6.5 Solve Absolute Value Equations

Objective: You will solve absolute value equations **What is**

an Absolute Value of a Number ?
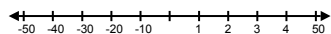
| 2 | = | -5 | =

| -4 | = | 3 | =

DEFINITION: An <mark>absolute value of a number</mark> n is the distance of that number away from zero. We use the following symbol to represent absolute value: | |

| -5 | =

```
←+--+--+--+--+--+--+--+--+--+--+→
 -50 -40 -30 -20 -10   1  2  3  4  50
```

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

EXAMPLE 1 Solve an absolute value equation

Solve $|x| = 7$.

What is an Absolute Value Equation ?

DEFINITION: An <mark>absolute value equation</mark> is an equation that contains an absolute value expression.

Here are some examples:

$$2|x+3| = 7 \qquad |2x-8| = 20 \qquad |x| = 10$$

How do we solve an Absolute Value Equation ?

We will solve absolute value equations by <mark>rewriting absolute value equation as two equations</mark> and then solving the equations.

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 $|x - 3| = 8$.

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) $4|t + 9| - 5 = 19$

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

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 _____ of a number x from a given value is the absolute value of the difference of x and the given value: absolute deviation = | x - 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 !

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 !