Unit Conversions Practice Problems

Rate Problems

Problem 1: Imagine that you are driving your car in Canada. As you're driving along, you notice that the speed limit signs have numbers like 120 (on the highway) and 50 (in the city). As you start to speed up, you realize that the signs are in km/hour. Unfortunately, your speedometer only reads in mi/hour. Figure out how fast you're allowed to go if the sign says:

1. 120 km/hr

2. 75 km/hr

3. 50 km/hr

Density Conversions *(multiple step problems)*

Problem 2: Geologists' observations suggest that the two most common rocks exposed at the surface of the Earth are granite (continental crust) and basalt (oceanic crust). From travel times of earthquake waves, we also know that the average density of the Earth is about 5.5 g/cm^3. See if you can do some unit conversions using information given in the questions below to determine whether the whole Earth could be made of these two rock types only.

1. As an astute observer walking around on continental crust (granite), you might decide to test the hypothesis that the Earth is made entirely of granite. You weigh a 1.00 cubic ft piece of granite on your home scale and find that it weighs 171 lbs. Thus you determine that the granite has a density of 171 lb/ft^3. Convert your granite's density to g/cm^3. Given the information above, could the earth be made completely of granite?

2. Given that basalt seems to well up when ocean crust pulls apart at Mid-Ocean ridges, you might decide that maybe the entire Earth is made of basalt. On your bathroom scale, a 64 in^3 (4in x 4in x 4in) block of basalt weighs 116 ounces. Use this information to calculate whether the average density of the Earth (5.5 g/cm^3) can be explained by an Earth made completely of basalt.

Scaling problems

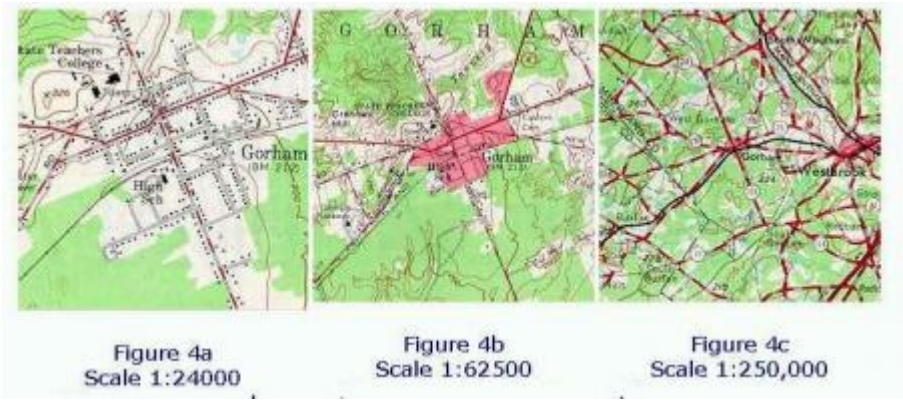

Figure 4a
Scale 1:24000

Figure 4b
Scale 1:62500

Figure 4c
Scale 1:250,000

Problem 3: You are working with a map that has a fractional scale of 1:24,000 (meaning that 1 unit on the map is equal to 24,000 units on the ground - 1mm = 24,000 mm or 1 in = 24,000 in). See if you can determine solutions to the following problems that geologists face when working with maps.

1. You are hiking to a field area and measure the length of the trail as 18.5 inches. Calculate how many miles you have to hike to get to the interesting rocks/geology?

2. Once you get to your field area, you are going to create a geologic map of that area. You have a mechanical pencil that has a lead that is 0.3 mm thick. The smallest feature you can map will be something that is 0.3 mm wide on the map. How wide (in m) can that feature be?

3. Now you have an idea of the size of features that can be drawn on your map. Convert your answer in problem 2.2 to feet.