

ADLC

Mathematics 9-4



Theme 3: Metric and Imperial Measurement

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Theme 3

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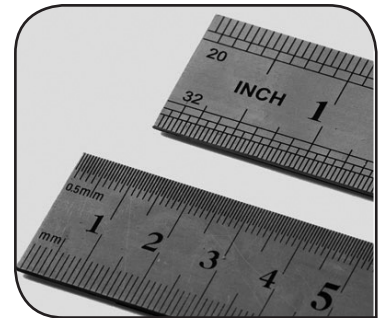
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Metric and Imperial Measurement

In this theme, you will learn about the metric and imperial measurements that we use for length, mass, and capacity. You will practise making accurate measurements in both systems and you will learn to convert between the systems using simple formulas.

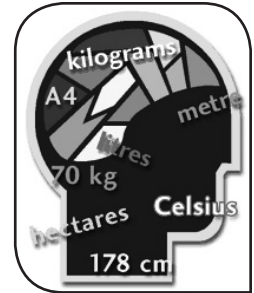
This theme includes four lessons:

- Lesson 11: An Introduction to Metric Measurements
- Lesson 12: A Look at Imperial Measurements
- Lesson 13: Converting from Metric to Imperial
- Lesson 14: Converting from Imperial to Metric



Lesson 11: An Introduction to Metric Measurements

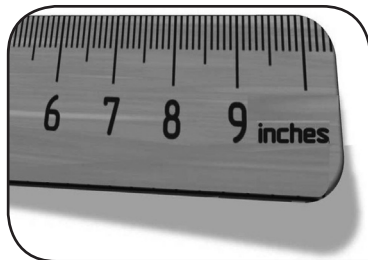
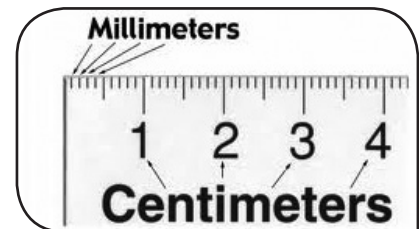
In this lesson, you will learn about the metric measurements for length, mass, and capacity.



Lesson 11: Activity 1 – Length



The metric system is a system of measurement. It was created so that people around the world could have a standard system. The metric system is sometimes called the SI system. This refers to System International, more commonly known as Standard International Units.



The imperial system is also a system of measurement. It was the traditional system of weights and measurements that was developed in Great Britain and used from 1824 until the adoption of the metric system beginning in 1965. You will look at both systems in this theme.

Think about what you know about the units that measure lengths.

Which is longer?

- A mile or a kilometre?
A mile is longer.
- A yard or a metre?
A metre is longer.
- An inch or a centimetre?
An inch is longer.



This lesson will focus on the metric system. First we will look at length measurements.

To begin, there are **seven** main levels of measure within the metric system. The prefixes do not change whether you are talking about length, mass, or volume.

The basic unit of length in the metric system is one **metre**. Most classrooms have a metre stick in them. You have probably worked with a metre stick.

Look at the chart below:

Length	
<i>millimetre</i> (mm)	
<i>centimetre</i> (cm)	
<i>decimetre</i> (dm)	
metre (m)	Base Unit
<i>dekametre</i> (dam)	
<i>hectometre</i> (hm)	
<i>kilometre</i> (km)	

metre:

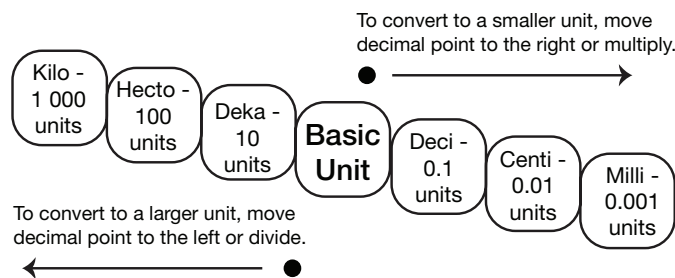
- the basic unit of length in the metric system

Notice the italicized parts of the words on the chart. These are the prefixes that tell how many of the base units you have.

The metric system is based on groups of 10. For example, there are **10** metres in a dekametre and **10** dekametres in a hectometre. This makes converting between different metric units very easy!

One of the easiest tools to do this with is to use the stair method. This involves moving the decimal in the number that you are working with one place for every stair. (The basic unit stair in the chart below is the metre.)

Metric Conversion Chart



Example 1: If you have a tractor that is 650 centimetres long and want to know how many metres long it is, you can figure it out like this:

It is two steps up from centimetres to metres. Since you are going up the stairs, you will move the decimal two places to the left in your number. Since your number doesn't have a decimal showing, put it at the end of the number and then move it.

650. becomes 6.50—this tells you that the tractor is 6.5 metres long!

Example 2: What if you had a room in your house that was 6.7 metres long and you wanted to know how many millimetres it was?

From metres (basic unit) to millimetres is three steps down the stairs, so you will move the decimal three places to the right.

Notice that you don't have enough numbers to move the decimal three places. When this happens, add zeros into the blank spots.

6.7 becomes 6 700.

6.7 metres is 6 700 millimetres long!



Example 3: What if you had measured the length of an object and found out it was 12 345 678.9 mm long and you wanted to know how many km long it was?

From mm to km is six steps up. You will move the decimal six places to the left. Try it!

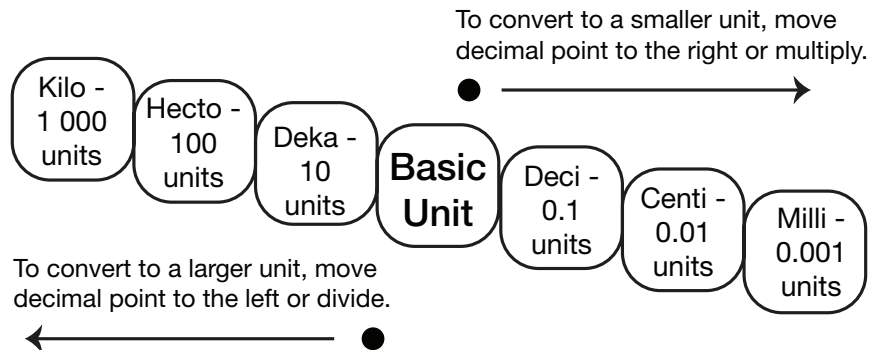
12 345 678.9 becomes 12.345 678 9 km long.

Lesson 11: Activity 1 – Self-Check



In this self-check activity, **convert** each of the following measurements of length.

Metric Conversion Chart



1. 1 000 mm = _____ m
2. 1 500 cm = _____ dam
3. 4 537 dm = _____ hm
4. 1 km = _____ m
5. 123 hm = _____ dam

1. 1
2. 1.5
3. 4.537
4. 1 000
5. 1 230

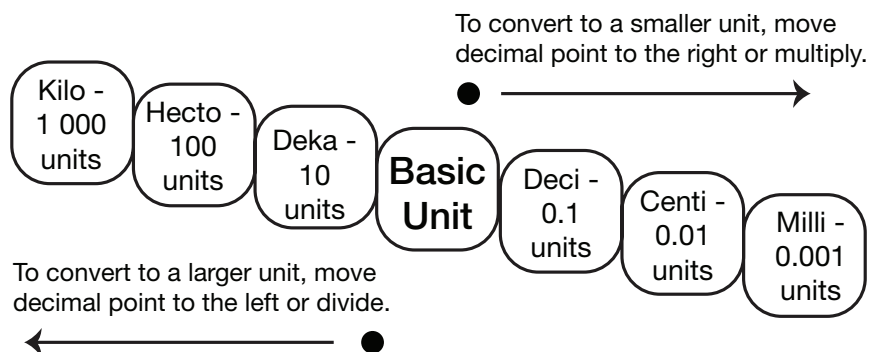
Answers to Lesson 11: Activity 1 – Self-Check

Lesson 11: Activity 1 – Assignment



In this assignment, **convert** each of the following measurements of length.

Metric Conversion Chart



1. 2.29 km = _____ m
2. 298 cm = _____ m
3. 12.5 cm = _____ mm
4. 43.25 dm = _____ mm
5. 6.87 km = _____ mm



Marking Guide: This assignment is worth **5 marks**.

Lesson 11: Activity 2 – Mass



Now that you have looked at metric lengths, you will turn your attention to mass.

Mass is the physical volume or bulk of a solid body. In everyday life, the word "weight" is often used when referring to mass. Keep in mind, however, that mass is the amount of matter in an object. Weight is a measure of how heavy an object is.



Thinking about the metric system and the imperial system once again, which weighs more

- A pound or a kilogram?

A kilogram weighs more than a pound. There are 2.2 pounds in 1 kilogram.

- an ounce or a gram?

An ounce weighs more than a gram. There are approximately 28.35 grams in an ounce.

Measuring mass in the metric system is very similar to measuring length in the metric system. All of the prefixes are the same, and you move between the units the same way.

Look at the chart below:

Mass
<i>milligram</i> (mg)
<i>centigram</i> (cg)
<i>decigram</i> (dg)
gram (g) Base Unit
<i>dekagram</i> (dag)
<i>hectogram</i> (hg)
<i>kilogram</i> (kg)



gram:

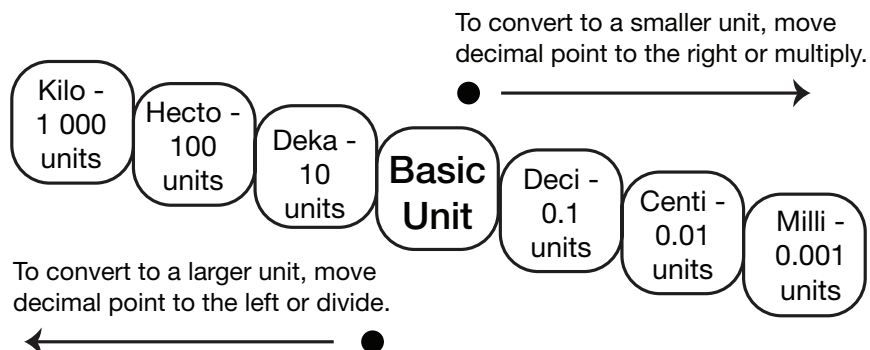
- the base unit of mass in the metric system

The main difference is that you only use **three** of the units when you talk about mass.

Have you decided what are the three measurements that you use from the chart? Did you choose **kilogram**, **gram**, and **milligram**? If you did, you are correct!

We can use the metric conversion chart once again as we are converting units of mass. This time, the basic unit measurement for measuring mass is a gram.

Metric Conversion Chart



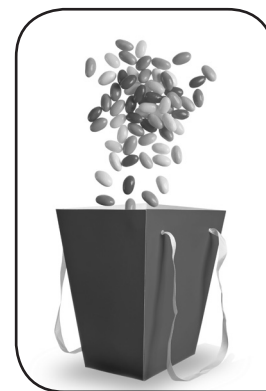
It is still 3 steps up to gram from milligram, so there are 1 000 milligrams in a gram. It is still three steps up to kilogram from gram, so there are 1 000 grams in a kilogram.

Example 1: What if you weighed a bag of jellybeans and it weighed 1 287 g? How many kg does it weigh?

It is three steps up from grams to kilograms. Since you are going up the stairs, you will move the decimal three places to the left in your number. Since your number doesn't have a decimal showing, put it at the end of the number and then move it.

1 287. becomes 1.287

This tells you the bag of jellybeans weighs 1.287 kg.



Example 2: What if you wanted to know how many milligrams the bag of jellybeans weighed?

It is three steps down from grams to milligrams. Since you are going down the stairs, you will move the decimal three places to the right in your number. Notice that you don't have enough numbers to move the decimal three places to the right. Remember----- that when this happens, add zeros into the blank spots.

1 287.000 becomes 1 287 000

The bag of jellybeans has a mass of 1 287 000 milligrams.

Example 3: What if you had a mass of 650 875.2 mg and wanted to know how many kg it was?

It is six steps up to kg from mg. Since you are going up the stairs, you will move the decimal six places to the left in your number.

650 875.2 becomes 0.650 875 2

It would weigh 0.650 875 2 kg.

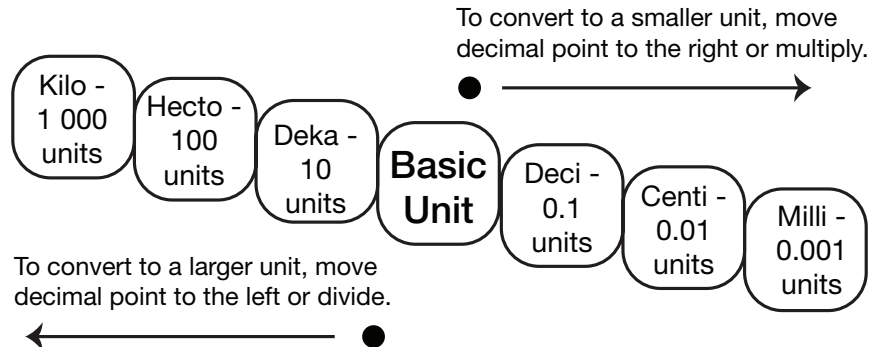


Lesson 11: Activity 2 – Self-Check



In this self-check, you will **convert** each of the following metric weights.

Metric Conversion Chart



1. 200 kg = _____ mg
2. 200 kg = _____ g
3. 5.389 g = _____ mg
4. 742 mg = _____ g
5. 5 478 g = _____ kg

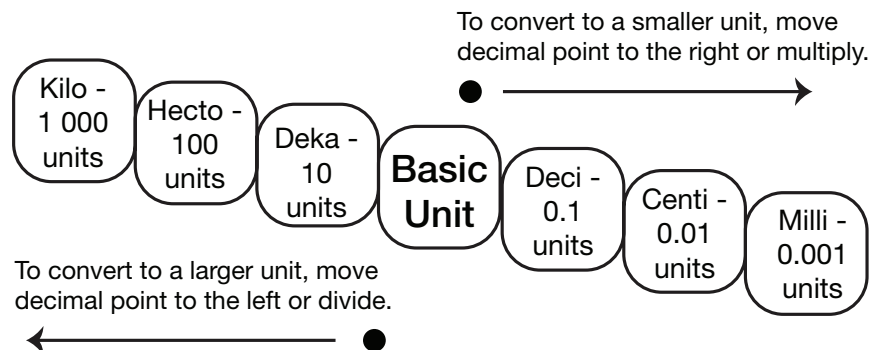
1. 2 000 000 000
2. 200 000
3. 5 389
4. 0.742
5. 5.478

Lesson 11: Activity 2 – Assignment



In this assignment, **convert** each of the following measurements of weight as indicated.

Metric Conversion Chart



1. 54 300 g = _____ kg
2. 14 kg = _____ g
3. 650 mg = _____ g
4. 7.642 g = _____ mg
5. 675 kg = _____ mg



Marking Guide: This assignment is worth **5 marks**.

Lesson 11: Activity 3 – Capacity



This third activity will focus on capacity. Capacity is the amount a container can hold. Another unit that is associated with capacity is volume. Volume is how much space an object takes up. In this activity, you will focus on capacity.

You may be quite aware of the measurements of capacity. A **litre** of pop or 4 litres of milk are examples you may see every day.

litre:

- the basic unit of capacity in the metric system

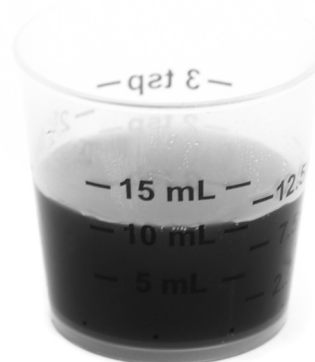


Measuring capacity in the metric system is very similar to measuring length or mass. The prefixes remain the same and you move between the units the same way.

The main difference between capacity and mass or length is that you only use **two** of the units when you talk about capacity in everyday situations.

Look at this chart:

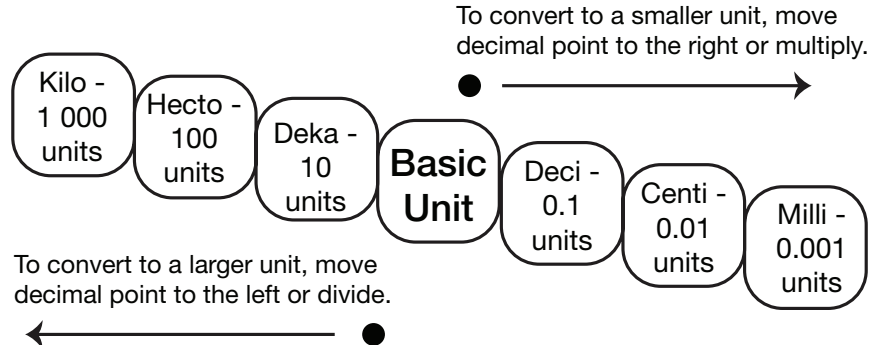
Mass
millilitre (mL)
centilitre (cL)
decilitre (dL)
litre (L) Base Unit
dekalitre (daL)
hectolitre (hL)
kilolitre (kL)



Have you chosen two measurements from the chart that you use on a daily basis? If you chose **litre** and **millilitre**, you are correct!

Here, once again, is the metric conversion chart. This time one litre is the basic unit for measuring capacity.

Metric Conversion Chart



It is still three steps up to litre from millilitre, so there are 1 000 millilitres in a litre. It is still three steps up to kilolitre from litre, so there are 1 000 litres in a kilolitre.

Example 1: What if you had 2 306 millilitres of milk and wanted to know how many litres of milk you had? It is three steps up from millilitres to litres. Since you are going up the stairs, you will move the decimal three places to the left in your number. Since your number doesn't have a decimal showing, put it at the end of the number and then move it.

2 306 becomes 2.306

You have 2.306 litres of milk.

Example 2: What if you had 4.5 litres of milk and wanted to know how many millilitres you had? It is three steps down from litres to millilitres. Since you are going down the stairs, you will move the decimal three places to the right in your number.

Notice that you don't have enough numbers to move the decimal three places to the right. Remember that when this happens, add zeros into the blank spots.

4.500

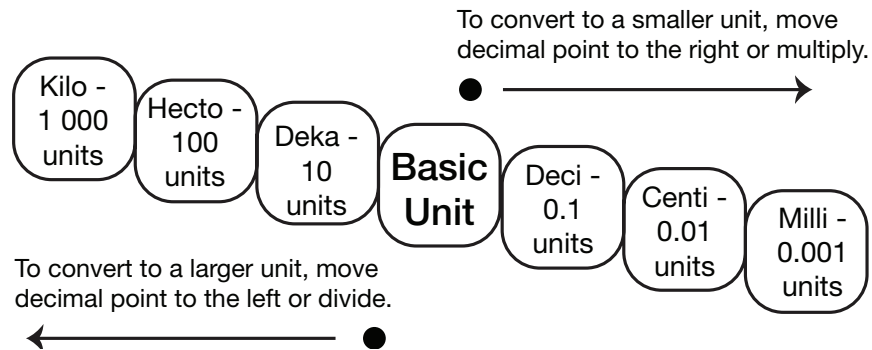
You have 4 500 millilitres of milk!

Lesson 11: Activity 3 – Self-Check



In this self-check, you will **convert** each of the following metric weights.

Metric Conversion Chart



1. 15 L = _____ mL
2. 150 mL = _____ L
3. 0.17 l = _____ mL
4. 17 582 mL _____ L
5. 32.8 L = _____ mL

5. 32 800
4. 17.582
3. 170
2. 0.150
1. 15 000

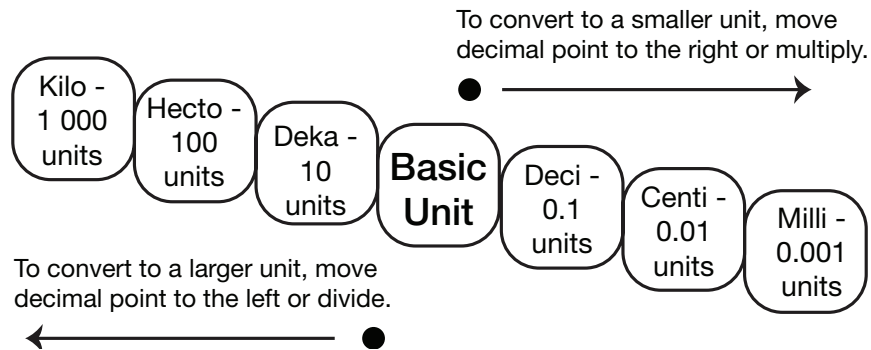
Answers to Lesson 11: Activity 3 – Self-Check

Lesson 11: Activity 3 – Assignment



In this assignment, **convert** each of the following measurements of volume as indicated.

Metric Conversion Chart



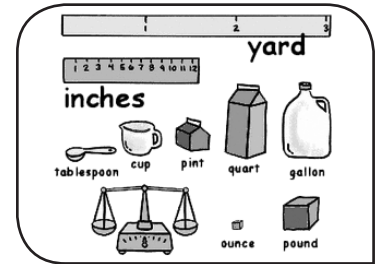
1. 27.23 L = _____ mL
2. 48 192 mL = _____ L
3. 91.6 L = _____ mL
4. 63 200 mL = _____ L
5. 690 L = _____ mL



Marking Guide: This assignment is worth **5 marks**.

Lesson 12: A Look at Imperial Measurements

In this lesson, you will learn how to use formulas, graphs, and charts to learn about measuring in the imperial units that we still use today.



Lesson 12: Activity 1 – Length



In the previous lesson, you read a little about the imperial system of measurement. In this lesson, you will look at it more closely. Here’s a little story about why we use the metric system today. You will learn about the beginnings of the imperial system in this story:

Although the measurements in the metric system are derived from scientific principles, the English unit measurements (and the subsequent USA and imperial measurements) are based on nature and everyday activities.

For example, a league is based on the distance that can be walked in an hour. Sailors (in days gone by) would drop a weighted rope into the water, lowering it by lengths (where each length was measured by holding the rope between their outstretched hands) until the weight at the end of the rope touched the seabed. This led to the definition of the fathom as the distance from the fingertips of one hand to the fingertips of the other, when the hands are held straight out to the sides. A grain (used to measure small quantities of precious metals) is the weight of a grain of wheat or barleycorn.

Such natural measures were well suited in a simple agricultural society. However, as trade and commerce grew, it was necessary to have more consistent measures (after all, not all grains of wheat have the same weight and not all sailors have the same length of arms). Consequently, metal weights and lengths were produced to represent exact measures; these metal representations were then used to produce official scales and measurements to ensure that trade was based on standard quantities.

For larger measures (e.g., a mile) it was impractical to build a metal equivalent, so they were redefined to be multiples of the smaller measures. It is for this reason that the mile was changed in 1595 under Queen Elizabeth I’s reign from the Roman standard of 5 000 feet to 5 280 feet (which is 8 furlongs, each furlong equal to 10 chains, each chain equal to 22 yards, and each yard equal to 3 feet).

Despite the development and standardization of the English units of measure, their roots in ancient agriculture and trade have resulted in a diverse and relatively complex set of measurements. The various trades each developed their own measures, so in many cases, the measure would depend on what it was being used for: a barrel of oil is not the same size as a barrel of wine (there are in fact eight different barrel sizes officially recognized).

Likewise there are both fluid ounces and weight ounces, with different types of weight ounces (depending on what was being weighed). This complexity was not eliminated when the English system evolved into the imperial and USA systems, with the result that these systems have approximately 300 different units of measurement. In comparison, the metric system has only 7 basic units of measurement (which can be increased or decreased in multiples of 10 to make larger or smaller units or combined to make more complex units).

From: <http://www.france-property-and-information.com/imperial-system-and-history.htm>

Can you see why most countries have switched to the metric system? In this lesson, you will learn about some of the basic imperial measurements that we still use in Canada today.

When you ask someone how tall they are, you are likely to hear them say that they are so many feet and inches tall. If you are a fan of the CFL, you know the field is 110 yards long, and if a team is just short of a first down, the announcer will say they are inches from a first down. A marathon race is 26 miles long. As you can see, even though Canada is a metric country, some imperial measures are still used today.



Unlike the metric system, where every measurement is based on 10, the imperial system does not follow any simple pattern. In this activity, you will learn about inches, feet, yards, and miles and how they are used to measure length.

Inch is exactly 2.54 cm long. It is the smallest unit of measure that you will look at in terms of imperial measures of length. You could use inches to say how long and wide a piece of paper is. An inch can be abbreviated as *in*.

Foot is 12 inches long. It can be used to measure such things as the height of a person or the length of a car. A foot can be abbreviated as *ft*.

Yard is 3 feet long. It is also 36 inches long. A yard is the basic unit of measurement in the imperial system. Inches, feet, and miles all evolved from the yard. A yard can be used to measure such things as the length of a football field. A yard can be abbreviated as *yd*.

Mile is 1 760 yards or 5 280 feet long. It is used to measure great distances. For example, the distance from Edson to Edmonton is 120 miles. A mile can be abbreviated as *mi*.

Imperial	Metric
1 inch	2.54 centimetres 25.4 millimetres 0.025 1 metres
1 foot	30.5 centimetres 305 millimetres 0.305 metres
1 yard (3 feet)	0.915 metres
1 mile (1 760 yards)	1.6 kilometres



Try this activity to do some measuring yourself. Play at least one level in both the centimetre and inch categories. Please type this link in your browser:

<http://quick.adlc.ca/measu3317>

Lesson 12: Activity 1 – Assignment



In this assignment, **match** each of the following terms with the item that would be used to measure it.

- | | |
|-----------------|--------------------------------------|
| _____ 1. inches | A. the length of a football field |
| _____ 2. feet | B. the distance from Calgary to Rome |
| _____ 3. yards | C. the length of a hand |
| _____ 4. miles | D. the length of a coffee table |



Marking Guide: This assignment is worth **4 marks**.

Lesson 12: Activity 2 – Mass



You have previously answered questions that asked which weighs more, kilograms or pounds, grams or ounces.

This activity will focus on the imperial units associated with mass.

Example: Does a slice of bread or a loaf of bread weigh about an ounce?

A slice of bread weighs about an ounce; a loaf of bread weighs about a pound.

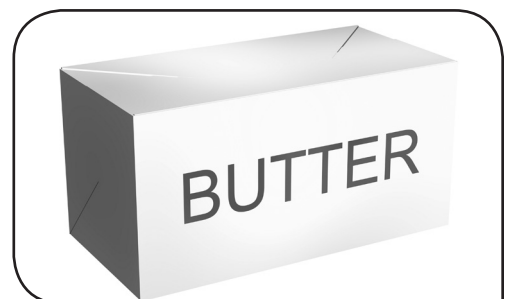
Does a bag of potatoes or a small car weigh about a ton?

A small car weighs about a ton; a bag of potatoes is usually sold in 5 or 10 pound bags.

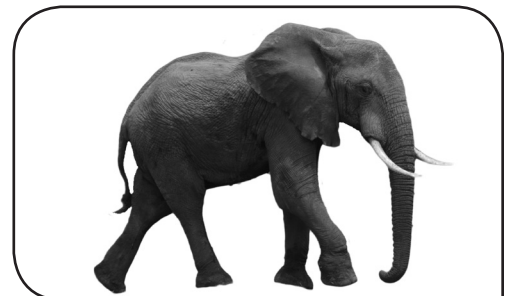
Ounce is the smallest of the imperial units of mass that you will deal with. It is used to measure such things as how heavy a pencil is. Gold is measured in ounces. Ounce is abbreviated as *oz*.



Pound consists of 16 ounces. A block of butter has a mass of 1 pound. Pound is abbreviated as *lb*.



Short ton is 2 000 pounds. Short tons can be used to measure the mass of such items as trucks or ships. Short tons are abbreviated as *t*.



Lesson 12: Activity 2 – Assignment



In this assignment, **select** the best measurement to use when referring to the weight of each of the following.

- _____ 1. a tractor
- A. ounces
 - B. pounds
 - C. tons
- _____ 2. a chair
- A. ounces
 - B. pounds
 - C. tons
- _____ 3. a grasshopper
- A. ounces
 - B. pounds
 - C. tons
- _____ 4. a sheep
- A. ounces
 - B. pounds
 - C. tons
- _____ 5. an eraser
- A. ounces
 - B. pounds
 - C. tons



Marking Guide: This assignment is worth **5 marks**.

Lesson 12: Activity 3 – Capacity



You have also previously looked at what capacity is. Remember that capacity is the amount a container can hold.

This activity will focus on the imperial units associated with capacity. There are four main units for measuring capacity in the imperial system. They are the **cup**, **pint**, **quart**, and **gallon**. Read the equivalents chart on the right.

cup (c) = 8 ounces
 pint (pt) = 2 cups
 quart (qt) = 2 pints
 gallon (gal) = 4 quarts

There are two different types of gallons in North America. The US gallon is slightly smaller than the Canadian gallon.

A **US gallon** is 3.785 litres. If you think of a 4-litre container of milk, a US gallon would be slightly smaller than the milk container. If you look at a jerry can, it may list the capacity in both US gallons and litres.

A **Canadian gallon** is 4.54 litres. It is bigger than a US gallon. It would be slightly bigger than a 4 L container of milk.

Example: Which units do you think you would use to measure the capacity of the following?

- the amount of milk in a cake recipe: a cup or a gallon
You would use a cup to measure the amount of milk in a cake recipe.
- the amount of gas in your car: quarts or gallons
You would use gallons when thinking about the amount of gas for your car.
- the amount of water in a fish tank: cups or gallons
You would also use gallons if you were filling up a fish tank.

Imperial Equivalents
1 foot (ft) = 12 inches (in)
1 yard (yd) = 3 ft
1 mile (mi) = 1 760 yd
1 pint (pt) = 2 cups (c)
1 quart (qt) = 2 pt
1 gallon (gal) = 4 qt
1 pound (lb) = 16 ounces (oz)



Watch this light-hearted video to see a further comparison of these units. Please type this link in your browser:

<http://http://quick.adlc.ca/umigo377c>

Lesson 12: Activity 3 – Assignment



In this assignment, **answer** the following questions regarding the best capacity unit to use in a particular situation.

- _____ 1. What is the best estimate of the amount of milk an average ninth grader drinks each day?
- A. 2 quarts
 - B. 2 pints
 - C. 1 gallon
- _____ 2. What is the best estimate for the amount of water used to take a bath?
- A. 2 cups
 - B. 20 cups
 - C. 40 gallon
- _____ 3. Which unit would you use to measure the capacity of the amount of water to add to a can of soup?
- A. cup
 - B. quart
 - C. gallon
- _____ 4. Which unit would you use to measure the capacity of the amount of oil to add to your car?
- A. cup
 - B. quart
 - C. gallon

- _____ 5. Which unit would you use to measure the capacity of the amount of water in a swimming pool?
- A. cup
 - B. quart
 - C. gallon



Marking Guide: This assignment is worth **5 marks**.

Lesson 13: Converting from Metric to Imperial

In this lesson, you will learn how to convert metric measurements to imperial measurements using simple formulas.

Lesson 13: Activity 1 – Length



We live close to the United States and receive a lot of our products from them. We also may travel to the USA as well as see a lot of information on television from the United States. It is important to be able to convert metric lengths into imperial lengths so that we can easily understand what the measurements are.



Think for a moment about products you may have seen on TV ads that show lengths given in imperial units.

How about if you have travelled through the United States? Were you able to do a **conversion** into metric units?

conversion

- the process of changing from one unit to another

There are three main conversions we will use when changing lengths in metric units into imperial units. They are

- metres to feet
- metres to yards
- kilometres to miles

To convert metres to feet, use this formula: metres \times 3.28 = feet.

Example 1: If you wanted to know how many feet were in 12 metres, you would calculate it this way:

$$12 \text{ m} \times 3.28 = 39.36 \text{ feet}$$

To convert metres to yards, use this formula: metres \times 1.09 = yards.

Example 2: If you wanted to know how many yards were in 34 metres, you would enter the information in the formula like this:

$$34 \text{ yds} \times 1.09 = 37.06 \text{ yards}$$

To convert kilometres to miles, use this formula: kilometres \times 0.621 = miles.

Example 3: It is approximately 200 kilometres to Edmonton from Edson. To figure out how many miles it is, you would enter the information in the above formula.

$$200 \text{ km} \times 0.621 = 124.2 \text{ miles}$$

Example 4: Kris drove 160 km on one tank of gas. How many miles did she travel? Use the formula above to solve. (Use a calculator to solve.)

$$160 \text{ km} \times 0.621 = 99.36 \text{ miles}$$

Kris drove 99.4 miles.



Lesson 13: Activity 1 – Self-Check



In this self-check, you will **convert** each of the following metric lengths to imperial lengths. Use the following formulas to help you. Use a calculator to solve. Round the answers to two places (e.g., 30 km = 18.63 miles).

$$\begin{aligned} \text{metres} \times 3.28 &= \text{feet (ft)} \\ \text{metres} \times 1.09 &= \text{yards (yd)} \\ \text{kilometres} \times 0.621 &= \text{miles (mi)} \end{aligned}$$

1. 50 km = _____ mi
2. 35 m = _____ ft
3. 40 m = _____ yd
4. 32 km/h = _____ mph

1. 31.05
2. 114.80
3. 43.60
4. 19.87

Answers to Lesson 13: Activity 1 – Self-Check

Lesson 13: Activity 1 – Assignment



In this assignment, **convert** the following metric lengths to imperial lengths. Use the following formulas to help you. Use a calculator to solve. Round the answers to two places (e.g., 30 km = 18.63 miles).

$$\begin{aligned}\text{metres} \times 3.28 &= \text{feet (ft)} \\ \text{metres} \times 1.09 &= \text{yards (yd)} \\ \text{kilometres} \times 0.621 &= \text{miles (mi)}\end{aligned}$$

1. 12 metres = _____ feet
2. 12 metres = _____ yards
3. 10 kilometres = _____ miles
4. 99 kilometres = _____ miles
5. 10 metres = _____ feet



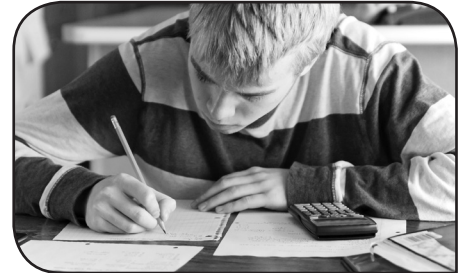
Marking Guide: This assignment is worth **5 marks**.



Lesson 13: Activity 2 – Mass

In this activity, you will learn to convert masses from metric measures to imperial measures. Remember that mass is the amount of material or matter in an object, and "weight" is often used when referring to mass.

Weight is a measurement of how gravity affects mass. Weight changes as the force of gravity changes. Mass does not change from place to place.



For example, the moon is approximately $\frac{1}{5}$ the mass of Earth. The weight of an object on the moon would be about $\frac{1}{5}$ of the weight of the same object on Earth. This is because the gravitational pull on the moon is less. But the mass (amount of matter) is the same on the moon as on Earth.

There are three main conversions when dealing with converting mass from metric measures to imperial measures. They are

- grams to ounces
- kilograms to pounds
- metric tons to short tons

To convert from grams to ounces, use this formula: grams \times 0.035 = ounces.

Example 1: If you wanted to know how many ounces were in 454 grams, you would calculate it this way:

$$454 \text{ g} \times 0.035 = 15.89 \text{ oz}$$

To convert from kilograms to pounds, use this formula: kilograms \times 2.202 = pounds.

Example 2: If you wanted to know how many pounds were in 200 kilograms, you would calculate it this way:

$$200 \text{ kg} \times 2.202 = 440.4 \text{ lb}$$

To convert from metric tons (t) to short tons (T), use this formula:
metric tons \times 1.103 = short tons.

Example 3: If you wanted to know how many short tons were in 20 metric tons, you would calculate it this way:

$$20 \text{ t} \times 1.103 = 22.06 \text{ T}$$

Example 4: Convert the following (use a calculator):

$$5 \text{ kilograms} = \underline{\hspace{2cm}} \text{ lbs}$$

$$5 \text{ kilograms} \times 2.202 = 11.01 \text{ lbs}$$

$$500 \text{ grams} = \underline{\hspace{2cm}} \text{ oz}$$

$$500 \text{ grams} \times 0.035 = 17.5 \text{ oz}$$

$$50 \text{ metric tons} = \underline{\hspace{2cm}} \text{ T}$$

$$50 \text{ metric tons} \times 1.103 = 55.15 \text{ T}$$



Lesson 13: Activity 2 – Assignment



In this assignment, **convert** the following metric masses to imperial lengths. Use the following formulas to help you. Use a calculator to solve. Round the answers to two places (e.g., 30 km = 18.63 miles).

$$\begin{aligned} \text{grams} \times 0.035 &= \text{ounces} \\ \text{kilograms} \times 2.202 &= \text{pounds} \\ \text{metric tons} \times 1.103 &= \text{short tons} \end{aligned}$$

1. 4 567 g = _____ oz
2. 56 kg = _____ lbs
3. 3 500 t = _____ T
4. 558 kg = _____ lbs
5. 14.567 g = _____ oz



Marking Guide: This assignment is worth **5 marks**.

Lesson 13: Activity 3 – Capacity



As you read previously, it is important to be able to convert between metric measurements and imperial units. Again, it is important because of the fact that our country interacts so much with the United States. Any product coming into our country from the USA will usually have both the imperial measurement and the metric measurement on it. However, when you go to USA, you have to be able to convert from the metric measurements you are used to into the measurements that are given there.



There are four main conversions when converting capacity from metric measurements to imperial measurements. They are

- millilitres to cups
- litres to quarts
- litres to US gallons
- litres to Canadian gallons

A millilitre is the standard unit in metric for smaller volumes.

To convert from millilitres to cups, use this formula: millilitres \times 0.0042 = cups.

Example 1: If you wanted to know how many cups were in 150 mL of sour cream, you would calculate it this way:

$$150 \text{ mL} \times 0.0042 = 0.63 \text{ cups (or } \frac{3}{5} \text{ of a cup)}$$

To convert litres to quarts, use this formula: litres \times 1.057 = quarts.

Example 2: If you wanted to know how many quarts were in 2 litres of milk, you would calculate it this way:

$$2 \text{ L} \times 1.057 = 2.11 \text{ quarts}$$

To convert from litres into US gallons, use this formula: litres \times 0.264 = US gallons.

Example 3: If you wanted to know how many US gallons there were in 50 litres, you would calculate it this way:

$$50 \text{ L} \times 0.264 = 13.2 \text{ US gallons}$$

However, a Canadian gallon is larger than a US gallon.

To convert from litres to Canadian gallons, use this formula: litres \times 0.219 = Canadian gallons.

Example 4: If you wanted to know how many Canadian gallons there were in 50 litres, you would calculate it this way:

$$50 \text{ L} \times 0.219 = 10.95 \text{ Canadian gallons}$$

Example 5: How many US gallons in 4 litres of milk? (Use a calculator to solve.)

$$4 \text{ L} \times 0.264 = 1.06 \text{ gallons}$$



Practise doing conversions. Please type this link in your browser:

<http://quick.adlc.ca/onlin38f7>



Lesson 13: Activity 3 – Assignment



In this assignment, convert the metric capacities (right column) to imperial units (left column).

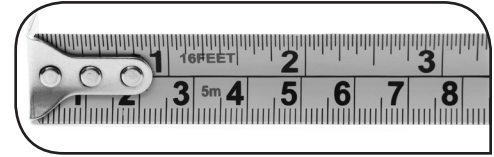
- | | | |
|----------|-----------------------|--------------------|
| _____ 1. | 5.28 US gallons | A. 25 litres |
| _____ 2. | 1.05 cups | B. 20 litres |
| _____ 3. | 5.3 quarts | C. 5 litres |
| _____ 4. | 4.41 Canadian gallons | D. 250 millilitres |
| _____ 5. | 26.4 quarts | |



Marking Guide: This assignment is worth **5 marks**.

Lesson 14: Converting from Imperial to Metric

In this lesson, you will learn how to convert imperial measurements to metric measurements using simple formulas.



Lesson 14: Activity 1 – Length



Have you ever watched an American show where they stated how long something was and you wondered how long that was in units that you are used to working with? In this activity, you will learn how to convert imperial measurements into metric measurements.

When you next watch TV, see if you notice anyone talking about something in imperial units. You may be surprised how often you hear something measured in feet, yards, or miles!

There are three main conversions we will use when changing imperial units into metric units. They are

- feet to metres
- yards to metres
- miles to kilometres

To convert feet to metres, use this formula: feet × 0.305 = metres.

Example 1: If you wanted to know how many metres were in 20 feet, you would calculate it this way:

$$20 \text{ ft} \times 0.305 = 6.1 \text{ metres}$$

To convert yards to metres, use this formula: yards × 0.914 = metres.

Example 2: If you wanted to know how many metres were in 50 yards, you would enter the information in the formula like this:

$$50 \text{ yds} \times 0.914 = 45.7 \text{ metres}$$

To convert miles to kilometres, use this formula: miles × 1.61 = kilometres.

Example 3: It is approximately 120 miles to Edmonton from Edson. To figure out how many kilometres it is, you would enter the information in the formula.

$$120 \text{ mi} \times 1.61 = 193.2 \text{ kilometres}$$

Example 4: Lisa is going on a trip to Montreal, Quebec. She found out it was 2 197 miles from Calgary to Montreal. How many kilometres is that? Use a calculator to solve.

$$2\,197 \text{ mi} \times 1.61 = 3\,537.17 \text{ kilometres}$$

Lesson 14: Activity 1 – Self-Check



In this self-check, you will **convert** the following imperial lengths to metric lengths. You may use the following formulas to help you. Use a calculator to solve. Round the answers to two places (e.g., 15 feet = 4.57 metres).

$$\begin{aligned} \text{feet} \times 0.305 &= \text{metres (m)} \\ \text{yards} \times 0.914 &= \text{metres (m)} \\ \text{miles} \times 1.61 &= \text{kilometres (km)} \end{aligned}$$

1. 12 feet = _____ metres
2. 35 yards = _____ metres
3. 900 miles = _____ kilometres
4. 106 yards = _____ metres
5. 99 feet = _____ metres

1. 3.66
2. 31.99
3. 1449
4. 96.88
5. 30.20

Answers to Lesson 14: Activity 1 – Self-Check

Lesson 14: Activity 1 – Assignment



In this assignment, solve the following problems by converting from miles to kilometres. Use the formula below and a calculator. Remember to write a concluding statement for each problem.

$$\text{miles} \times 1.61 = \text{kilometres}$$

- ② 1. Two years ago, Mick travelled a total of 982 miles during his vacation to the west coast of the United States. How many kilometres did he travel?

- ② 2. He found that the speed limit on many American highways was 60 miles per hour. What is that speed in kilometres?

- ⑤ 3. Mick enjoyed his US vacation so much that he went again last summer. That time, he and his family went to the northern United States. On day one of the trip, the family travelled 145 miles; on day two of the trip, they travelled 225 miles; and on the third day, they travelled 246 miles. How many kilometres did Mick and his family travel each day? (Calculate to the nearest kilometre.) How many kilometres did they travel in total?



Marking Guide: This assignment is worth **9 marks**.

Lesson 14: Activity 2 – Mass



In this activity, you will practise converting measurements of mass from imperial to metric units.

Did you know that truck drivers must keep track of the mass of their vehicles and their loads? If they carry too much mass, it can damage roads and the vehicle's suspension and cost the driver a fine at vehicle weigh stations located along highways.

There are three main conversions when dealing with converting mass from imperial measure to metric measure. They are

- ounces to grams
- pounds to kilograms
- short tons to metric tons



To convert from ounces to grams, use this formula: ounces \times 28.35 = grams.

Example 1: If you wanted to know how many grams were in 21 ounces, you would calculate it this way: $21 \text{ oz} \times 28.35 = 595.35 \text{ g}$

To convert from pounds to kilograms, use this formula: pounds \times 0.454 = kilograms.

Example 2: If you wanted to know how many kilograms were in 240 pounds, you would calculate it this way:

$$240 \text{ lbs} \times 0.454 = 109 \text{ kg}$$

To convert from short tons to metric tons, use the formula short ton \times 0.907 = metric tons.

Example 3: If you wanted to know how many metric tons were in 10 short tons, you would calculate it this way:

$$10 \text{ T} \times 0.907 = 9.07 \text{ t}$$

NOTE: Metric tons can also be written as tonnes.

Example 4: A semi-trailer truck weighs 55 short tons. How many metric tons is this?
 $55 \text{ T} \times 0.907 = 49.89 \text{ t}$

The truck weighs 49.89 metric tons.

Lesson 14: Activity 2 – Assignment



In this assignment, **convert** imperial masses to metric masses.

_____ 1. To convert 17 short tons to metric tons, you would multiply 17 by

- A. 0.454
- B. 0.907
- C. 28.35

_____ 2. To convert 142 ounces to grams, you would multiply 142 by

- A. 0.907
- B. 0.454
- C. 28.35

Convert the following imperial masses to metric masses. You may use the following formulas to help you. Solve using a calculator. Round your answers to two decimal places.

$$\text{oz} \times 28.35 = \text{g}$$

$$\text{lb} \times 0.454 = \text{kg}$$

$$\text{T} \times 0.907 = \text{t}$$

3. 12 ounces _____ grams

4. 42 pounds = _____ kilograms

5. 17 short tons = _____ metric tons



Marking Guide: This assignment is worth **5 marks**.

Lesson 14: Activity 3 – Capacity



In this activity, you will practise converting measurements of capacity from imperial to metric units.

The main measurement used in the United States for measuring such items as jerry cans, fuel tanks, and large volumes of liquids is how many gallons they will hold. In Canada, we use litres to measure the same volumes.

Here are the main conversions when converting capacity from imperial measurements to metric measurements. They are



- US gallons to litres
- Canadian gallons to litres
- quarts to litres
- teaspoons (tsp) and tablespoons (tbsp) to millilitres (mL)

To convert from US gallons to litres, use this formula: US gallons \times 3.785 = litres.

Example 1: If you wanted to know how many litres were in 8 US gallons, you would calculate it this way:

$$8 \text{ US gal} \times 3.785 = 30.28 \text{ litres}$$

To convert from a Canadian gallons to litres, use this formula: Canadian gallons \times 4.54 = litres.

Example 2: If you wanted to know how many litres were in 8 Canadian gallons, you would calculate it this way:

$$8 \text{ Canadian gal} \times 4.54 = 36.32 \text{ litres}$$

Remember, the Canadian gallon is larger than the US gallon.

To convert from quarts to litres, use this formula: $\text{quarts} \times 0.946 = \text{litres}$.

Example 3: If you wanted to know how many litres in 5 quarts of oil, you would calculate it this way:

$$5 \text{ qt} \times 0.946 = 4.73 \text{ litres}$$

We will now look at two of the smaller capacities.

To convert from teaspoons to millilitres, use this formula: $\text{teaspoon} \times 5 = \text{millilitres}$.

Example 4: If you wanted to know how many mL were in 20 teaspoons, you would calculate it this way:

$$20 \text{ tsp} \times 5 = 100 \text{ millilitres}$$

To convert tablespoons to millilitres, use this formula: $\text{tablespoon} \times 15 = \text{millilitres}$.

Example 5: If you wanted to know how many millilitres were in 34 tablespoons, you would calculate it this way:

$$34 \text{ tbsp} \times 15 = 510 \text{ millilitres}$$



Lesson 14: Activity 3 – Self-Check



In this self-check, you will **convert** the following imperial measurements to metric units.

$$\begin{aligned} \text{US gallons} \times 3.785 &= \text{L} \\ \text{Canadian gallons} \times 4.5 &= \text{L} \\ \text{tsp} \times 5 &= \text{mL} \\ \text{tbsp} \times 15 &= \text{mL} \end{aligned}$$

	True	False
1. If you multiplied 14 US gallons by 3.785, you would be converting the US gallons into litres.		
2. If you multiplied 14 Canadian gallons by 3.785, you would be converting the Canadian gallons into litres.		
3. If you multiplied 3 teaspoons by 5, you would be converting the teaspoons into millilitres.		
4. If you multiplied 6 tablespoons by 15, you would be converting the tablespoons into teaspoons.		
5. If you multiplied 4 US gallons by 3.785, you would be converting the US gallons into Canadian gallons.		

1. True
 2. False
 3. True
 4. False
 5. False

Answers to Lesson 14: Activity 3 – Self-Check

Lesson 14: Activity 3 – Assignment



In this assignment, use the equivalents below to complete the conversions that follow. Use a calculator to solve.

$$\begin{aligned} \text{US gallons} \times 3.785 &= \text{L} \\ \text{Canadian gallons} \times 4.5 &= \text{L} \\ \text{tsp} \times 5 &= \text{mL} \\ \text{tbsp} \times 15 &= \text{mL} \end{aligned}$$

1. 14 US gal = _____ litres
2. 14 Canadian gal = _____ litres
3. 3 teaspoons = _____ millilitres
4. 6 tablespoons = _____ millilitres
5. 10 teaspoons = _____ millilitres



Marking Guide: This assignment is worth **5 marks**.



Theme 3: Review

In Theme 3, you

- learned about the metric measurements for length, mass, and capacity
- learned about measuring in the imperial units that we still use today
- used common metric units and instruments to take accurate measurements of length, mass, and capacity
- used common imperial units and instruments to take accurate measurements of length, mass, and capacity
- learned how to convert metric measurements to imperial measurements using simple formulas
- learned how to convert imperial measurements to metric measurements using simple formulas



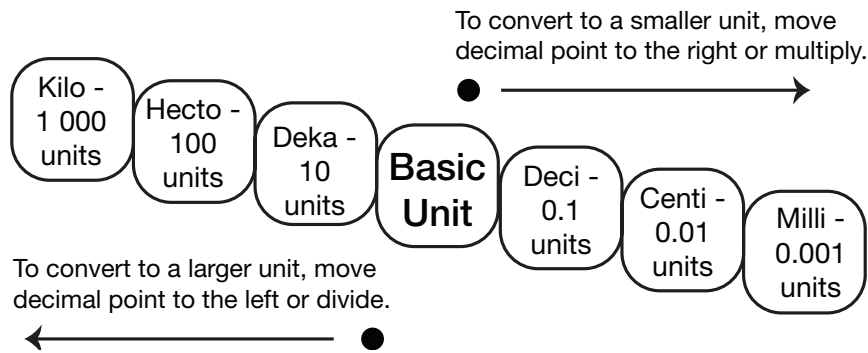
Theme 3: Show What You Have Learned



Complete the following activities to show what you have learned in the lessons for this theme.

*Match the length with the correct conversion.
You may use the conversion chart below to help you.*

Metric Conversion Chart



_____ 1. 1 kilometre

A. 10 000 metres

_____ 2. 10 kilometres

B. 100 centimetres

_____ 3. 5 257 dekametres

C. 1 000 metres

_____ 4. 10 hectometres

D. 525.7 hectometres

_____ 5. 1 000 millimetres

E. 1 kilometre

Decide whether the following statements are true or false.
You may use the conversion chart to help answer these questions.

	True	False
6. A dog's weight can be stated as 6.5 kilograms or 650 grams.		
7. Tracy's mother sent her to the store to buy 5 grams of flour. All of the bags were in milligrams, so she bought 5 000 milligrams. She was correct?		
8. A farmer shipped 80 000 grams of wheat and received a statement that recorded this amount as 800 dekagrams. This was correct?		
9. If 2 drops treated 1 000 millilitres of water, Chad was sure that if he put 4 drops into two litres of water, his fish would be fine.		
10. Jake's lawn mower takes 2 litres of gas to fill the tank. If he buys 4 000 millilitres, he will be able to fill it twice.		

Convert each of the following metric measurements to imperial measurements.
Use the table below for the formulas and a use calculator to solve.

Multiply	By	To Obtain/Multiply	By	To Obtain
Metres	3.28	Feet	0.305	Metres
Metres	1.09	Yards	0.914	Metres
Kilometres	0.621	Miles	1.61	Kilometres
Grams	0.035	Ounces	28.25	Grams
Kilograms	2.202	Pounds	0.454	Kilograms
Metric Tons	1.103	Short Tons	0.907	Metric Tons
Millimetres	0.004 2	Cups		Millimetres
Litres	1.057	Quarts	0.946	Litres
Litres	0.264	US Gallons	3.785	Litres
Litres	0.219	Canadian Gallons	4.54	Litres
		Teaspoons	5	Millilitres
		Tablespoons	15	Millilitres

11. 6 metres = _____ feet
12. 50 metres = _____ yards
13. 5 kilograms = _____ pounds
14. 200 grams = _____ ounces
15. 345 litres = _____ Canadian gallons

Convert each of the following imperial measurements to metric measurements.
Use the table below for the formulas and a calculator to solve.

Multiply	By	To Obtain/Multiply	By	To Obtain
Metres	3.28	Feet	0.305	Metres
Metres	1.09	Yards	0.914	Metres
Kilometres	0.621	Miles	1.61	Kilometres
Grams	0.035	Ounces	28.25	Grams
Kilograms	2.202	Pounds	0.454	Kilograms
Metric Tons	1.103	Short Tons	0.907	Metric Tons
Millimetres	0.004 2	Cups		Millimetres
Litres	1.057	Quarts	0.946	Litres
Litres	0.264	US Gallons	3.785	Litres
Litres	0.219	Canadian Gallons	4.54	Litres
		Teaspoons	5	Millilitres
		Tablespoons	15	Millilitres

16. 20 miles = _____ kilometres
17. 150 feet = _____ metres
18. 15 short tons = _____ metric tons
19. 120 pounds = _____ kilograms
20. 100 Canadian gallons = _____ litres



Marking Guide: This assignment is worth **20 marks**.

Theme 3: Reflection



Now that you have completed Theme 3, reflect on the following questions. Answer these questions in complete sentences.

1. What did you enjoy learning about the most in this theme on metric and imperial measurements?

2. What challenges or difficulties did you experience while working through this theme?

3. Thinking about completing conversions between systems, which kind of conversions do you think you will use the most in your everyday life? Why is this?

Theme 3: Glossary



3-D object: an object that has height, width, and depth

4-Step Method: the 4 steps to solve a math word problem

- understand the problem
- think of a plan
- carry out the plan
- look back and verify

acute angle: an angle that is less than 90 degrees

acute triangle: a triangle with all angles less than 90 degrees

area: the amount of space inside the boundary of a flat (two-dimensional) object such as a triangle

arithmetic sequence: a sequence made by adding the same value each time (e.g., 1, 4, 7, 10, 13, 16, 19, 22, 25—each number is three larger than the number before it)

bar graph: a graphical display of data using bars of different heights (sometimes called a bar chart)

Canadian gallon: an imperial unit of capacity that equals 4.54 litres

capacity: the amount of weight a container can hold

cell: each small rectangle in a spreadsheet

cell address: the name given to the cell's location in a spreadsheet

Celsius: a metric scale of temperature in which water freezes at 0° and boils at 100° under standard conditions

centimetre: a metric unit of length that equals a hundredth of a metre

circumference: the distance around a circle

column: the vertical divisions in a spreadsheet

complementary angles: angles that add up to 90 degrees (a right angle)

composite number: a number with at least one factor other than 1 and the number itself

conversion: the process of changing from one unit to another

conversion factor: a number used for converting a quantity in one set of units (e.g., metric units) into an equivalent set of units (e.g., imperial units)

coordinates: a set of values that show an exact position; on maps and graphs, it is common to have a pair of numbers to show where a point is—the first number shows the distance along and the second number shows the distance up or down

coordinate plane: the plane determined by a horizontal number line, called the x -axis, and a vertical number line, called the y -axis, intersecting at a point called the origin; each point in the coordinate plane can be specified by an ordered pair of numbers

cup: an imperial unit of capacity that is equal to 8 fluid ounces

denominator: the number below the line of a fraction that tells the number of parts the whole has been divided into

diameter: a straight line passing from side to side through the centre of a circle

dividend: the quantity or amount to be divided

division: the act of separating something into parts or groups

divisor: the number you divide by

enlargement: when a document or image is made bigger or larger

equivalent fractions: different fractions that name the same number, such as $\frac{1}{2}$ and $\frac{2}{4}$

equivalent measurements: two numbers that are equal in value measurements

estimating: the act of roughly calculating the value, number, or quantity of something

extrapolation: the act of estimating a value beyond known values

factors: numbers that are multiplied to get an answer (the product)

Fahrenheit: an imperial scale of temperature in which water freezes at 32° and boils at 212° under standard conditions

fluid ounce: unit of capacity equal to one sixteenth of a US pint

foot: an imperial unit of length that equals 12 inches

fraction: a part of a group, a number, or a whole

frequency distribution table: a table that lists a set of scores and their frequency (how many times each one occurs)

gallon: a unit of volume for liquid measure

geometric sequence: a sequence made by multiplying by some value each time (e.g., 2, 4, 8, 16, 32, 64, 128, 256—each number is two times the number before it)

gram: the base unit of mass in the metric system

greatest common factor (GCF): the greatest factor (number) that can divide evenly into two or more numbers

height: the measurement of an object from the base to the top

hexagon: a six-sided polygon

hundredths: the position of the second digit to the right of the decimal point (e.g., the 5 in 1.25)

imperial system: the system used in the United States for measurement

improper fraction: a fraction in which the numerator is greater than the denominator (e.g., $\frac{5}{4}$)

inch: an imperial unit of length that is equal to one twelfth of a foot

income: money received, especially on a regular basis, for work

integers: positive and negative numbers

interpolation: the act of estimating a value between two known values

kilogram: a metric unit of mass equal to 1 000 grams

kilometre: a metric unit of length that is equal to 1 000 metres

label: the words at the top of a column

line graph: a graph that shows information that is connected in some way (such as change over time)

line of reflection: the line that is reflected over in a reflection; also called the mirror line

line of symmetry: the imaginary line where you could fold the image and have both halves match exactly

litre: the basic unit of capacity in the metric system

long ton: a measure of mass in the imperial system that equals 2 240 pounds

lowest common multiple (LCM): the smallest number that two or more whole numbers can divide into evenly

lowest terms: when the greatest common factor (GCF) of the numerator and denominator is 1

mass: the measurement of the amount of matter an object has

mean: the average of a set of numbers; to calculate—add up all the numbers, then divide by how many numbers there are

median: the middle number in a sorted list of numbers

metre: the basic unit of length in the metric system; equal to 100 centimetres or 1 000 millimetres

metric system: a system of measuring length, weight, and volume with one basic unit of measure; the main system used in Canada

mile: an imperial unit of length that is equal to 1 760 yards

milligram: a metric unit of mass that is equal to one thousandth of a gram

millilitre: a metric unit of capacity that is equal to one thousandth of a litre

millimetre: a metric unit of length that is equal to one thousandth of a metre

mirror image: an image or object that is identical in form to another but with the structure reversed, as in a mirror

mixed number: a number consisting of a whole number and a proper fraction (e.g., $4\frac{1}{2}$)

mode: the number that appears most often in a set of numbers

multiple: the product of a known number and a whole number

numerator: the number above the line in a fraction that tells how many parts of the whole

obtuse angle: an angle that measures more than 90 degrees but less than 180 degrees

obtuse triangle: a triangle that has an angle greater than 90 degrees

ordered pair: two numbers written in a certain order, usually like this: (4, 5); can be used to show the position on a graph where the “x” (horizontal) value is first and the “y” (vertical) value is second

origin point: the point where two axes meet

ounce: the smallest imperial unit of mass that equals 30 grams

path: a route or course to follow to accurately reach a destination

percent: a number written in parts per 100 (e.g., 95% is 95 parts per 100 parts)

perimeter: the distance all the way around the outside of a two-dimensional shape

pictograph: a graph that uses pictures or symbols to show the value of data

pint: an imperial unit of capacity equal to 2 cups

place value: the value of a number based on the position in that number

polygon: any closed 2-D shape that has three or more straight sides

pound: an imperial unit of mass that equals 16 ounces

powers of 10: a way of writing large or small numbers

prediction: an educated guess on a problem

prime factorization: the prime factors that multiply to make up a number

prime number: a number with only two factors: 1 and the number itself

probability: the chance that something will happen; how likely it is that some event will happen

product: the answer to a multiplication problem

proper fraction: a fraction that is less than one, with the numerator less than the denominator (e.g., $\frac{4}{5}$)

proportion: when two ratios (or fractions) are equal

protractor: an instrument for measuring angles, typically in the form of a flat semicircle marked with degrees along the curved edge

quadrant: any of the four areas made when we divide up a plane by x and y axes

quadrilateral: a flat shape with four straight sides

quart: an imperial unit of capacity equal to 2 pints or 4 cups

quotient: the answer to a division problem

radius: a straight line from the centre to the outer edge of a circle

range: the difference between the highest and lowest values

rates: comparisons of two different measurements with different units

ratio: a term describing how much of one thing there is compared to another thing

ray: a line with a start point but no end point (it goes to infinity)

reflection: when a shape is given a mirror image based on a line of reflection; also called a flip

reflex angle: an angle that is more than 180 degrees but less than 360 degrees

relevant information: information that is given in the problem that is actually needed to solve the problem

remainder: the amount left over after division

right angle: an angle of 90 degrees, as in a corner of a square or at the intersection of two perpendicular straight lines

right-angled triangle: a triangle with a 90-degree angle

rotation: when a shape is turned about a pivot point (centre of rotation or rotation point); simply means “turning around a centre”; the distance from the centre to any point on the shape stays the same

rotation point: the central point around which a figure is rotated

rounding: the act of making a number simpler but keeping its value close to what it was; the result is less accurate but easier to use

row: each horizontal division in a spreadsheet

scalene triangle: a triangle with all sides of different lengths

scientific notation: a way to write a number as a decimal multiplied by a power of 10

short ton: a measure of mass in the imperial system; 1 ton = 2 000 pounds

SI: another name for the metric system; sometimes called the SI system, which means System International from the French Le Système International d'Unités, or more commonly, Standard International Units

spreadsheet: an electronic document in which data is arranged in the rows and columns of a grid and can be manipulated and used in calculations

straight angle: an angle of 180 degrees; looks like a straight line

supplementary angles: angles that add up to 180 degrees (a straight angle)

symmetrical: when a shape is located directly on the reflection line so that both sides of the shape match exactly

symmetry: when each part of a divided object is a mirror image of the other part

tenths: the position of the first digit to the right of the decimal point (e.g., the 2 in 1.25)

thousandths: the position of the third digit to the right of the decimal point (e.g., the 5 in 1.235)

translation: the movement of a shape left/right (horizontally) or up/down (vertically); also known as a slide

US gallon: an imperial unit of capacity equal to 16 cups, 8 pints, or 4 quarts

value: the numbers entered in a cell in a spreadsheet

variable: a letter or symbol that is used to represent an unknown quantity

vertex: a point where two or more straight lines meet; a corner

weight: the measurement of how strongly gravity pulls an object toward Earth

whole numbers: numbers that are zero (0) or larger

x-axis: the line on a graph that runs horizontally (left/right) through zero

x-coordinate: the left/right (horizontal) motion on a coordinate plane

y-axis: the line on a graph that runs vertically (up/down) through zero

y-coordinate: the up/down (vertical) motion on a coordinate plane

yard: an imperial unit of length that equals 3 feet

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