Unit 4 Family Support Materials

Linear Inequalities and Systems

In this unit, your student will analyze inequalities as ways to represent constraints. For example, if you have $20 to spend at the store, you do not need to spend exactly that much. You could afford any total between $0 and $20. This might be represented by the inequalities $t \geq 0$ and $t \leq 20$.

The symbol < means that the value of the left side of the inequality must be less than the value of the right side of the inequality. Conversely, the symbol > means that the value of the right side is less. If there is a line under either of these symbols ($\leq$ or $\geq$), then the two sides of the inequality are allowed to be equal and still satisfy the constraint.

Here are some additional examples of inequalities representing constraints:

$w < 20$. An apartment building allows dogs that weigh less than 20 pounds, only.

$12.5c + 15a \geq 1{,}000$. In order for a concert to be performed, the artists need to be sure of $1,000 in ticket sales. Tickets for children under 18 are $12.50, and tickets for adults are $15.

Inequalities usually have many solutions that are grouped together in a region on the number line or coordinate plane. For example, all the amounts of money you could spend at the store with your $20 might be represented on the number line like this.



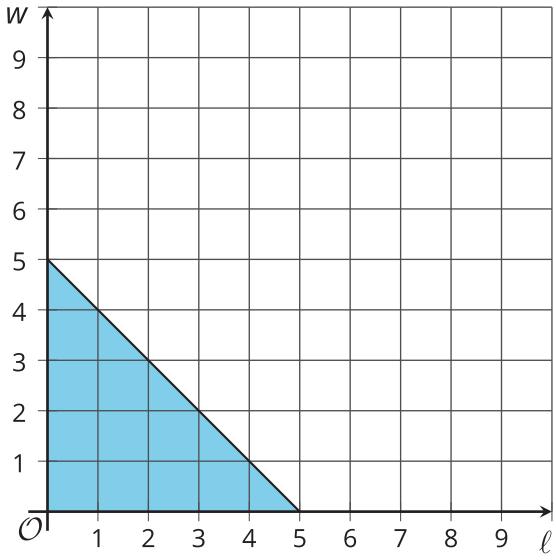
total spent at the store

Here is a task for you to try with your student:

A rectangle can have a perimeter of at most 10 cm. Let ℓ represent the length of the rectangle and w represent the width.

1. Which of these represents the constraint?
   a. $2\ell + 2w < 10$
   b. $2\ell + 2w \leq 10$
   c. $2\ell + 2w > 10$
   d. $2\ell + 2w \geq 10$
2. What is an example of values for ℓ and w that satisfy the constraint?
3. Here is a graph that could represent the rectangles that fit the constraint. How can you see your example values in the graph?

CC BY NC 2024
Illustrative Mathematics®



4. Use the graph to find another pair of values that satisfy the constraint. Explain your reasoning.

Solution:

1. $2\ell + 2w \leq 10$. The phrase "at most" usually means that equality is allowed. If the rectangle isn't allowed to have a perimeter of 10 cm, then the problem could say "A rectangle can have a perimeter less than 10 cm."
2. Sample response: $\ell = 2$ and $w = 1$. Any pair of values that make $2\ell + 2w$ less than or equal to 10.
3. Sample response: The values I chose correspond to the point $(2, 1)$, which is in the shaded region.
4. Sample response: $(1, 3)$ is also in the shaded region.