Name: _____   Date: _____

MINDFUL MANIPULATION OF PERCENTS
COMMON CORE ALGEBRA II

Percents and phenomena that grow at a constant percent rate can be challenging, to say the least. This is due to the fact that, unlike linear phenomena, the growth rate indicates a constant multiplier effect instead of a constant additive effect (linear). Because constant percent growth is so common in everyday life (not to mention in science, business, and other fields), it's good to be able to **mindfully manipulate percents**.

Exercise #1: A population of wombats is growing at a constant percent rate. If the population on January 1st is 1027 and a year later is 1079, what is its yearly percent growth rate to the nearest *tenth* of a percent?

Exercise #2: Now let's try to determine what the percent growth in wombat population will be over a decade of time. We will assume that the rounded percent increase found in *Exercise #1* continues for the next decade.

(a) After 10 years, what will we have multiplied the original population by, rounded to the nearest hundredth? Show the calculation.

(b) Using your answer from (a), what is the decade percent growth rate?

Exercise #3: Let's stick with our wombats from Exercise #1. Assuming their growth rate is constant over time, what is their monthly growth rate to the nearest tenth of a percent? Assume a constant sized month.

Exercise #4: If a population was growing at a constant rate of 22% every 5 years, then what is its percent growth rate over a 2 year time span? Round to the nearest tenth of a percent.

(a) First, give an expression that will calculate the single year (or yearly) percent growth rate based on the fact that the population grew 22% in 5 years.

(b) Now use this expression to calculate the percent growth over 2 years.

Exercise #5: World oil reserves (the amount of oil unused in the ground) are depleting at a constant 2% per year. We would like to determine what the percent decline will be over the next 20 years based on this 2% yearly decline.

(a) Write and evaluate an expression for what we would multiply the initial amount of oil by after 20 years.

(b) Use your answer to (a) to determine the percent decline after 20 years. Be careful! Round to the nearest percent.

Exercise #6: A radioactive substance's half-life is the amount of time needed for half (or 50%) of the substance to decay. Let's say we have a radioactive substance with a half-life of 20 years.

(a) What percent of the substance would be radioactive after 40 years?

(b) What percent of the substance would be radioactive after only 10 years? Round to the nearest tenth of a percent.

(c) What percent of the substance would be radioactive after only 5 years? Round to the nearest tenth of a percent.

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MINDFUL MANIPULATION OF PERCENTS
COMMON CORE ALGEBRA II HOMEWORK

APPLICATIONS

1. A quantity is growing at a constant 3% yearly rate. Which of the following would be its percent growth after 15 years?

   (1) 45%   (3) 56%

   (2) 52%   (4) 63%

   _____

2. If a credit card company charges 13.5% yearly interest, which of the following calculations would be used in the process of calculating the monthly interest rate?

   (1) $\dfrac{0.135}{12}$ (3) $(1.135)^{12}$

   (2) $\dfrac{1.135}{12}$ (4) $(1.135)^{1/12}$

   _____

3. The county debt is growing at an annual rate of 3.5%. What percent rate is it growing at per 2 years? Per 5 years? Per decade? Show the calculations that lead to each answer. Round each to the nearest tenth of a percent.

4. A population of llamas is growing at a constant yearly rate of 6%. At what rate is the llama population growing per month? Please assume all months are equally sized and that there are 12 of these per year. Round to the nearest tenth of a percent.

5. Shana is trying to increase the number of calories she burns by 5% per day. By what percent is she trying to increase per week? Round to the nearest tenth of a percent.

6. If a bank account doubles in size every 5 years, then by what percent does it grow after only 3 years? Round to the nearest tenth of a percent. Hint: First write an expression that would calculate its growth rate after a single year.

7. An object's speed decreases by 5% for each minute that it is slowing down. Which of the following is closest to the percent that its speed will decrease over half-an hour?

(1) 21%   (3) 48%

(2) 79%   (4) 150%

                                                      _____

8. Over the last 10 years, the price of corn has decreased by 25% per bushel.

(a) Assuming a steady percent decrease, by what percent does it decrease each year? Round to the nearest tenth of a percent.

(b) Assuming this percent continues, by what percent will the price of corn decrease by after 50 years? Show the calculation that leads to your answer. Round to the nearest percent.