

Volume of Solids



Area of Any Triangle



Area of



Parallelogram

Area of Kite & Rhombus



Area of Trapezium



Composite



Area

Volume & Surface Area



Surface Area of a Cylinder



Volume of a Cylinder



Composite Volume

Exam

Type

Questions



Simple Areas

Definition : Area is “ how much space a shape takes up”

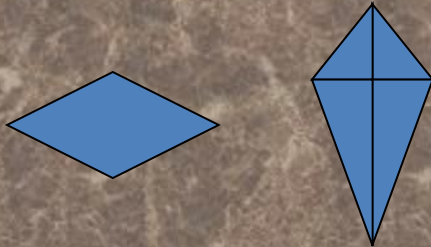
A few types of special Areas



Any Type of Triangle



Parallelogram



Rhombus and kite



Trapezium

Any Triangle Area

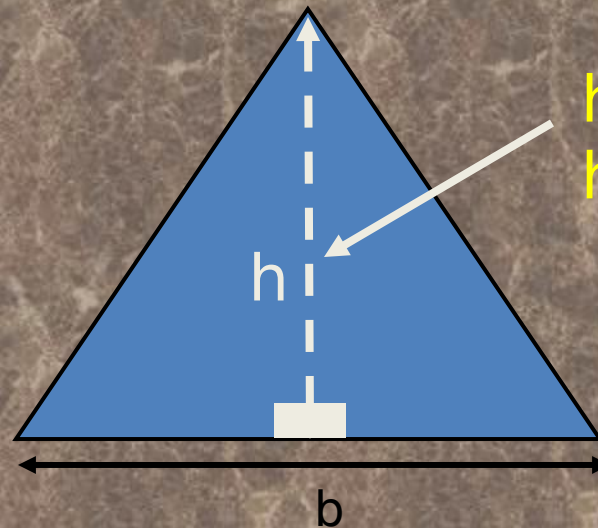
Learning Intention

1. To develop a formula for the area of ANY triangle.
2. Use the formula to solve problems.

Success Criteria

1. To know the formula for the area of ANY triangle.
2. Apply formula correctly. (showing working)
3. Answer containing appropriate units

Any Triangle Area



h = vertical
height

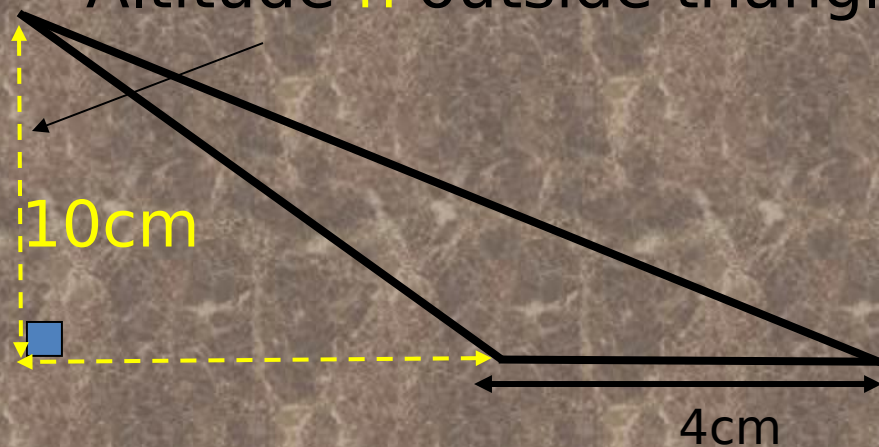
Sometimes
called the
altitude

$$Area = \frac{1}{2} b \times h$$

Any Triangle Area

Example 2 : Find the area of the triangle.

Altitude h outside triangle this time



The diagram shows a triangle with a horizontal base of 4cm. An altitude of 10cm is drawn from the top vertex to the extension of the base, indicated by a dashed line. A right-angle symbol is shown at the intersection of the altitude and the base extension. An arrow points to the altitude line with the label 'Altitude h outside triangle this time'.

$$Area = \frac{1}{2}b \times h$$
$$Area = \frac{1}{2} \times 4 \times 10$$
$$Area = 20cm^2$$

Hint : Use
Pythagoras Theorem first !

Triangle Area

Example 3 : Find the area of the isosceles triangle.

$$a^2 + b^2 = c^2$$

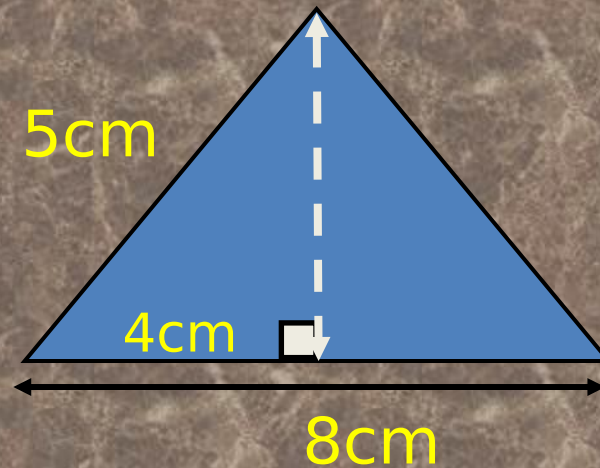
$$4^2 + b^2 = 5^2$$

$$b^2 = 5^2 - 4^2$$

$$b^2 = 9$$

$$b = \sqrt{9}$$

$$b = 3$$



$$Area = \frac{1}{2}b \times h$$

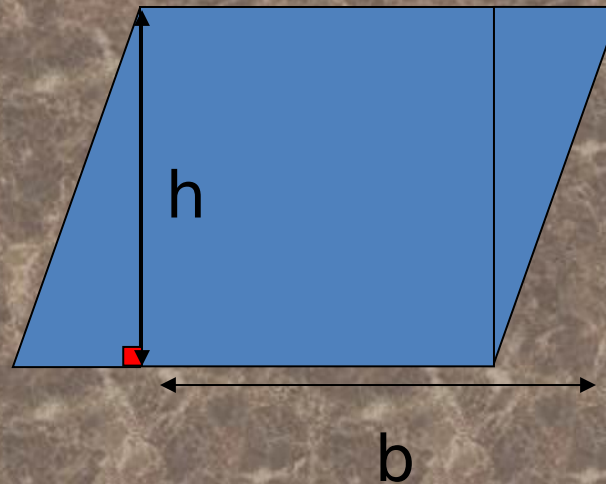
$$Area = \frac{1}{2} \times 8 \times 3$$

$$Area = 12cm^2$$

Parallelogram Area

Important NOTE

h = vertical height



$$\text{Parallelogram Area} = b \times h$$

Rhombus and Kite Area

Learning Intention

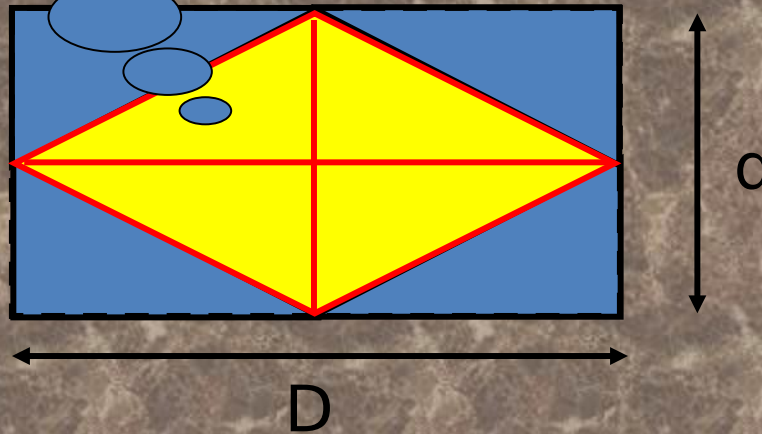
1. To develop a single formula for the area of ANY rhombus and Kite.
2. Use the formula to solve problems.

Success Criteria

1. To know the formula for the area of ANY rhombus and kite.
2. Apply formulae correctly.
(showing working)
3. Answer containing appropriate units

This part of
the rhombus
is half of the small
rectangle.

Area of a Rhombus

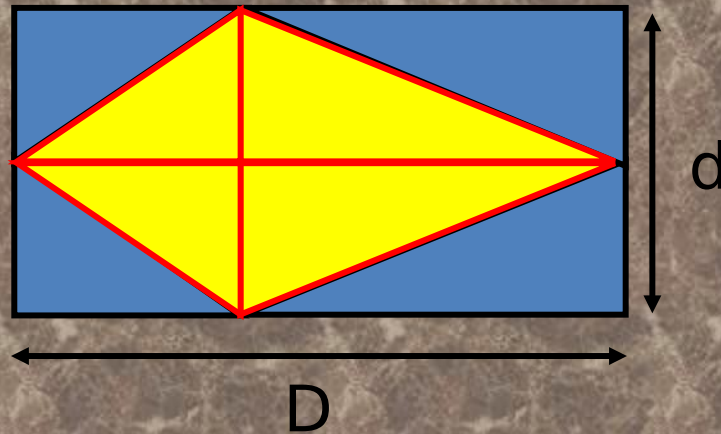


Rectangle Area $= (D \times d)$

$$\text{Rhombus Area} = \frac{1}{2} (D \times d)$$

Area of a Kite

Exactly the same process as the rhombus

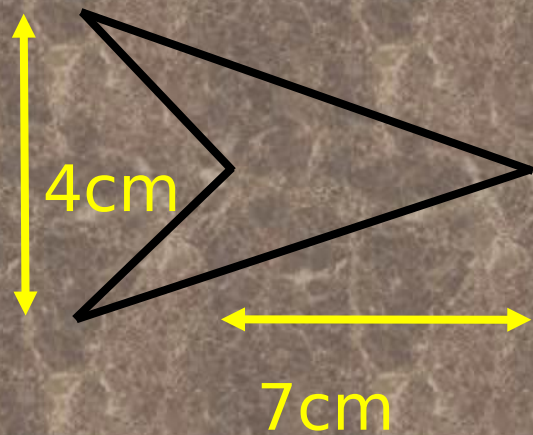


Rectangle Area $= (D \times d)$

$$\text{Kite Area} = \frac{1}{2}(D \times d)$$

🚩 Rhombus and Kite Area

Example 2 : Find the area of the V - shape kite.



$$\text{Kite Area} = \frac{1}{2}(D \times d)$$

$$\text{Area} = \frac{1}{2}(7 \times 4)$$

$$\text{Area} = 14\text{cm}^2$$

Trapezium Area

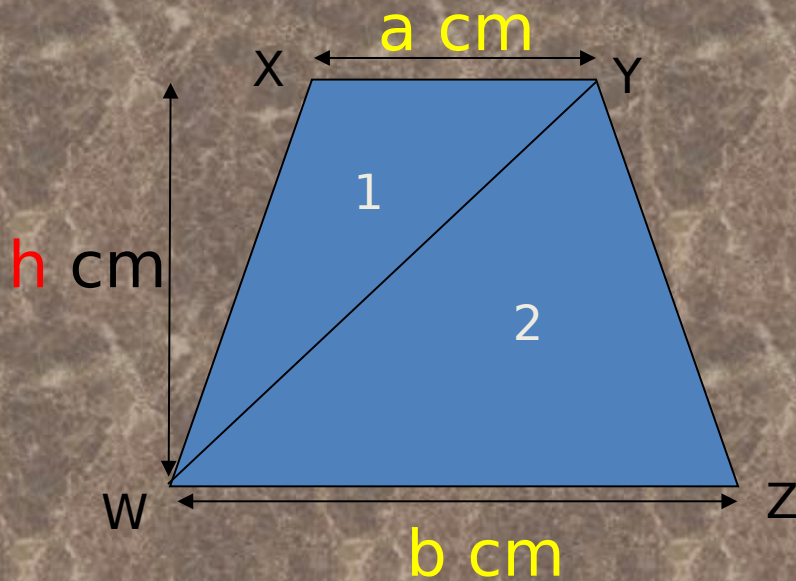
Learning Intention

1. To develop a formula for the area of a trapezium.
2. Use the formula to solve problems.

Success Criteria

1. To know the formula for the area of a trapezium.
2. Apply formula correctly. (showing working)
3. Answer containing appropriate units

Trapezium Area



Two triangles WXY and WYZ

$$\text{Area 1} = \frac{1}{2}a \times h \quad \text{Area 2} = \frac{1}{2}b \times h$$

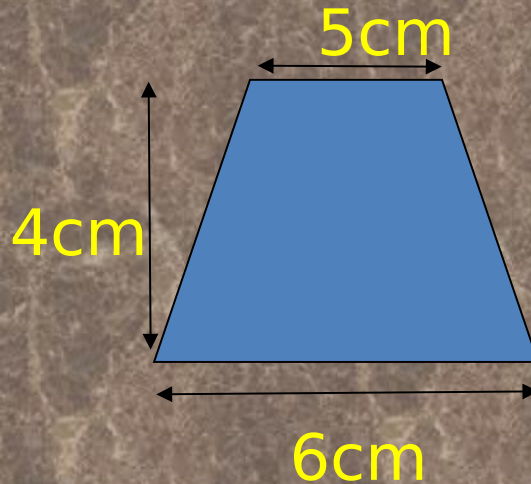
$$\text{Total Area} = \frac{1}{2}a \times h + \frac{1}{2}b \times h$$

$$\text{Trapezium Area} = \frac{1}{2}(a + b)h$$



Trapezium Area

Example 1 : Find the area of the trapezium.



$$\text{Trapezium Area} = \frac{1}{2}(a + b)h$$

$$\text{Trapezium Area} = \frac{1}{2}(5 + 6) \times 4$$

$$\text{Trapezium Area} = 22\text{cm}^2$$

Composite Areas

Learning Intention

1. To show how we can apply basic area formulae to solve more complicated shapes.

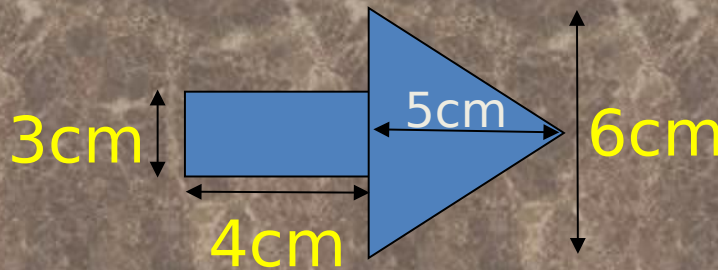
Success Criteria

1. To know the term composite.
2. To apply basic formulae to solve composite shapes.
3. Answer containing appropriate units

Composite Areas

We can use our knowledge of the basic areas to work out more complicated shapes.

Example 1 : Find the area of the arrow.



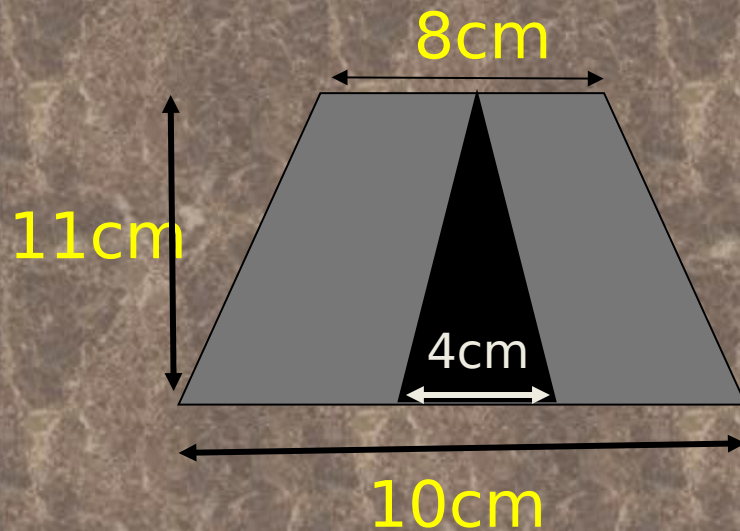
$$\text{Rectangle Area} = l \times b = 3 \times 4 = 12\text{cm}^2$$

$$\text{Triangle Area} = \frac{1}{2}b \times h = \frac{1}{2} \times 6 \times 5 = 15\text{cm}^2$$

$$\text{Total Area} = 15 + 12 = 27\text{cm}^2$$

Composite Areas

Example 2 : Find the area of the shaded area.



Trapezium Area - Triangle Area

$$\begin{aligned}\text{Trapezium Area} &= \frac{1}{2}(a + b) \times h \\ &= \frac{1}{2}(10 + 8) \times 11 = 99\text{cm}^2\end{aligned}$$

$$\text{Triangle Area} = \frac{1}{2}bh = \frac{1}{2} \times 4 \times 11 = 22\text{cm}^2$$

$$\text{Shaded Area} = 99 - 22 = 77\text{cm}^2$$

Summary Areas



Any Type of Triangle

$$\text{Area} = \frac{1}{2}b \times h$$



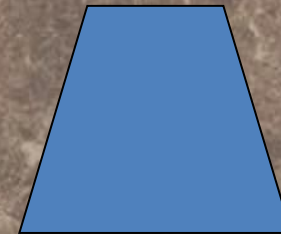
Rhombus and kite

$$\text{Area} = \frac{1}{2}(D \times d)$$



Parallelogram

$$\text{Area} = b \times h$$



Trapezium

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

Volume of Solids

Prisms

Learning Intention

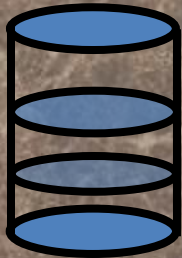
1. To understand the prism formula for calculating volume.

Success Criteria

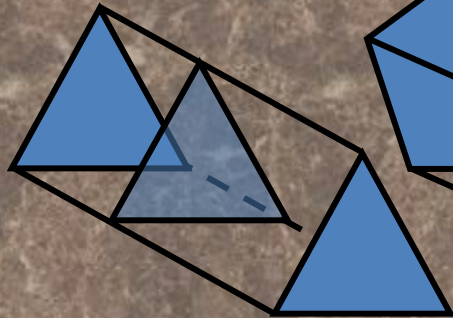
1. To know the volume formula for any prism.
2. Work out volumes for various prisms.
3. Answer to contain appropriate units and working.

Volume of Solids

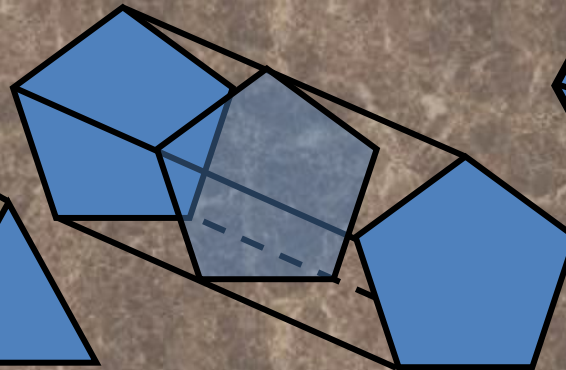
Definition : A prism is a solid shape with uniform cross-section



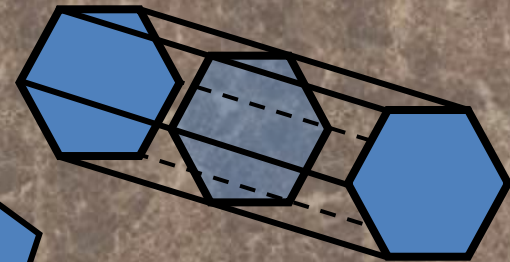
Cylinder
(circular Prism)



Triangular Prism



Pentagonal Prism



Hexagonal Prism

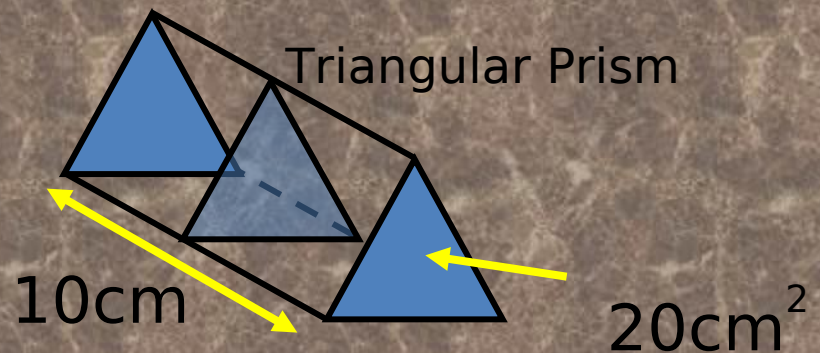
$$\text{Volume} = \text{Area of Cross section} \times \text{length}$$

Definition : A prism is a solid shape with uniform cross-section

Q. Find the volume the triangular prism.

$$\text{Volume} = \text{Area} \times \text{length}$$

$$= 20 \times 10 = 200 \text{ cm}^3$$





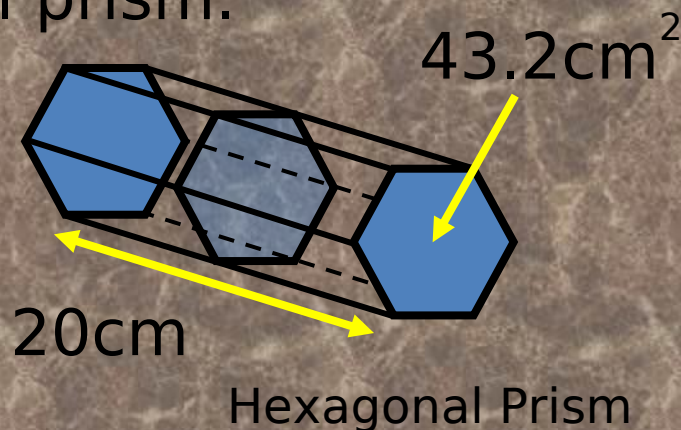
Volume of Solids

Definition : A prism is a solid shape with uniform cross-section

Q. Find the volume the hexagonal prism.

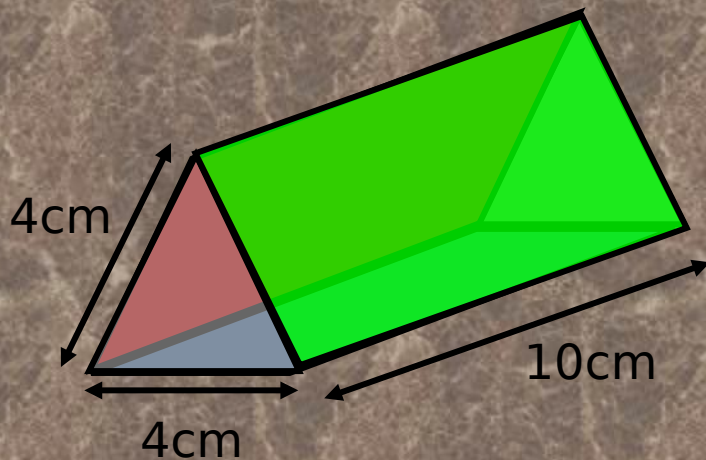
$$\text{Volume} = \text{Area} \times \text{length}$$

$$= 43.2 \times 20 = 864 \text{ cm}^3$$



Net and Surface Area

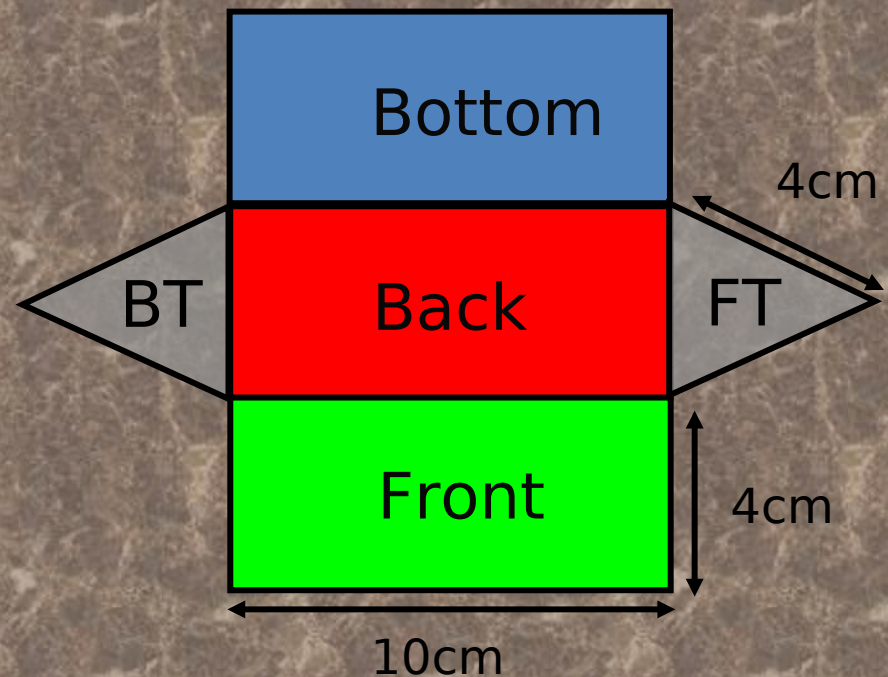
Triangular Prism



5 faces

3 congruent rectangles

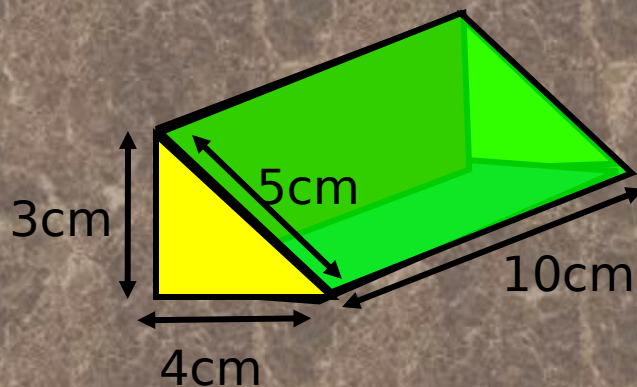
2 congruent triangles



This is a NET for the triangular prism.

Example

Find the surface area of the right angle prism



2 triangles the same

1 rectangle 3cm by 10cm To

1 rectangle 4cm by 10cm =

1 rectangle 5cm by 10cm

Working

$$\begin{aligned}\text{Triangle Area} &= \frac{1}{2}bh \\ &= 2 \times 3 = 6\text{cm}^2\end{aligned}$$

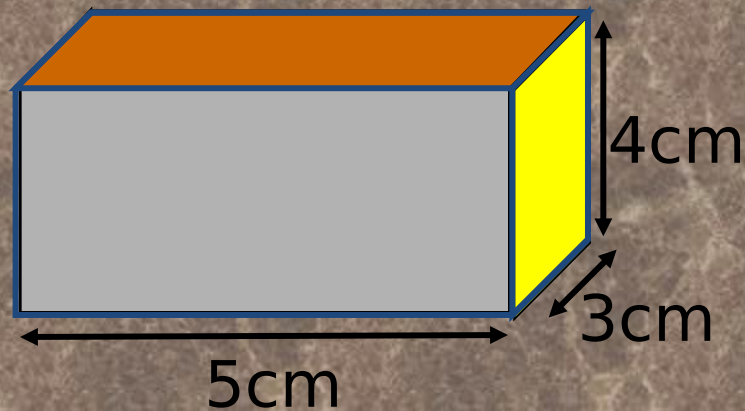
$$\begin{aligned}\text{Rectangle 1 Area} &= l \times b \\ &= 3 \times 10 = 30\text{cm}^2\end{aligned}$$

$$\begin{aligned}\text{Rectangle 2 Area} &= l \times b \\ &= 4 \times 10 = 40\text{cm}^2\end{aligned}$$

$$\begin{aligned}\text{Rectangle 3 Area} &= l \times b \\ &= 5 \times 10 = 50\text{cm}^2\end{aligned}$$

Net and Surface Area

The Cuboid

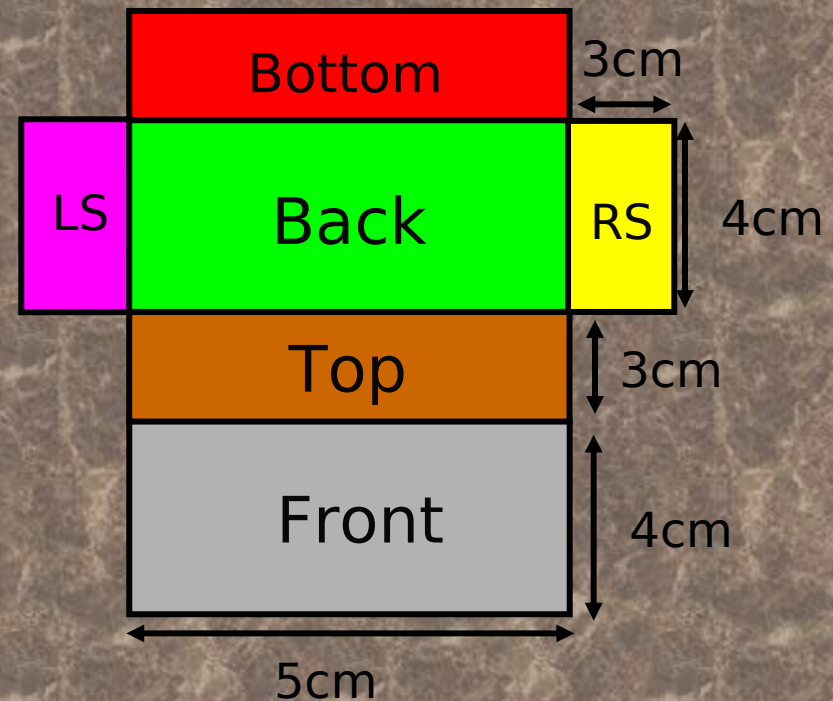


6 faces

Top and bottom congruent

Front and back congruent

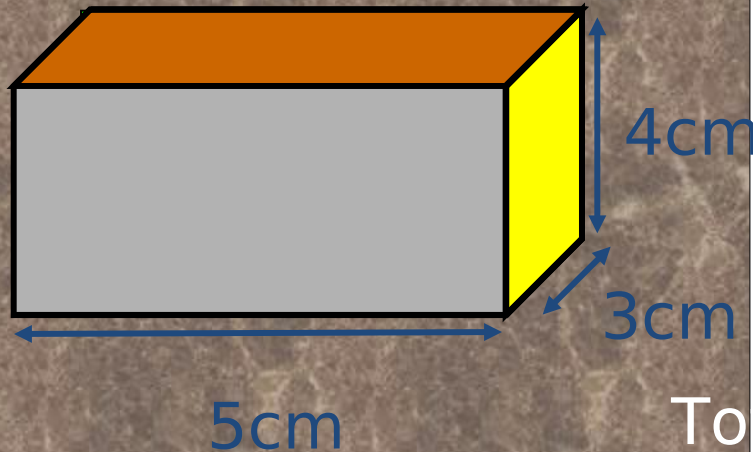
Left and right congruent



This is a NET for the cuboid

Example

Find the surface area of the cuboid



To

Front and back are the same

Top and bottom are the same

Right and left are the same

Working

Surface Area of a Cylinder

Learning Intention

1. To explain how to calculate the surface area of a cylinder by using basic area.

Success Criteria

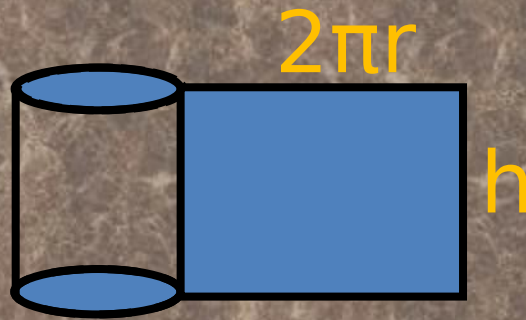
1. To know split up a cylinder.
2. Calculate the surface area of a cylinder.

Surface Area of a Cylinder

The surface area of a cylinder is made up of 2 basic shapes can you name them.

Cylinder
(circular Prism)

Roll out
curve side $\Rightarrow$



Curved Area $= 2\pi rh$

Top Area $= \pi r^2$

Bottom Area $= \pi r^2$

$$\text{Total Surface Area} = 2\pi r^2 + 2\pi rh$$

Surface Area of a Cylinder

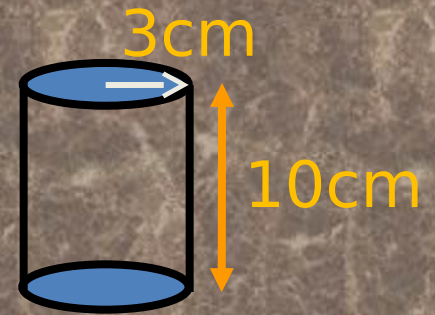
Example : Find the surface area of the cylinder below:

$$\text{Surface Area} = 2\pi r^2 + 2\pi rh$$

$$= 2\pi(3)^2 + 2\pi \times 3 \times 10$$

$$= 18\pi + 60\pi$$

$$= 78\pi \text{ cm}$$



Cylinder
(circular Prism)

Surface Area of a Cylinder

$$\text{Diameter} = 2r$$

Example : A net of a cylinder is given below.
Find the diameter of the tin and the
total

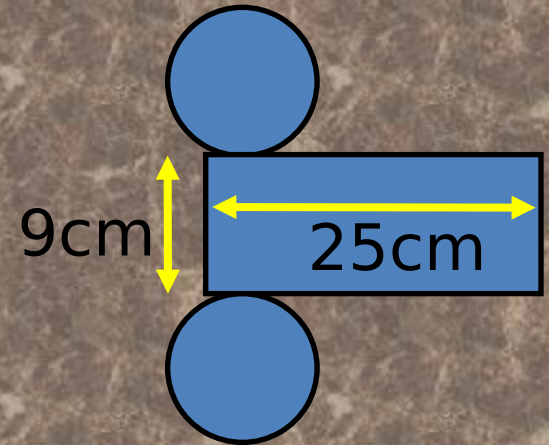
surface area.

$$2\pi r = 25$$

$$2r = \frac{25}{\pi}$$

$$\text{Surface Area} = 2\pi r^2 + 2\pi rh$$

$$\begin{aligned} &= 2\pi(25/2\pi)^2 + 2\pi(25/2\pi) \times 9 \\ &= 625/2\pi + 25 \times 9 = 324.5 \text{ cm} \end{aligned}$$



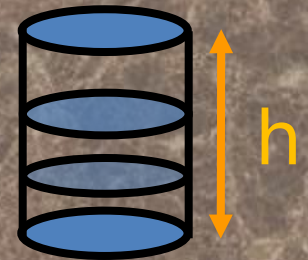
Volume of a Cylinder

The volume of a cylinder can be thought as being
a pile
of circles laid on top of each other.

$$\text{Volume} = \text{Area} \times \text{height}$$

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

$$= \pi r^2 h$$



Cylinder
(circular Prism)

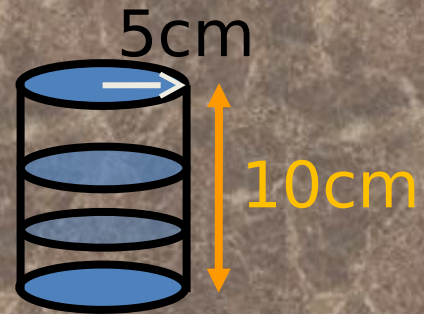
Volume of a Cylinder

Example : Find the volume of the cylinder below.

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

$$= \pi(5)^2 \times 10$$

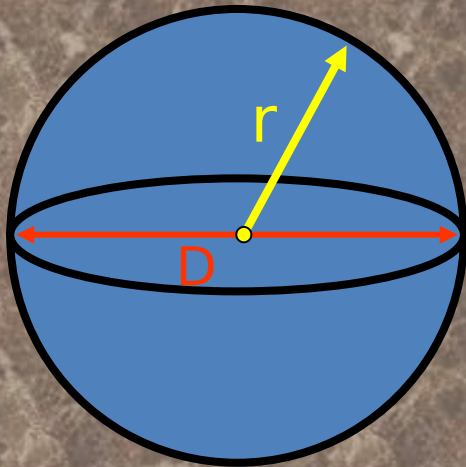
$$= 250\pi \text{ cm}$$



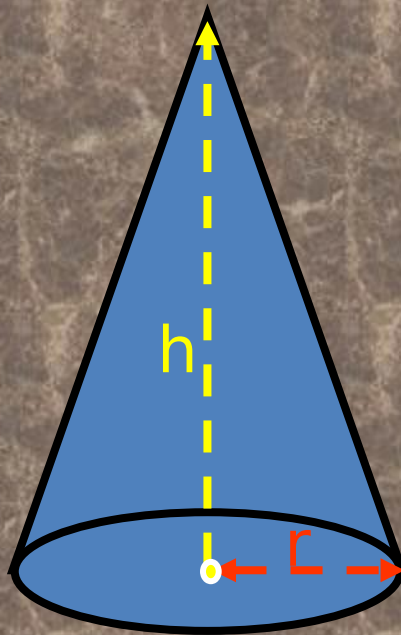
Cylinder
(circular Prism)

Other Simple Volumes

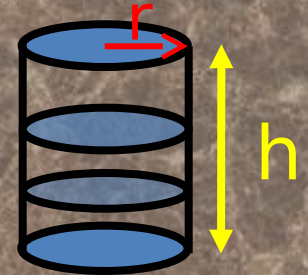
Composite volume
is simply volumes that are made up from basic volumes.



$$\text{Volume} = \frac{4}{3}\pi r^3$$



$$\text{Volume Cone} = \frac{1}{3}\pi r^2 h$$



Cylinder
(circular Prism)

$$\text{Cylinder} = \pi r^2 h$$

Volume of Solids

Prisms

Learning Intention

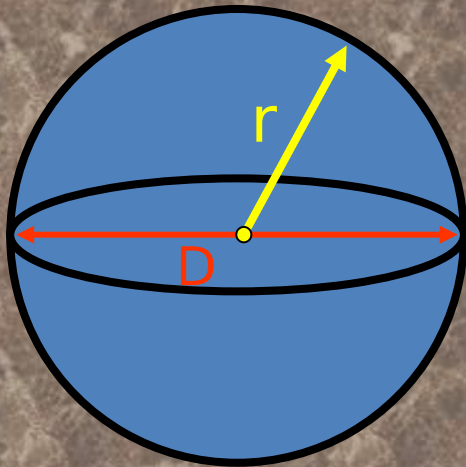
1. To calculate volumes for composite shapes using knowledge from previous sections.

Success Criteria

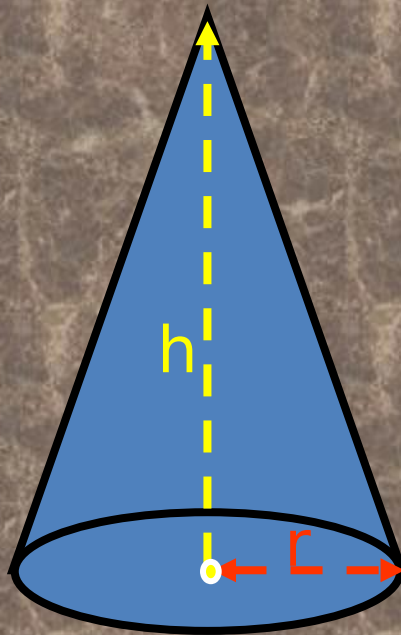
1. To know what a composite volume is.
2. Work out composite volumes using previous knowledge of basic prisms.
3. Answer to contain appropriate units and working.

Other Simple Volumes

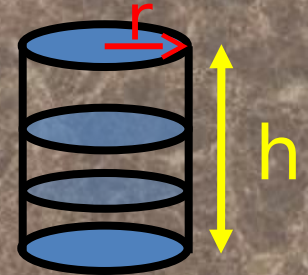
Composite volume
is simply volumes that are made up from basic volumes.



$$\text{Volume} = \frac{4}{3}\pi r^3$$



$$\text{Volume Cone} = \frac{1}{3}\pi r^2 h$$



Cylinder
(circular Prism)

$$\text{Cylinder} = \pi r^2 h$$

Volume of a Solid

Composite volume
is simply volumes that are made up from basic volumes.

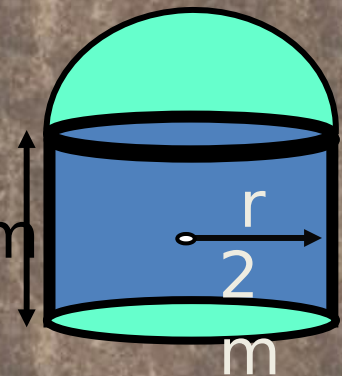
Q. Find the volume the composite shape.

Volume = Cylinder + half a sphere

$$V = \pi r^2 h + \frac{1}{2} \times \left(\frac{4}{3} \pi r^3 \right) = \pi (2)^2 6 + \frac{1}{2} \times \left(\frac{4}{3} \pi (2)^3 \right)$$

$$= 24\pi + \frac{2}{3} \pi (8) = 24\pi + \frac{16}{3} \pi = \frac{88}{3} \pi$$

$$h = 6\text{m}$$



Volume of a Solid

Composite Volumes
are simply volumes that are made up from basic volumes

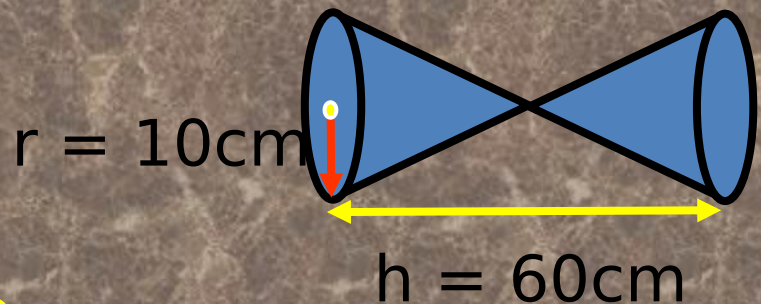
Q. This child's toy is made from 2 identical cones.
Calculate the total volume.

Volume = 2 x cone

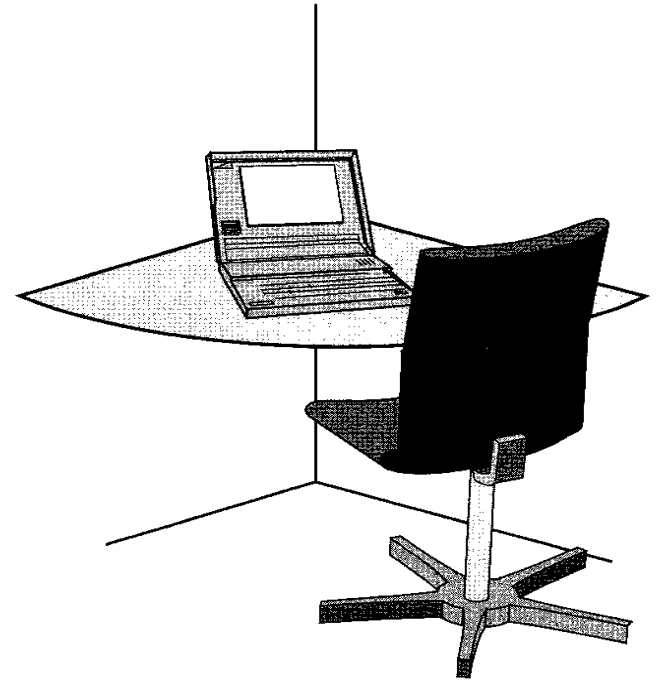
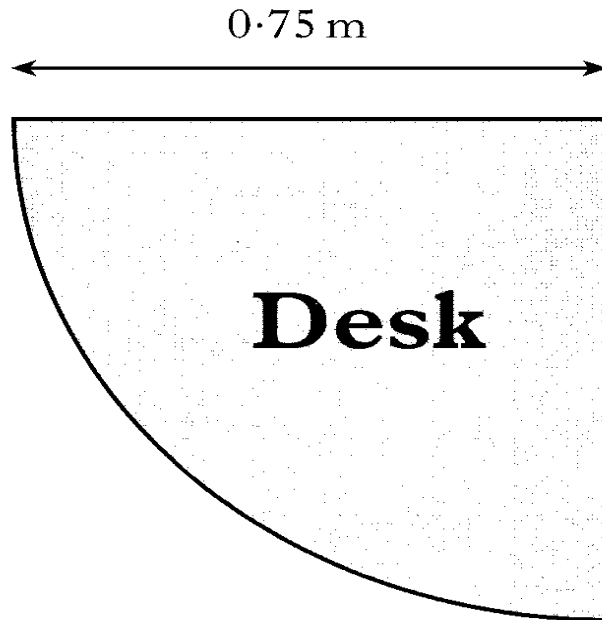
$$V = 2 \times \frac{1}{3} \pi r^2 h$$

$$= \frac{2}{3} \times \pi \times (10)^2 \times 30$$

$$= 6283 \text{cm}^3$$

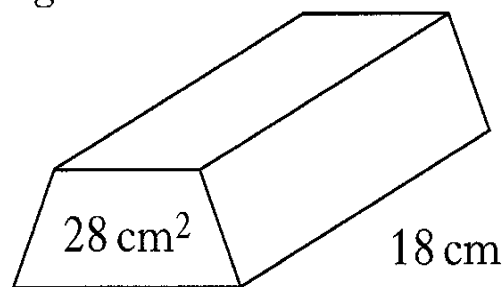


9. The top of Calum's desk is in the shape of a quarter-circle as shown. The measurement shown is in metres.



- (a) Calculate the area of the top of the desk.
- (b) Calum wants to paint the top of his desk.
The tin of paint he buys has a coverage of 1 m^2 .
Using this tin of paint, how many times could he paint the top of his desk?

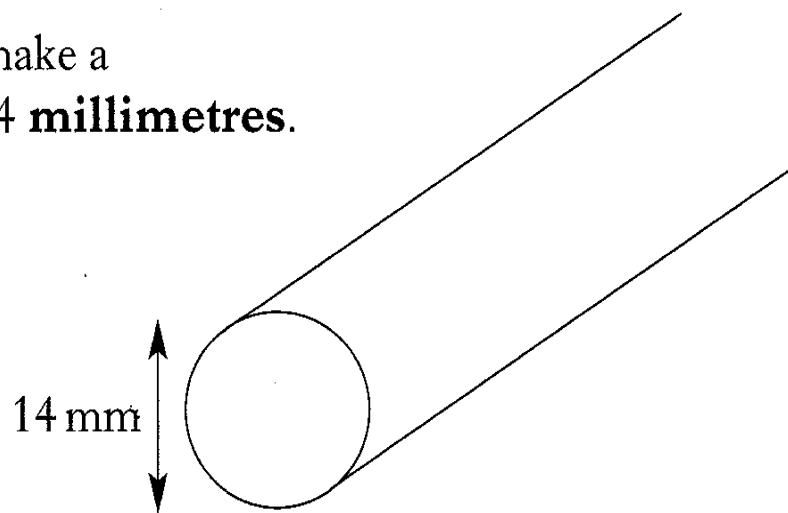
7. (a) A block of copper 18 centimetres long is prism shaped as shown.



The area of its cross section is 28 square centimetres.

Find the volume of the block.

- (b) The block is melted down to make a cylindrical cable of diameter 14 **millimetres**.



Calculate the length of the cable.