

6.5 Solve Absolute Value Equations

Objective: You will solve absolute value equations

What is an Absolute Value of a Number ?

$$| 2 | =$$

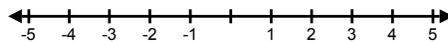
$$| -5 | =$$

$$| -4 | =$$

$$| 3 | =$$

DEFINITION: An **absolute value** is the distance of that number away from zero. We use the following symbol to represent absolute value: $| \quad |$

$$| -5 | =$$



What is an Absolute Value Equation ?

DEFINITION: An **absolute value equation** is an equation that contains an absolute value expression.

Here are some examples:

$$2|x+3|=7$$

$$|2x-8|=20$$

$$|x|=10$$

How do we solve an Absolute Value Equation ?

We will solve absolute value equations by **isolating the absolute value expression** and then solving the equations.

Skill #50: Solve an absolute value equation with no steps inside the absolute value bars.

EXAMPLE 1 Solve an absolute value equation

Solve $|x| = 7$.

Your Turn !

You Try: Skill #50

Solve

(a) $|x| = 3$

(b) $|x| = 15$

Don't forget to show your work and write
down your answer !

Skill #51: Solve an absolute value equations with one step inside the absolute value bars.

EXAMPLE 2 Solve an absolute value equation

Solve $|x - 3| = 8$.

Your Turn !

You Try: Skill #51

Solve the equation.

$$|r - 7| = 9$$

Don't forget to show your work and write
down your answer !

Skill #52: Solve an absolute value equations by isolating the absolute value first.

EXAMPLE 3 Rewrite an absolute value equation

Solve $3|2x - 7| - 5 = 4$.

Your Turn !

You Try: Skill #52

Solve the equation.

(a) $2|s| + 4.1 = 18.9$

(b) $4|t + 9| - 5 = \underline{19}$

Don't forget to show your work and write
down your answer !

Skill #53: Recognizing when there is no solution to an absolute value equation.

EXAMPLE 4 Decide if an equation has no solutions

Solve $|3x + 5| + 6 = -2$

Your Turn !

You Try: Skill #53

Solve the equation

(a) $2|m - 5| + 4 = 2$

(b) $-3|n + 2| - 7 = -10$

Don't forget to show your work and write down your answer !

What is an Absolute Deviation ?

DEFINITION: The **distance** of a number x from a given value is the absolute value of the difference of x and the given value: absolute deviation = $|x - \text{given value}|$

Skill #54: Use absolute deviation

EXAMPLE 5 Use absolute deviation

BASKETBALLS Before the start of a professional basketball game, a basketball must be inflated to an air pressure of 8 pounds per square inch (psi) with an absolute error of 0.5 psi. (*Absolute error* is the absolute deviation of a measured value from an accepted value.) Find the minimum and maximum acceptable air pressures for the basketball.



Your Turn !

You Try: Skill #54

The absolute deviation of x from 7.6 is 5.2. What are the values of x that satisfy this requirement?

Don't forget to show your work and write
down your answer !