Measurement

Term	Definition
Area	The measure of the flat space enclosed by a given boundary. Area can be measured using non-standard and standard units, but is usually measured in square units such as square centimetres (cm^2) and square metres (m^2).
Breadth	How broad something is from side to side.
Capacity	The maximum amount of space inside an object or container. Capacity is usually measured in millilitres (ml) or litres (l). There are 1000 milliltres in a litre.
Circumference	The distance around the edge of a circle.
Conservation of volume	The recognition that shapes and objects that have different dimensions can be equal in volume. This can be illustrated by putting the same amount of liquid into different containers. In the example shown, there is 150 millilitres of juice in each container. 
Degree of accuracy	A measure of how close and correct a stated value is to the actual, real value being described. A value may be rounded to: • the nearest multiple of 10, 100, 1000 …. • a given number of decimal places. • a given number of significant figures.

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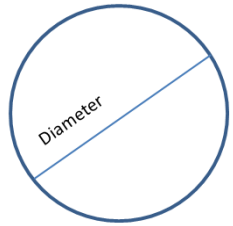
Diameter of a circle	The distance from one side of a circle to the other through its centre. 
Height	How tall something is from its base to its top. The vertical distance between the top and the bottom of an object.
Length	How long something is from end to end. The distance from one point to another. Distance is usually measured in millimetres (mm), centimetres (cm), metres (m) or kilometres (km). There are 10 millimetres in a centimetre, 100 centimetres in a metre and 1000 metres in a kilometre.
Mass	The amount of matter in an object. In everyday language, the term **Weight** is used. Mass is usually measured in grams (g) and kilograms (kg). There are 1000 grams in a kilogram.
Metre stick	 A straight measuring device that is 1 metre in length, usually marked in centimetres but may also marked in millimetres.
Metric system	The decimal measuring system based on the metre, litre, and gram as units of length, capacity, and weight or mass.

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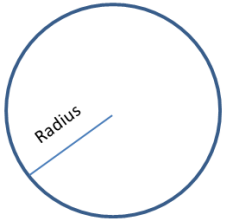
Non-standard units of measurement	Everyday objects which can be used in measurement, for example hands, feet or leaves. These can be used to compare and estimate measurements until standard, metric units of measurement are introduced.
Pedometer	 A measuring device to calculate the distance travelled by the user by measuring the number of steps taken. Pedometers can be attached to clothing or the body or be part of an application on a smart device.
Pi (π)	The ratio of a circle's circumference to its diameter. It is approximately equal to 3•14159.
Radius of a circle	The distance from the edge of a circle to its centre. The radius is half the length of the diameter. 
Ruler	 A straight measuring device, usually 15 or 30 centimetres in length. It can also be used to draw straight lines.

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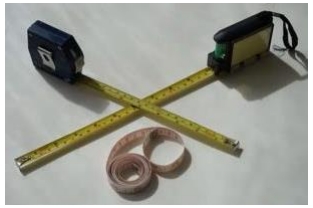
Scales	A measuring device used to measure an object's weight (mass). Digital and analogue examples are shown below.    
Speedometer	 A measuring device used to measure the speed at which a vehicle is travelling. Usually found on the vehicle's dashboard. Speedometers can be analogue or digital.
Tape measure (or measuring tape)	A tape measure is flexible, so is often used to measure around things, for example measuring body parts for clothes. Tape measures vary in length. Many of them have dual measures showing metric and imperial measurements (metres and centimetres as well as yards, feet and inches). 
Thermometer	 A measuring device used to measure temperature. The thermometer reading will rise when the temperature rises and fall when the temperature falls. Temperatures are recorded using the standard units of Degrees Celsius (°C) or Fahrenheit (°F).

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Tolerance	Tolerance describes the margin for error acceptable in measurement. For example, 3 ± 0•2 cm (3 plus or minus 0•2 centimetres) describes an ideal length of 3 cm but any lengths that are between a minimum of 2•8 cm and a maximum of 3•2 cm would be within tolerance. Lengths shorter than 2•8 cm or longer than 3•2 cm would be outside of tolerance and would be rejected. The tolerance that is set depends very much on the context – in precision engineering the tolerance will be very small, but when making handmade goods it is likely to be larger.
Trundle wheel	 A measuring device for measuring larger distances when a metre stick or tape measure may be impractical, for example measuring a football field or car park length. One full rotation of the trundle wheel is 1 metre and it clicks to alert the user when rotation has been completed.
Volume	The measure of space taken up by a three dimensional object. Volume is usually measured in cubic units such as cubic centimetres (cm^3) and cubic metres (m^3). Capacity and Volume are linked and 1 cm^3 of space has the capacity 1 ml.
Width	How wide something is from side to side.

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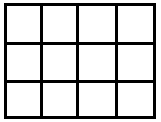
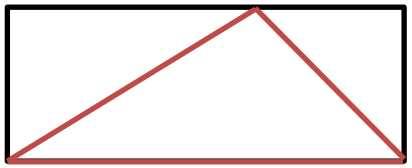
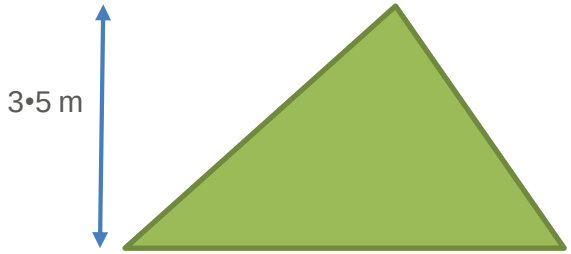
To Calculate	Method	Examples
Area of a square or rectangle	This can be found by counting squares, or noticing that the number of squares is the number of rows, multiplied by the number of columns. In general **Area = Length x Breadth**	 Area = 3 x 4 = 12 squares  4 cm 8 cm Area = 8 x 4 = 32 cm^2
Area of a triangle	The area of a triangle is half the area of the rectangle that surrounds it. The base and height of a triangle are the same as the length and breadth of this rectangle.  Therefore **Area = $\frac{1}{2}$ x Base x Vertical Height**	 3•5 m 4 m Area = $\frac{1}{2}$ x 4 x 3•5 = 7 m^2

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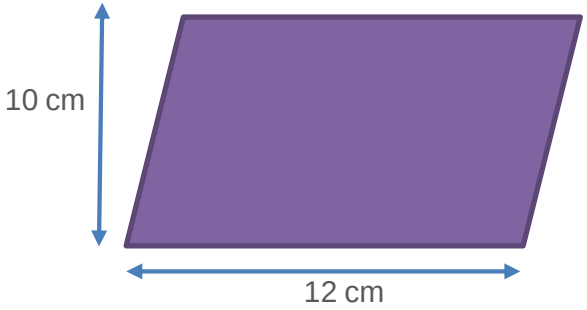
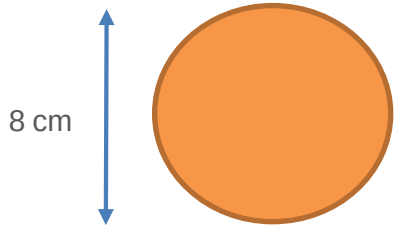
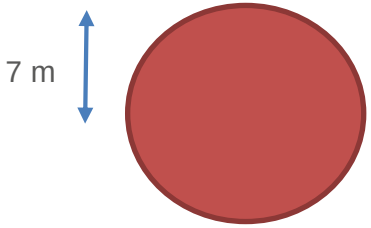
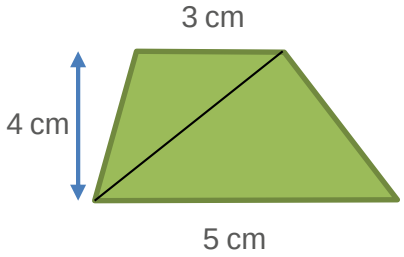
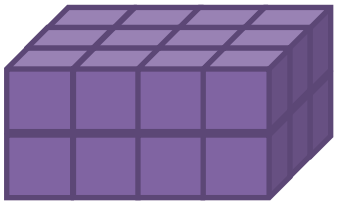
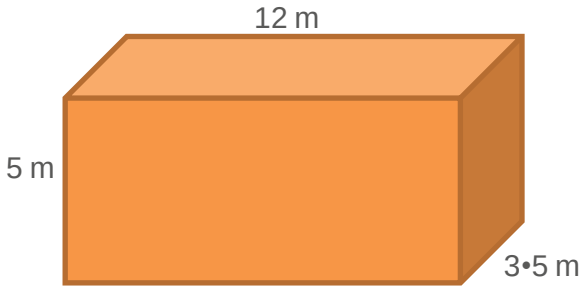
To Calculate	Method	Examples
Area of a parallelogram	The area of a parallelogram is the same as the area of a rectangle with the same dimensions.  Therefore **Area = Length x Breadth** Note: the breadth of the parallelogram is shorter than the sloping edge.	 Area = 12 x 10 = 120 cm^2
Perimeter of a Polygon	The perimeter of a shape is the total length around its outer edge. A polygon is a 2 dimensional shape with straight sides. Add together the lengths of each of the sides to find the perimeter.	

To Calculate	Method	Examples
Circumference of a circle	This is the distance around a circle, and is just over three times the distance across it. In general **Circumference = π x Diameter** **Or** **Circumference = 2 x π x Radius** This can be written **C = π d or C = 2 π r**	 Circumference = π x 8 = 25•1327… = 25•1 cm (rounded to 1 decimal place)
Area of a circle	The area of a circle can be calculated using **Area = π x Radius x Radius** This is generally written **Area = π r^2**	 Area = π x 7^2 = 153•9380… = 153•9 m^2 (rounded to 1 decimal place)

<table>
<tr><th>To Calculate</th><th>Method</th><th>Examples</th></tr>
<tr><td>Area of a trapezium</td><td>A trapezium is a shape that has one pair of parallel sides. It can be split into two triangles to find its total area
  </td><td> 

Area of upper triangle
$= \frac{1}{2}$ x 3 x 4 = 6 cm^2
Area of lower triangle
$= \frac{1}{2}$ x 5 x 4 = 10 cm^2
Total Area = 6 + 10 = 16 cm^2</td></tr>
<tr><td>Surface Area</td><td colspan="2">The surface area of a three dimensional object is the total area of all of its faces.
Learners can apply their knowledge of areas of shapes such as rectangles, triangles and circles to find the surface areas of objects such as cuboids, triangular prisms and cylinders.</td></tr>
<tr><td>Volume of a cube or cuboid</td><td>This can be found by counting cubes, or noticing that the number of cubes is the number of rows, multiplied by the number of columns, multiplied by the number of layers.
In general
Volume = Length x Breadth x Height</td><td> 
Each layer is 4 x 3 = 12 cubes
There are 2 layers so the volume is 24 cubes.
 

Volume of cuboid
= 12 x 3•5 x 5
= 210 m^3</td></tr>
</table>

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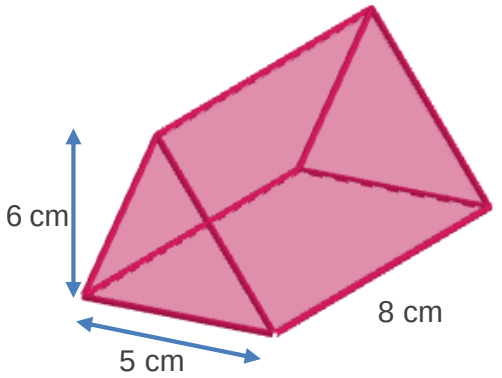
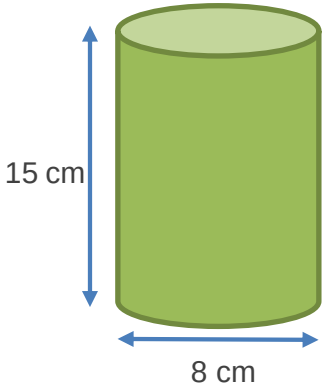
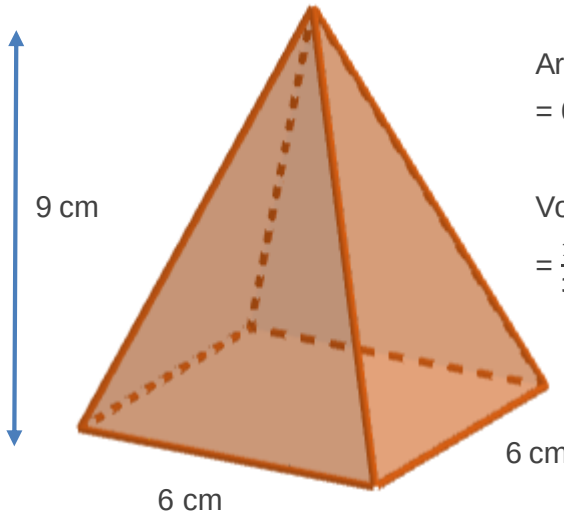
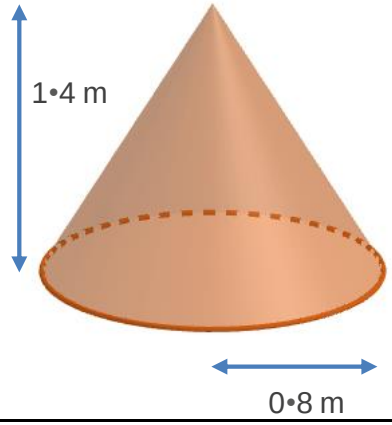
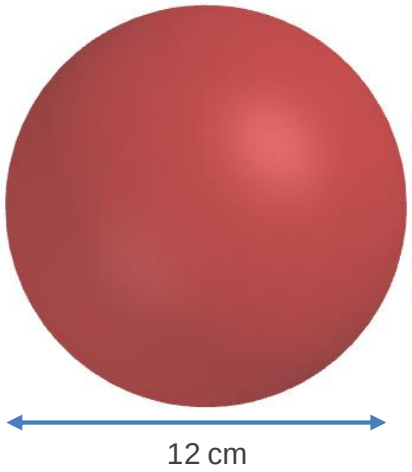
To Calculate	Method	Examples
Volume of a prism	Prisms have the same cross section from end to end. Their volume can be found by multiplying the area of the cross section by the length of the prism. The example of a triangular prism is given.	 Area of cross section $= \frac{1}{2}$ x 5 x 6 = 15 cm^2 Volume of prism = 15 x 8 = 120 cm^3
Volume of a cylinder	Cylinders have the same cross section from end to end. The cross section is circular. Their volume can be found by multiplying the area of the cross section by the height of the cylinder. In general **Volume = π r^2 h**	 Diameter = 8 cm Radius = 4 cm Volume = π x 4^2 x 15 = 754•0 cm^3

To Calculate	Method	Examples
Volume of a pyramid	Pyramids can have a variety of shapes as their base, and rise to a point (or vertex) at the top. Their volume is one third of the corresponding prism. In general **Volume = $\frac{1}{3}$ x Area of base x Height** The example of a square based pyramid is given.	 Area of base = 6 x 6 = 36 cm^2 Volume = $\frac{1}{3}$ x 36 x 9 = 108 cm^3
Volume of a cone	The volume of a cone is one third of the volume of the corresponding cylinder. In general **Volume = $\frac{1}{3}$ x π r^2 h**	 Volume = $\frac{1}{3}$ x π x 0•8^2 x 1•4 = 0•938 m^3

To Calculate	Method	Examples
Volume of a sphere	The volume of a sphere is given by the formula: **Volume** $= \frac{4}{3} \times \pi \times r^3$	 Diameter = 12 cm Radius = 6 cm Volume $= \frac{4}{3} \times \pi \times 6^3$ $= 904 \cdot 8\ cm^3$