Chapter 5 Project

Confused Conversions

An activity to investigate the proper use of conversions between systems of measurements in real life.

Imagine talking to your European friend and you remark that the daily high was 30 degrees. Things can get a little confusing: 30 °F is a cold snap while 30 °C is a very warm summer day. This confusion could be avoided by making sure that you are clear about which system's units you are using.

Could confusing measurements between the metric system and the US system cause more harm than just a misunderstanding? We will explore some real-life situations where things didn't go very well.

1. In 1983, Air Canada Flight 143, the infamous Gimli Glider made an emergency landing in Gimli, Manitoba, when it ran out of fuel midair. The mistake can be traced to a refueling procedure: the plane was supposed to be fueled using kilograms, but it was instead refueled using pounds.

   a. Considering that there are approximately 0.454 kilograms in one pound, determine the number of kilograms in 100 pounds of fuel.

   b. Suppose an empty tank can hold 400 kilograms of fuel. Instead, 400 pounds of fuel are added to the tank. How many more kilograms of fuel would be needed to get a full tank?

2. In 1998, NASA had a slight miscommunication with the Mars Climate Orbiter. This was a $125-million spacecraft designed to study Mars's atmosphere. It was forever lost in space once it was made to accelerate too quickly.

   a. The standard metric unit for impulse is the Newton-second (N · s) while the customary English unit is the pound-second (lb · s). We know that one Newton is approximately equal to 4.45 pounds. What is the value of 250 N · s in lb · s?

   b. The Mars Climate Orbiter was calibrated to receive impulse information in N · s but NASA inadvertently converted the number to lb · s. How many times larger was the impulse value that was relayed to the orbiter compared to the correct value.

3. A grain is a unit of measure equal to about 0.065 grams. In 1999, the Institute for Safe Medication Practices reported a case of a patient who received 0.5 *grams* of phenobarbital (a sedative) instead of the prescribed 0.5 *grains*.

   a. Determine the dose in grains of 0.5 grams of phenobarbital. Round to the nearest tenth.

   b. What is a possible consequence of giving a patient 0.5 grams instead of 0.5 grains?

4. Perform an internet search for "Verizon cents versus dollars." This is a video of a customer disputing their data charges with a cellphone carrier. Explain how his billing issue is related to our confused conversions problems.

5. Have you ever found yourself in a situation where a misunderstanding about units and conversions created a problem? Either describe your own situation or research one on the internet.