Activity 3.2 Unit Conversion

Introduction

Engineers of all disciplines are constantly required to work with measurements of a variety of quantities – length, area, volume, mass, force, time, temperature, electric current, etc. It is often necessary to be able to express those measurements in different units. For example, when designing a water distribution piping system, it is important to know how much water pressure is lost as the fluid flows through the pipe. The pressure loss depends on the length of the pipe which is often measured in *miles*. One formula that is sometimes used to calculate pressure loss requires that the pipe length be input in *feet*. Therefore, it is necessary to be able to convert miles to feet.

In other situations you may be forced to work between the SI and U S Customary measurement systems. Say, for example, that as a U S company, your product is manufactured and produced based on U S Customary units. However, a European company would like a proposal to incorporate your system into their existing assembly line, the characteristics of which are based on SI units. You must be able to convert between the two systems in order to provide a proposal for a design which includes your company's U S product.

In this activity you will convert measurements among units in both the U S Customary System and the SI system, and you will convert quantities between the two systems of measurement. You will also gain experience with converting units among units that are not specific to one measurement system (such as people and tanks of water) and use the skills you learn to solve everyday problems (such as calculating the cost of gas to travel a given distance).

Equipment

- Engineering notebook
- Pencil
- Ruler – U S Customary and metric
- Tape measure
- PLTW Engineering Formula Sheet

Procedure

Complete each of the following. When a calculation is required, show your work.

1. Write an equation that shows the equivalency between meters and Gigameters.

2. What conversion factor should be used to convert from meters to Gigameters?

3. Convert each of the following quantities to the indicated units. Use the appropriate number of significant figures to express your answer unless directed otherwise.

    a. 4.567 trillion (4,567,000,000,000) meters to Gigameters.

    b. 14520 milliliters to liters. Report to the nearest hundredth of a liter.

    c. 43 thousand microseconds to seconds. Report to the nearest thousandth of a second.

    d. 6.30 yards to feet.

    e. 0.55 feet to inches.

    f. 9 ft – 2 ½ in. to inches. Report answer using fractional inches.

    g. 3 ft – 5 inches to decimal feet. Report to the nearest hundredth of a foot.

    h. 59.2 cm to inches.

    i. 3.20 yards to inches.

j. 350.0 billion nanoliters to decaliters.

4. A village on a Caribbean island was devastated by a hurricane. The supply of fresh water was contaminated when the storm surge washed over the island, inundating the wells. Several tanks of fresh water were delivered to the village. Each tank contains 10.5 hectoliters of water.

   a. How many liters of water does each tank contain?

   b. On any given day, one person needs an average of 2.5 liters of water to survive. How many *people* will a tank supply for the day? Hint: Create a conversion factor to convert from liters to people.

   c. If the village (which includes people and livestock) requires a total of 430 liters of water each day, approximately how long (in *days*) will one tank provide an adequate supply for the village? Give your answer to the nearest tenth of a day. Hint: Create a conversion factor to convert form liters to days.

      [Challenge] Convert the result to days and hours. Give your answer to the nearest hour.

5. It is 3.67 miles to your grandparents' home.

   a. If you can walk 4 miles in one hour, how long will it take for you to walk to your grandparents' home? Express your answer in decimal hours and then convert the time to minutes (to the nearest minute).

      Hours: _____

      Minutes: _____

   b. If your average stride length is 2.6 feet, how many strides will it take you to walk to your grandparents' home? Hint: You will need two conversion factors.