

# Lesson 14: Finding Solutions to Inequalities in Context

## 14.1: Solutions to Equations and Solutions to Inequalities

1. Solve  $-x = 10$
2. Find 2 solutions to  $-x > 10$
3. Solve  $2x = -20$
4. Find 2 solutions to  $2x > -20$

## 14.2: Earning Money for Soccer Stuff

1. Andre has a summer job selling magazine subscriptions. He earns \$25 per week plus \$3 for every subscription he sells. Andre hopes to make at least enough money this week to buy a new pair of soccer cleats.
  - a. Let  $n$  represent the number of magazine subscriptions Andre sells this week. Write an expression for the amount of money he makes this week.
  - b. The least expensive pair of cleats Andre wants costs \$68. Write and solve an equation to find out how many magazine subscriptions Andre needs to sell to buy the cleats.
  - c. If Andre sold 16 magazine subscriptions this week, would he reach his goal? Explain your reasoning.

- d. What are some other numbers of magazine subscriptions Andre could have sold and still reached his goal?
- e. Write an *inequality* expressing that Andre wants to make at least \$68.
- f. Write an inequality to describe the number of subscriptions Andre must sell to reach his goal.
2. Diego has budgeted \$35 from his summer job earnings to buy shorts and socks for soccer. He needs 5 pairs of socks and a pair of shorts. The socks cost different amounts in different stores. The shorts he wants cost \$19.95.
- a. Let  $x$  represent the price of one pair of socks. Write an expression for the total cost of the socks and shorts.
- b. Write and solve an equation that says that Diego spent exactly \$35 on the socks and shorts.
- c. List some other possible prices for the socks that would still allow Diego to stay within his budget.
- d. Write an inequality to represent the amount Diego can spend on a single pair of socks.

### 14.3: Granola Bars and Savings

1. Kiran has \$100 saved in a bank account. (The account doesn't earn interest.) He asked Clare to help him figure out how much he could take out each month if he needs to have at least \$25 in the account a year from now.

- a. Clare wrote the inequality  $-12x + 100 \geq 25$ , where  $x$  represents the amount Kiran takes out each month. What does  $-12x$  represent?
- b. Find some values of  $x$  that would work for Kiran.
- c. We could express *all* the values that would work using either  $x \leq \underline{\hspace{1cm}}$  or  $x \geq \underline{\hspace{1cm}}$ . Which one should we use?
- d. Write the answer to Kiran's question using mathematical notation.

2. A teacher wants to buy 9 boxes of granola bars for a school trip. Each box usually costs \$7, but many grocery stores are having a sale on granola bars this week. Different stores are selling boxes of granola bars at different discounts.

- a. If  $x$  represents the dollar amount of the discount, then the amount the teacher will pay can be expressed as  $9(7 - x)$ . In this expression, what does the quantity  $7 - x$  represent?
- b. The teacher has \$36 to spend on the granola bars. The equation  $9(7 - x) = 36$  represents a situation where she spends all \$36. Solve this equation.
- c. What does the solution mean in this situation?
- d. The teacher does not have to spend all \$36. Write an inequality relating 36 and  $9(7 - x)$  representing this situation.

e. The solution to this inequality must either look like  $x \geq 3$  or  $x \leq 3$ . Which do you think it is? Explain your reasoning.

### Are you ready for more?

Jada and Diego baked a large batch of cookies.

- They selected  $\frac{1}{4}$  of the cookies to give to their teachers.
- Next, they threw away one burnt cookie.
- They delivered  $\frac{2}{5}$  of the remaining cookies to a local nursing home.
- Next, they gave 3 cookies to some neighborhood kids.
- They wrapped up  $\frac{2}{3}$  of the remaining cookies to save for their friends.

After all this, they had 15 cookies left. How many cookies did they bake?

### Lesson 14 Summary

Suppose Elena has \$5 and sells pens for \$1.50 each. Her goal is to save \$20. We could solve the equation  $1.5x + 5 = 20$  to find the number of pens,  $x$ , that Elena needs to sell in order to save *exactly* \$20. Adding -5 to both sides of the equation gives us  $1.5x = 15$ , and then dividing both sides by 1.5 gives the solution  $x = 10$  pens.

What if Elena wants to have some money left over? The inequality  $1.5x + 5 > 20$  tells us that the amount of money Elena makes needs to be *greater* than \$20. The solution to the previous equation will help us understand what the solutions to the inequality will be. We know that if she sells 10 pens, she will make \$20. Since each pen gives her more money, she needs to sell *more* than 10 pens to make more than \$20. So the **solution to the inequality** is  $x > 10$ .