

# Finding Solutions to Inequalities in Context

Let's solve more complicated inequalities.

## 14.1 Is the Inequality True or False?

The table shows four inequalities and four values for  $x$ . Decide whether each value makes each inequality true, and complete the table with “true” or “false”.

$x$	0	100	-100	25
$x \leq 25$				
$100 < 4x$				
$-3x > -75$				
$10 \geq 35 - x$				

1. Andre has a summer job selling magazine subscriptions. He earns \$25 plus \$3 for every subscription he sells. Andre hopes to earn enough money to buy a new pair of soccer cleats.
  - a. Write an expression for the amount of money that Andre earns. Use  $n$  to represent the number of magazine subscriptions he sells.
  - b. The cleats that Andre wants cost \$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 numbers of magazine subscriptions Andre could sell and still reach his goal?
  - e. Write an *inequality* to represent that Andre wants to earn at least \$68.
  - f. Write an inequality to represent the number of subscriptions Andre must sell to reach his goal.
2. Diego has budgeted \$35 to buy shorts and socks for soccer. He needs 5 pairs of identical socks and a pair of shorts. The shorts he wants cost \$19.95.
  - a. Write an expression for the total cost of the socks and shorts. Use  $x$  to represent the price of one pair of socks.
  - b. Write and solve an equation that represents Diego spending 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.



1. Kiran has \$100. He wants to know how much he could spend each month to still have at least \$25 left one year from now.
  - a. To represent this situation, Kiran writes the inequality  $-12x + 100 \geq 25$ . What does  $-12x$  represent? Why is it negative?
  - b. Find some values of  $x$  that would work for Kiran.
  - c. To express *all* the values that would work, should we use  $x \leq \underline{\hspace{1cm}}$  or  $x \geq \underline{\hspace{1cm}}$ ? Explain your reasoning.
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  $9(7 - x)$ . 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 her spending all \$36. Solve this equation. What does the solution mean in this situation?
  - c. The teacher does not have to spend all \$36. Write an inequality that represents her spending at most \$36.
  - d. The solution to this inequality must either look like  $x \leq \underline{\hspace{1cm}}$  or  $x \geq \underline{\hspace{1cm}}$ . Which one is it? Explain your reasoning.

## Are you ready for more?

Jada and Diego grew plants from seedlings.

- They selected  $\frac{1}{4}$  of the plants to give to their teachers.
- Next, they threw away 1 damaged plant.
- They delivered  $\frac{2}{5}$  of the remaining plants to a local nursing home.
- Then they gave 3 plants to some neighbors.
- They boxed up  $\frac{2}{3}$  of the remaining plants to save for their friends.

After all this, Jada and Diego had 15 plants left. How many plants did they grow from seedlings?

## Lesson 14 Summary

We can write and solve inequalities to solve problems.

Example: 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 save more than \$20? The inequality  $1.5x + 5 > 20$  tells us that the amount of money Elena saves 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 Elena sells 10 pens, she will save *exactly* \$20. Since each pen gives her more money, she needs to sell more than 10 pens to save more than \$20. So, we can represent all the solutions to the inequality with another inequality:  $x > 10$ . A **solution to an inequality** is a number that can be used in place of the variable to make the inequality true.