

1.0 - Review of Unit Conversion

September 4, 2019 4:00 PM

Unit 1: Measurement

Topic	Assignment
1.0: Review of Unit Conversion	Worksheet
1.1: Linear Scale Factors & Perimeter	Pg. 5 # 1 – 10
1.2: Scale Diagrams	Pg. 13 # 1, 3 – 7, 10, 9*
1.3: Linear Scale Factors & Area	Pg. 19 # 1 – 8
1.4: Linear Scale Factors, Surface Area, & Volume	Pg. 27 # 1 – 7, 8*

* = Challenge Problem

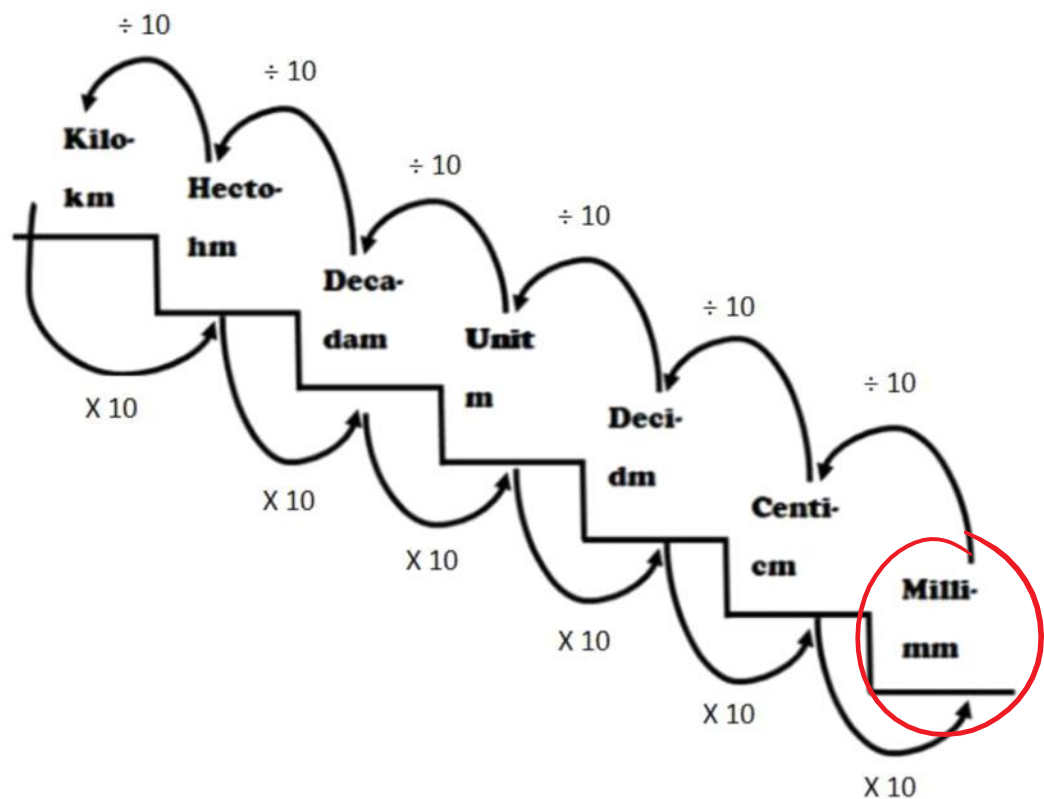
One of the most important skills in measurement is to be able to **convert** between 2 different units. There are a few different ways to do this.

Method 1: SI Conversion Chart

“SI Units” stands for the French term “Système International” which we say in English as the “International System of Units”, or just “SI Units”. The SI units are an agreed-upon collection of units almost all countries around the world share to avoid confusing conversions. It is also known as the “Metric System”.

The SI system is a base ten system, that is, if we use meters as an example, there are 10 millimeters in 1 centimeter, 10 centimeters in 1 decimeter, etc.

We can use the following diagram to help us, or the chart on page 1 of your workbook:



To use this chart, determine what unit you are starting in, and use the corresponding operation to arrive at the unit to wish to be in.

Example

Convert 13m to decimeters

$$13\text{m} \times 10 = 130\text{ dm}$$

Convert 4398 mL to liters

$$4398\text{ mL} \div 10 = 439.8\text{ cL}$$

$$439.8\text{ cL} \div 10 = 43.98\text{ dL}$$

$$43.98\text{ dL} \div 10 = 4.398\text{ L}$$

or

3 steps, so
3 zeroes!

$$\Rightarrow \frac{4398\text{ mL}}{1000} = 4.398\text{ L.}$$

Method 2: Proportional Reasoning

From previous courses, you might have encountered a ratio in the form: $\frac{a}{b} = \frac{c}{d}$

We can use this ratio to convert units. Before we can, however, we need to know a **conversion factor**, such as 1 km is 1000 m, or 12 inches is 1 foot.

This method is particularly useful when converting between an SI unit and an imperial unit. The **imperial system** is another system of units used mainly by the United States which doesn't have convenient conversion factors with the SI system. You can refer to the following chart or the one on page 1 of your workbook:

	Common Imperial	Imperial and SI	SI
Length	1 mile = 1760 yards 1 mile = 5280 feet 1 yard = 3 feet 1 yard = 36 inches 1 foot = 12 inches	1 mile ≈ 1.609 km 1 yard = 0.9144 m 1 foot = 30.48 cm 1 inch = 2.54 cm	1 km = 1000 m 1 m = 100 cm 1 cm = 10 mm
Mass (Weight)	1 ton = 2000 pounds 1 pound = 16 ounces	2.2 pounds ≈ 1 kg 1 pound ≈ 454 g 1 ounce ≈ 28.35 g	1 t = 1000 kg 1 kg = 1000 g

***** You must make sure your units line up in the numerator and the denominator.

Example

Convert 0.05 miles to ~~miles~~ ^{yd.}

1 mi = 1760 yd.

$$\Rightarrow \frac{1 \text{ mi}}{1760 \text{ yd}} = \frac{0.05 \text{ mi}}{x \text{ yd.}}$$

$$\Rightarrow x \text{ yd.} = \frac{1760 \times 0.05}{1} = 88 \text{ yd.}$$

Convert 3 miles to kilometers

1 mi. = 1.609 Km

$$\Rightarrow \frac{1.609 \text{ Km}}{1 \text{ mi.}} = \frac{x \text{ Km}}{3 \text{ mi.}}$$

$$\Rightarrow \frac{1.609 \times 3}{1} = 4.827 \text{ Km}$$

round to nearest tenth:

4.8 Km

Method 3: Unit Analysis / Dimensional Analysis

Unit analysis is often used when multiple conversions are needed. Just like in proportional reasoning, we need to know a conversion factor.

In this method, we start with the amount we're given, and determine what unit we need and select the conversion factor that contains both of those units and turn it in to a fraction. That is, if we take the conversion factor of 12 inches = 1 foot, we can rewrite it as:

$$\underline{\frac{12 \text{ in.}}{1 \text{ ft.}}} \quad \text{OR} \quad \underline{\frac{1 \text{ ft.}}{12 \text{ in.}}}$$

★ The trick here is to put the units we want to **finish with** on **top** and then multiply it by the units we started with so that something interesting happens: ★

Example

$$\frac{x \cdot x}{x} = x$$

Convert 13 mm to cm

We are in millimeters and need to get to centimeters, so our conversion factor must contain both of those units.

$$10 \text{ mm} = 1 \text{ cm} \quad \left| \quad (13 \cancel{\text{mm}}) \left(\frac{1 \text{ cm}}{10 \cancel{\text{mm}}} \right) = \frac{13}{10} \text{ cm} = 1.3 \text{ cm}$$

$$\underline{\frac{10 \text{ mm}}{1 \text{ cm}} \quad \text{or} \quad \frac{1 \text{ cm}}{10 \text{ mm}}}$$

★ It is very important that all units except the one we want to cancel out, otherwise we have made an error.

Example ¹ $1 \text{ km} = 1000 \text{ m}$
₂ $1 \text{ m} = 1000 \text{ mm}$

Convert 3.5 km to mm

$$(3.5 \cancel{\text{km}}) \left(\frac{1000 \cancel{\text{m}}}{1 \cancel{\text{km}}} \right) \left(\frac{1000 \text{ mm}}{1 \cancel{\text{m}}} \right) = 3500000 \text{ mm}$$

* km on
bottom
so they
cancel