume of any prism = cross-sectional area \times length

or

$V = Al$

EXAMPLE 19

Find the volume of a prism of base area 68 cm^2 and length 7.5 cm.

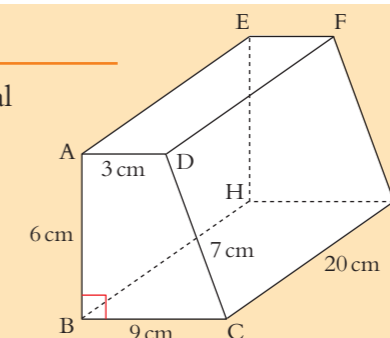
SOLUTION

$V = Al$

$V = 68 \times 7.5 = 510 \text{ cm}^3$

EXAMPLE 20

Find **a** the volume and **b** the total surface area of the trapezoidal prism shown.



SOLUTION

- a** The cross-sectional area is the trapezium ABCD.

Area of ABCD = $\frac{1}{2}(3 + 9) \times 6 = 36 \text{ cm}^2$

Volume = $Al = 36 \times 20 = 720 \text{ cm}^3$

- b** To get the total surface area we must find the area of each side and add up all the answers:

$$\text{Area of ABCD} = 36 \text{ cm}^2$$

$$\text{Area of HGFE} = 36 \text{ cm}^2$$

BCGH, CGFD, DFEA and BHEA are all rectangles

$$\text{Area of BCGH} = 9 \times 20 = 180 \text{ cm}^2$$

$$\text{Area of CGFD} = 7 \times 20 = 140 \text{ cm}^2$$

$$\text{Area of DFEA} = 3 \times 20 = 60 \text{ cm}^2$$

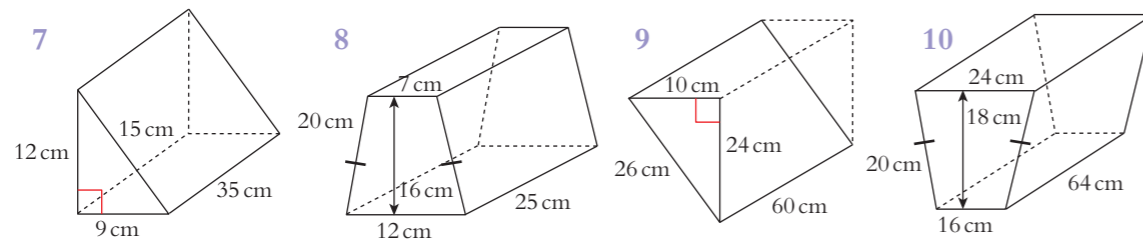
$$\text{Area of BHEA} = 6 \times 20 = 120 \text{ cm}^2$$

So the total surface area is
 $36 + 36 + 180 + 140 + 60 + 120 = 572 \text{ cm}^2$.

Exercise 37.9

- Find the volume of a prism of cross-sectional area 264 cm^2 and length 75 cm .
- Find the volume of a prism of cross-sectional area 35 cm^2 and length 8.4 cm .
- Find the length of a prism of cross-sectional area 65 cm^2 and volume 1183 cm^3 .
- Find the cross-sectional area of a prism of length 7.2 cm and volume 93.6 cm^3 .
- Find the length of a prism of cross-sectional area 72.8 cm^2 and volume 698.88 cm^3 .
- Find the cross-sectional area of a prism of length 36 cm and volume 3168 cm^3 .

For questions 7–10, find **a** the volume and **b** the total surface area of each of the prisms.



Surface area and volume of a cylinder

The top and bottom of a cylinder are circles and so their area is given by:

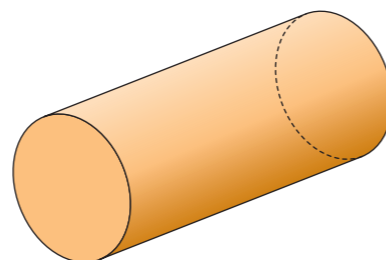
$$A = \pi r^2$$

where r is the base radius.

The curved surface area is given by:

$$\text{Curved surface area} = 2\pi rh$$

where h is the height.



So

- the total surface area of a cylinder closed at both ends is $2\pi rh + 2\pi r^2$
- the total surface area of a cylinder open at one end is $2\pi rh + \pi r^2$
- the total surface area of a cylinder open at both ends is $2\pi rh$.

A cylinder is a circular prism and so its volume is given by:

$$V = Ah = \pi r^2 h$$

EXAMPLE 21

A cylinder has a base radius of 18 cm and a height of 64 cm . It is open at one end. Find:

- the volume
- the curved surface area
- the total surface area.

SOLUTION

$$\text{a } r = 18 \text{ cm} \quad \text{and} \quad h = 64 \text{ cm}$$

$$\begin{aligned} \text{So } V &= \pi r^2 h = \pi \times 18^2 \times 64 \\ &= 65\,100 \text{ cm}^3 \text{ (to 3 significant figures)} \end{aligned}$$

$$\begin{aligned} \text{b Curved surface area} &= 2\pi rh = 2\pi \times 18 \times 64 \\ &= 7240 \text{ cm}^2 \text{ (to 3 significant figures)} \end{aligned}$$

$$\begin{aligned} \text{c The area of one end} &= \pi r^2 = \pi \times 18^2 = 1020 \text{ cm}^2 \\ \text{So the total surface area} &= 7240 + 1020 = 8260 \text{ cm}^2. \end{aligned}$$

EXAMPLE 22

The base diameter and curved surface area of a cylinder are 18 cm and 1700 cm^2 . Find its volume.

SOLUTION

We must first find the cylinder's height.

$$d = 18 \text{ cm} \text{ and so } r = \frac{18}{2} = 9 \text{ cm}$$

$$\text{Curved surface area} = 2\pi rh = 2\pi \times 9 \times h = 56.55h = 1700 \text{ cm}^2$$

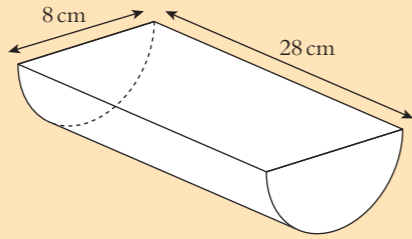
$$h = \frac{1700}{56.55} = 30 \text{ cm}$$

$$\text{So } V = \pi r^2 h = \pi \times 9^2 \times 30 = 7630 \text{ cm}^3.$$

EXAMPLE 23

For the semicircular prism shown, find:

- the volume
- the total surface area.



SOLUTION

- a** The cross-sectional area is a semicircle.

$$d = 8 \text{ cm} \quad \text{so} \quad r = 4 \text{ cm}$$

$$A = \frac{1}{2}\pi r^2 = \frac{1}{2}\pi \times 4^2 = 25.13 \text{ cm}^2$$

$$l = 28 \text{ cm}$$

$$\text{So } V = 25.13 \times 28 = 704 \text{ cm}^3$$

- b** The top is a rectangle with area = $8 \times 28 = 224 \text{ cm}^2$

The curved surface area is half the curved surface area of a cylinder

$$= \frac{1}{2} 2\pi rh = \pi rh$$

$$\text{So the curved surface area} = \pi \times 4 \times 28 = 352 \text{ cm}^2$$

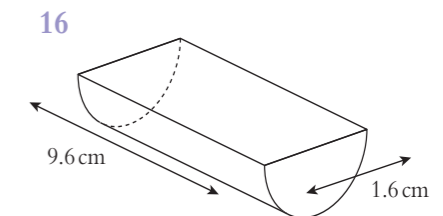
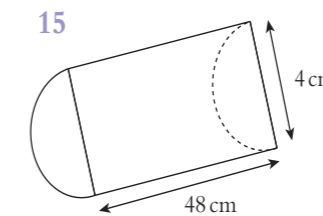
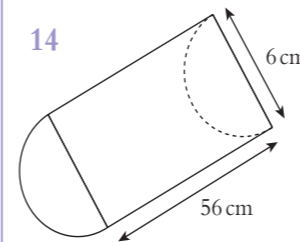
$$\text{The total surface area} = 224 + 352 = 576 \text{ cm}^2.$$

Exercise 37.10

- Find the **a** the volume, **b** the curved surface area and **c** the total surface area of a cylinder with base radius 24 cm and height 50 cm if it is open at one end.
- Find the **a** the volume, **b** the curved surface area and **c** the total surface area of a cylinder with base radius 9.6 cm and height 16 cm if it is closed at both ends.
- Find the **a** the volume and **b** the total surface area of a cylinder with base radius 18 cm and height 64 cm open at both ends.
- Find the **a** the volume, **b** the curved surface area and **c** the total surface area of a cylinder with base diameter 6 cm and height 13 cm if it is open at one end.
- Find the **a** the volume, **b** the curved surface area and **c** the total surface area of a cylinder with base radius 72 cm and height 124 cm if it is closed at both ends.
- Find the **a** the volume and **b** the total surface area of a cylinder with base diameter 8.4 cm and height 12.5 cm open at both ends.
- The base radius and curved surface area of a cylinder are 7 cm and 800 cm^2 . Find its volume.

- The base diameter and curved surface area of a cylinder are 23 cm and 890 cm^2 . Find its volume.
- The base radius and volume of a cylinder are 8.6 cm and 2600 cm^3 . Find its curved surface area.
- The height and curved surface area of a cylinder are 42 cm and 7000 cm^2 . Find its volume.
- The base diameter and volume of a cylinder are 8 cm and 1100 cm^3 . Find its curved surface area.
- The base diameter and curved surface area of a cylinder are 13 cm and 370 cm^2 . Find its volume.
- The height and volume of a cylinder are 4.5 cm and 120 cm^3 . Find its curved surface area.

For each semicircular prism in questions 14–16, find **a** the volume and **b** the total surface area.



- The curved surface area and volume of a cylinder are 6330 cm^2 and $88\,700 \text{ cm}^3$. Find the **a** base radius and **b** the height.

You should now:

- calculate the perimeter and area of a circle and of shapes including circular sections
- calculate the area of a parallelogram and a trapezium
- calculate the surface area and volume of a prism and a cylinder.

Summary exercise 37

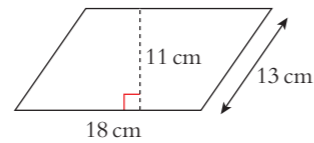
- Find the **a** the circumference and **b** the area of a circle radius 8.9 cm.
- Find the **a** the circumference and **b** the area of a circle diameter 53 cm.
- The circumference of a circle is 65 cm. Find its area.

4 The area of a circle is 74.9 cm^2 . Find its circumference.

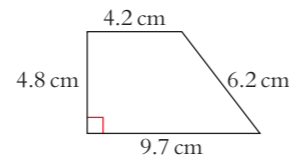
5 Find the **a** the perimeter and **b** the area of a semicircle diameter 2.7 cm.

6 Find the **a** the perimeter and **b** the area of a quadrant of a circle radius 16 cm.

7 Find the area of this parallelogram.



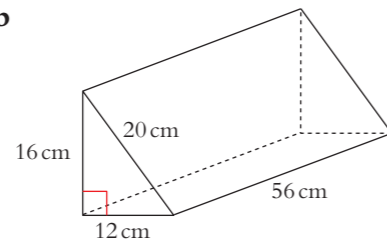
8 Find the area of this trapezium.



9 Find the **a** the surface area and **b** the volume of a cuboid with length 3.6 cm, breadth 2.8 cm and height 1.5 cm.

10 The volume of a cube is 39.304 cm^3 . Find its surface area.

11 Find the **a** the surface area and **b** the volume of the prism below.



12 Find the length of a prism of cross-sectional area 63.5 cm^2 and volume 546.1 cm^3 .

13 Find the **a** the volume, **b** the curved surface area and **c** the total surface area of a cylinder with base radius 8.4 cm and height 13.2 cm if it is open at one end.

14 The base radius and curved surface area of a cylinder are 3.8 cm and 524 cm^2 . Find its volume.

15 The base diameter and volume of a cylinder are 25 cm and 1600 cm^3 . Find its curved surface area.

16 The curved surface area and volume of a cylinder are 374 cm^2 and 1265 cm^3 . Find the **a** the base radius and **b** the height.

Examination questions

1 XXXXX
a xxxxxx

Mark

<insert exam questions from exam file>

<see additional file when confirmed>