AREA AND PERIMETER OF BASIC SHAPES
Geometry and Measures

Key Concepts
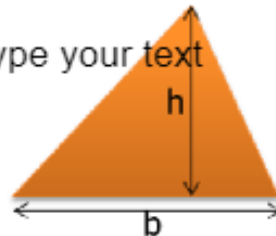
The **area** of a 2D shape is the space inside it. It is measured in units squared e.g. cm^2

The **perimeter** of a shape is the distance around the edge of the shape. Units of length are used to measure perimeter e.g. mm, cm, m

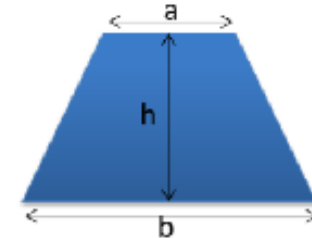A **compound shape** is a shape made up of others joined together.

Examples

Type your text

$A = b \times h$

$A = \dfrac{b \times h}{2}$

$A = l \times w$

$A = \dfrac{(a + b) \times h}{2}$

Type your text

Split the shape into shapes that you can find the area of

8cm

2cm

5cm

5 cm

3 cm

3cm

$8 - 3 = 5cm$

$5 - 2 = 3cm$
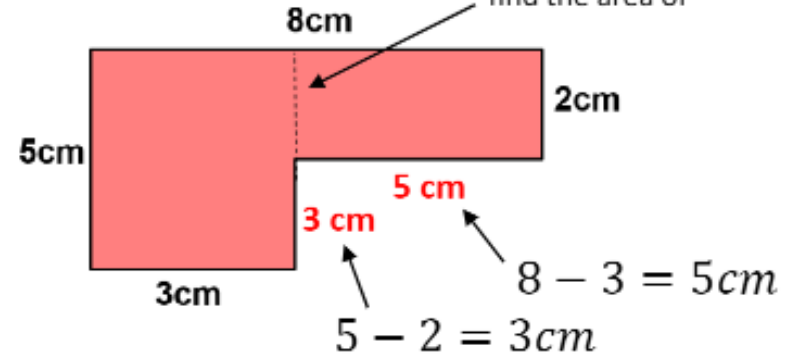
$Area = (5 \times 3) + (2 \times 5)$
$= 25cm^2$

$Perimeter = 3 + 5 + 8 + 2 + 5 + 3$
$= 26cm$

MathsWatch
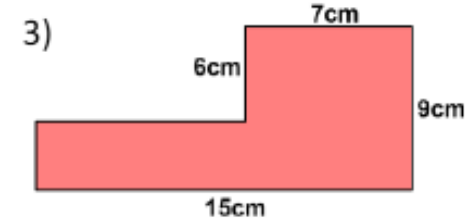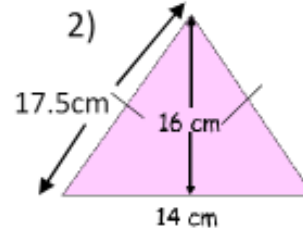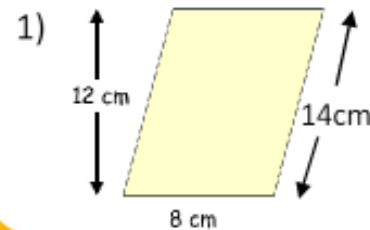
53, 54, 55, 56

Key words
Area
Perimeter
Base
Height
Width
Length

Calculate the area and perimeter of each shape:

1)

12 cm

14cm

8 cm

2)

17.5cm

16 cm

14 cm

3)

7cm

6cm

9cm

15cm

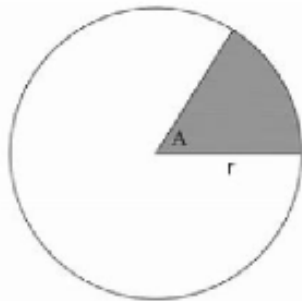ANSWERS: 1) A = 96 cm² P = 44cm   2) A = 112 cm² P = 49cm   3) A = 87 cm² P = 48cm

AREA OF CIRCLES AND PART CIRCLES
Geometry and Measures

Key Concepts

The **area** of a circle is calculated by πr^2

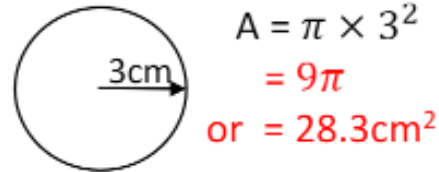The **area of a sector** is calculated by $\frac{\theta}{360}\pi r^2$

Examples

Calculate:

a) Area

3cm

$A = \pi \times 3^2$

$= 9\pi$

or $= 28.3\text{cm}^2$
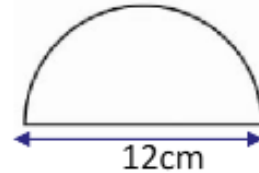
b) Radius when the area is 20cm²

$A = \pi \times r^2$

$20 = \pi \times r^2$

$\frac{20}{\pi} = r^2$

$\sqrt{\frac{20}{\pi}} = r$

Or $2.52cm$

c) Area

12cm

$P = \frac{\pi \times r^2}{2}$

$P = \frac{\pi \times 6^2}{2}$

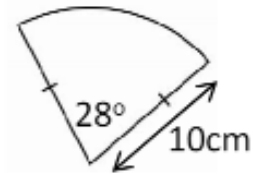$P = 18\pi$

Or $= 56.55\text{cm}^2$

d) Area of a sector

$\text{Arc} = \frac{\theta}{360} \times \pi \times r^2$

$\text{Arc} = \frac{28}{360} \times \pi \times 10^2$

$\text{Arc} = \frac{28}{360} \times \pi \times 100$

$\text{Arc} = \frac{70}{9}\pi$

Or $= 24.43\text{cm}$

28° 10cm
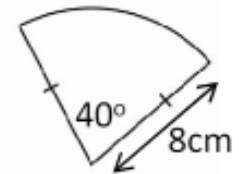
Key Words
Circle
Area
Radius
Diameter
Pi
Sector

Calculate:

1) The area of a circle with a radius of 9cm
2) The radius of a circle with an area of 45cm²
3) The area of a semicircle with diameter of 16cm
4) The area of the sector in the diagram

40° 8cm

ANSWERS: 1) 81π or 254.47cm² 2) $\sqrt{\frac{45}{\pi}}$ or 3.78cm 3) 32π or 100.53cm² 4) $\frac{64}{9}\pi$ or 22.34cm

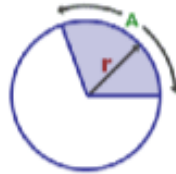# PERIMETER AND CIRCUMFERENCE
Geometry and Measures

Key Concepts

Parts of a circle

Circumference of a circle is calculated by πd and is the distance around the circle.

Arc length of a sector is calculated by $\frac{\theta}{360}\pi d$.

Examples

Calculate:

a) Circumference

$$C = \pi \times 4$$
$$= 4\pi$$
$$\text{or } = 12.57\text{cm}$$

b) Diameter when the circumference is 20cm

$$C = \pi \times d$$
$$20 = \pi \times d$$
$$\frac{20}{\pi} = d$$

Or $6.37cm$

c) Perimeter

$$P = \frac{\pi \times d}{2} + d$$
$$P = \frac{\pi \times 6}{2} + 6$$
$$P = 3\pi + 6$$

Or = 15.42cm

d) Arc length

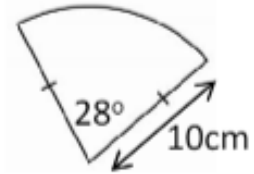
$$Arc = \frac{\theta}{360} \times \pi \times d$$
$$Arc = \frac{28}{360} \times \pi \times 2 \times 10$$
$$Arc = \frac{28}{360} \times \pi \times 20$$
$$Arc = \frac{14}{9}\pi$$

Or = 4.89cm
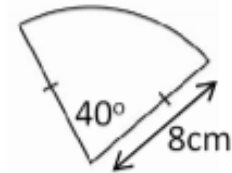
Key Words
Circle
Perimeter
Circumference
Radius
Diameter
Pi
Arc

Calculate:
1) The circumference of a circle with a diameter of 12cm
2) The diameter of a circle with a circumference of 30cm
3) The perimeter of a semicircle with diameter 15cm
4) The arc length of the diagram

ANSWERS: 1) 12π or 37.7cm 2) $\frac{30}{\pi}$ or 9.54cm 3) 38.56cm 4) $\frac{16}{9}\pi$ or 5.59cm
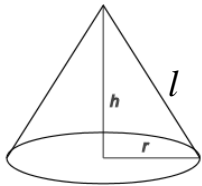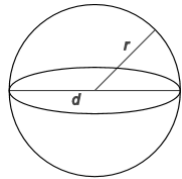
VOLUME AND SURFACE AREA OF CONES, SPHERES AND PYRAMIDS
Geometry and Measures

Key Concepts

In your exam you will be **given** the following formulae to use:

$$Volume\ of\ a\ sphere = \frac{4}{3}\pi r^3$$

$$Surface\ area\ of\ a\ sphere = 4\pi r^2$$

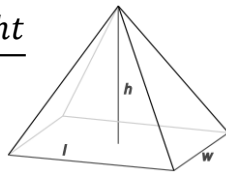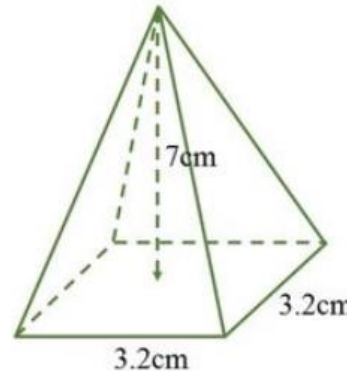$$Volume\ of\ a\ cone = \frac{\pi r^2 h}{3}$$

$$Surface\ area\ of\ a\ cone = \pi r^2 + \pi r l$$

In your exam you will **need to know** the following formulae:

$$Volume\ of\ a\ pyramid = \frac{base\ area \times height}{3}$$

Examples

$$Volume\ of\ a\ pyramid = \frac{(3.2 \times 3.2) \times 7}{3}$$

$$= 23.89 cm^3$$

$$Surface\ area = base + 4\ triangles$$

$$3.2 \times 3.2 = 10.24 cm^2$$

We will need to find the slanted height to be able to calculate the area of our triangles.

7cm

3.2cm

3.2cm

$$Slanted\ height = \sqrt{7^2 + 1.6^2}$$
$$= \sqrt{51.56} cm$$

$$Area\ of\ 4\ triangles =$$
$$4\left(\frac{3.2 \times \sqrt{51.56}}{2}\right)$$
$$= 45.96 cm^2$$

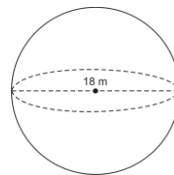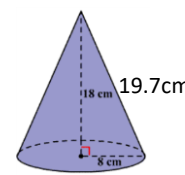$$Surface\ area = 10.24 + 45.96 = 56.20 cm^2$$

MathsWatch

169,170,171

Key Words
Surface Area
Volume
Sphere
Cone
Pyramid
Radius
Height
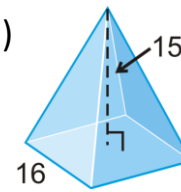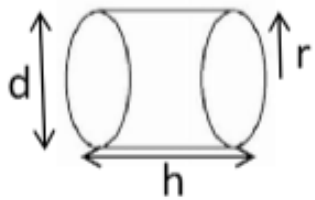Slanted length

Calculate the volume and surface area of:

1)   18 m

2)   18 cm   19.7cm   8 cm

3)   15   16

ANSWERS: 1) V = 3053.6cm³ SA = 1017.9cm² 2) V = 1206.4cm³ SA = 696.2cm² 3) V = 1280cm³ SA = 800cm²

VOLUME AND SURFACE AREAS OF CYLINDERS
Geometry and Measures

Key Concepts

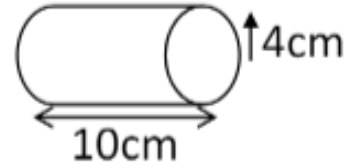A **cylinder** is a **prism** with the cross section of a circle.

The **volume** of a cylinder is calculated by $\pi r^2 h$ and is the space inside the 3D shape

The **surface area** of a cylinder is calculated by $2\pi r^2 + \pi dh$ and is the total of the areas of all the faces on the shape.

Examples

From the diagram calculate:

↑4cm

10cm

a) **Volume**

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

$V = \pi \times 4^2 \times 10$

$V = 160\pi$

$Or = 502.65cm^3$

b) **Surface Area** – You can use the net of the shape to help you

Area of two circles
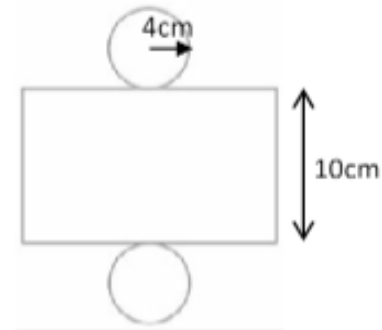$= 2 \times \pi \times r^2$
$= 2 \times \pi \times 4^2$
$= 32\pi$

Area of rectangle
$= \pi \times d \times h$
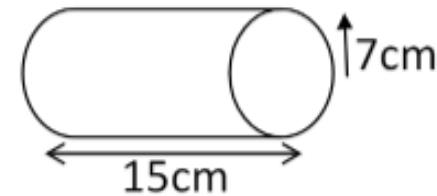$= \pi \times 8 \times 10$
$= 80\pi$

4cm

10cm

$Surface\ Area = 32\pi + 80\pi$
$= 112\pi$
$or = 351.86cm^3$

119

Key Words
Cylinder
Surface Area
Radius
Diameter
Pi
Volume
Prism

Calculate the volume and surface area of this cylinder
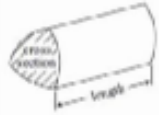
↑7cm

15cm

VOLUME AND SURFACE AREA OF PRISMS
Geometry and Measures

Key Concept

The **volume** of an object is the amount of space that it occupies. It is measured in units cubed e.g. cm^3.

To calculate the volume of any prism we use:
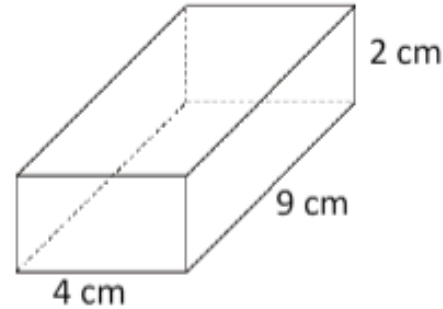
$$\frac{area\ of}{cross\ section} \times length$$

A **prism** is a 3D shape which has a continuous cross-section.

The **surface area** of an object is the sum of the area of all of its faces. It is measured in units squared e.g. cm^2.

Examples

$$Volume = 4 \times 9 \times 2$$

$$= 72cm^3$$

2 cm

9 cm

4 cm

Surface area:
$Front = 4 \times 2 = 8$
$Back = 4 \times 2 = 8$
$Side\ 1 = 9 \times 2 = 18$
$Side\ 2 = 9 \times 2 = 18$
$Bottom = 4 \times 9 = 36$
$Top = 4 \times 9 = 36$
$Total = \mathbf{124cm^2}$

$$Area\ of\ triangle = \frac{5 \times 7}{2}$$

$$= 17.5mm^2$$

$$Volume = 17.5 \times 11$$

$$= \mathbf{192.5mm^3}$$

8.6 mm

5 mm

7 mm

11 mm
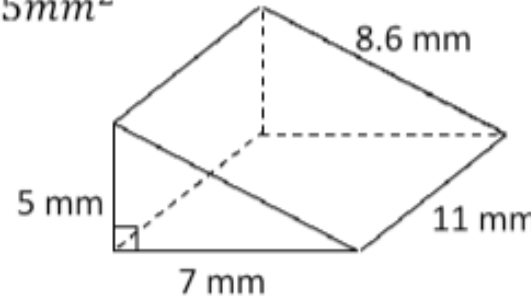
Surface area:
$Front = \dfrac{7 \times 5}{2} = 17.5$
$Back = \dfrac{7 \times 5}{2} = 17.5$
$Side\ = 5 \times 11 = 55$
$Bottom = 7 \times 11 = 77$
$Top = 11 \times 8.6 = 94.6$
$Total = \mathbf{261.6cm^2}$

Key Words
Volume
Capacity
Prism
Surface area
Face

Find the volume and surface area of each of these prisms:

1) 8 cm
40 cm
18 cm

2) 9.8m
4 m
9 m
9 m

ANSWERS: 1)Volume = 5760 cm^3 Surface area = 2368 cm^2 2) Volume = 162 m^3 Surface area = 241.2m^2