APPLICATION OF NUMBER LEVEL TWO

Area and Volume - Volumes of Composite Shapes

After completing this unit, you will be able to:

- **Calculate the volume of a cuboid.**
- **Calculate the volume of a cylinder.**
- **Calculate the volume of a triangular prism.**
- **Calculate the volume of composite shapes.**

Volume of a prism

A prism is a three-dimensional shape which has the same cross-section throughout its length or height.

To find the volume of a prism you need to know the area of the cross section and the length or height.

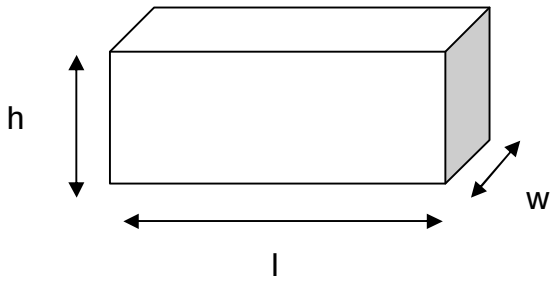
The volume is given in cubic units - $(\text{units})^3$

Volume of a cuboid

To find the volume of a cuboid we need to know the length, width and height.

Then the area of the cross-section = length x height

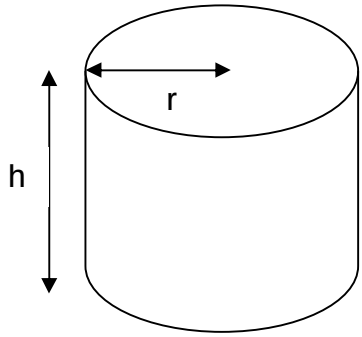
And the volume = length (l) x height (h) x width (w)



Volume of a cylinder

Area of the cross section = π x (radius)^2 = πr^2

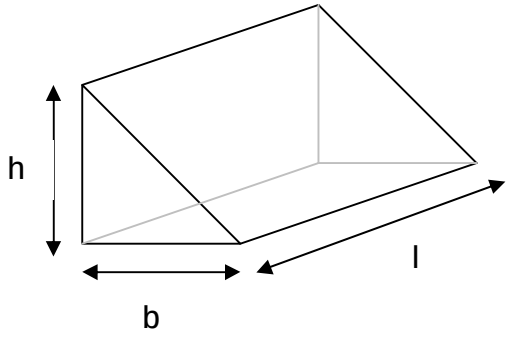
Volume = π x (radius)^2 x height = πr^2 x h



Volume of a right angled triangular prism

Area of Cross-section = ½ (base x height) = ½ (b x h)

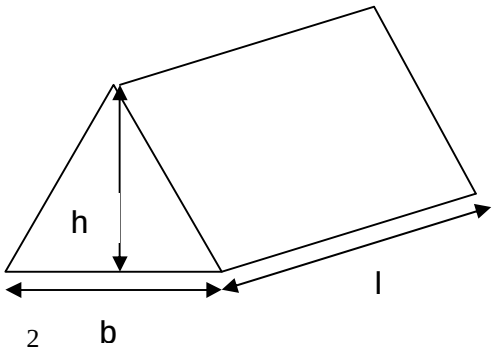
Volume = ½ (base x height) x length = ½ (b x h) x l



Volume of a triangular prism

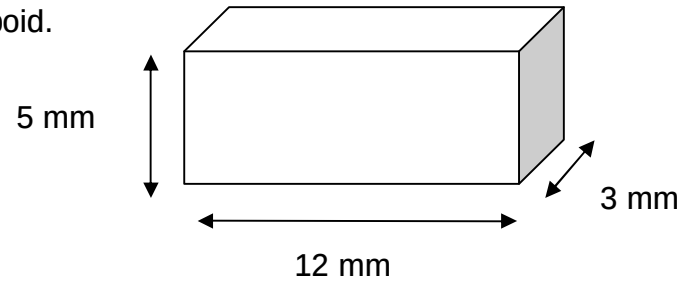
Area of Cross-section = ½ (base x perpendicular height) = ½ (b x h)

Volume = ½ (base x perpendicular height) x length = ½ (b x h) x l

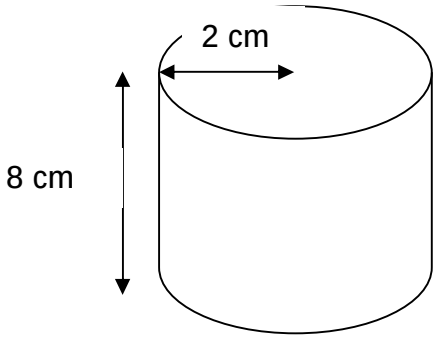


Self Assessment One - Volume of prisms

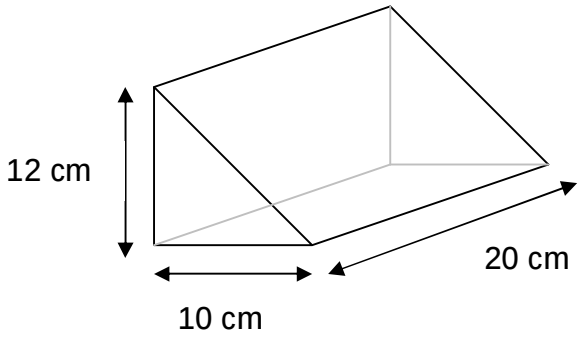
1. Calculate the volume of this cuboid.



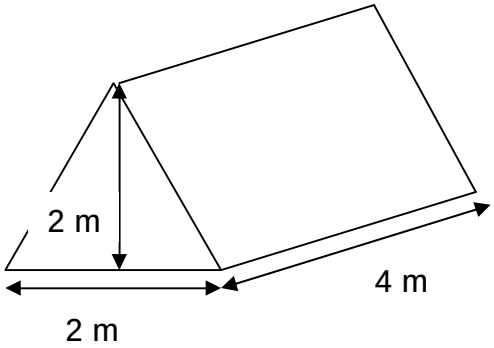
2. Calculate the volume of this cylinder.
(Use π = 3.14)



3. Calculate the volume of this prism.



4. Calculate the volume of this prism.



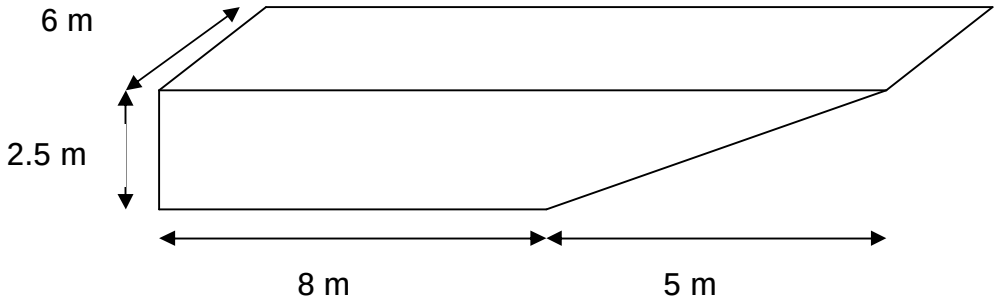
Volume of composite shapes

In real life, buildings and other structures are rarely simple shapes.
However if you look at them you will see that they are often composite shapes made from some of the basic shapes you have just looked at.

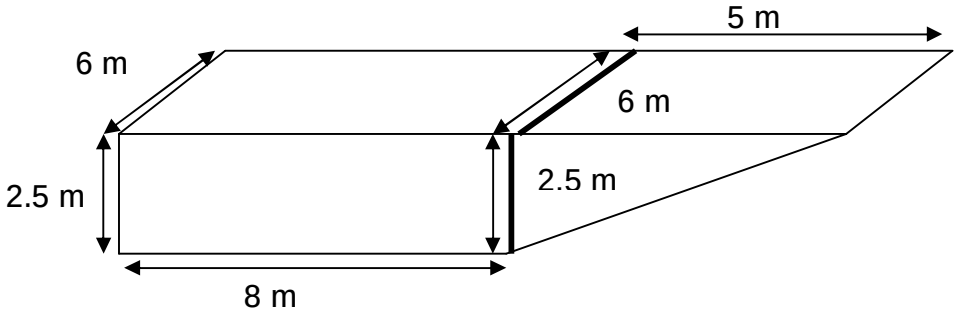
To work out the volume of these composite shapes you need to

- *Identify the shapes which go together to make up the structure*
- *Ensure you have all the measurements you need to do your calculations*
- *Work out the volume of each component shape*
- *Add them all together to give the total volume of the structure*

e.g A swimming pool shelves in gently from the edge at the shallow end. The main part of the pool is at a constant depth of 2.5 m. Its width throughout is 6 m. The other dimensions are shown in the diagram below.
Calculate the volume of water needed to completely fill the pool.



The pool is effectively made up of two simple shapes - a cuboid and a right angled triangular prism.
So we can work out the volumes of these two shapes separately



The area of the cuboid = length x width x height

= 8 m x 6 m x 2.5 m

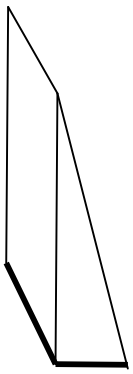
= 120 m^3

The area of the triangular prism = ½ (base x height x length)
(Imagine it standing vertically)

= ½ (2.5 x 5 x 6)

= ½ (75)

= 37.5 m^3

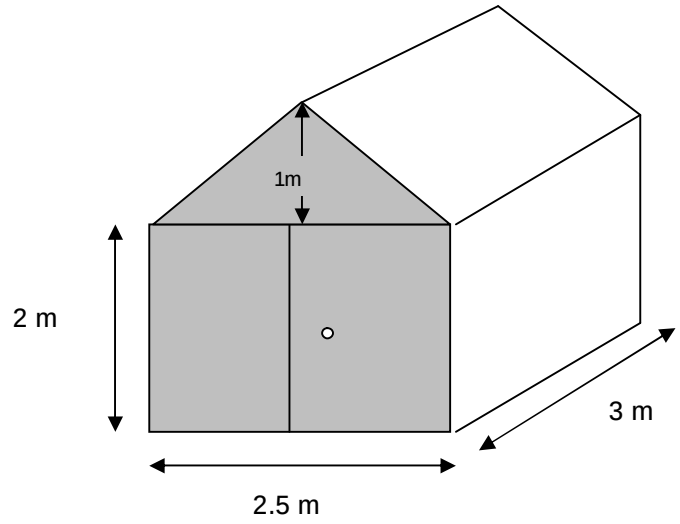


Total volume = 120 m^3 + 37.5 m^3

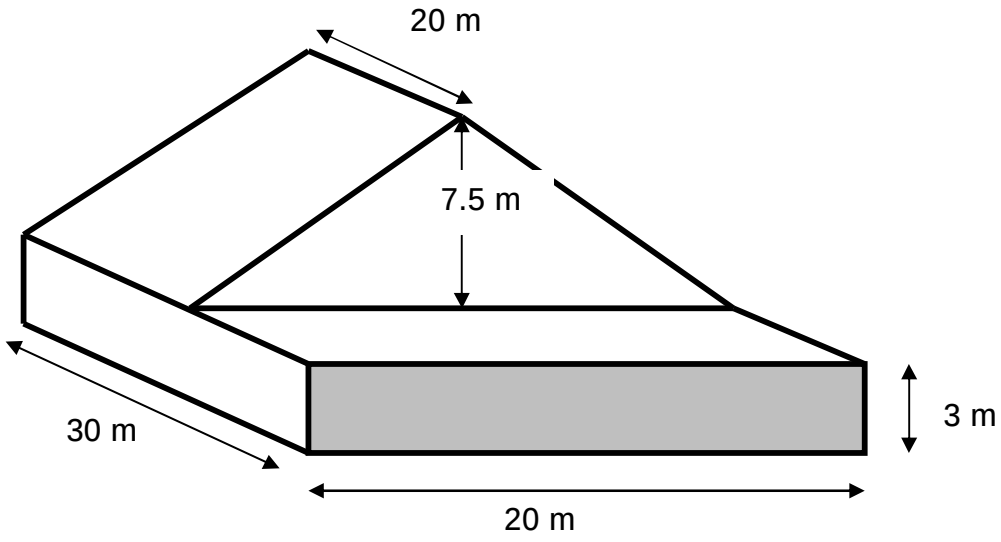
So the total volume of water
required to completely fill the pool = **<u>157.5 m^3</u>**

Self Assessment Two - Volume of composite shapes

1. What is the volume of this garage ?



2. The diagram below shows the outside dimensions of a new factory building. What is its total volume ?



Answers

Self Assessment One - Volume of prisms

1. 180 mm^3

2. 100.48 cm^3

3. 1200 cm^3

4. 8 m^3

Self Assessment Two - Volume of composite shapes

1.	Volume of Triangular prism	3.75 m^3
	Volume of Cuboid	15 m^3
	Total Volume	18.75 m^3

1.	Volume of Triangular prism	1500 m^3
	Volume of Cuboid	1800 m^3
	Total Volume	3300 m^3