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**.

Growth factor = 100% + percent change

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

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?