Chapter 8 Project

Going to Extremes!

An activity to demonstrate the use of signed numbers in real life.

When asked what the highest mountain peak in the world is, most people would say Mount Everest. This answer may be correct, depending on what you mean by highest. According to geology.com, there may be other contenders for this important distinction.

The peak of Mount Everest is 8850 meters or 29,035 feet above sea level, giving it the distinction of being the mountain with the highest altitude in the world. However, Mauna Kea is a volcano on the big island of Hawaii whose peak is over 10,000 meters above the nearby ocean floor, which makes it taller than Mount Everest. A third contender for the highest mountain peak is Chimborazo, an inactive volcano in Ecuador. Although Chimborazo only has an altitude of 6310 meters (20,703 feet) above sea level, it is the highest mountain above Earth's center. Most people think that the Earth is a sphere, so how could a mountain that is only 6310 meters tall be higher than a mountain that is 8850 meters tall? Because the Earth is really not a sphere but an "oblate spheroid". It is widest at the equator. Chimborazo is 1° south of the equator which makes it about 2 km farther from the Earth's center than Mount Everest.

What about the other extreme? What is the lowest point on Earth? As you might have guessed, there is more than one candidate for that distinction as well. The lowest exposed area of land on Earth's surface is on the Dead Sea shore at 413 meters below sea level. The Bentley Subglacial Trench in Antarctica is the lowest point on Earth that is not covered by ocean but it is covered by ice. This trench reaches 2555 meters below sea level. The deepest point on the ocean floor occurs 10,916 meters below sea level in the Mariana Trench in the Pacific Ocean.

1. Calculate the **difference** in elevation between Mount Everest and Chimborazo in both meters and feet. What operation does the word **difference** imply?

2. Write an expression to calculate the **difference** in elevation between the peak of Mount Everest and the lowest point on the Dead Sea shore in meters and simplify.

3. If you were to travel from the bottom of the Mariana Trench to the top of Mount Everest, how many meters would you travel?

4. If Mount Everest were magically moved and placed at the bottom of the Mariana Trench, how many meters of water would lie above Mount Everest's peak?

5. How much farther below sea level (in meters) is the Mariana Trench as compared to the Dead Sea shore?

6. Add the elevations (in meters) together for Mount Everest, Chimborazo, the Dead Sea Shore, the Bentley Subglacial Trench, and the Mariana Trench and show your result. Is this number positive or negative? Would this value represent an elevation above or below sea level?

7. Convert the results in Problems 2 through 4 above to feet using the conversion factor 1 meter = 3.28 feet. Do not round your answers.

8. Convert the results in Problem 7 from feet to miles using the conversion factor 1 mile = 5280 feet. (Round your answers to the nearest thousandth.)

9. Using the height of Mount Everest in meters as an example, the conversions in Problems 7 and 8 could have been combined to do the conversion from meters directly to miles by using the following sequence of conversion factors:

$$8850 \text{ m} \cdot \frac{3.25 \cancel{\text{ ft}}}{1 \cancel{\text{ m}}} \cdot \frac{1 \cancel{\text{ m}}}{5280 \cancel{\text{ ft}}} = 5.498 \text{ miles}$$

(A mountain peak over 5 miles high!)

*Now notice that in doing the conversions, the units for meters and feet cancel out since they appear in both the numerator and denominator, leaving only the unit of miles in the numerator of your result. This is called **unit analysis** and is extremely helpful in converting measurements to make sure you end up with the correct answer and the correct units on your result.*

Now verify that this sequence of conversions works by taking the results from Problems 2 through 4 and applying both conversion factors above. How do your results compare to the results from Problem 8? (Round your answers to the nearest thousandth.)

10. There is more than one way that this conversion could have been performed. Using the conversion factors 1 km = 1000 m and 1 mile = 1.61 km, convert the results in Problems 2 through 4 from meters to miles by using these factors in sequence similar to Problem 9 and performing a **unit analysis**. (Round your answer to the nearest thousandth.) Do you get **exactly** the same results? Why do you think this is so?