Relative Growth — Math 111

One of the most common ways to talk about growth is with percentages. This type of growth is called **relative growth** because it is stated relative to the size of the population that is growing with a percentage. For example, 5% growth of the United States population would be a lot, because the US population is large. The best way to understand relative growth is to convert percentage increases and decreases into **growth factors**.

$$\textbf{Growth factor} = 100\% + \text{percent change}$$

A growth factor is also the ratio of the new amount divided by the old amount.

$$\textbf{Growth factor} = \frac{\text{new amount}}{\text{old amount}}$$

1. The US population in 2010 was 310 million. In 2000 it was 282 million. What is the growth factor? What is the percent change?

2. Average family health insurance premiums in the US increased 26% between 2009 and 2014. If the average premium was $13,300 in 2009, what is the average premium in 2014?

3. The price of oil fell by 48% in 2015. What is the growth factor?

Caution: You cannot add and subtract percent changes. That is not how they work. But you can multiply growth factors.

4. Suppose that the population of a town increases 70% one decade. The next decade the population decreases by 30%. In the third decade, the population increases by 10%. What is the percentage change in the town's population over the last 30 years?

5. If my wealth increases by 5% one year, but decreases by 5% the next year, why won't I be back to where I to where I started? Explain.

6. How much more fuel efficient is a car that gets 40 MPG versus one that gets 34 MPG as a percentage, i.e., what is the relative increase in fuel economy?

7. How much more fuel efficient is a car that gets 18 MPG versus one that gets 14 MPG as a percentage?

8. Based on your answers to the last two questions, which do you think would be more valuable for the environment, increasing the fuel economy of a large SUV by 4 MPG or increasing the fuel economy of a compact car by 6 MPG?

Remember repeated multiplication is the same as a power. This can help when applying the same growth factor many times.

9. If the population grows by 1% every year for a decade, what is the growth factor for the whole decade? What is the percent increase for the whole decade?

10. Which would be better: to invest your money in a mutual fund that grows 0.8% every month, or to invest in a fund that grows 10% every year?