Unit 4, Lesson 8

Percent Increase and Decrease with Equations

Let's use equations to represent increases and decreases.

8.1 Math Talk: Starting with 50

Solve each equation mentally.

- $a \cdot 50 = 10$
- $b \cdot 50 = 60$
- $c \cdot 50 = 51$
- $d \cdot 50 = 49$

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8.2 Matching Equations

For each situation:

- Draw a diagram to represent the situation.
- Match an equation to the situation.
- Solve the equation to find the initial value, x.

$0.32x = 52$

$0.68x = 52$

$1.32x = 52$

$1.68x = 52$

1. The water level in a reservoir is now 52 meters. If this was a 32% increase, what was the initial depth?

   Diagram:

   Equation:

   Solution:

2. The snow is now 52 inches deep. If this was a 68% decrease, what was the initial depth?

   Diagram:

   Equation:

   Solution:

3. Write a story for one of the equations that doesn't have a match.

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Are you ready for more?

An astronaut was exploring a distant planet and found some glowing goo at the bottom of a very deep crater. She brought a 10-gram sample of the goo to her laboratory. When the goo was exposed to light, the total amount of goo increased by 100% every hour.

1. How much goo will she have after 1 hour? After 2 hours? After 3 hours? After n hours?

2. When she put the goo in the dark, it shrank by 75% every hour. How many hours will it take for the goo that was exposed to light for n hours to return to the original size?

8.3 Decorating Fabric

Write an equation to represent each situation. Then, solve the equation.

1. A piece of fabric weighed 15 ounces. After it was decorated with zardozi, the weight had increased by 82%. What is the weight of the finished piece?

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2. Another finished zardozi piece weighs 22 ounces. This is a 76% increase from the original weight of the fabric. What was the original weight?

3. Before making a mola, the layers of fabric weighed 4.7 ounces. When the mola was finished, the weight had decreased by 17%. What is the weight of the finished mola?

4. Another finished mola weighs 4.9 ounces. This is a 21% decrease from the original weight of the fabric. What was the original weight?

Are you ready for more?

A piece of fabric weighed 12 ounces. After it was decorated with zardozi, the finished piece weighed 27 ounces. By what percentage did the weight increase? Explain your reasoning.

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8.4 Representing Percent Increase and Decrease: Equations

1. Last year, scientists counted 12 foxes in a conservation area. This year, they counted 50% more than that. How many foxes did they count this year?

   Explain why this situation can be represented by the equation $(1.5) \cdot 12 = f$. Make sure that you explain what f represents.

2. Write an equation to represent each of the following situations.

   a. After replacing some grass with rocks, a business decreased its water usage by 20%. If their old water usage was 15,000 gallons per week, how much do they use now?

   b. After a 25% discount, the price of a T-shirt was $12. What was the price before the discount?

   c. Compared to last year, the population of Boom Town has increased by 25%.The population is now 6,600. What was the population last year?

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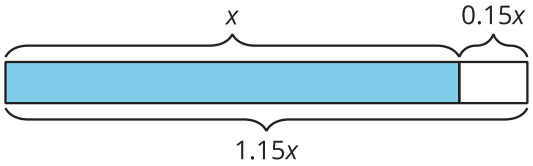
Lesson 8 Summary

We can use equations to express percent increase and percent decrease.

For example, if y is 15% more than x, we can represent this by using any of these equations:

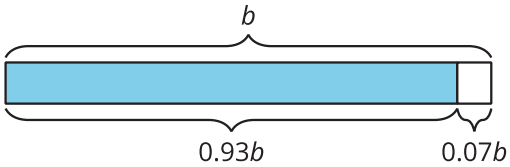
$$y = x + 0.15x \qquad y = (1 + 0.15)x \qquad y = 1.15x$$



So if someone makes an investment of x dollars, and its value increases by 15% to reach $1,250, then we can write the equation $1.15x = 1{,}250$ to find the value of the initial investment.

Here is another example: if a is 7% less than b, we can represent this by using any of these equations:

$$a = b - 0.07b \qquad a = (1 - 0.07)b \qquad a = 0.93b$$



So if the amount of water in a tank decreased 7% from its starting value of b to its ending value of 348 gallons, then we can write $0.93b = 348$.

Often, an equation is the most efficient way to solve a problem involving percent increase or percent decrease.

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