

Conversions

This page contains **video notes** to accompany the Conversions video lectures 1 and 2. Fill in the screen captures as the video progresses.

Metric Conversion Factors

(YOU MUST KNOW THESE!)

Milli-

Centi-

Kilo-

Converting from One Unit to Another

How many dozen eggs are in 125 eggs?

Convert 38 kg to g. # PREDICTION _____

Convert 34,509 cl to L. # PREDICTION _____

Convert 0.389 m to cm. # PREDICTION _____

Convert 0.56 km to mm. # PREDICTION _____

Convert 45 km to ft. # PREDICTION _____
1.6 km = 1 mile
1 mile = 5280 ft

Convert 54,000 s to days. # PREDICTION _____

Conversions

Using Dimensional Analysis to Always Get It Right

Dimensional analysis is just a fancy name for a method of calculating that

1. uses numbers in the form of fractions.
2. enables us to convert from one type of unit measurement to another.

It is something you will encounter heavily in this class and can also be useful in your daily lives outside class (cooking, work, etc). This worksheet is intended to help you get comfortable with manipulating numbers in terms of their units (i.e. dimensional analysis). In this worksheet you will encounter some definitions or terms that you may or may not have seen before. These are terms we will be using in the class, so please get to know them. These terms are identified by putting them in **bold** font.

What is a Unit?

A **unit** is something that gives definition to a numerical value, quantity, or measurement. Let us consider “1 mile”. The **unit** involved here is the “mile”. Without the **unit**, you would not know what the 1 is measuring. Now you know it is length because mile is a **unit** used to measure length. Different measurements often times have multiple possible **units** associated with them. For example:

Measurement: Some Possible Units

Length: Meters, centimeters, feet, inches, miles, kilometers

Mass: Kilograms, grams, slugs

Time: Hours, minutes, seconds, days, months

Volume: Cups, teaspoons, liters, milliliters, gallons, quarts

Currency: Dollars, cents, dimes

Turning Numbers (or quantities) into fractions based on their conversion factors

If a quantity does not appear as a fraction, it is possible to put it in a fraction form. Doing this sometimes makes solving **dimensional analysis** problems easier. Remember that numbers and **units** that appear above the fraction line are in the “**numerator**” and numbers and units that appear below the fraction line are in the “**denominator**”. Let’s start with a couple conversions you are familiar with.. How about:

- **eggs**: Eggs are sold in dozens rather than individually so
12 eggs = 1 dozen. (**conversion factor**)

This quantity is not in the form of a fraction. To put it in fraction form, we put the number and **unit** from one side of the **conversion factor** in the **numerator**, and simply put the other number and **unit** from the **conversion factor** in the **denominator**. To make it a fraction there are two ways to look at it:

$$\frac{12 \text{ eggs}}{1 \text{ dozen}} \quad \text{or} \quad \frac{1 \text{ dozen}}{12 \text{ eggs}}$$

Example: If you own a chicken farm and your chickens produce 530 eggs each day, how many dozen eggs are produced?

Setup of the problem:

Step 1: Write down the number and units given in the problem

Example: 530 eggs

Step 2: Place a times (x) sign and a fraction next to the original number.

Example: (530 eggs) x _____

Step 3: Using the fractional conversion factors that relate the two units

$$\frac{12 \text{ eggs}}{1 \text{ dozen}} \quad \text{or} \quad \frac{1 \text{ dozen}}{12 \text{ eggs}}$$

Select the one that has **the unit that you want to get rid of in the denominator**. In this case

$$\frac{1 \text{ dozen}}{12 \text{ eggs}}$$

is the correct choice because we have **530 eggs in the numerator** of our math problem. Therefore our setup will look like:

Example: $(530 \text{ eggs}) \times \frac{1 \text{ dozen}}{12 \text{ eggs}}$

Canceling Units

If a **unit** appears in the **numerator** and the same **unit** appears in the **denominator**, it can be **cancelled** or removed. This **unit** can be in the **numerator** and **denominator** of the same fraction or in two different fractions being **multiplied** together.

$$(530 \cancel{\text{ eggs}}) \times \frac{1 \text{ dozen}}{12 \cancel{\text{ eggs}}}$$

Now it's just math, grab your calculator and let the setup tell you what to do. Any number in the numerator you multiply by and any number in the denominator you divide by. In this case, take 530, multiply by 1 and then divide by 12.

$$(530 \cancel{\text{ eggs}}) \times \frac{1 \text{ dozen}}{12 \cancel{\text{ eggs}}} = 44.2 \text{ dozen}$$

This process can be repeated multiple times in order to convert to any unit.

Dimensional Analysis Practice Worksheet

There are 10 practice problems in this worksheet. Each problem involves changing a quantity (the **given** quantity) from one type of **unit** to another in a step by step manner. All 10 problems indicate how many **conversion factors** you will need to use in order to get to the final answer. Problems one through five indicate the **units** involved in each step. For problems six through ten you will have to determine the **units** involved in each step yourself.

1) Convert 56 mg to grams

$$56 \text{ mg} \times \frac{\text{g}}{\text{mg}} = \text{g}$$

2) Convert 240 km to m

$$240 \text{ km} \times \frac{\text{m}}{\text{km}} = \text{m}$$

3) Convert 2 in to m (1 in = 2.54 cm)

$$2 \text{ in} \times \frac{\text{cm}}{\text{in}} \times \frac{\text{m}}{\text{cm}} = \text{m}$$

4) Convert 500 ft to m (1 m = 3.28 ft)

$$500 \text{ ft} \times \frac{\text{m}}{\text{ft}} = \text{m}$$

5) Convert 3 weeks to minutes

☆
$$3 \text{ week} \times \frac{\text{day}}{\text{wk}} \times \frac{\text{hours}}{\text{day}} \times \frac{\text{min}}{\text{hr}} = \text{min}$$

6) Convert 50 kg to g

$$50 \text{ kg} \times \text{ } = \text{g}$$

7) Convert 8500 mm to km

$$8500 \text{ mm} \times \text{ } \times \text{ } =$$

8) Convert 50 ml to cups (1 L = 4.226 cups)

$$50 \text{ ml} \times \text{ } \times \text{ } =$$

9) Convert 3 yards to inches

$$3 \text{ yd} \times \text{ } \times \text{ } =$$

10) 124 miles to cm (1 mi = 5280 ft)

☆
$$124 \text{ miles} \times \text{ } \times \text{ } \times \text{ } =$$

Room measurements

Task 1: Measure the height of the door in cm.

Convert your measurement to meters.

Task 2: Measure the height of a computer station in mm.

Convert your measurement to meters.



Task 3 (hallway): There are two pieces of tape marked on the wall in the hallway. The two pieces of tape are 30 meters apart. Using a stopwatch determine the speed you normally walk at in m/s. $\left(v = \frac{d}{t} \right)$

Task 4: Measure the area of the classroom in a metric unit you think makes the most sense for an object of this size. (Hint: **area = length x width**)

