

## CONVERSION

Metric is the official system of measurement in Canada, but industries in Canada frequently purchase materials and machinery made in the United States, one of the few remaining countries that uses the Imperial system of measurement. For this reason, tradespersons need to be able to convert between and within systems of measurement.



### KEY POINTS

#### Conversion:

- in this context means to change between units of measurement. You can change between the systems (imperial and metric), or within the systems (imperial units to different imperial units, or metric units to different metric units).
- only changes how the measurement is expressed in relation to another measurement unit and does not change the measurement itself.
- uses known conversion ratios, for example, the conversion ratio of inches to centimetres is approximately 1 in. to 2.54 cm.
- can be calculated using an equation involving equivalent conversion ratios to determine unknown values.
- using an equation of equivalent ratios maintains an equivalent relationship between different measurement units. This method allows you to go back and forth between measurements and accurately find converted values.
- may involve using more than one conversion equation to find the final unknown value.
- can be applied to convert common types of measurements such as length (distance), area, weight (mass), or volume.
- of temperature, however, is calculated using a specific conversion formula.



### STEPS

1. Decide what type of unit the conversion is for – length (distance), area, weight (mass) or volume.
 

Conversion ratios can be written:

  - ✓ using a fraction  $\frac{1 \text{ in.}}{2.54 \text{ cm}}$
  - ✓ using a colon **1 in. : 2.54 cm**
  - ✓ using the equal sign **1 in. = 2.54 cm**
2. Determine if you are converting *from* metric *to* imperial, or *from* imperial *to* metric, or converting units within the same measurement system.
3. Find the appropriate conversion ratio in the reference table. You may need to choose more than one appropriate conversion ratio to arrive at the final unknown value. For example, when you are converting cm to feet, you will use conversion ratios for inches to cm and feet to inches.

4. Write out an equation using equivalent ratios. The ratio containing the value to be converted is placed on the left-hand side of the equation and the appropriate conversion ratio chosen from the reference table is placed on the right-hand side of the equation, separated by an equal sign. Ensure corresponding units are on the top and bottom of both sides of the equation.

$$\text{If converting } 63.5 \text{ cm into inches use: } \frac{? \text{ in.}}{63.5 \text{ cm}} = \frac{1 \text{ in.}}{2.54 \text{ cm}}$$

$$\text{If converting } 25 \text{ inches to cm use: } \frac{? \text{ cm}}{25 \text{ in.}} = \frac{2.54 \text{ cm}}{1 \text{ in.}}$$

5. Isolate the unknown value. When isolating the unknown value, whatever is done to one side of the equation is also done to the other side.

$$\text{a. } \frac{? \text{ in.}}{63.5 \text{ cm}} = \frac{1 \text{ in.}}{2.54 \text{ cm}} \longrightarrow \frac{(? \text{ in.} \times 63.5 \text{ cm})}{63.5 \text{ cm}} = \frac{(1 \text{ in.} \times 63.5 \text{ cm})}{2.54 \text{ cm}}$$

$$\text{b. } ? \text{ in.} = \frac{(1 \text{ in.} \times 63.5 \text{ cm})}{2.54 \text{ cm}}$$

$$\text{c. } ? \text{ in.} = \frac{(63.5 \text{ in.})}{2.54}$$

$$\text{d. } ? \text{ in.} = 25 \text{ in.}$$

$$\text{e. } 25 \text{ in.} = 63.5 \text{ cm} \text{ or } \frac{25 \text{ in.}}{63.5 \text{ cm}}$$

6. *If necessary*, complete another conversion equation to transform your converted value into the desired final unknown value. Choose a second appropriate conversion ratio from the reference table.

For example, to convert 63.5 cm to feet, you will first use the conversion ratio for inches to cm (as shown above, 63.5 cm = 25 inches) and then use the feet to inches conversion ratio to convert inches to feet.

$$\text{a. } \frac{? \text{ ft.}}{25 \text{ in.}} = \frac{1 \text{ ft.}}{12 \text{ in.}} \longrightarrow \frac{(? \text{ ft.} \times 25 \text{ in.})}{25 \text{ in.}} = \frac{(1 \text{ ft.} \times 25 \text{ in.})}{12 \text{ in.}}$$

$$\text{b. } ? \text{ ft.} = \frac{(1 \text{ ft.} \times 25 \text{ in.})}{12 \text{ in.}}$$

$$\text{c. } ? \text{ ft.} = \frac{(25 \text{ ft.})}{12}$$

$$\text{d. } ? \text{ ft.} = 2.08 \text{ ft.}$$

$$\text{e. } 2.08 \text{ ft.} = 25 \text{ in.} \text{ or } \frac{2.08 \text{ ft.}}{25 \text{ in.}}$$

7. If an instruction for rounding is given, round the answer to the required number of decimal places, (see the *Rounding Skill Builder* for help). Importantly, use original values when calculating and only round your answer in the last step.

For example, to convert 25 inches to feet rounded to the nearest hundredth.

$$? \text{ ft.} = \frac{(25 \text{ ft.})}{12} \longrightarrow ? \text{ ft.} = 2.08333... \text{ ft.} \longrightarrow ? \text{ ft.} = 2.08 \text{ ft.}$$

$$2.08 \text{ ft.} = 25 \text{ in.} \text{ or } \frac{2.08 \text{ ft.}}{25 \text{ in.}} \text{ rounded to the nearest hundredth.}$$

- For Temperature conversions follow the conversion formulas provided in the reference table.

**Conversion Ratio Reference Tables:**

Conversion ratios between measurement systems	
Length or Distance	
1 in. = 25.4 mm	
1 in. = 2.54 cm	
1 m = 39.37 in.	
1 m = 3.28 ft.	
1 m = 1.09 yd	
1 mi = 1.61 km	
Area	
1 in <sup>2</sup> = 645 mm <sup>2</sup>	
1 in <sup>2</sup> = 6.45 cm <sup>2</sup>	
1 m <sup>2</sup> = 1,550 in <sup>2</sup>	
1 m <sup>2</sup> = 10.76 ft. <sup>2</sup>	
1 m <sup>2</sup> = 1.196 yd <sup>2</sup>	
1 ac = 4,047 m <sup>2</sup>	
1 ha = 2.471 ac	
1 mi <sup>2</sup> = 2.59 km <sup>2</sup>	
Weight or Mass	
1 oz. = 28.35 g	
1 kg = 2.2 lb.	
1 metric tonne = 1.102 US ton	
1 US ton = 907.2 kg	
1 UK ton = 1016 kg	
Volume	
1 fl. oz. (US) = 29.57 mL	
1 L = 1.06 qt. (US)	
1 gal. (US) = 3.785 L	

Imperial and Metric system conversion ratios	
Length or Distance	
Imperial System	Metric System
1 ft. = 12 in.	1 cm = 10 mm
1 yard (yd) = 36 in.	1 m = 100 cm
1 yd = 3 ft.	1 km = 1,000 m
1 mile (mi) = 1,760 yd	
1 mi = 5,280 ft.	
Area	
Imperial System	Metric System
1 ft. <sup>2</sup> = 144 in. <sup>2</sup>	1 m <sup>2</sup> = 10,000 cm <sup>2</sup>
1 yd <sup>2</sup> = 9 ft. <sup>2</sup>	1 hectare (ha) = 10,000 m <sup>2</sup>
1 acre (ac) = 4840 yd <sup>2</sup>	1 km <sup>2</sup> = 100 ha
1 ac = 43,560 ft. <sup>2</sup>	1 km <sup>2</sup> = 1,000,000 m <sup>2</sup>
1 mi <sup>2</sup> = 640 ac	
Weight or Mass	
Imperial System	Metric System
1 lb. = 16 oz.	1 g = 1,000 mg
1 US ton = 2,000 lb.	1 kg = 1,000 g
1 UK ton = 2,240 lb.	1 metric tonne = 1,000 kg
Volume	
Imperial System	Metric System
1 pint (pt.) = 16 fl. oz. (US)	1 L = 1000 mL
1 quart (qt.) = 2 pt.	
1 qt. = 32 fl. oz. (US)	
1 gallon (gal.) (US) = 4 qt.	

Formulas for Temperature Conversion	
Celsius to Fahrenheit	
°F = (°C x 1.8) + 32	Convert 20° Celsius to Fahrenheit °F = (20 x 1.8) + 32 °F = 36 + 32 °F = 68
Fahrenheit to Celsius	
°C = (°F - 32) ÷ 1.8	Convert 72° Fahrenheit to Celsius °C = (72 - 32) ÷ 1.8 °C = 40 ÷ 1.8 °C = 22.22°



## EXAMPLES

Workplace examples of conversion include:

- converting imperial measurements of length of building materials to metric
- converting metric measurement of weight or volume to imperial

Convert 23.5 metres to yards and round to two decimal places:

1. Decide what type of unit the conversion is for: **length (distance)**
2. Determine if you are converting *from* metric *to* imperial or *from* imperial *to* metric or converting units within the same measurement system: **metric to imperial**
3. Find the corresponding conversion ratio in a reference table: **1 m = 1.09 yd**
4. Write out an equation of equivalent conversion ratios where the conversion ratio containing the unknown value is placed on the left-hand side of the equation and the conversion ratio chosen from the reference table is placed on the right-hand side of the equation. Put the same unit as the unknown conversion value in the numerator position for each conversion ratio in the equation. Separate each conversion ratio using an equal sign.

$$\frac{? \text{ yd}}{23.5 \text{ m}} = \frac{1.09 \text{ yd}}{1 \text{ m}}$$

5. Isolate the unknown value. When isolating the unknown value, whatever is done to one side of the equation is also done to the other side.

$$\text{a. } \frac{? \text{ yd}}{23.5 \text{ m}} = \frac{1.09 \text{ yd}}{1 \text{ m}} \longrightarrow \frac{(? \text{ yd} \times 23.5 \text{ m})}{23.5 \text{ m}} = \frac{(1.09 \text{ yd} \times 23.5 \text{ m})}{1 \text{ m}}$$

$$\text{b. } ? \text{ yd} = \frac{(1.09 \text{ yd} \times 23.5 \text{ m})}{1 \text{ m}}$$

$$\text{c. } ? \text{ yd} = \frac{(25.615 \text{ yd})}{1}$$

$$\text{d. } ? \text{ yd} = 25.615 \text{ yd}$$

$$\text{e. } 23.5 \text{ m} = 25.615 \text{ yd} \text{ or } \frac{23.5 \text{ m}}{25.615 \text{ yd}}$$

6. If an instruction for rounding is given, round the answer to the required number of decimal places, (see the *Rounding Skill Builder* for help). Importantly, use original values when calculating and only round your answer in the last step.

- Convert 23.5 metres to yards and **round to two decimal places**.

$$? \text{ yd} = \frac{(25.615 \text{ yd})}{1} \longrightarrow ? \text{ yd} = 25.615 \text{ yd} \longrightarrow ? \text{ yd} = 25.62 \text{ yd}$$

$$? \text{ yd} = 25.62 \text{ yd}$$

$$23.5 \text{ m} = 25.62 \text{ yd} \text{ or } \frac{23.5 \text{ m}}{25.62 \text{ yd}} \text{ rounded to two decimal places.}$$

Convert  $37\frac{1}{2}$  square yards to square metres and round to nearest whole number:

1. Decide if the conversion is for length, area, weight or volume and find the corresponding conversion table: **Area**.
2. Determine if you are converting from metric to imperial or from imperial to metric: **imperial to metric**
3. Find the corresponding conversion ratio in a reference table:  $1\text{ m}^2 = 1.196\text{ yd}^2$
4. Write out an equation of equivalent conversion ratios where the conversion ratio containing the unknown value is placed on the left-hand side of the equation and the conversion ratio chosen from the reference table is placed on the right-hand side of the equation. Put the same unit as the unknown conversion value in the numerator position for each conversion ratio in the equation. Separate each conversion ratio using an equal sign.

$$\frac{? m^2}{37.5\text{ yd}^2} = \frac{1 m^2}{1.196\text{ yd}^2}$$

NOTE: Change the fraction  $37\frac{1}{2}\text{ yd}^2$  to a decimal ( $37.5\text{ yd}^2$ ).

5. Isolate the unknown value. When isolating the unknown value, whatever is done to one side of the equation is also done to the other side.

$$\text{a. } \frac{? m^2}{37.5\text{ yd}^2} = \frac{1 m^2}{1.196\text{ yd}^2} \longrightarrow ? m^2 = \frac{(1 m^2 \times 37.5\text{ yd}^2)}{1.196\text{ yd}^2}$$

$$\text{b. } ? m^2 = \frac{(1 m^2 \times 37.5\text{ yd}^2)}{1.196\text{ yd}^2}$$

$$\text{c. } ? m^2 = \frac{(37.5 m^2)}{1.196}$$

$$\text{d. } ? m^2 = 31.354515 m^2$$

$$\text{e. } 37.5\text{ yd}^2 = 31.354515 m^2 \text{ or } \frac{37.5\text{ yd}^2}{31.354515 m^2}$$

6. If an instruction for rounding is given, round the answer to the required number of decimal places, (see the *Rounding Skill Builder* for help). Importantly, use original values when calculating and only round your answer in the last step.

$$? m^2 = \frac{(37.5 m^2)}{1.196} \longrightarrow ? m^2 = 31.354515 m^2 \longrightarrow ? m^2 = 31 m^2$$

$$? m^2 = 31 m^2$$

$$37.5\text{ yd}^2 = 31 m^2 \text{ or } \frac{37.5\text{ yd}^2}{31 m^2} \text{ rounded to nearest whole number.}$$

Think you understand how to perform conversions?

Try it yourself on the next page.

## USING THE SKILL



**In the Workplace:** Being able to use conversion effectively is a useful workplace skill.

*NOTE: All resulting decimal values are carried through in full and rounded in the last step of the equation.*

Convert 35,000 km to mi. <i>Round to the nearest whole number.</i>	Convert 537 mi. to km <i>Round to the nearest tenth.</i>
Convert 22 gal. (US) to L	Convert 14 oz. to g
Convert 75°F to °C <i>Round to the nearest whole number.</i>	Convert 8°C to °F <i>Round to the nearest whole number.</i>
Convert 27 in. to cm	Convert 231 yd. to m <i>Round to the nearest tenth.</i>
Convert 93 kg to lb.	Convert 37 in. to mm
Convert 17 ½ cm to ft. <i>Round to the nearest tenth.</i>	Convert 43,560 yd <sup>2</sup> to mi <sup>2</sup> <i>Round to the nearest thousandth.</i>
Convert 27 mL to fluid oz. (US) <i>Round to the nearest hundredth.</i>	Convert 17 L to gal. (US) <i>Round to the nearest tenth.</i>
Convert 133 lb. to kg <i>Round to the nearest hundredth.</i>	Convert 82 ft. to m



## REFLECTION

How do you use conversion at work? When do you use it?