

3.4 Solving Linear Equations

To maintain the equality of two expressions, you can add, subtract, multiply, or divide each side of the equality by the same number. These are called the **properties of equality**. In the last Problem, you applied properties of equality and numbers to find a solution to an equation.

So far in this Investigation, all of the situations have involved positive whole numbers.

- Does it make sense to think about negative numbers in a coin situation?
- Does it make sense to think about fractions in a coin situation?

? What strategies do you have for solving an equation like $-2x + 10 = 15$?

You have used the properties of equality to solve equations involving pouches and coins. These properties are also useful in solving all linear equations.

Problem 3.4

A For parts 1-3:

- Record each step you take to find your solution.
- Then, check your answer.

- a. $5x + 10 = 20$ b. $5x - 10 = 20$ c. $5x + 10 = -20$
 d. $5x - 10 = -20$ e. $10 - 5x = 20$ f. $10 - 5x = -20$
- a. $\frac{1}{4}x + 6 = 12$ b. $1\frac{1}{2} + 2x = 6\frac{1}{2}$ c. $\frac{3}{5} = -x + 1$
 d. $3.5x = 130 + 10x$ e. $15 - 4x = 10x + 45$
- a. $3(x + 1) = 21$ b. $2 + 3(x + 1) = 6x$ c. $-2(2x - 3) = -2$

Problem 3.4 continued

B Below are examples of students' solutions the equations from Question A, part (3) above. Is each solution correct? If not, explain what the error is.

$$3(x + 1) = 21$$

Corry's Solution

3 times something in the parentheses must be 21.

So $3(\quad) = 21$.

The something is 7.

So $x + 1 = 7$, and

$x = 6$.

$$2 + 3(x + 1) = 6x$$

Hadden's Solution

$2 + 3(x + 1)$ is equivalent to $5(x + 1)$.

So I can rewrite the original equation as $5(x + 1) = 6x$.

Using the Distributive Property, this is the same as

$$5x + 5 = 6x.$$

Subtracting $5x$ from each side, I get $5 = 1x$.

So $x = 5$.

$$-2(2x - 3) = -2$$

Jackie's Solution

By using the Distributive Property on the left-hand side of the equality, I get $-4x - 6 = -2$.

By adding 6 to each side, I get $-4x = 4$.

By dividing both sides by -4 , I get $x = -1$.

C Describe the strategies you have used for solving linear equations. When might you use one over another?