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

14.2 Earning Money for Soccer Stuff

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.

14.3 Granola Bars and Savings

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 $x \leq$ ___ or $x \geq$ ___? 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 $x \leq$ ___ or $x \geq$ ___. 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.