# Lesson - Length, perimeter, mass and capacity

Year: Year 3

Hello, I am Otto! How tall are you? How heavy is your school bag? How much water fits in a bottle? We answer these questions by measuring. In this chapter you measure length, mass and capacity with the right units, compare and calculate with measures, and find the perimeter of shapes.

**Starter activity**

Use a ruler to measure your pencil in centimetres. Then guess how many pencils long your desk is. Measure the desk with your ruler or with a metre stick. Is your guess close? Measuring is a skill that needs sensible estimates first and careful measuring second.

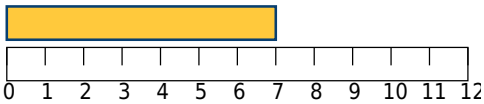
## Measuring length

**Definition: units of length**

We measure **length** in **millimetres (mm)**, **centimetres (cm)**, **metres (m)** and **kilometres (km)**. Use mm for tiny things, cm for a pencil or a book, m for a room and km for a road journey.

**Key fact: converting length**

- 10 mm = 1 cm
- 100 cm = 1 m
- 1000 m = 1 km
- To change metres to centimetres, multiply by 100. To change centimetres to metres, divide by 100.




The yellow strip is 7 cm long. We line up the zero of the ruler with the left end of the object.

**Method: measuring with a ruler**

1. Put the zero mark at one end of the object.
2. Keep the ruler straight along the edge of the object.
3. Read the mark at the other end of the object.
4. Write the number with its unit, for example 7 cm.

**Example 1**

**Write 3 m 40 cm in centimetres.**

3 m = 300 cm, and 300 + 40 = **340 cm**. To go back: 340 cm = 3 m and 40 cm.

## Comparing and calculating with length

**Rule: calculating with measures**

You can add and subtract measures when they have the **same unit**. If the units are different, change them to the same unit first. For example 1 m 20 cm + 85 cm: change 1 m 20 cm to 120 cm, then 120 + 85 = 205 cm = 2 m 5 cm.

**Example 2**

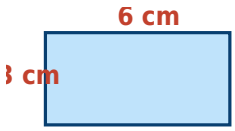
**A rope is 2 m long. Ali cuts off 65 cm. How long is the rest?**

Change 2 m to 200 cm. 200 − 65 = 135. The rest is **135 cm**, which is 1 m 35 cm.

## Perimeter

**Definition: perimeter**

The **perimeter** of a shape is the total distance all the way round its edges. To find it, add the lengths of all the sides. The perimeter is measured in units of length such as cm or m.




The rectangle is 6 cm long and 3 cm wide.

**Method: perimeter of a rectangle**

1. Write down all four side lengths. Opposite sides of a rectangle are equal.
2. Add the four sides: 6 + 3 + 6 + 3.
3. Write the answer with the unit: 18 cm.
4. Short cut: add the length and the width, then double: (6 + 3) × 2 = 18.

**Example 3**

**A garden is 12 m long and 5 m wide. How long is the fence round it?**

Perimeter = 12 + 5 + 12 + 5 = **34 m**. Check with the short cut: (12 + 5) × 2 = 17 × 2 = 34.

**Example 4**

**A square has sides of 8 cm. What is its perimeter?**

All four sides are equal: 8 + 8 + 8 + 8 = 4 × 8 = **32 cm**.

**Watch out**

Perimeter is about the **edge**, not the inside. Do not leave out any side, and do not count a side twice. If a diagram shows only some of the sides, work out the missing ones first. Always include the unit.

## Measuring mass

**Definition: mass**

**Mass** tells us how heavy something is. We measure mass in **grams (g)** and **kilograms (kg)**. A paperclip has a mass of about 1 g. A bag of sugar has a mass of 1 kg.

**Key fact: converting mass**

- 1 kg = 1000 g
- Half a kilogram is 500 g, and a quarter of a kilogram is 250 g.
- To change kg to g multiply by 1000.

**Method: reading a scale**

1. Look at the numbers on the scale. Work out what each small mark stands for by counting the steps between two numbers.
2. Read where the pointer is. If it is between two marks, choose the closer one.
3. Write the number with the unit g or kg.

**Example 5**

**A parcel has a mass of 2 kg 300 g. What is its mass in grams?**

2 kg = 2000 g. 2000 + 300 = **2300 g**.

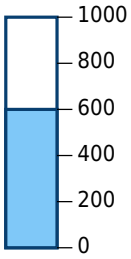
## Measuring capacity

**Definition: capacity**

**Capacity** is how much a container can hold. We measure capacity in **millilitres (ml)** and **litres (l)**. A teaspoon holds about 5 ml, and a big bottle of water holds 1 litre.

**Key fact: converting capacity**

- 1 l = 1000 ml
- Half a litre is 500 ml, and a quarter of a litre is 250 ml.
- To change litres to millilitres multiply by 1000.




The jug shows 600 ml. Each big number on the scale goes up in steps of 200 ml.

**Example 6**

**A jug holds 1 litre. Mia pours out 350 ml. How much is left?**

1 l = 1000 ml. 1000 − 350 = **650 ml**.

## Choosing the right unit and estimating

Before you measure, estimate. A pencil is about 15 cm, a door is about 2 m high, a bag of flour is about 1 kg, a cup holds about 200 ml. Use these fixed things to make sensible guesses. When you answer a question, check that your answer is sensible: a bus is not 3 cm long, and a pencil does not weigh 5 kg.

**Example 7**

**Which unit would you use for the mass of an apple: g or kg? And the capacity of a bath: ml or l?**

An apple is light, so use **g** (about 150 g). A bath holds a lot, so use **litres** (about 150 l).

**Did you know?**

In the past people measured length using parts of the body, such as the foot and the cubit (the length from the elbow to the fingertip). The trouble was that everybody had different feet! Today the metric system makes it easy because each unit is 10, 100 or 1000 times the next one.

**Otto's tip**

Memorise three facts: 100 cm = 1 m, 1000 g = 1 kg and 1000 ml = 1 l. With these you can change almost any measure. Write down the units at each step to stay safe.