

# Introduction

**Inequalities** are similar to equations in that they are mathematical sentences. They are different in that they are not equal all the time. An inequality has infinite solutions, instead of only having one solution like a linear equation. Setting up the inequalities will follow the same process as setting up the equations did. Solving them will be similar, with two exceptions, which will be described later.

# Key Concepts

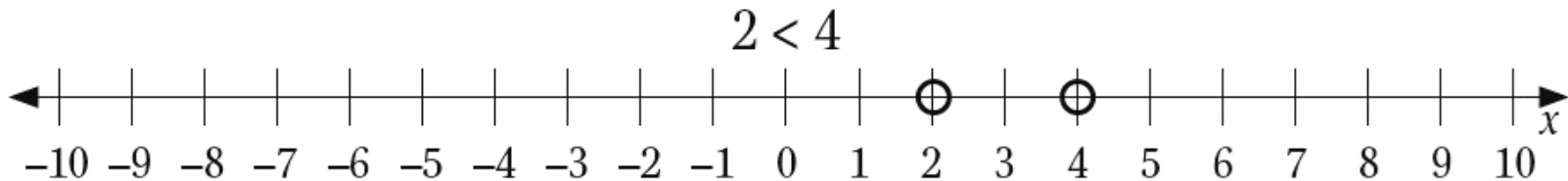
- The prefix *in-* in the word *inequality* means “not.” Inequalities are sentences stating that two things may not be equal. For example,  $12 > 2$  and  $1 < 7$ .
- Remember that the symbols  $>$ ,  $<$ ,  $\geq$ ,  $\leq$ , and  $\neq$  are used with inequalities.
- Use the table on the following slide to review the meanings of the inequality symbols and the provided examples with their **solution sets**, or the value or values that make a sentence or statement true.

## Key Concepts, *continued*

| Symbol | Description                               | Example    | Solution set  |
|--------|---|------------|---|
| $>$    | greater than,<br>more than                | $x > 3$    | all numbers greater than 3;<br>does not include 3     |
| $\geq$ | greater than or<br>equal to, at least     | $x \geq 3$ | all numbers greater than or<br>equal to 3; includes 3 |
| $<$    | less than                                 | $x < 3$    | all numbers less than 3;<br>does not include 3        |
| $\leq$ | less than or<br>equal to, no<br>more than | $x \leq 3$ | all numbers less than or<br>equal to 3; includes 3    |
| $\neq$ | not equal to                              | $x \neq 3$ | includes all numbers except 3                         |

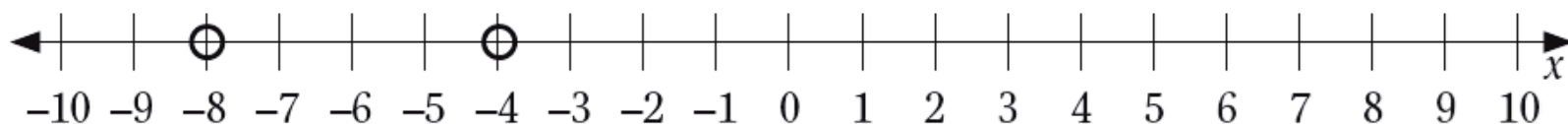
## Key Concepts, *continued*

- Solving a linear inequality is similar to solving a linear equation. The processes used to solve inequalities are the same processes that are used to solve equations.
- Multiplying or dividing both sides of an inequality by a negative number requires reversing the inequality symbol. Here is a number line to show the process.
  - First, look at the example of the inequality  $2 < 4$ .



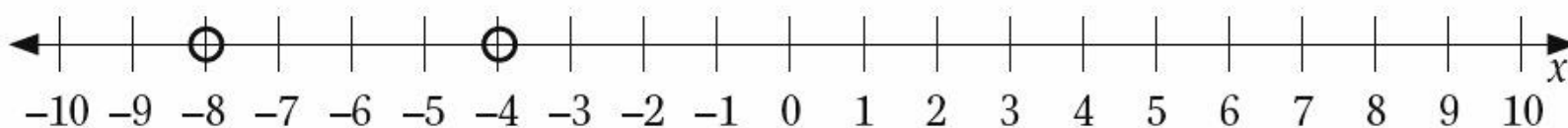
## Key Concepts, *continued*

- Multiply both sides by  $-2$  and the inequality becomes  $2(-2) < 4(-2)$  or  $-4 < -8$ .



- Is  $-4$  really less than  $-8$ ?
- To make the statement true, you must reverse the inequality symbol:  $-4 > -8$

$$-4 > -8$$



# Key Concepts, *continued*

## Creating Inequalities from Context

1. Read the problem statement carefully.
2. Reread the scenario and make a list of the known quantities.
3. Read the statement again, identifying the unknown quantity or variable.
4. Create expressions and inequalities from the known quantities and variable(s).
5. Solve the resulting inequality.
6. Interpret the solution of the inequality in terms of the context of the problem.

# Common Errors/Misconceptions

- not translating the words into the correct symbols, especially with the phrases *no fewer than*, *no more than*, *at least as many*, and so on
- forgetting to switch the inequality symbol when multiplying or dividing by a negative
- not interpreting the solution in terms of the context of the problem — students can often mechanically solve the problem but don't know what the solution means



# Guided Practice

## Example 1

Juan has no more than \$50 to spend at the mall. He wants to buy a pair of jeans and some juice. If the sales tax on the jeans is 4% and the juice with tax costs \$2, what is the maximum price of jeans Juan can afford?



## Guided Practice: Example 1, *continued*

### 1. Read the problem statement carefully.

#### Problem statement:

Juan has no more than \$50 to spend at the mall. He wants to buy a pair of jeans and some juice. If the sales tax on the jeans is 4% and the juice with tax costs \$2, what is the maximum price of jeans Juan can afford?

## Guided Practice: Example 1, *continued*

### 2. Reread the scenario and make a list of the known quantities.

Sales tax is 4%.

Juice costs \$2.

Juan has no more than \$50.

## Guided Practice: **Example 1, *continued***

- 3. Read the statement again, identifying the unknown quantity or variable.**

The unknown quantity is the cost of the jeans.

## Guided Practice: Example 1, *continued*

### 4. Create expressions and inequalities from the known quantities and variable(s).

The price of the jeans + the tax on the jeans + the price of the juice must be less than or equal to \$50.

$$x + 0.04x + 2 \leq 50$$

## Guided Practice: Example 1, *continued*

### 5. Solve the resulting inequality.

$$x + 0.04x + 2 \leq 50$$

Inequality from the previous step

$$1.04x + 2 \leq 50$$

Add like terms.

$$1.04x \leq 48$$

Subtract 2 from both sides.

$$x \leq 46.153846$$

Divide both sides by 1.04.

## Guided Practice: **Example 1, *continued***

Regardless of the digit in the thousandths place, round down to 46.15; rounding up will increase the price to a value that is not in Juan's budget.

$$x \leq 46.15$$

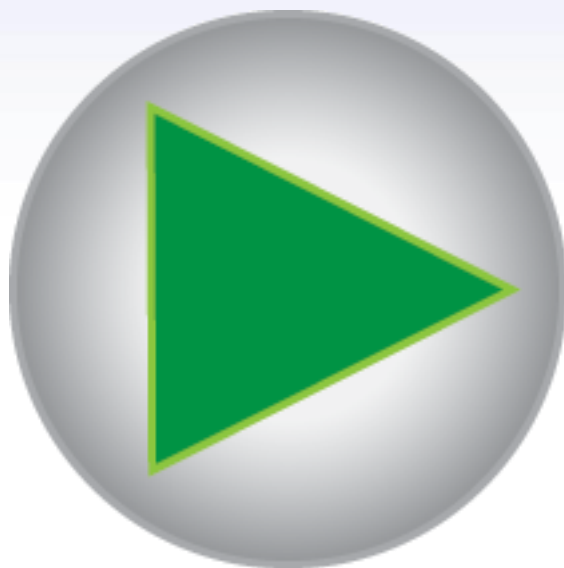
## Guided Practice: Example 1, *continued*

6. Interpret the solution of the inequality in terms of the context of the problem.

Juan should look for jeans that are priced at or below \$46.15.



## Guided Practice: **Example 2, *continued***





## Guided Practice

### Example 2

Alexis is saving to buy a laptop that costs \$1,100. So far she has saved \$400. She makes \$12 an hour babysitting. What's the least number of hours she needs to work in order to reach her goal?

## Guided Practice: Example 2, *continued*

### 1. Read the problem statement carefully.

#### Problem statement:

Alexis is saving to buy a laptop that costs \$1,100. So far she has saved \$400. She makes \$12 an hour babysitting. What's the least number of hours she needs to work in order to reach her goal?

## Guided Practice: **Example 2, continued**

### 2. Reread the scenario and make a list of the known quantities.

Alexis has saved \$400.

She makes \$12 an hour.

She needs at least \$1,100.

## Guided Practice: Example 2, *continued*

3. Read the statement again, identifying the unknown quantity or variable.

You need to know the least number of hours Alexis must work to make enough money. Solve for hours.

## Guided Practice: Example 2, *continued*

### 4. Create expressions and inequalities from the known quantities and variable(s).

The sum of Alexis's saved money and her earned money must be greater than or equal to the cost of the laptop.

$$400 + 12h \geq 1100$$

## Guided Practice: Example 2, *continued*

### 5. Solve the resulting inequality.

$400 + 12h \geq 1100$       Inequality from the  
previous step

$12h \geq 700$       Subtract 400 from  
both sides.

$h \geq 58.3\bar{3}$       Divide both sides by 12.

## Guided Practice: Example 2, *continued*

### 6. Interpret the solution of the inequality in terms of the context of the problem.

In this situation, it makes sense to round up to the nearest half hour since babysitters usually get paid by the hour or half hour. Therefore, Alexis needs to work at least 58.5 hours to make enough money to save for her laptop.



## Guided Practice: **Example 2, *continued***

