3.3 From Pouches to Variables

Writing Equations

In the last Problem, you used pictures of pouches and gold coins to solve equations. Your solutions maintained the equality of the coins on both sides of the equal sign. For example, you might have removed (or subtracted) the same number of coins or pouches from each side of the equation. To better understand how to maintain equality, let's look first at numerical statements.

The equation $85 = 70 + 15$ states that the quantities 85 and $70 + 15$ are equal.

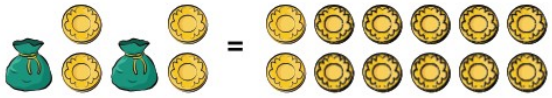
What do you have to do to maintain equality if you:

- subtract 15 from the left-hand side of the original equation?
- add 10 to the right-hand side of the original equation?
- divide the left-hand side of the original equation by 5?
- multiply the right-hand side of the original equation by 4?

Try your methods on another example of equality. Summarize what you know about maintaining equality between two quantities.

Throughout this Unit, you have been solving equations with two variables. Sometimes the value of one variable is known, and you want to find the value of the other variable. In this Problem, you will continue to find the value of a variable without using a table or a graph. You will learn to use *symbolic* methods to solve a linear equation.

The picture below shows a situation from Problem 3.2.



Because the number of gold coins in each pouch is unknown, you can let x represent the number of coins in one pouch. You can let 1 represent the value of one gold coin.

You can write the following equation to represent the situation:

$$2x + 4 = 12$$

Or, you can use Nichole's method from Problem 3.2 to write this equation:

$$2(x + 2) = 12$$

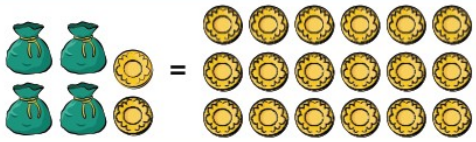
The expressions $2x + 4$ and $2(x + 2)$ are **equivalent expressions.** Two or more expressions are equivalent if they have the same value, regardless of what number is substituted for the variable. These two expressions are an example of the Distributive Property for numbers.

$$2(x + 2) = 2x + 4$$

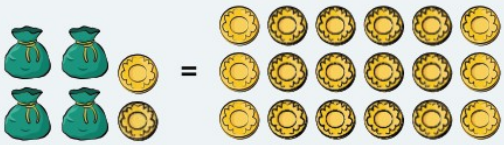
In this Problem, you will revisit situations with pouches and coins, but you will use symbolic equations to represent your solution process.

Problem 3.3

A For each situation, find the number of coins in each pouch. Record your answers in a table like the one shown.

Picture	Steps for Finding the Coins in Each Pouch	Solution Using Equations
		

- In the second column, use your method from Problem 3.2 to find the number of gold coins in each pouch. Record your steps.
- In the third column, write an equation that represents the situation. Use x to represent the number of gold coins in each pouch. Use the number 1 to represent each coin. Then, use your equation to find the number of gold coins in each pouch.
- Check your answers.

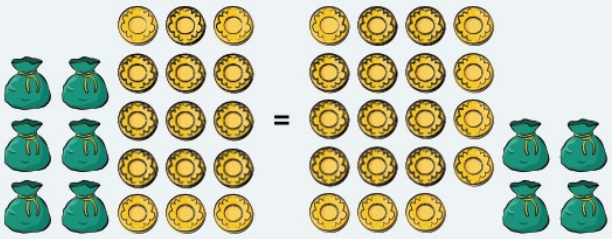
1. 

2. 

3. 

Problem 3.3 continued

4.



5. Describe two situations in Question A for which you could write more than one equation to represent the situation.

B For each equation:

- Use your strategies from Question A to solve the equation.
- Check your answer.

1. $30 = 6 + 4x$
2. $7x = 5 + 5x$
3. $7x + 2 = 12 + 5x$
4. $2(x + 4) = 16$

C Describe a general method for solving equations using what you know about equality.

ACE Homework starts on page 69.