



# Concepts and Examples Absolute Value Equations

Based on power point presentations by Pearson Education, Inc.  
Revised by Ingrid Stewart, Ph.D.

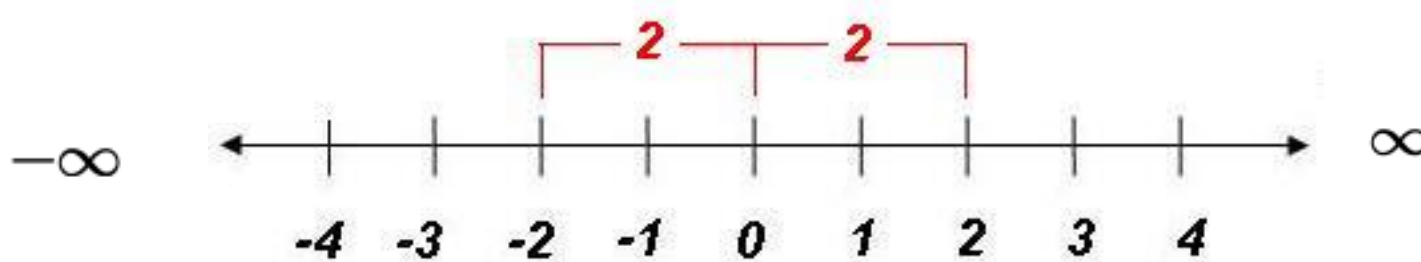
# Learning Objectives

1. Find the absolute value.
2. Solve absolute value equations.

# 1. Find the Absolute Value (1 of 2)

The **absolute value** is defined to be a distance from the point 0 on a number line to some other point. The point can be positive or negative.

Let's look at a number line and a distance of 2 from the point 0.



We can see that the distance between 0 and 2 is **2**. BUT the distance between 0 and  $-2$  is also **2**. We can express this as follows:

$|2| = 2$  means that the distance between 0 and 2 is 2. It is pronounced “the absolute value of 2 equals 2.”

$|-2| = 2$  means that the distance between 0 and  $-2$  is 2. It is pronounced “the absolute value of  $-2$  equals 2.”

# Find the Absolute Value (2 of 2)

Example 1:

- a. Rewrite the expression without absolute value bars:

$$|-8|$$

Solution: 8

- b. Rewrite the expression without absolute value bars:

$$|15.3|$$

Solution: 15.3

## 2. Solve Absolute Value Equations (1 of 3)

In absolute value equations the variable occurs within the absolute value symbol.

### **Strategy for Solving Absolute Value Equations:**

If  $c$  is a positive value and  $u$  represents any mathematical expression, then the absolute value equation  $|u| = c$  is equivalent to two equations NOT containing absolute value symbols. Specifically,

$$u = c \text{ and } -u = c$$

We must solve both equations! There are TWO solutions!

# Solve Absolute Value Equations (2 of 3)

Example 2:

Solve the absolute value equation  $|5 - 5x| = 30$ .

Here we must solve both  $(5 - 5x) = 30$  and  $-(5 - 5x) = 30$ , which are both linear equations.

- $(5 - 5x) = 30$

$$5 - 5x = 30$$

$$-5x = 25$$

$$x = -5$$

- $-(5 - 5x) = 30$

$$-5 + 5x = 30$$

$$5x = 35$$

$$x = 7$$

The absolute value equation has two solutions, namely  $-5$  and  $7$ .

# Solve Absolute Value Equations (3 of 3)

Example 3:

Solve the absolute value equation  $|3x| - 6 = 0$ .

We MUST first isolate the absolute value as follows to isolate the absolute value.

$$|3x| = 6.$$

We must now solve  $3x = 6$  and  $-3x = 6$ , which are both linear equations.

- $3x = 6$

$$x = 2$$

- $-3x = 6$

$$x = -2$$

The absolute value equation has two solutions, namely  $-2$  and  $2$ .