

CHAPTER

19

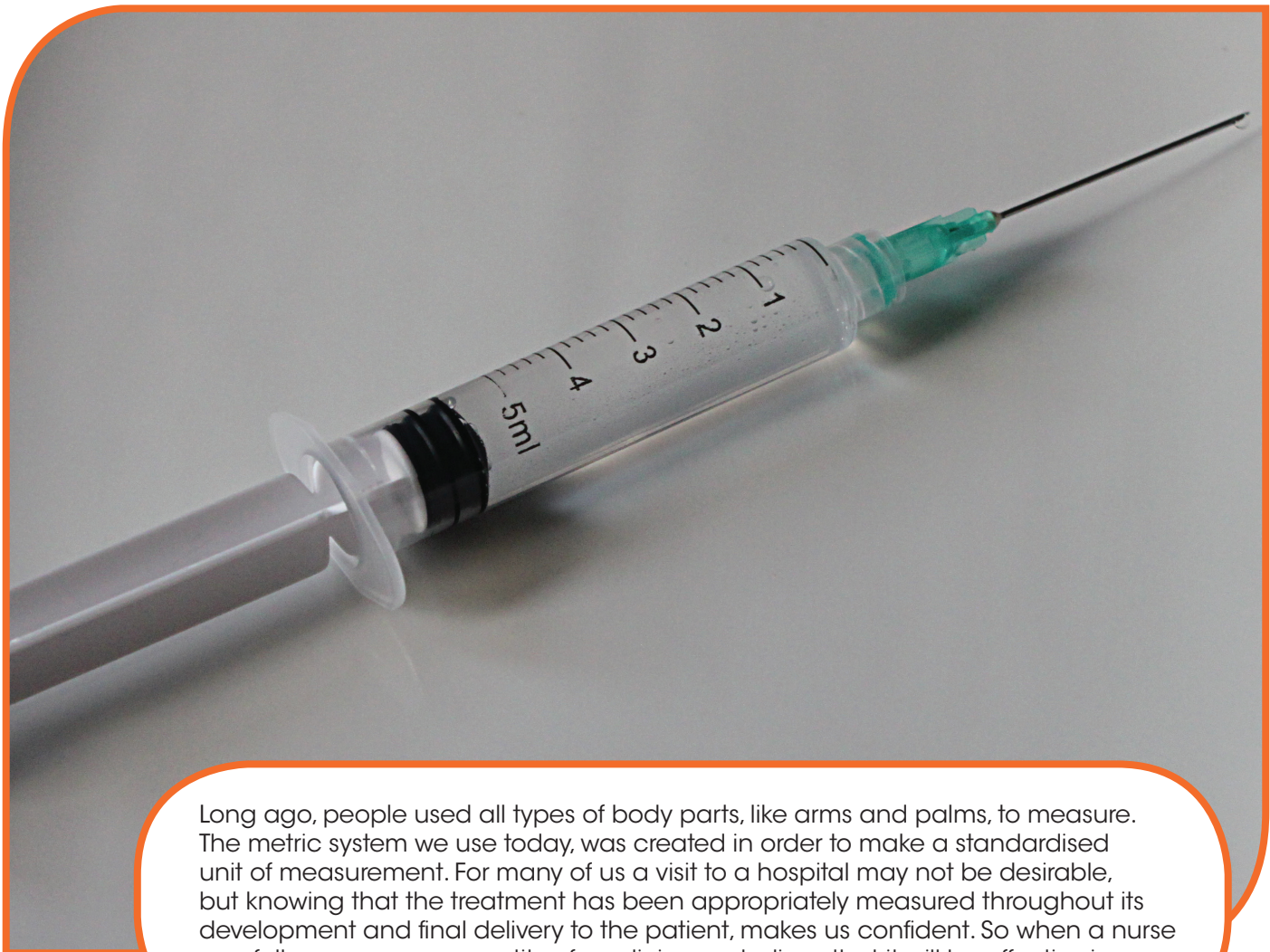
Understanding the Metric System

Vocabulary:

milli
centi
kilo
millimetre
gram
litre

Chapter Outcomes:

- Demonstrate an understanding of the relationship between standard units and their sub-parts to solve practical problems.



Long ago, people used all types of body parts, like arms and palms, to measure. The metric system we use today, was created in order to make a standardised unit of measurement. For many of us a visit to a hospital may not be desirable, but knowing that the treatment has been appropriately measured throughout its development and final delivery to the patient, makes us confident. So when a nurse carefully measures a quantity of medicine we believe that it will be effective in making us get better.

Getting Ready for Chapter 19

Tick the measurement unit you would use to measure each of the following.



- | | |
|--------------------------------------|---------------------------------|
| 1. The width of the book | 2. The mass of the pumpkin |
| ☐ grams | ☐ grams |
| ☐ centimetres | ☐ metres |
| ☐ litres | ☐ litres |

Solve.

- | | |
|------------------------|------------------------|
| 3. $12 \times 10 =$ | 4. $6.81 \times 100 =$ |
| 5. $6\,549 \div 100 =$ | 6. $10.9 \div 10 =$ |

Express each as a decimal fraction.

- | | |
|-----------------------|---------------------|
| 7. $\frac{12}{100} =$ | 8. $\frac{6}{10} =$ |
|-----------------------|---------------------|

Find the fractional part of each.

- | | |
|-------------------------|----------------------------|
| 9. $\frac{1}{4}$ of 100 | 10. $\frac{1}{2}$ of 1 000 |
|-------------------------|----------------------------|

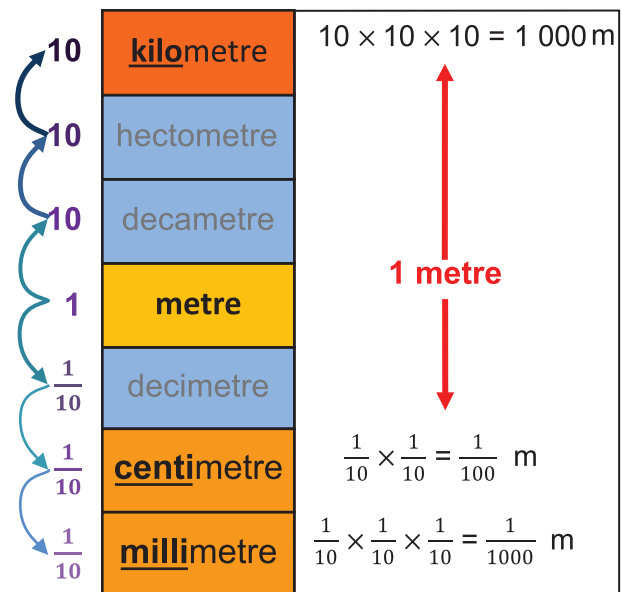
Metric Units of Length

Teaching Point 1:

What is the relationship between metric units of length?

The basic measurement unit for length in the metric system is the **metre**.

The metric system is based on **multiples of 10**. Every metric unit is **10 times as great** as the next smaller unit.



kilo means 1 000.

centi means one hundredth or $\frac{1}{100}$ (0.01)

milli means one thousandth or $\frac{1}{1000}$ (0.001)

1 000 metres = 1 kilometre (km)

1 metre = 1 metre (m)

$\frac{1}{100}$ or (0.01) metre = 1 centimetre (cm)

$\frac{1}{1000}$ or (0.001) metre = 1 millimetre (mm)

10 millimetres = 1 centimetre

$\frac{1}{10}$ or 0.1 centimetre = 1 millimetre

Teaching Point 2:

How can you relate standard units to their sub parts?

1 kilometre (km) = 1 000 metres (m)

$\frac{1}{4}$ kilometre (km) = 250 metres (m)

$\frac{1}{2}$ kilometre (km) = 500 metres (m)

$\frac{3}{4}$ kilometre (km) = 750 metres (m)

1 metre (m) = 100 centimetres (cm)

$\frac{1}{4}$ metre (m) = 25 centimetres (cm)

$\frac{1}{2}$ metre (m) = 50 centimetres (cm)

$\frac{3}{4}$ metre (m) = 75 centimetres (cm)

					6	5
km	hm	dam	m	dm	cm	mm

2.5 kilometres = ____ metres

You **multiply** to convert larger units to smaller units.

Convert **kilometres** to **metres**.

$2.5 \times 1\,000 = 2\,500\text{ m}$ ← Move the decimal point 3 places to the right.

2	5	0	0			
km	hm	dam	m	dm	cm	mm

Conversion - Units of Lengths

Teaching Point 1:

How can you convert metric units of length?

65 mm = ____ cm

You **divide** to convert smaller units to larger units.

Convert **millimetres** to **centimetres**.

$65\text{ mm} \div 10 = 6.5\text{ cm}$ ← Move the decimal point 1 place to the left.

Activity 1:

Complete the table to show equivalent measures.

	kilometres	metres
1.	4	4 000
2.	12	
3.		3 000
4.		58 000
5.	25	
6.		1 000 000
7.	2.3	
8.	0.65	

Activity 2:

Complete the table to show equivalent measures.

	metres	centimetres	millimetres
1.	2	200	2 000
2.		1 900	
3.	8.9		
4.	0.67		
5.		750	
6.		226	
7.			4 500

Activity 3:

Solve.

- Complete the statement.
 $1.75 \text{ km} = \underline{\hspace{2cm}} \text{ m}$
- Express 24.76 kilometres in kilometres and metres.
- Sharon has a 6 centimetres piece of string. Calculate the length of the string in millimetres.
- A length of fabric is 475 centimetres. What is the length of the fabric in metres?
- A 4 500 millimetres length of ribbon is cut into 1-metre pieces.
 - How many 1-metre pieces can be cut from the ribbon?
 - What will be the length, in centimetres, of the remaining piece of ribbon?

- A runner completes a distance of 4.35 km in length. Find the distance that was covered in metres.

Teaching Point 2:

How can you use sub units to solve problems?

Jenna bought 145 centimetres of fabric. Jayley bought $1\frac{1}{2}$ metres of fabric. Who bought more fabric?

Convert metres to centimetres.

$$\frac{1}{2} \text{ metre} = 50 \text{ cm}$$

$$1 \text{ metre} \rightarrow 1 \times 100 = 100$$

$$1\frac{1}{2} \text{ metres} = 100 + 50 = 150 \text{ cm}$$

$$150 \text{ cm} > 145 \text{ cm}$$

So, Jayley bought more fabric.

Activity 4:

Solve.

- Complete the statement.
 $\frac{1}{2}$ centimetre = $\underline{\hspace{2cm}}$ millimetres
- A football team runs $\frac{5}{8}$ km around a track. What is the distance in metres?
- Adam uses a metre ruler to measure and cut $\frac{1}{8}$ metre pieces of ribbon.
 - What is the length of each piece of ribbon in centimetres?

- b) How many pieces of ribbon will Adam get from a 4 metre roll of ribbon?
4. Which length is closer to 1 metre?
- a) $\frac{1}{2}$ km b) 225 m
- c) $\frac{1}{4}$ km d) $\frac{1}{8}$ km
5. Carl lives $2\frac{3}{4}$ kilometres away from the school. He takes the bus for $1\frac{1}{4}$ kilometres and walks the rest. How many metres does Carl walk?
6. The diagram below shows the distances that Maria covered on her trip to the mall.

car	walk	maxi taxi
		
750 m	$\frac{1}{4}$ km	1 km

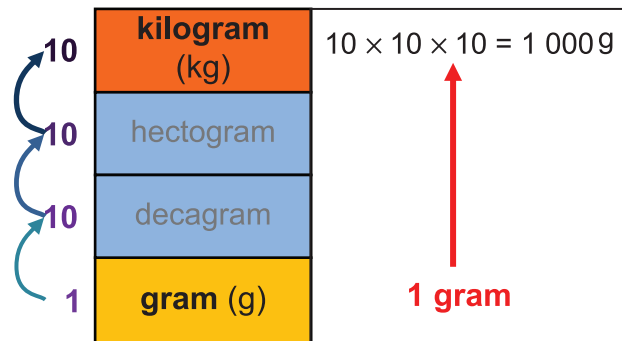
How many metres did Maria cover altogether?

7. Mai has a piece of fabric that is 8.7 metres long.
- a) How many $\frac{1}{2}$ metre pieces can she cut from the cloth?
- b) How much will be left over?

Metric Units of Mass

Teaching Point 1:

What is the relationship between metric units of mass?



1 000 grams = 1 kilogram (kg)

1 gram (g) = $\frac{1}{1000}$ kilogram

Teaching Point 2:

How can you relate standard units with their sub parts?



1 kilogram (kg) = 1 000 grams (g)

$\frac{1}{4}$ kilogram (kg) = 250 grams (g)

$\frac{1}{2}$ kilogram (kg) = 500 grams (g)

$\frac{3}{4}$ kilogram (kg) = 750 grams (g)

Conversion - Units of Mass

Teaching Point 1:

How can you convert units of mass?

1 200 grams = ____ kilograms.

Divide to convert smaller units to larger units.

$1\,200\text{ g} \div 1\,000 = 1.2\text{ kg}$

2.5 kg = ____ grams.

Multiply to convert larger units to smaller units.

$2.5\text{ kg} \times 1\,000 = 2\,500\text{ g}$

Activity 1:

Complete the table to show equivalent measures.

kilograms	grams
1. 2	2 000
2. 7	
3.	6 000
4.	24 000
5. 3.1	
6.	720
7. 0.39	
8. 1.55	
9. 0.63	
10.	1 250
11.	2 060
12.	1 600

Activity 2:

Solve.

- Complete the statement.
 $3.8\text{ kg} = \underline{\hspace{2cm}}\text{ grams}$
- Convert 6 500 grams to kilograms.
- Complete the statement.
 $3\,200\text{ grams} = \underline{\hspace{2cm}}\text{ kilograms.}$
- Express 6.45 kilograms in grams.
- A crate has 10 000 grams of chicken. How many kilograms of chicken are in the crate?
- A bag of potatoes has a mass of 7 990 grams. What is the mass of the potatoes in kilograms?
- Mark's baby brother weighed 1.9 kilograms at birth. What was the baby's weight in grams?



Teaching Point 2:

How can you use sub units to solve problems?

How many $\frac{1}{4}\text{ kg}$ packs can you fill from a 2 500 gram bag of nuts?

$\frac{1}{4}\text{ kg} = 250\text{ g} \rightarrow 1\text{ pack of nuts}$

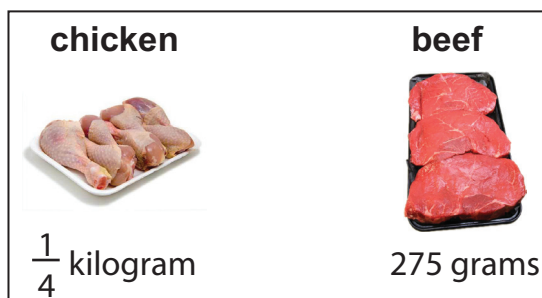
$2\,500\text{ g} \div 250\text{ g} = 10$

So, you can fill 10 packs of nuts.

Activity 3:

Solve.

- The mass of a bag of sugar is $1\frac{3}{4}$ kilograms. What is its weight in grams?
- A packet has $2\frac{1}{2}$ kilograms of flour. Mother uses 500 grams of flour to make two cakes. How many cakes can she make from the packet of flour?
- A vendor has a fish that weighs 2 kilograms. He sold $\frac{3}{4}$ kilogram of fish and gave his friend $\frac{1}{2}$ kilogram of the fish. How many grams of fish has he remaining?
- Two pieces of meat are shown below. Which piece of meat has the greater mass?

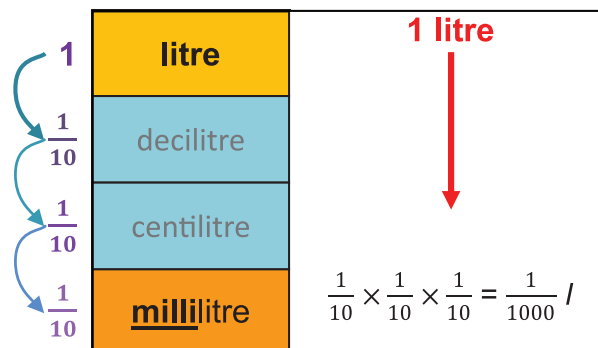


- Leon has a bag of raisins that has a mass of 4.7 kilograms. He wants to make 250 gram packets of raisin for sale.
 - How many packets of raisins can he get from the bag?
 - How many more grams of raisins does he need to fill another packet?

Metric Units of Capacity

Teaching Point 1:

What is the relationship between metric units of capacity?



1 000 millilitres (ml) = 1 litre (l)

1 millilitre (ml) = $\frac{1}{1000}$ litre (l)

Teaching Point 2:

How can you relate standard units with their sub parts?



1 litre (l) = 1 000 millilitres (ml)

$\frac{1}{4}$ litre (l) = 250 millilitres (ml)

$\frac{1}{2}$ litre (l) = 500 millilitres (ml)

$\frac{3}{4}$ litre (l) = 750 millilitres (ml)

Conversion - Units of Capacity

Teaching Point 1:

How can you convert metric units of capacity?

Express 4.56 litres in millilitres.

Multiply to convert larger units to smaller units.

$$4.56 \text{ L} \times 1\,000 = 4\,560 \text{ ml}$$

Convert 19 400 millilitres to litres.

Divide to convert smaller units to larger units.

$$19\,400 \text{ ml} \div 1\,000 = 19.4 \text{ L}$$

Activity 1:

Complete the table to show equivalent measures.

	litres	millilitres
1.	4	4 000
2.	5	
3.		8 000
4.		6 700
5.	3.2	
6.		1 900
7.	4.57	
8.		600
9.		1 200
10.	0.45	

Activity 2:

Solve.

- Express 12.57 litres in litres and millilitres.
- Convert 12 000 millilitres to litres.
- A glass contains 240 ml of water. Express the amount of water in the glass as litres.



- A bottle of shampoo contains 750 millilitres. Express the amount of shampoo in litres.
- A bottle has 0.05 litres of medicine. If one dose is 1 millilitre, how many doses does the bottle have?

Teaching Point 2:

How can you use sub units to solve problems?
How many cups will it take to fill the bowl?



$$3\,000 \text{ ml} = 3 \text{ L}$$

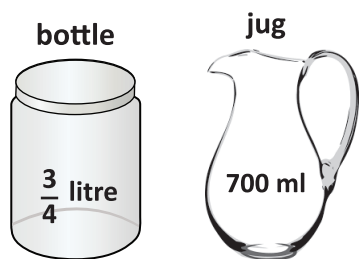
$$3 \div \frac{3}{4} \rightarrow \frac{3 \div 3}{1} \times \frac{4}{3 \div 3} = 4$$

So, it will take 4 cups to fill the bowl.

Activity 3:

Solve.

1. A jug holds $1\frac{3}{4}$ litres of juice. How many 250 ml glasses of juice can be filled from the jug?
2. A carton contains 750 ml of milk. Ravi drank $\frac{1}{4}$ litre of milk with his cereal. How many millilitres of milk is left?
3. 40 children each drank 250 millilitres (ml) of water from a water cooler. How many litres of water did they drink altogether?
4. Two containers are shown below. Which container holds less?



5. A man drinks 8 bottles of water each day. Each bottle contains $\frac{1}{4}$ litre of water. How many litres of water does he drink in one week?

Chapter Review

Answer all questions.

1. 1 000 grams = 1 kilogram Convert 6 300 grams to kilograms.

2. Complete this statement.
2 400 metres = _____ kilometres.
3. Convert 250 centimetres to metres.
4. Complete the statement below.
 $\frac{1}{8}$ litre = _____ millilitres
5. $2\frac{1}{4}$ kilometres = _____ metres.
6. How many $\frac{1}{4}$ litre glasses of juice can be filled from a jug holding 4 litres?
7. A bag of sugar weighing 5 000 grams is divided into $\frac{1}{2}$ kilogram packets. How many packets were made from the bag of sugar?
8. Two bags are shown below. Which bag has the greater mass?



9. Mark runs $\frac{3}{4}$ km around the savannah to warm up before playing football. What is the distance in metres?
10. A bottle contained 750 ml of water. Mother used $\frac{1}{2}$ litre of the water to make juice. How much water was left in the bottle?