Mass

When we use the word **weight** we actually mean **mass.** Mass is the amount of matter in a body, whereas weight is a measure of the force of gravity on a body. On the surface of the earth, mass and weight are the same; however, on the moon your mass is the same as on the earth but the effect of gravity is much less, thus your weight is much less.
The units of mass and weight are the same. In the International System of Units (SI) the standard unit of mass is the kilogram, kg.

The common units of mass are:

Milligram,	mg	a grain of sand
Gram,	g	a 5c coin, a paper clip
Kilogram,	kg	1 litre of milk or water
Tonne,	t	a very small car

Conversions

As in all conversions involving measurement, the following rule applies:

large → small	multiply
small → large	divide

The conversion factors are:

1 gram = 1000 milligrams

1 kilogram = 1000 grams

1 tonne = 1000 kilograms

Remember: If you are converting tonnes to grams you need two steps:

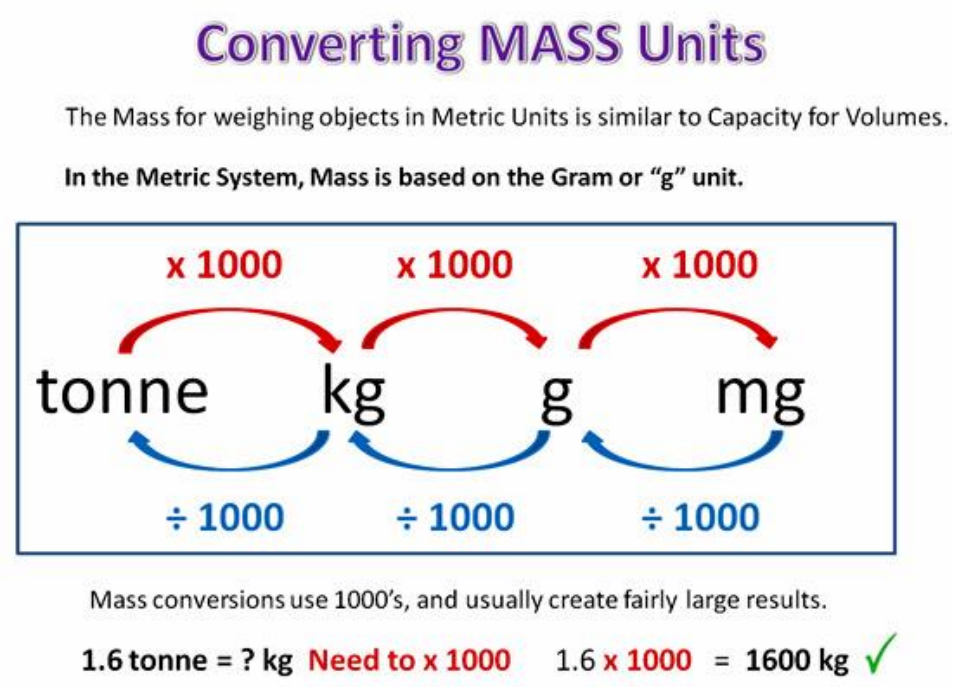
tonnes → kilograms → grams

Exercise 1

Q1. What units would be most appropriate for measuring the mass of:

a) a pencil b) a student c) a hamburger

d) a bus d) a human hair d) a mobile phone



Q2. For the following conversions, write multiply or divide.

a) g → kg b) g → mg c) kg → t

d) kg → g e) t → g f) mg → kg

Q3. Find the following conversions.

a) 3 kg = g b) 12 t = kg c) 1500 g = kg

d) 2400 kg = t e) 850 kg = g f) 900 g = kg

Q4. A hospital pharmacist ordered 2000 tablets. Each tablet has a mass of 5 mg.

a) What is total mass of the tablets in mg?

b) What is the total mass in grams?

Q5. List two items whose mass you would measure in:

a) tonnes

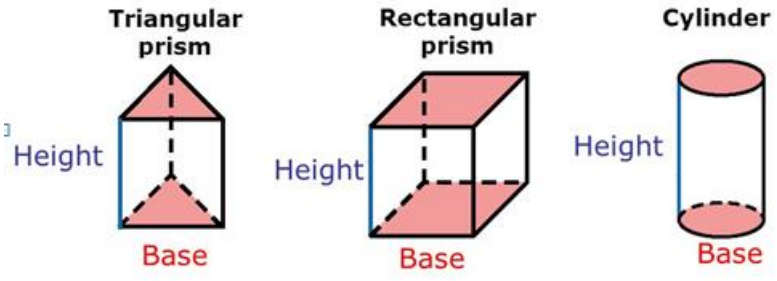
b) kilograms

c) grams

d) milligrams

Volume

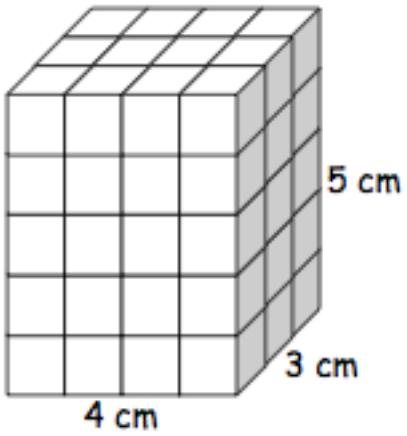
We have looked at the surface areas of solids, now we will look at the amount of space **inside** a solid.



Prisms
The volume of both rectangular and triangular prisms (in fact any prism) is found by counting the number of cubes that would fit inside the prism. Multiplying the area of the base by the height will also find the number of cubes that would fit inside the solid.

Example 1

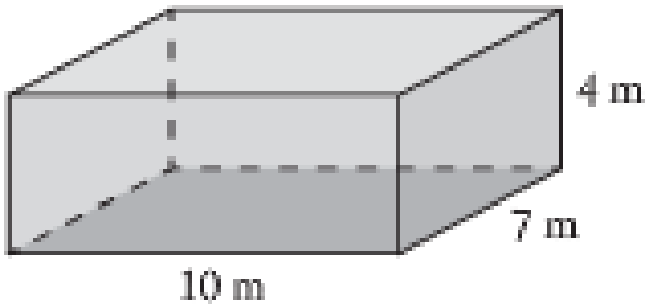
Count the number of cubes in the rectangular prism by multiplying the three dimensions (length x width x height)



Volume = 4 x 3 x 5
= 60 cm^3

Example 2

Calculate the volume of this rectangular prism.



V = A × h

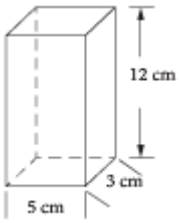
The area of the rectangular base is 10 × 7 = 70 m^2

Using the formula: V = A × h gives 70 × 4 = 280 m^3

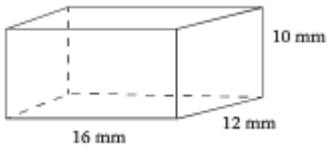
Exercise 2

Calculate the volume of the following rectangular prisms.

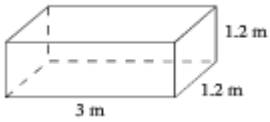
Q1. a)



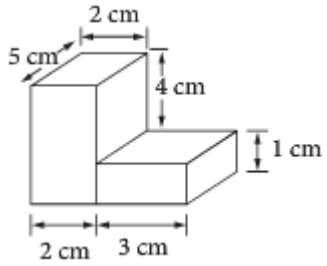
b)



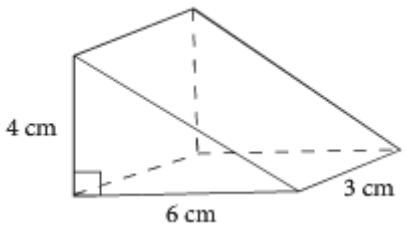
c)



d)



Q2. Sometimes, when we are calculating the volume of this rectangular prism, it is easier to think of the volume formula as V = area of the front × depth

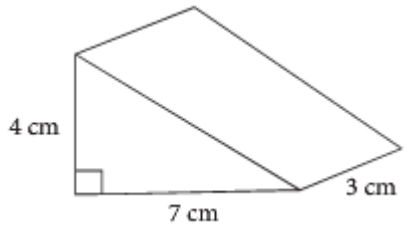


a) Calculate the area of the front triangle.

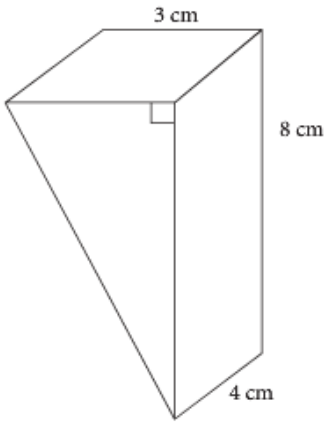
b) Multiply the area of the triangle by 3 cm to calculate the volume of the prism.

Q3. Calculate the volumes of these triangular prisms.

a)

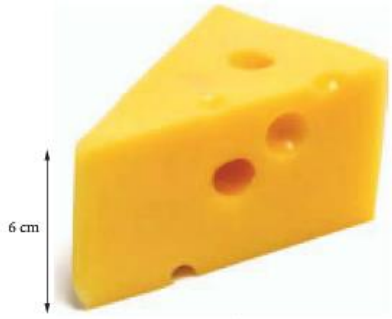


b)



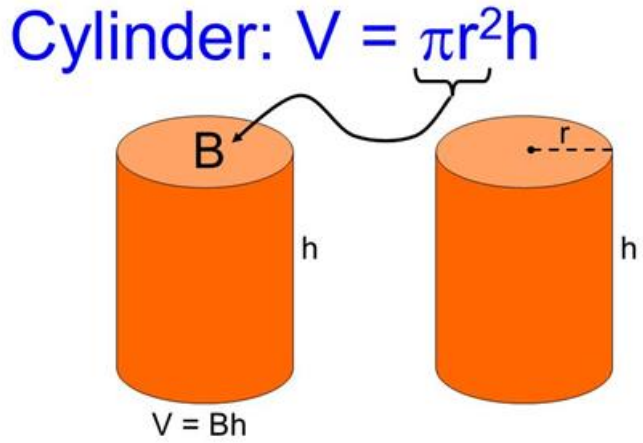
c)

d)

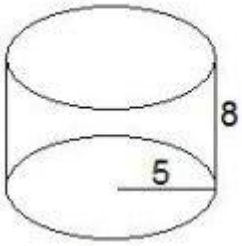


Area of the base = 32 cm^2

Cylinders



Worked Example:

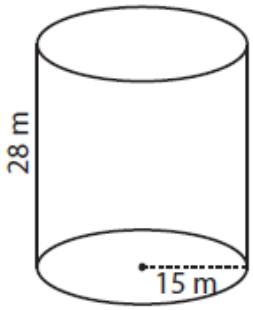


area of circle
$= \pi \times r^2$
=78.5
then multiply the result by 8
=78.5×8
$=628cm^3$

Exercise 3

Q1. Find the volume of the following cylinders.

a)

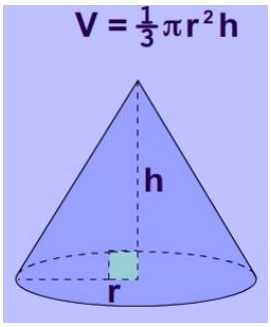


b)

d = 4 cm, h = 10 cm

Cones

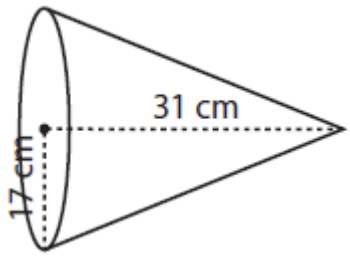
The volume of a cone is given by: $V = \frac{\pi r^2 h}{3}$



Exercise 4

Find the volumes of the cones below.

a)



b)

d = 4 cm, h = 14 cm

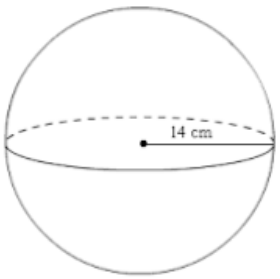
Spheres

The **volume** of a sphere is given by:

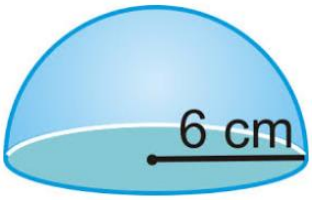
$$V = \frac{4\pi r^3}{3}$$

Exercise 5

Q1. a) Find the volume:



b) Find the volume:



c) Given that the diameter of the earth is 12,742 km, what is its volume?

Q2. Consider the ice creams below:

Cone height = 6 cm
Spherical height = 5 cm
Diameter = 6 cm
Find total volume of all 6 ice creams

Show all working.

Week 4 Investigation questions:

1. Your boss has asked you for the volume of a sheet of A4 paper.

You do not have any specialised small measuring equipment with you (or available).
How do you find out the volume for one piece of paper?

Show measurements/calculations and explain your working.

2. You are selling crystal balls that are 6cm radius and they are packed in a cardboard box that must have 2cm clearance all around the ball to make sure there is no damage to the ball during shipping.

   How much volume of packing material do you need for each crystal ball?

   Hints – draw a sketch and show required dimensions…