


## 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.

- |                               |                                       |                           |
|-------------------------------|---------------------------------------|---------------------------|
| 1. a. $5x + 10 = 20$          | b. $5x - 10 = 20$                     | c. $5x + 10 = -20$        |
| d. $5x - 10 = -20$            | e. $10 - 5x = 20$                     | f. $10 - 5x = -20$        |
| 2. 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. $15 - 4x = 10x + 45$               |                           |
| 3. 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?

**A C E** Homework starts on page 69.