Circles and Cylinders 1

Chapter 15

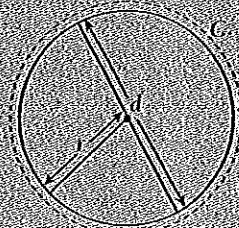| Student Name	Class	Score
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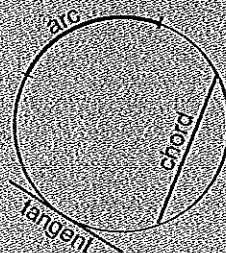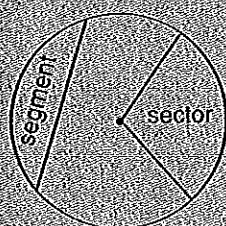## 15:01 | Parts of a Circle

Outcome SGS 4.3

The circumference of a circle (c) is the total distance around it. *Note: r* is the radius and *d* is the diameter.

Other parts of the circle are:
• sector • segment • arc
• chord • tangent

Minor sectors and segments take up less than half of the circle. Likewise, minor arcs take up less than half of the circumference.

1 Match each of these descriptions with the correct part of a circle. _____

a a line that touches a circle _____

b a region in a circle bounded by an arc and a chord _____

c a line segment joining the centre of a circle to the circumference _____

d part of the circumference of a circle _____

2 Describe a sector of a circle in your own words.

_____

_____

3 Give another name for a chord that passes through the centre of a circle. _____

4 Draw diagrams to show these parts of a circle.
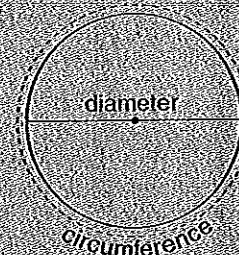
a a minor arc   b a major arc

c a minor segment   d a major sector

5 Explain whether it is possible to draw part of a circle which is both a sector and a segment.

_____

_____

15:02 | Circumference of a Circle
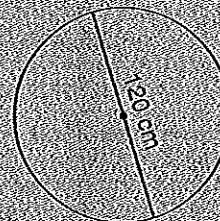
Outcome MS 4.1

The **circumference** (C) of a circle is the distance around the outside edge.

For any circle, the circumference is approximately three times the length of the diameter.
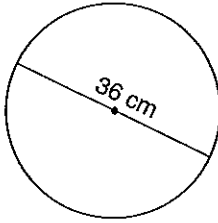
$$C \approx 3 \times d$$

The exact relationship is $C = \pi \times d$

π is a special number and is $3.141\ 592\ 654\ldots$

Calculators have a special key that gives π accurately.

Example: Calculate the circumference of this circle.

$$C = \pi \times d$$
$$= \pi \times 120$$
$$= 377 \text{ cm (nearest whole number)}$$

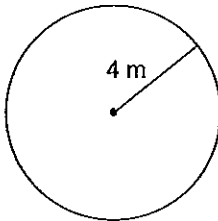**1** Calculate the circumference of this circle.

36 cm

2 Calculate the circumferences of circles with these diameters. Give your answers correct to one decimal place.

a 10 m _____

b 5.3 cm _____

3

4 m

a What is the diameter of this circle? _____

b Calculate the circumference. _____

15:03 | Solving Problems Involving Circumference

Outcome MS 4.1

To calculate the diameter when you know the circumference, you *divide by π*.

Example: A tape measure extends 1·63 m around a concrete pipe. Calculate the diameter of the pipe to two decimal places.

Answer: $d = C \div \pi = 1.63 \div \pi = 0.52$ m

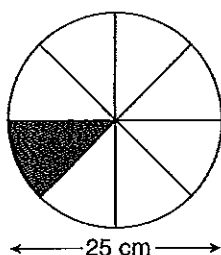Some shapes have both curved and straight sides. To calculate the perimeter, find the length of each part first. Make sure that all lengths are in the same units and then add these up.

1 Calculate the diameters of circles that have these circumferences:

a 52 cm _____

b 19.7 m _____

2 A pizza is cut into eight identical pieces. The diameter of the pizza was 25 cm.

←——25 cm——→

Calculate the *perimeter* of one of these slices. Show your working, and explain what you are calculating at each step.

3 A coin is rolled once around a square with sides of 7 cm. The diameter of the coin is 4 cm. Calculate the distance travelled by the *centre* of the coin when the coin has returned to where it started.
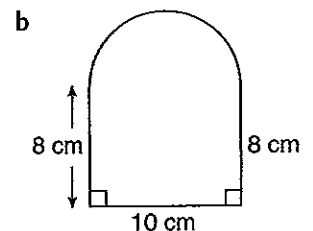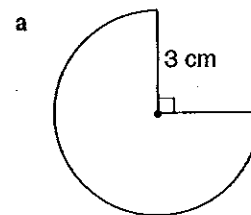

4 cm

7 cm
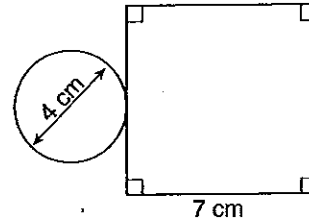
4 This steering wheel has a diameter of 280 mm.

The front of it has been covered with thin stainless steel strips, which are straight on the spokes and curved on the wheel.

Estimate the total length of these strips. Show your calculations, and explain what you are working out at each step.

5 Calculate the perimeter of each of these shapes.

a

3 cm

b

8 cm   8 cm

10 cm

Student Name	Class	Score
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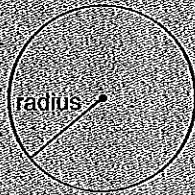## 15:04 | Area of a Circle

Outcome MS 4.1

The area of a circle is calculated from the formula
$A = \pi r^2$.
r is the radius of the circle.
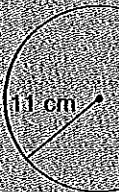π is a special number used in circle work. Its value is approximately 3.14.
You can get it more accurately from the π key on a calculator.

(radius)
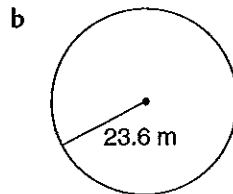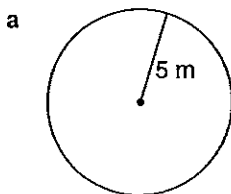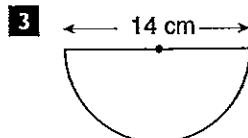
Example: Calculate the area of this circle.

$$Area = \pi r^2$$
$$= \pi \times 11^2$$
$$= \pi \times 11 \times 11$$
$$= \pi \times 121$$
$$= 380.1 \text{ cm}^2$$

(11 cm)

1 Calculate the area of each circle. Give your answer in m^2, to the nearest whole number.

a (5 m)

b (23.6 m)

2 Calculate the area of a circle with a radius of 7.3 cm. Give your answer correct to one decimal place.

3 ← 14 cm →

a What is the radius of this semicircle?

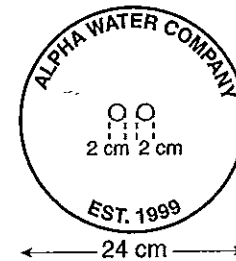b Calculate the area of the semicircle.

4 A donkey is tied to a post by a rope. The rope measures 6 m. Estimate the area of grass the donkey can reach, to the nearest 10 m^2.

5 A sports stadium is roughly circular. The maximum distance across the grass turf is approximately 120 m.

a Draw a diagram to show this.

b Estimate the area of grass turf to the nearest 100 m^2.

6 A water meter is covered by a thin, circular steel plate. The diameter of the plate is 24 cm. There are two holes, each with a diameter of 2 cm, to help make the plate easier to lift.
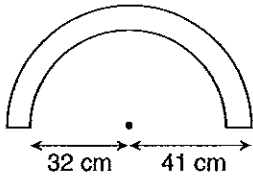
ALPHA WATER COMPANY
EST. 1999
2 cm 2 cm
← 24 cm →

Calculate the area of the top of the steel plate. Show your working, and explain what you are calculating at each step.

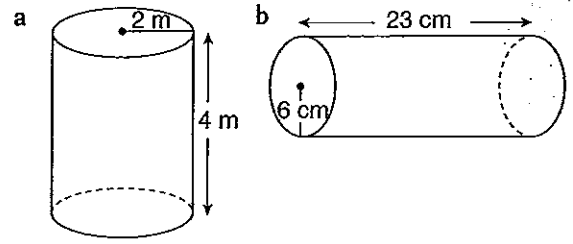**7** Calculate the area of this shape. The curved part is a semicircle. _____

16 cm

8 cm
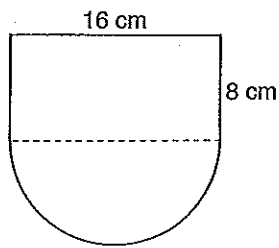
**8** Semicircular concrete tree rings are made with an inside radius of 32 cm and an outside radius of 41 cm.

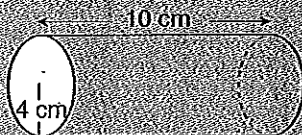

32 cm   41 cm

What area of ground does one of these rings cover?

15:05 | Volume of a Cylinder

A cylinder is a circular prism. Each end is a circle with radius r. The height (or length) of the cylinder is labelled h.

The volume of a cylinder is $\pi r^2 h$.

Example: Calculate the volume of a cylinder with radius 4 cm and length 10 cm.

10 cm

4 cm

Answer: Volume $= \pi r^2 h$
$= \pi \times 4^2 \times 10$
$= \pi \times 16 \times 10$
$= 502.7 \text{ cm}^3 \text{ (4 sig. figs.)}$

1 Calculate the volumes of these cylinders.

a

2 m

4 m

b

23 cm

6 cm

2 A test tube with a flat base has a radius of 1 cm and a height of 11 cm. What volume of water (in cm³) will it hold when full?

3 A timber company sells 'half-rounds'. They are used to build retaining walls.

0.15 m

1.8 m
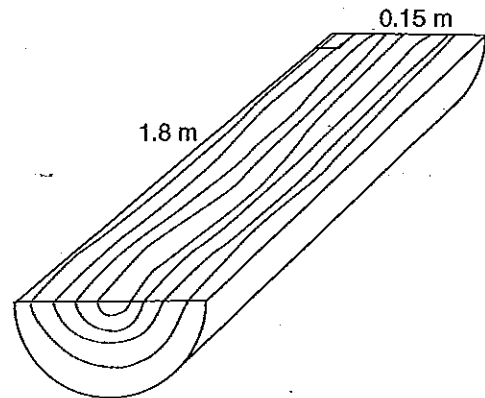
Calculate the volume of one of these 'half-rounds'.

4 Derrin decides to fill a small rectangular fish tank measuring 24 cm by 15 cm with a height of 12 cm by carrying water in a large glass tumbler from a kitchen tap. The glass tumbler is cylindrical, with a diameter of 7 cm and a height of 14 cm. How many times will she need to take water in the tumbler to the fish tank to fill it? _____