# Mathematics 10-3

## Unit 4
## Measurement Systems



## Lesson C
## Conversions between Imperial and Metric Measurements

LEARNING ANYTIME ANYWHERE

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# Mathematics 10-3

## Unit 4
# Measurement Systems

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1. Submit Assignment Booklets regularly for correction.

2. **Submit only one Assignment Booklet at one time.** This allows your teacher to provide helpful comments that you can apply to subsequent course work and exams (if applicable).

3. **Check the following** before submitting each Assignment Booklet:

   - ☐ Are all assignments complete?
   - ☐ Have you edited your work to ensure accuracy of information and details?
   - ☐ Have you proofread your work to ensure correct grammar, spelling, and punctuation?
   - ☐ Did you complete the Assignment Booklet cover and attach the correct label?

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Determine sufficient postage by having the envelope weighed at a post office. (Envelopes less than two centimetres thick receive the most economical rate.)

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# Mathematics 10-3

## Unit 4, Lesson C

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**For successful completion of this course, you must do the following:**

1. **Complete all questions in each Assignment Booklet to the best of your ability.** Incomplete Assignment Booklets will be returned unmarked.

2. **Achieve a Final Exam mark of at least 40%.**

3. **Achieve a final course mark of at least 50%.**

## Process

- **Read the course material** and complete the practice questions as well as the assignments in this booklet.

- **Proceed carefully** through each assignment. Reflect upon your answers and prepare your written responses to communicate your thoughts effectively. Time spent in planning results in better writing.

- **Proofread your work** before submitting it for marking. Check for content, organization, paragraph construction (if applicable), grammar, spelling, and punctuation.

- **If you encounter difficulties or have any questions**, contact your course teacher at Alberta Distance Learning Centre for assistance.

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- format your work using an easy-to-read 12-point font such as Times New Roman
- include your full name and student file number as a document header
- double-space your final copy
- staple your printed work to this Assignment Booklet

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# Lesson C
# Conversions between Imperial and Metric Measurements

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**Lesson A:**
Imperial and Metric Systems Introduction

**Lesson B:**
Imperial and Metric Measurements

**Lesson C:**
Conversions between Imperial and Metric Measurements

# Icons

**The following icons will guide you through the course.**

**Let's Get Messy**

**How Does It Work?**

**Digging Deeper**

**Practice Questions**


**Practice Solutions**

**Assignment**

**Treasure Chest**

**Coins**

**Discussions**

**Check It Out**

**How Did It Go?**


**Unit Quiz**

# Lesson C: Conversions between Imperial and Metric Measurements

The big day finally arrived for Tristine. After several months of training, she arrived at the triathlon ready to race. The only problem was that she did not know for sure what distance she would be required to run. She knew that she would be going 500 m in the pool and then 15 km on her bike, but she never found out how far she would need to run.

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Tristine went to the registration table to get her competition number and to ask how far the run was. She was hoping that all her miles of country running had been far enough.

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After she registered, she found out that the distance she was required to run in the triathlon was 5 km. She still was not sure if she had trained with enough distance.

She knew her Saturday morning run was 6 miles, but how far was that compared to the 5 km of the triathlon? Tristine needed to learn how to convert from Imperial units to metric units!

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## Here are the things that you will learn in this lesson.

- How to estimate what a SI (metric) unit of measure is in the Imperial system
- How to estimate what an Imperial unit of measure is in the metric system
- How to convert metric measurements to Imperial measurements
- How to convert Imperial measurements to metric measurements
- How to complete Math operations with measurements from one or both systems
- Solve problems that involve conversion between systems of measurement

# Let's Get Messy

Here are the items you need for this activity:

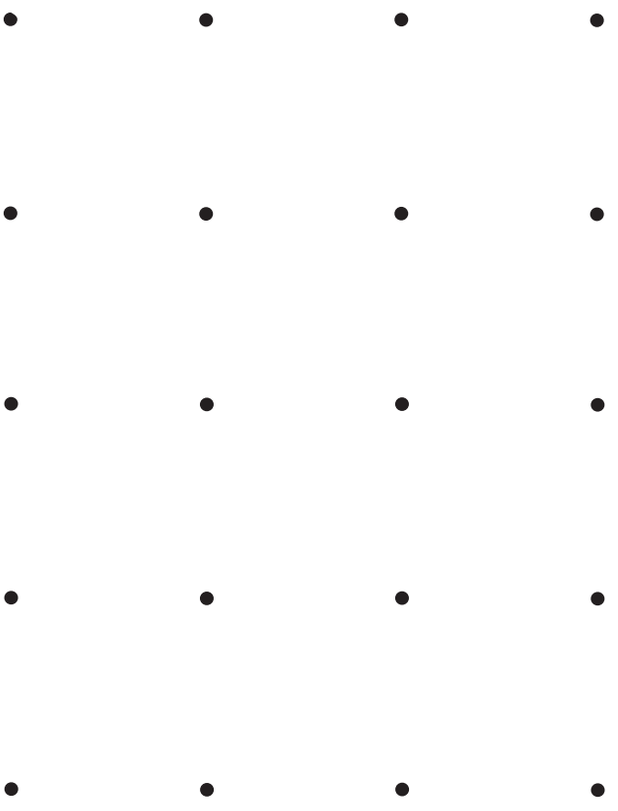


- grid paper (in this booklet)
- dot paper (in this booklet)
- scissors
- glue
- pencil
- 2 rulers (one with cm and one with inches)

**This Get Messy activity is designed to help you understand conversions between measurement systems.**

## Task 1

On the dot paper, use a straight edge to connect four dots to make the smallest square possible.



## Task 2

Using your grid paper and a straight edge, draw a section of squares that will fit into the square you drew on the dot paper. Cut out the section and glue your grid paper squares onto the dot paper square you drew in this booklet.

Now, notice that the grid paper squares fit exactly over the dot paper squares. The dot paper was 3 units wide and 3 units long. The grid paper square was 6 units wide and 6 units long, but the total size was the same as the dot paper square.

# Task 2 - Grid Paper

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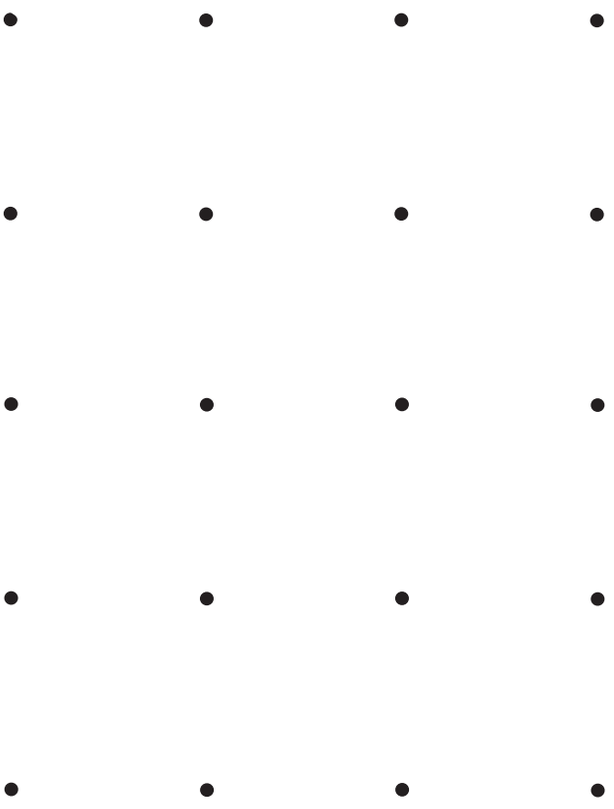
## Task 3

On the dot paper, use a straight edge to make a rectangle that is 4 dots connected across and 3 dots connected up and down.



# Task 4

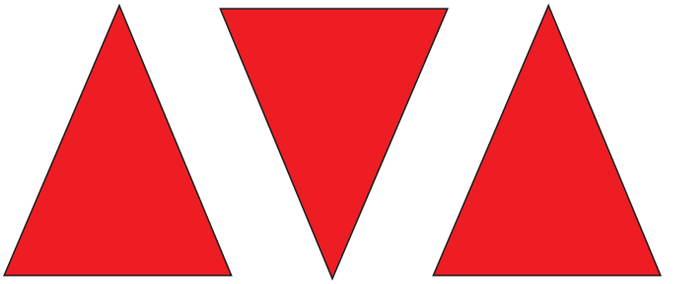
On your 'Task 4' Grid Paper, draw **3** triangles that would fit together into your dot paper rectangle.

Hint: the height of the triangles should be the same as the width of your dot paper triangle. The total length of the three triangles should close to the length of your dot paper rectangle.

Cut out the triangles that are on your grid paper and place them in the rectangle that you drew on the dot paper.

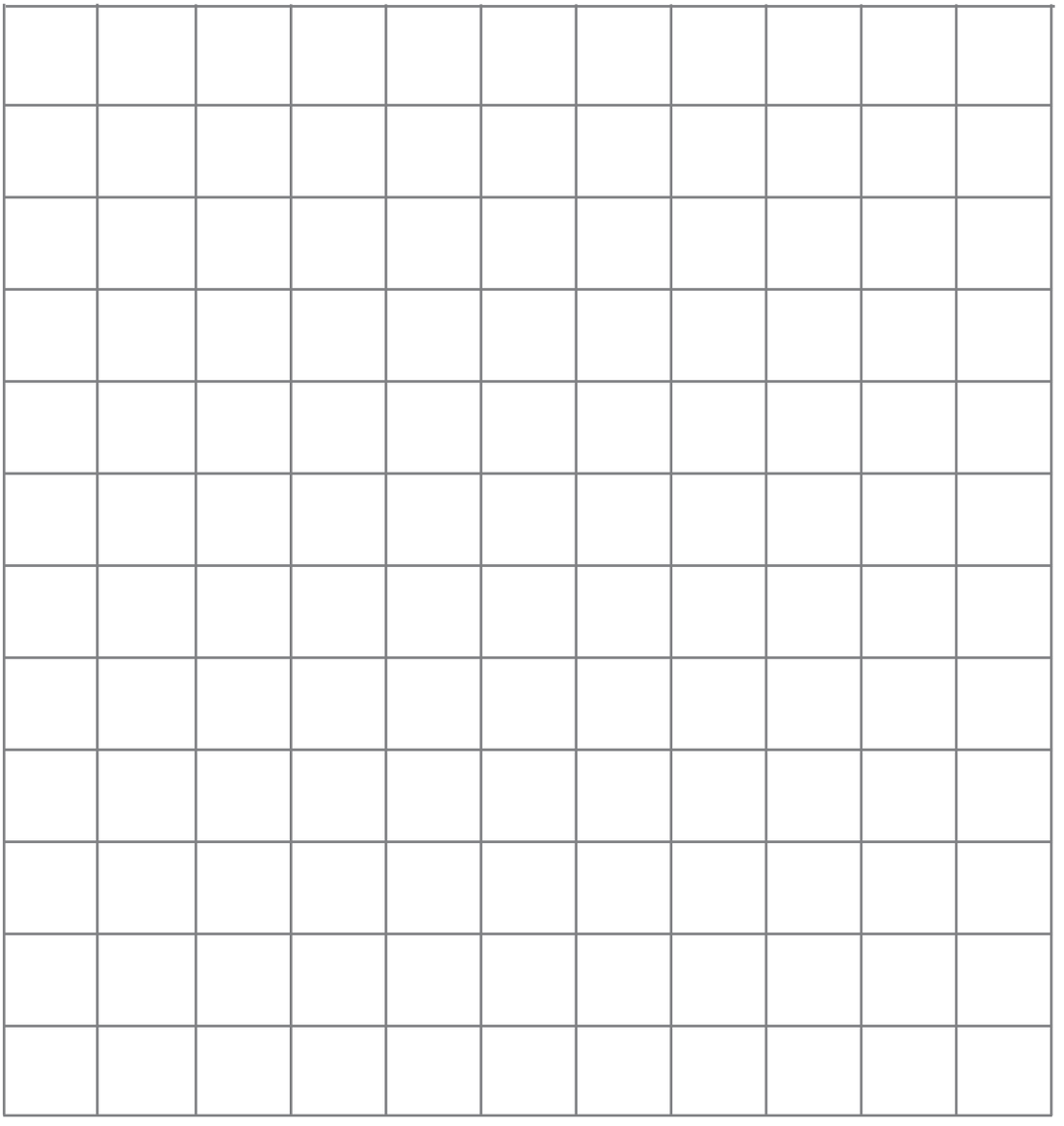
Try flipping one of them over so that they will fit the rectangle better. Once you get the best fit, glue the triangles onto the grid paper.

Now, you will notice that the triangles fit quite well. Three triangles **almost** equal 1 rectangle but not quite exactly.





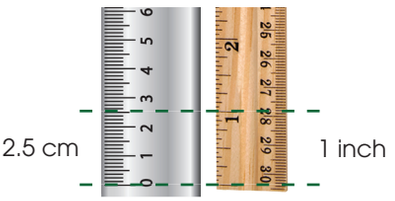
# Task 4 - Grid Paper



## Task 5

You have two rulers. One is metric and the other is Imperial. Place the one with inches vertically (up and down). Then, turn the centimetre ruler so it is next to the inches ruler. Place it so that the zero lines up with the start of one of the inches.

See how many centimetres will fit into one inch.






You should see that about 2.5 cm will fit into one inch. You can conclude that, as an estimation, 1 inch is **about** 2.5 cm.



How does this activity relate to Tristine and the fact that she needs to convert miles to kilometres? Let's find out!

# How Does It Work?

When you changed centimetres to metres in Lesson 4B, you were converting units within the **same** measurement system, the metric system. When you changed inches to feet, you again converted units within the same measurement system, the Imperial system. It is an exact conversion. 1 cm = 10 mm exactly. 1 ft = 12 inches exactly.

In the Get Messy task, you saw that four squares on the **grid** paper fit into a box made from connecting the dots on the **dot** paper. The 4 squares fit exactly into the square made by the dots. Four small squares made one big square… just as 10 small units in the metric system made 1 larger unit or 12 inches made exactly 1 foot in the Imperial system. The size is the same as one whole unit but the parts or sections were different sizes.

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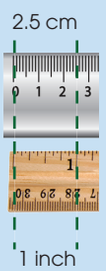
However, when you put the triangles together, you found that 3 triangles **almost** fit one rectangle. It was not an exact fit. That is like converting from metric to Imperial. The translation or conversion is not exact. **About** 2.5 centimetres fit into the same length as 1 inch, but it is not quite an exact fit.

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Remember from the Get Messy activity that you put a centimetre ruler right beside the inches ruler and saw that 1 inch was about the same size as 2.5 cm, but it was **not exactly** the same size. In fact, some conversion charts show 1 inch to be about **2.54 cm**.

It helps if you have a picture in your mind of approximately how big a unit of measure is in one system so that you can also picture what it converts to in the other system.

***comparable:*** *similar; in this case similar in size*

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The Imperial system uses measurements that are ***comparable*** to measurements in the metric system. They may not be exactly the same size, but they are comparable.

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Inches compare in size to centimetres and yards compare in size to metres. Pounds compare to kilograms and so on. A unit from one system is compared to a similar unit in the other system.

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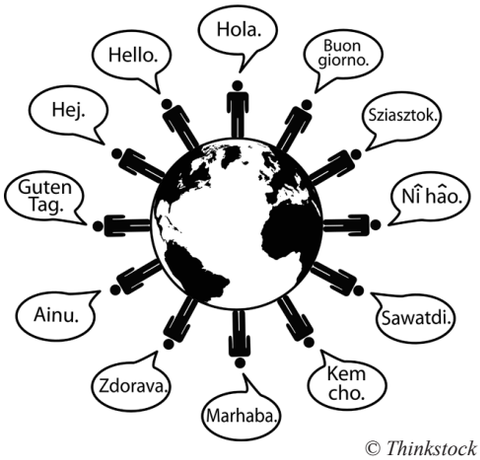
**Vegreville, Alberta is home to the world's largest 'pysanda' which is Ukrainian for**
**a. perogy**
**b. Easter egg**
**c. cabbage roll**

**Call your instructor to give your treasure chest answer and earn coins towards bonus marks.**

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Do you know how to speak another language? Perhaps you don't know another language, but you may know a few words or phrases from another language.

For instance, many Canadian schools teach students French because it is one of the official languages of Canada. You may know that to say "hello" in French you would say 'bonjour'.

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How about Spanish? The Spanish word for hello is 'hola', which is pronounced 'o-la'.

Ukrainians spell hello like this - слухаю

The Ukrainian alphabet is different from the English alphabet, and it has different letters with various sounds.

These are all examples of direct translations of a word that has exactly the same meaning.

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Colours are common words in any language, and for some languages, there are direct translations.

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The French word for ‘red’ is ‘rouge’. The Spanish word is ‘rojo’ pronounced ‘roho’. Some of the letters in the Spanish language look like English letters but they sound different.

However, the Blackfoot word for the colour red is ‘máóhk’, but it becomes a whole new word when used to describe something that is red. For example, ‘the bird is red’ is ‘mi'ksinaawa’.

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So, why are we learning all these new words in other languages? This is a math course, not a second language course!

Even in a math course, you learn a second language. Letters really are symbols that stand for something — a sound — and sounds put together are words that mean certain things. That is how language develops.

Symbols in math ‘translate’ into words, too. The ‘+’ symbol means ‘plus’ and a‘ ÷’ symbol means ‘divide’. Math ***is*** like a second language.

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Converting units of measure from one system to another is like translating words from one language to another.

When converting units of measurement, some are exact. For example, red and rojo mean the same thing just as 1 cm = 10 mm. 1 cm converts or 'translates' exactly as 10 mm.

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Also, one measurement system can 'translate' into the other system. We can convert metric units into Imperial units although they might not be an exact fit.

Here is another language example.


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When we leave the house in the morning, we say "Goodbye". In German, a person might say "Tshcus" (pronounced chues or chews).

This does not actually mean goodbye. It is more like… "See you later" or "Take care".

It is not an exact translation, but it is close.

When we switch units from Imperial to metric, it is not an exact translation, but it is close.


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Degrees Celsius is part of the metric system and degrees Fahrenheit is in the Imperial system.


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When you are in the United States, the radio stations will tell you the temperature in degrees Fahrenheit, but when you are at home in Canada, the temperature is given in degrees Celsius. While you are in the States, you would 'convert' the Fahrenheit degrees to Celsius so that you could understand better what the temperature is.


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Tristine had planned to do her Saturday morning run with her cousin who was visiting from the States. Her cousin called the week before to see what kind of running clothes she would need. Tristine told her that the forecast was for 25 degrees. Her cousin just about had a fit!

She asked how Tristine could run when it was so cold outside. Tristine laughed and told her cousin that 25° Celsius was not cold at all. Then, Tristine explained that Canada uses Celsius and the States uses Fahrenheit and that these are just two ways to measure temperature.

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You have already learned that inches and centimetres are comparable units of measure from two different systems. You have seen on a ruler that about 2.5 cm fit into 1 inch. Those mental images help when you do calculations. They are estimations so that, when you do a calculation, you can tell if you did the calculation correctly.

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Here are some examples to help you understand the approximate translation of units from one system to the other.

## Example 1

Approximately how many **centimetres** are in one **foot**?

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### Solution

Picture 1 foot in your mind. The rulers that we commonly use are 1 foot long, which is 12 inches.

If 1 inch is about 2.5 cm, then you can set up a ratio to get an idea of how many cm make a ruler that is 1 foot long.

1 foot = 12 inches

1 inch is ***approximately*** 2.5 cm.

12 inches are **about** ___ cm?

Multiply 1 inch by 12 to get 12 inches.

Multiply 2.5 cm by 12 to get the approximate number of cm in 12 inches (or 1 foot).

Approximately 2.5 cm × 12 ≃ 30 cm

About 30 cm are in 1 foot.

Now, look on your rulers. Were you close?

***approximately:*** *about, nearly*
*In Math, we try to be as exact as possible, but sometimes an approximate value is used in a calculation to produce an "approximate" answer. The symbol that means approximately equal to but not exactly equal to is* ≃.

# Example 2

Approximately how many cups are in one litre?

## Solution

Can you picture 1 cup of water? Think of a mug of hot chocolate. That is usually close to one cup in the Imperial system, unless you really like hot chocolate and bought the monster-sized mug.

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Now, picture cartons of milk. The big jug of milk is 4 litres, and the smaller one is 2 litres. 1 litre of milk is the carton.

Now, picture how many cups of hot chocolate fit into the 1 L milk carton.

You may even want to test it with a real carton

**About 4 cups of liquid will fill a 1-litre carton.**


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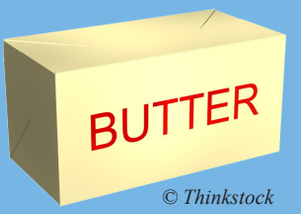
## Example 3

Approximately how many pounds are in 1 kg?






### Solution

Can you picture 1 pound? It is not a common thing to see!

But if you picture 1 block of butter, you have a good idea of how big one pound is.

Notice that the word "beurre" is the French word for "butter". In this example, we are converting 1 lb of butter to an approximate amount of beurre in kilograms!




Hey! We just estimated a conversion from kilograms to pounds and we translated English to French! Wow! We are really bilingual now!

Now, picture a hand weight that you could lift with your finger. That is about 1 kg.

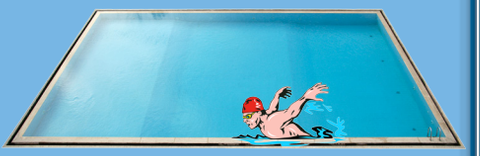



A pound of butter is a heavier than that—about 2 times heavier.

1 pound is approximately 2 kg.

# Example 4

Water boils at 100° Celsius and on the Fahrenheit scale the boiling point of water is 212°. What would be a good temperature for water in a swimming pool in **Fahrenheit**?



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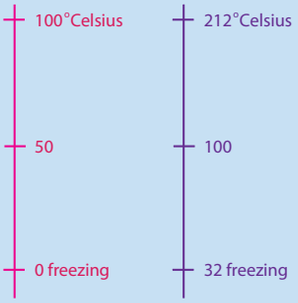
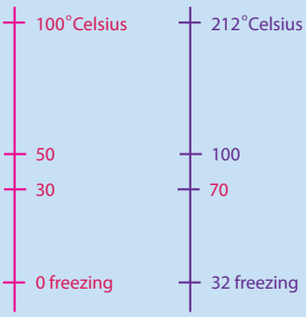
## Solution

It is helpful to also know that the freezing point of water is 0° Celsius and 32° Fahrenheit.




Think about 50° Celsius - about half way between freezing and boiling. That would still be hot water.

Look at a comparable temperature for the Fahrenheit scale.




Half way between boiling and freezing is about 100° Fahrenheit. So 100° F is similar to 50° C, and that is too hot for swimming pools.

A 30° Celsius day feels very nice and warm. On the Fahrenheit scale that is about 70°.

**An estimation of a comfortable temperature for swimming pool water is about 70° F.**

**The average temperature of the hot pool at Radium Hot Springs in BC is**

**a. 39℃ or 105℉**
**b. 105℃ or 39℉**
**c. 50℃ or 100℉**

**Call your instructor to give your treasure chest answer and earn coins towards bonus marks.**

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# How Does It Work? Practice Questions

1. Give an approximation for each of the following. Explain how you decided to use that approximation.

   a. The number of feet in 1 metre

   _____

   _____

   b. The number of litres in 1 gallon

   _____

   _____

   c. The number of pounds in a 20-kg flour sack

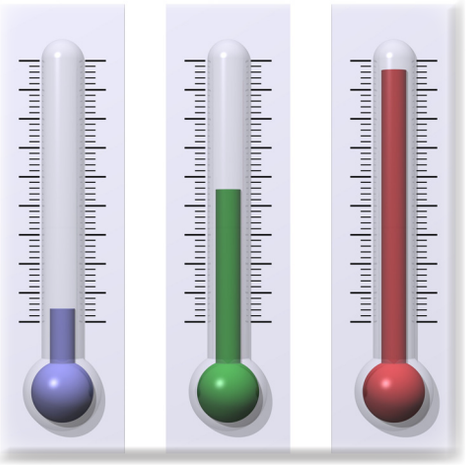
   _____

   _____

2. The following list shows linear units from both the Imperial and the SI (metric ) systems. Put them **in order** from smallest to biggest, 1 to 7.

   _____ 1 yard
   _____ 1 foot
   _____ 1 metre
   _____ 1 inch
   _____ 1 kilometre
   _____ 1 mile
   _____ 1 cm

3. If 0° Celsius is the same as 32° Fahrenheit, will 35° Fahrenheit be really hot or will it feel cold? Explain.



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# Practice Solutions

1. Give an approximation for each of the following. Explain how you decided to use that approximation.

   a. The number of feet in 1 metre

   **On a ruler that shows both inches and centimetres, we see that**
   **1 foot ≃ about 30 centimetres**

   **There are 100 cm in 1 metre. So,**
   **30 cm × (something) = 100 cm**
   **Divide both sides by 30.**
   **something = 100/30 =3.333…**
   **1 foot ≃ about 30 cm**
   **3.333 ft ≃ 100 cm**
   **Therefore, 1 metre is about 3.333… ft. It is not an exact fit, but 1 metre is more than 3 feet but less than 3 ½ feet.**

   b. The number of litres in 1 gallon

   **1 gallon = 16 cups exactly.**
   **1 litre looks like it will hold about 4 cups.**
   **So, 4 cups × 4 = 16 cups.**
   **And then, 1 litre × 4 is about how many litres there are in 1 gallon.**
   **1 gallon is about 4 litres.**

   c. The number of pounds in a 20 kg flour sack

   **The lesson mentioned that 1 pound is about 2 times heavier than 1 kg**
   **2 lb is about 1 kg**
   **20 lb is about ____ kg**
   **20 lbs is about 40 kg**

2. The following list shows linear units from both the Imperial and the SI (metric ) systems. Put them in order from smallest to biggest, 1 to 7.

**Step 1: Put the metric units in one group and all the Imperial units in another group.**

| | |
|---|---|
| **1 m** | **1 yd** |
| **1 mm** | **1 ft** |
| **1 cm** | **1 in** |
| | **1 mi** |

**Step 2: Put all the metric units in that group in order from smallest to largest, and then put all the Imperial units in that group in order from smallest to largest.**

| | |
|---|---|
| **1 cm** | **1 in** |
| **1 m** | **1 ft** |
| **1 km** | **1 yd** |
| | **1 mi** |

**Step 3: Now, decide if 1 cm is bigger or smaller than 1 inch. Compare them on rulers: about 2.5 cm fit into 1 inch. So, 1 cm is smaller than 1 inch. Start the list again, blending the two systems.**

**1 cm**
**1 in**

**Next, compare the 1 m and the 1 ft. On the ruler, you can see that 12 inches or 1 ft is about 30 cm. And you know that 1 m is exactly 100 cm. So, 1 ft is smaller than 1 m. Continue the list.**

**1 cm**
**1 in**
**1 ft**
**1 m**

**Step 4: Where does 1 yard fit into the group? 1 yard is 3 feet. 1 foot is about 30 centimetres, so 3 feet is about 90 cm. 1 metre is 100 cm is bigger than 1 yard which is only about 90 cm. And now we can add it to the list.**
**1 cm**
**1 in**
**1 ft**
**1 yd**
**1 m**

**Now, the last to compare are 1 km and 1 mile.**
**1 km = 1000 m exactly**
**1 mile = 5280 feet exactly**
**1 m is about 3 feet.**

**Therefore, 1 km or 1000 m is about 3000 feet. Because 1 mile is 5280 feet, 1 km is smaller than 1 mile. Now we can finish the list.**
**1 cm**
**1 in**
**1 ft**
**1 yd**
**1 m**
**1 km**
**1 mile**

3. If 0° Celsius is the same as 32° Fahrenheit, will 35° Fahrenheit be really hot or will it feel cold?

**Cold. 0 ℃ is the temperature at which water freezes or turns to ice.**

Total
27

# How Does It Work? Assignment

**Now it's time to show your stuff!**
**Put lots of details into your work.**

(2) 1. The following list is a mixture of SI (metric) and Imperial units of measure. Arrange the measurements from smallest (1) to largest (4).

_____ 10 km

_____ 10 yd

_____ 10 miles

_____ 10 m

(2) 2. Blair's dad told him that when he was young he had to walk a mile to school every day. Now Blair has to walk 1 km to school every day. Which person walked farther to school, Blair or his dad? Explain your answer.

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3. Are the following true or false? **Circle** true or false for each situation. Explain your choice.

(2) a. The length of the school yard is 500 m and the width is 400 m. Find the perimeter of the school yard. The school buys 900 yards of chain link fence. The school bought enough to put a fence around the school yard.

True False

(2) b. 10° Celsius is very cold and 10° Fahrenheit is quite warm.

True False

(2) c. There are 36 inches in 1 yard.

True False

(2) d. 2 000 000 ml of water is enough to fill a swimming pool.

True False

(6) 4. Complete the chart with the unit that is comparable in size to the one shown.

(1) 5. Approximately how many cm are in one yard?

(2) 6. Approximately how many millitres are in one cup? Remember that there are 1000 mL in one litre and about 4 cups filled 1 litre.

(2) 7. Keely is in Whitefish, Montana, to ski for a week. Before she leaves, she checks the weather network on the channel from Spokane for an idea of what the temperatures will be when she is skiing. She sees that the temperatures will range from -4° Fahrenheit to -9° Fahrenheit.

Will it be quite cold or not very cold there for skiing? Explain your answer.

(2) 8. Philip is planning to buy a cow from a farmer in Idaho, USA. He phoned the farmer to see how much the cow weighs. He found out that the cow weighs 810 pounds. Philip is used to weighing things in kilograms.

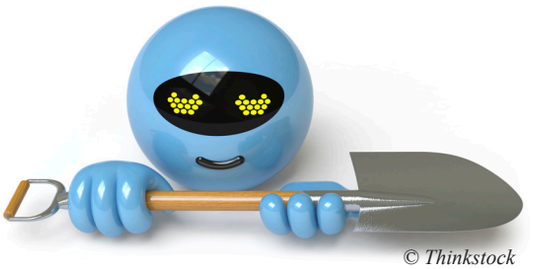
Approximately how much does the cow weigh in kilograms? Explain your answer.

(2) 9. A recipe calls for 500 mL of milk. Ron has Imperial measuring cups. Approximately how many cups of milk will he need for the recipe?

# Check it Out

**Have fun playing a game to practice matching units from different measurement systems**

**Matching Game**
**Compare Imperial to Metric**



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**You are ready to start Digging Deeper!**

# Digging Deeper

Ursula bought a milkshake at the Igloo Restaurant. It cost $2.50. She paid for it with a $5 bill. She expected to get $2.50 in change, but instead, the clerk gave her a toonie.

© Thinkstock

"Excuse me," Ursula said. "You gave me $2 in change and it should be $2.50."

The clerk shrugged her shoulders and said, "Well, I don't have any quarters, so isn't that close enough?"

What do you think? Is close "good enough"?

In the *How Does It Work?* section, you saw that Imperial units of measure have similar-sized units in the metric system.

You saw that 1 inch was close to 2.5 centimetres and 1 kg is close to 2 pounds.

However, these are just estimations. Calculations using approximate units will give approximate results. Remember the symbol ≃ means approximately equal to.

If you are only close with your measurements on a construction project, the object will not turn out well. Measurements that are more exact result in better products.

© Thinkstock

Imagine buying a pattern to sew a dress. On the pattern, the instructions state that 3 metres are needed to sew a size 8 dress. If you buy 2.8 metres (That's close to 3 m!), you will not have enough material to make the correct size dress.

© Thinkstock


© Thinkstock

The Chunnel is a tunnel that runs under the English Channel and connects France and England so that people can drive to and from those two countries.

To construct the Chunnel, one crew of builders began digging in England and another crew started in France. The two crews met somewhere in the middle under the English Channel—and there's a lot of seawater up there!

© Thinkstock

If the plans for construction had **not** been precise, the two digging crews would have missed each other. *Oops*!

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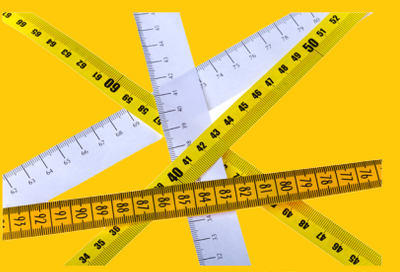
In this section of the lesson, you will learn to convert units of measure from one system to the other with more precision. Charts help to give more precise conversions from one measurement system to the other.

| Imperial Units of Conversion | | |
|---|---|---|
| **Length** | **Weight and Mass** | **Capacity** |
| 1 inch = 2.54 cm | 1 ounce = 28.35 grams | 1 ounce = 28.41 mL |
| 1 foot = 0.3048 m | 1 pound = 0.4536 kg | 1 pint = 0.57 L |
| 1 mile = 1.609344 km | | 1 quart = 1.14 KL |

## Example 5




Oswaldo is 5 feet 11 inches tall.

a. What is his height in inches

b. What is his height in cm?

### Solution a

1 foot = 12 inches
Oswlado's height = 5 feet + 11 inches
= 5ft × 12 inches/foot + 11 inches.
= 60 inches + 11 inches

**= 71 inches**

### Solution b

1 inch = 2.54 cm according to the chart.
Let 'n' be the number of centimetres in 71 inches.

**Step 1:** Set up a ratio.

1 inch : 2.54 cm

71 inches : $n$ cm

**Step 2:** Multiply to keep the ratio equivalent.

$$\times 71 \quad \begin{matrix} 1 \text{ inch} : 2.54 \text{ cm} \\ 71 \text{ inches} : n \text{ cm} \end{matrix} \quad \times 71$$

$$n = 2.54 \times 71$$
$$= 180.34 \text{ cm}$$

**Another method:** Set up the ratio so that the unknown is on the top of the equation. Then, finding the value of the unknown is easier.

$$\frac{n \text{ cm}}{71 \text{ inches}} = \frac{2.54 \text{ cm}}{1 \text{ inch}}$$

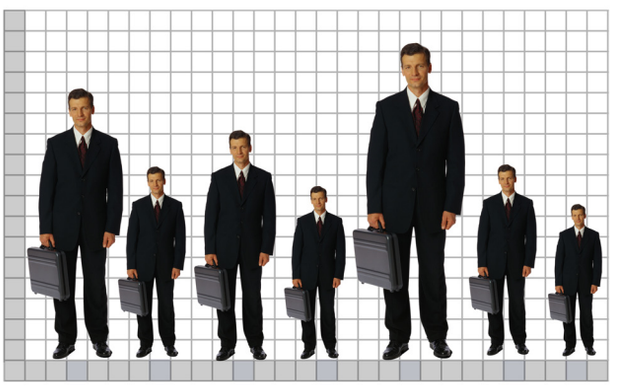
Multiply both sides by 71. It cancels off the left side.

$n$ cm = 71 inches × 2.54 cm/ inch

Cancel the units that you do not want and multiply.

$n$ cm = 71 inches × 2.54 cm/ inch

**$n$ cm = 180.34 cm**



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## Example 6

Convert 1 kg to pounds.

### Solution

The chart indicates that 1 pound = 0.4536 kg
We can use that to calculate how many pounds in 1 kg.

**Step 1:** Get an estimation. Because 1 pound does not have 1 full kilogram in it, we know the pound is bigger than 1 kg.

**Step 2:** Use 1 pound = 0.4536 kg (from the chart) to set up a ratio for finding how many pounds in 1 kg.

1 pound : 0.4536 kg
? pounds : 1 kg

**Step 3:** Set up an equation with the ratios.
By dividing 1 pound by 0.4536 kg, you get a unit rate for the number of pounds in 1 kg

$$\frac{?\ \text{lb}}{1\ \text{kg}} = \frac{1\ \text{lb}}{0.4535\ \text{kg}}$$

$$?\ \text{lb} = 1 \div 0.4536$$

$$= 2.2$$

**1 kg is about 2.2 pounds.**

# Digging Deeper
# Practice Questions

1. Luther is 6 feet 2 inches tall. What is his height to the nearest centimetre?

2. If a table does not have the exact conversion you need, the table can still help you to do a conversion.

   Tables cannot have every conversion in them, but you can use a table to make more conversions or expand the conversion table.

   Expand the conversion table.

| Imperial Units of Conversion | | |
|---|---|---|
| **Length** | **Weight and Mass** | **Capacity** |
| 1 inch = 2.54 cm | 1 ounce = 28.35 grams | 1 ounce = 28.41 mL |
| 1 foot = 0.3048 m | 1 pound = 0.4536 kg | 1 pint = 0.57 L |
| 1 mile = 1.609344 km | | 1 quart = 1.14 KL |
| a. 1 yard = _____ cm | c. _____ lb = 1 kg. | d. 1 gallon = ____ litres |
| b. 1 m = _____ feet | | |

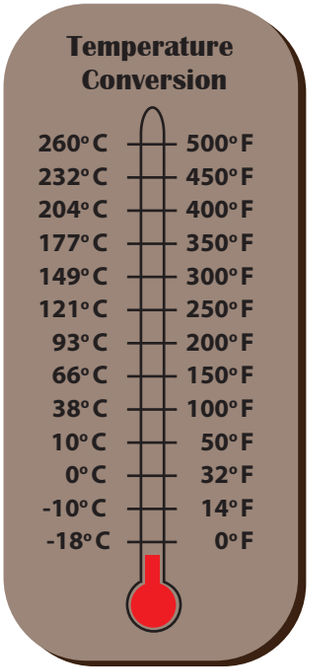
3. Eric is making round table clothes for a catering company that asked for 5 round table clothes each with a diameter of 2 m.

   a. What is the circumference of **each** table cloth? Recall from the previous unit that circumference = pi × diameter.

b. How many **yards** of lace would be needed to go around all the 5 table clothes?

| Imperial Units of Conversion | | |
|---|---|---|
| **Length** | **Weight and Mass** | **Capacity** |
| 1 inch = 2.54 cm | 1 ounce = 28.35 grams | 1 ounce = 28.41 mL |
| 1 foot = 0.3048 m | 1 pound = 0.4536 kg | 1 pint = 0.57 L |
| 1 mile = 1.609344 km | | 1 quart = 1.14 KL |

4. Water freezes at 0° Celsius. What is the temperature in Fahrenheit at 0° Celsius?






5. A formula can be used to convert from degrees Fahrenheit to degrees Celsius.

The formula is $T_C = \frac{5}{9} \times (T_F - 32°)$

$T_C$ means temperature in Celsius and $T_F$ is the temperature in Fahrenheit.

What is 105° Fahrenheit in Celsius? Round to the nearest degree.

6. Earn Coins!

Use $\mathbf{T_C = \frac{5}{9} \times (T_F - 32°)}$ to develop a formula for the temperature in Fahrenheit ($T_F$ = _____). Show your steps.


# Practice Solutions

1. Luther is 6 feet 2 inches tall. What is his height to the nearest centimetre?

**Change to inches only. There are 12 inches/1 foot**

**6 ft × 12 inches/1ft + 2 inches**

**= 72 inches + 2 inches**

**= 74 inches**

**Now convert 74 inches to cm using the conversion table from the course material. (Example 5)**

**1 inch = 2.54 cm**
**74 inches = ? cm**
**Multiply the ratio by 74**
**74× 1 inch = 2.54 cm × 7**
**74 inches = ? cm**

**? cm = 2.54 × 74**

**= 187.96 cm or 188 cm rounded**

**6 ft 2 inches is about 188 cm.**

2. If a table does not have the exact conversion you need, the table can still help you to do a conversion.

Tables cannot have every conversion in them, but you can use a table to make more conversions or expand the conversion table.

Expand the conversion table.

| Imperial Units of Conversion | | |
|---|---|---|
| **Length** | **Weight and Mass** | **Capacity** |
| 1 inch = 2.54 cm | 1 ounce = 28.35 grams | 1 ounce = 28.41 mL |
| 1 foot = 0.3048 m | 1 pound = 0.4536 kg | 1 pint = 0.57 L |
| 1 mile = 1.609344 km | | 1 quart = 1.14 KL |
| 1 yard = _____ cm | _____ lb = 1 kg. | 1 gallon = ____ litres |
| 1 m = _____ feet | | |

a. 1 yard = ___ cm

**Start with 1 yd = 3 feet.**

**×3** **1 ft = 12 inches** / **3 ft = 36 inches** **×3**

**Now, we have 1 yard = 36 inches and we know from the chart that 1 inch = 2.54 cm.**

**×36** **1 inch = 2.54 cm** / **36 inches = 91.44 cm** **×36**

**1 yard = 91.44 cm**
*** Use 2 decimal values in the answer because 2.54 cm has 2 decimal places**

b. 1 m = ___ feet

**Start with 2.54 cm = 1 inch and 100 cm = 1 m.**
**2.54 cm = 1 inch**

**100 cm = ___ inches**
**Let '*x*' be the number of inches in 1 metre.**

$$\frac{\text{1 inch}}{\text{2.54 cm}} = \frac{\text{?inch}}{\text{100 cm}}$$

**100 ÷ 2.54 = x inches**

**39.37 = x inches**

**So, 100 cm or 1 m = 39.37 inches.**
**Now, 39.37 inches = ___ ft**
**12 inches = 1 ft**
**Let F be the number of feet in 39.37 inches.**

$$\frac{\text{F}}{\text{39.37 inches}} = \frac{\text{1 ft}}{\text{12 inches}}$$

$$\text{F} = \frac{39.37}{12}$$

$$= 3.28 \text{ ft}$$

**1 metre is about 3.28 ft.**

c. ___ lb = 1 kg

**From the chart 1 lb = 0.4536 kg**
**Let '*x*' be the number of pounds in 1 kg.**

**x lb = 1 kg**

**Set up a ratio with the unknown on the top**

$$\frac{\text{x lb}}{\text{1 kg}} = \frac{\text{1 lb}}{\text{0.4536 kg}}$$

**x = 1 ÷ 0.4536**

**= 2.2 lb**

**There are about 2.2 lb in 1 kg.**

d. 1 gallon = **x** litres

**1 gallon = ___ litres**
**1 pint = 0.57 L (from the Imperial Chart)**
**1 gallon = 8 pints**

×8 ↷ **1 pint = 0.57 L**
**8 pints = ____ L** ↷ ×8

**8 pints = 0.57 L × 8 = 4.56 L**
**Remember 8 pints = 1 gallon**
**so, 1 gallon = 4.56 L**

3. Eric is making round table clothes for a catering company that asked for 5 round table clothes each with a diameter of 2 m.

   a. What is the circumference of **each** table cloth? Recall from the previous unit that circumference = pi × diameter.

      **C = pi × diameter**

      **diameter = 2 m**

      **C = 3.14 × 2 m**

      **= 6.28 m**

      **The circumference of each table cloth is 6.28 m.**

b. How many **yards** of lace would be needed to go around all the 5 table clothes?

| Imperial Units of Conversion | | |
|---|---|---|
| **Length** | **Weight and Mass** | **Capacity** |
| 1 inch = 2.54 cm | 1 ounce = 28.35 grams | 1 ounce = 28.41 mL |
| 1 foot = 0.3048 m | 1 pound = 0.4536 kg | 1 pint = 0.57 L |
| 1 mile = 1.609344 km | | 1 quart = 1.14 KL |

**Convert 6.28 m to yards**

**Using the conversion chart:**
**0.3048 m = 1 ft and 3 ft = 1 yd**

$$\times 3 \left( \begin{array}{l} 0.3048\ \text{m} = 1\ \text{ft} \\ 0.9144\ \text{m} = 3\ \text{ft} \end{array} \right) \times 3$$

**or**

$$0.9144\ \text{m} = 1\ \text{yd}$$

$$\frac{Y\ \text{yards}}{6.28\ \text{m}} = \frac{1\ \text{yd}}{0.9144\ \text{m}}$$

$$Y = 6.28 \div 0.9144\ \text{m}$$

$$= 6.87\ \text{yards}$$

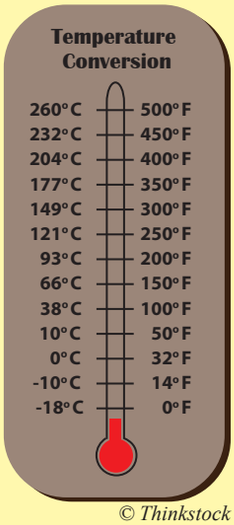
**Eric needs 6.87 yards of lace to put around one table cloth.**

$$\frac{6.87\ \text{yards}}{1\ \text{tablecloth}} \times 5\ \text{tablecloths} = 34.34\ \text{yards}$$

**He needs 34.34 yards of lace total to go around 5 table clothes.**

4. Water freezes at 0° Celsius. What is the temperature in Fahrenheit at 0° Celsius?

**From the thermometer read 0° Celsius on the left and on the right it matches with 32° Fahrenheit.**
**0° Celsius = 32° Fahrenheit**



5. A formula can be used to convert from degrees Fahrenheit to degrees Celsius.

The formula is $T_C = \frac{5}{9} \times (T_F - 32°)$

Where $T_C$ means temperature in Celsius and $T_F$ is the temperature in degrees Fahrenheit. What is 105° Fahrenheit in Celsius?

**$T_F = 105°$**

**$T_C = ?$**

**Use 105° F in the formula in place of $T_F$.**

$$T_C = \frac{5}{9} \times (T_F - 32°)$$

$$= \frac{5}{9} \times (105° - 32°)$$

**Do what is in the brackets first.**

$$T_C = \frac{5}{9} \times (73)$$

**Now, on the calculator type in**

**5 ÷ 9 × 75**

**$T_C = 40.55$**

**$T_C = 41°C$**

**105° F is about 41° C.**

## Check it Out

**Have some fun converting units with Marble Drop Conversions.**

Total
27

# Digging Deeper Assignment

**Now it's time to show your stuff!**
**Put lots of details into your work.**

| Imperial Units of Conversion | | |
|---|---|---|
| **Length** | **Weight and Mass** | **Capacity** |
| 1 inch = 2.54 cm | 1 ounce = 28.35 grams | 1 ounce = 28.41 mL |
| 1 foot = 0.3048 m | 1 pound = 0.4536 kg | 1 pint = 0.57 L |
| 1 mile = 1.609344 km | | 1 quart = 1.14 KL |

(2) 1. Ingrid is 5 feet 3 inches tall. What is her height in cm?

(4) 2. Bert bought 150 cm of cloth. He needs 1 yard. Does he have enough cloth?

3. Decide if the following statements are true or false. Circle your answer. If the statement is false, rewrite it so that it is true.

(2) a. 41 728 inches is equal to 144 feet.

True or False

_____

_____

_____

(2) b. 1 mile is 1609 metres.

True or False

_____

_____

_____

(2) c. 1 gallon = 4 litres.

True or False

_____

_____

_____

4. Donald measured his rectangular living room and found the length to be 25 feet and the width to be 16 feet 5 inches. (P = total distance around.)

(2) a. What is the perimeter of the room?

(3) b. Baseboard goes around the perimeter of the room. Donald can buy base board in 2m strips. How many strips of baseboard does he need to buy for his living room?

(4) 5. Trisha has a landscaping company. Her client asked for a circular rock garden with a diameter of 5 metres. The blocks that Trisha uses for rock gardens are 9 inches long. How many does she need to go around the rock garden? Remember that the circumference of a circle is Circumference = pi $\times$ diameter.

***Use the following formula to answer #6.***

$$T_C = \frac{5}{9} \times (T_F - 32°)$$

Where $T_C$ is temperature in Celsius
$T_F$ is the temperature in Fahrenheit.

6. Lisa has relatives coming to visit her in Grande Prairie for a week in the summer. They are coming from Florida, US. They called to ask what the temperature is as they are planning the clothes they will pack.

   Lisa told her relatives that the temperature is around 28° Celsius. Her relatives then ask if they need to bring winter jackets and mittens even though it is summer.

(2) a. What do you think? Is 28° Celsius cold enough for winter clothes?

(2) b. Convert 28° C to a temperature in Fahrenheit using the formula shown above.

(2) 7. Let's not forget about Tristine and her triathlon. She trained by running 6 miles every Saturday.

She has to run 5 km in the triathlon. Is her training distance more or less than 5 km? Do a conversion to support your answer.

**What sport has the two events, cross country skiing plus target shooting?**

**a. slalom**
**b. biathlon**
**c. sport hunting**

**Call your instructor to give your treasure chest answer and earn coins towards bonus marks.**

# Lesson Summary

**In this lesson, you learned that converting measurements from one system to another is like translating English to another language. The translation is not an exact fit.**

**Estimations can be made to compare related units of measure in two measurement systems.**

**Charts and unit rates or conversion factors can be used to convert related units of measure from Imperial to metric or metric to Imperial to get a close calculation.**

**Please attach your return address label to the back of this booklet and send Unit 4, Lesson C to be marked.**

**Be sure the checklist on the next page is completed. After receiving your marked lesson, you can write the Unit 4 Quiz. Then, proceed to Unit 5 Lesson A.**

# How Did It Go?

Earn coins by filling in the chart below. After your teacher has looked over your checklist and talked with you about the unit, you will be able to write the unit quiz. Please call or e-mail your teacher to talk about your checklist. Your instructor will send your unit quiz with this marked lesson.

| Topics | Good to Go! | Sounds familiar. I might know how. | A little fuzzy. I need to look it up. | Really not sure. I had trouble with this before. | Going to need help. I can't seem to do these. | Never heard of it before. |
|---|---|---|---|---|---|---|
| History of Imperial system | | | | | | |
| History of SI (metric) system | | | | | | |
| Common Imperial units of measure | | | | | | |
| Common metric units of measure | | | | | | |
| Appropriate uses for common units of measure | | | | | | |
| Prefix use in SI (metric) system | | | | | | |
| Base 10 and decimals in SI (metric) system | | | | | | |
| Conversion of SI units to related SI units | | | | | | |
| Fractions in Imperial system | | | | | | |
| Conversion of Imperial units to related Imperial units | | | | | | |
| Use conversion charts | | | | | | |
| Convert SI to related Imperial measures | | | | | | |

# ALBERTA DISTANCE LEARNING CENTRE

## MAT1793

# Math 10-3

### Unit 4: Measurements Systems

### Lesson C: Conversions between Imperial and Metric Measurements

**Student's Questions and Comments**

**FOR STUDENT USE ONLY**

(If label is missing or incorrect)

**File Number:** _____

Please use the correct preprinted label for this course and Assignment Booklet.

Name

Address

City/Town Province Postal Code

Apply Assignment Label Here

**FOR ADLC USE ONLY**

**Assigned to** _____

**Marked by** _____

**Mark:** _____ %

**Date Received:** _____

**Summary**

| | Possible Marks | Your Marks | % |
|---|---|---|---|
| How Does It Work? Assignment | 27 | | |
| Digging Deeper Assignment | 27 | | |

**Teacher's Comments**

_____

**Teacher's Signature**

June 2010