Good Morning!

Today you will need:

- **Pencil**
- **Lab sheet (I will pass out**
- **Class Notebook**

Investigation 3

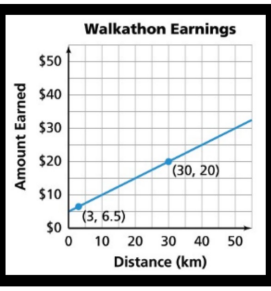
2 + 3.3

Solving Equations

In the last Investigation, you examined the patterns in the table and graph for the relationship relating Alana's distance d and money earned A in the walkathon.

The equation $A = 5 + 0.5d$ is another way to represent that relationship. The graph of the relationship is a line that contains infinitely many points. The coordinates of each point can be substituted into the equation to make a true statement. The coordinates of these points are solutions to the equation.

For example, the point (3, 6.5) lies on the line of $A = 5 + 0.5d$. This means that $d = 3$, $A = 6.5$, and $6.5 = 5 + 0.5(3)$ is a true statement. So, the coordinate pair (3, 6.5) is a solution to the equation.



- Does the point (30, 20) lie on the line? Is it a solution to the equation? Explain.
- Does the point (20, 20) lie on the line? Is it a solution to the equation? Explain.
- What happens if you choose a point that is not visible on this section of the graph, such as (70, 40)? Is it on the line? Explain.

The corresponding entries in a table are the coordinates of points on the line representing the equation $A = 5 + 0.5d$. So, we can also find a solution to an equation by using a table.

d	A
0	5
1	5.5
2	6
3	6.5
4	7
20	15
25	17.5
30	20

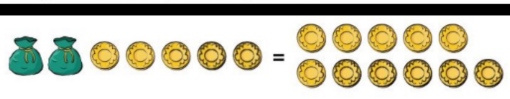
- How could you find the value of d that corresponds to $A = 30$ in the table?

3.2 Mystery Pouches in the Kingdom of Montarek

Exploring Equality

In the Kingdom of Montarek, money takes the form of $1 gold coins called rubas. Messengers carry money between the king's castles in sealed pouches that always hold equal numbers of coins.

One day a messenger arrived at one of the castles with a box containing two sealed pouches and five loose $1 coins. The ruler thanked the messenger for the money, which equaled $11.



In this Problem, you will solve more problems involving mystery pouches.

In the following problems, each pouch contains the same number of $1 gold coins, and the total number of coins on each side of the equation is the same.

Find the number of gold coins in each pouch. Write down your steps so that someone else could follow them.

1.

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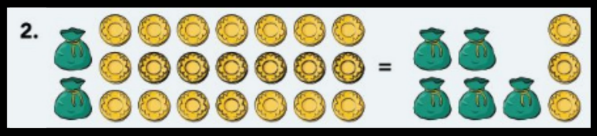
2. 

3. How can you check your answer? That is, how do you know you found the correct number of gold coins in each pouch?

4. How did you maintain equality at each step?

Class Work Answers:

1. 2 coins per pouch.
2. 6 coins per pouch.
3. Add the number of coins inside and outside the pouches on each side of the equal sign. If the total number of coins is the same on both sides, then the solution is correct.
4. To maintain equality, you have to add, subtract, multiply, or divide the same number to each side of the equation.

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?

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.

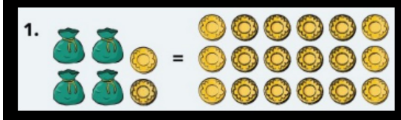
You can write the following equation to represent the situation:

$$2x + 4 = 12$$

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

For each problem:

- Write an equation to represent the situation.
- Let x represent the number of gold coins in one pouch and use numbers to represent the number of coins.
- Use the equation to find the number of gold coins in each pouch.

1. 

Equation:

For each problem:

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2.  Equation:

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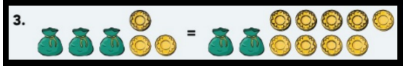
3.  Equation:

For each equation below, solve them using your ideas from the problems above. Check your answer.

4. $30 = 6 + 4x$

5. $7x + 2 = 12 + 5x$

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

Homework:

finish 3.3 worksheet

Class Work Answers:

1. 4x + 2 = 18
x = 4

2. 3x +6 = 12
x = 2

3. 3x + 3 = 2x + 9
x = 6

4. x = 6

5. x = 5

6. Do the same operations to both sides of the equation until you get the variable on one side and a number on the other.

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