Name: _____   Date: _____

PERCENT INCREASE AND DECREASE
COMMON CORE ALGEBRA I

In the last lesson we learned a quick way to find a percent of a total. In this lesson, we would like to develop and understand methods for increasing and decreasing a number by a certain percent. We will start with the increasing case.

Exercise #1: Agronomists are studying how quickly the population of an invasive species of beetle will increase in a controlled farm setting. They calculate that the population is increasing at a steady rate of 6% per week. At the beginning of the week, the population was 350 beetles.

(a) Find the population of beetles a week later by first finding 6% of 350 and adding it to the original population.
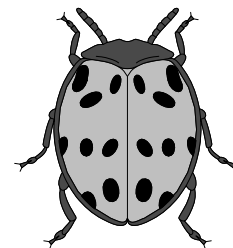
(b) Find the population of beetles a week later by a single multiplication. Why does this work?

(c) What will be the beetle population after two weeks?

The ability to increase a total by a certain percent using this method is important. Get some **fluency** with it in the next problem.

Exercise #2: Find the result of each of the following. Many of your answers will involve decimals. Do not round.

(a) Increasing 440 by 12%

(b) Increasing 68 by 8%

(c) Increasing 120 by 3.5%

Exercise #3: Adriana has a saving account that promises to increase her balance by 2.5% per year. If she deposits $720 in it at the beginning of the year, which of the following would be her balance at the end of the year if she does not withdraw or deposit any additional money?

(1) $900

(3) $738

(2) $842

(4) $756

We would also like to work with decreasing by a certain percent. This will follow a similar, if not identical, pattern to the increasing case. Again, let's understand what is going on with an introductory problem.

Exercise #4: A cup of coffee is cooling down such that its temperature is decreasing at a constant rate of 8% per minute. Let's say the coffee starts at a temperature of 200 °F.

(a) Find its temperature after one minute by finding 8% of 200 and then subtracting.

(b) Find its temperature after one minute by finding a single product. How can you interpret this in terms of the 8%?

(c) What will the temperature of the coffee be after two minutes? Round to the nearest degree.

Decreasing by a certain percent is an important skill to be **fluent with** as well. It often is harder for students because they need to think about **what percent remains**.

Exercise #5: The enrollment of students at a school is decreasing at a constant rate of 5% per year.

(a) What percent remains after one year?

(b) If the population this year is 2300, what will its population be next year? Do in a single calculation.

Exercise #6: Find the result of each of the following. Many of your answers will involve decimals. Do not round. Write the calculations you use to find yours answers.

(a) Decrease 620 by 10%   (b) Decrease $22.50 by 8%   (c) Decrease 122 by 3.5%

Exercise #7: The cost of gasoline has decreased recently by 4.5%. If it started at $3.80 per gallon, which of the following is its price after the decrease?

(1) $3.63/gal   (3) $3.22/gal

(2) $3.72/gal   (4) $3.97/gal

PERCENT INCREASE AND DECREASE
COMMON CORE ALGEBRA I HOMEWORK

FLUENCY

1. Perform each of the following calculations using a single multiplication. Show the product that you use to find your final answer. Do not round your final answers.

   (a) Increase 350 by 5%   (b) Increase 120 by 10%   (c) Increase 34 by 2%

   (d) Increase $450 by 3.5%   (e) Increase $1,300 by $6\frac{1}{2}$%   (f) Increase 2,698 by $2\frac{3}{4}$%

2. Perform each of the following calculations using a single multiplication. Show the product that you use to find your final answer. Do not round your final answers.

   (a) Decrease 160 by 10%   (b) Decrease 450 by 6%   (c) Decrease 122,000 by 12%

   (d) Decrease $1,820 by 3%   (e) Decrease $12,500 by 15%   (f) Decrease $4.50 by 8%

APPLICATIONS

3. A population of bacteria is growing at a rate of 20% per hour. If the population starts at 320, what is it an hour later?

   (1) 360   (3) 372

   (2) 356   (4) 384

4. The price of oil, in dollars per barrel, declined last week by 3.5%. If it started the week at $102.00 per barrel, at what per barrel price did it end the week?

   (1) $98.43   (3) $99.12

   (2) $98.50   (4) $100.56

5. A savings account grows by 3% per year. Sofia places $500 in the account at the beginning of the year.

   (a) How much does Sofia have at the end of the year once her $500 has been increased by 3%?

   (b) How much does Sofia have at the end of the second year based on increasing your answer from part (a) by 3%?

   (c) Did the amount of money in Sofia's account grow faster the first year or the second year? Explain how you arrived at your answer. Use proper units in your explanation.

6. An environmental firm is removing pollution from a river bed. They find that the pollution is decreasing at a rate of 5% per month, as measured by parts per million. The pollution starts off at a level of 360 parts per million (ppm).

   (a) What is the pollution level one month after they begin clean-up? Use appropriate units.

   (b) What is the level two months after? Use appropriate units.

REASONING

Percents build on one another in strange ways. It would seem that if you increased a number by 5% and then increased its result by 5% more, the overall increase would be 10%.

7. Let's do exactly this with the easiest number to handle in percents.

   (a) Increase 100 by 5%

   (b) Increase your result form (a) by 5%.

   (c) What was the overall percent increase of the number 100? Why is it not 10%?