

Find all the numbers that fit each description:

1. Exactly 6 units from zero on a number line.

$$x = -6 \text{ or } 6$$

2. More than 4 units from zero on a number line.

$$x > 4 \text{ or } x < -4$$

3. Less than 7 units from zero on a number line.

$$-7 < x < 7$$

### Absolute Value:

The distance from zero on a number line.

### Solving Absolute Value Equations:

$$|x| = k \quad x = k \text{ or } x = -k$$

Solve.  $|x + 3| = 7$

$$x + 3 = 7 \quad \text{or} \quad x + 3 = -7$$

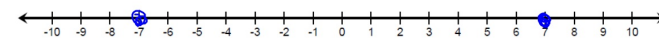
$$x = 4 \quad \text{or} \quad x = -10$$

Solving Absolute Value equations  
using a number line.

Solve.  $|x + 3| = 7$

Distance  
from zero

Is exactly  
7 units



$$\begin{array}{ccc} x+3 = -7 & \text{or} & x+3 = 7 \\ \begin{array}{cc} -3 & -3 \end{array} & & \begin{array}{cc} -3 & -3 \end{array} \end{array}$$

$$x = -10 \quad \text{or} \quad x = 4$$

## Solving Absolute Value Inequalities: Page 35.

### Properties

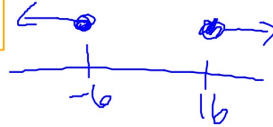
### Absolute Value Inequalities

Let  $k$  represent a positive real number.

$|x| \geq k$  is equivalent to  $x \leq -k$  or  $x \geq k$   
 $|x| \leq k$  is equivalent to  $-k \leq x \leq k$ .

Solve.  $|x - 5| \geq 11$

$$\begin{array}{l} x - 5 \leq -11 \quad \text{or} \quad x - 5 \geq 11 \\ +5 \quad +5 \quad +5 \quad +5 \\ x \leq -6 \quad \text{or} \quad x \geq 16 \end{array}$$



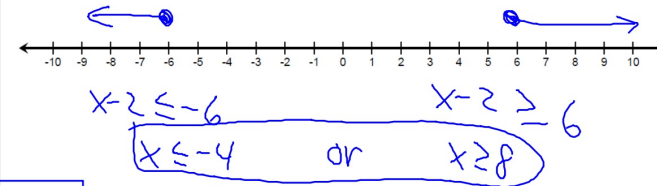
Solving using a number line.

$$|x - 2| \geq 6$$

Distance from zero

Is more than 6 units

Further than 6 units from zero



### Properties

### Absolute Value Inequalities

Let  $k$  represent a positive real number.

$|x| \geq k$  is equivalent to  $x \leq -k$  or  $x \geq k$ .  
 $|x| \leq k$  is equivalent to  $-k \leq x \leq k$ .

Solve.  $|x + 1| < 8$

$$\begin{array}{l} -8 < x + 1 < 8 \\ -9 < x < 7 \end{array}$$

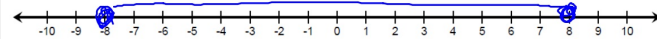
Solving using a number line.

$$|x + 1| < 8$$

Distance from zero

Is less than 8 units

Closer than 8 units from zero



then solve for  $x$

$$-8 < x + 1 < 8 \quad \boxed{-9 < x < 7}$$

Solve each Absolute Value equation or inequality.

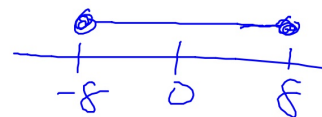
1.  $|2x + 6| \leq 8$

2.  $2|4x - 1| = 18$

See next pages for solutions

3.  $|x - 4| + 5 > 11$

1.  $|2x + 6| \leq 8$



$$-8 \leq 2x + 6 \leq 8$$

$$-14 \leq 2x \leq 2$$

$$-7 \leq x \leq 1$$

2.  $2|4x - 1| = 18$

$$|4x - 1| = 9$$

$$4|x - 1| = -9$$

$$x = -2$$

or

$$4|x - 1| = 9$$
$$x = 2.5$$

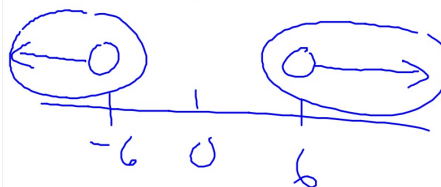


Sol:  $x = -2$  or  $2.5$

3.  $|x - 4| + 5 > 11$

$$-5 < -5$$

$$|x - 4| > 6$$



$$x - 4 < -6$$

$$x < -2$$

or

$$x - 4 > 6$$

$$x > 10$$

$$x < -2 \text{ or } x > 10$$

Solve.

$$|x-3| + 13 = 6$$

-13   -13

$$|x-3| = -7$$

NO SOL

Solve

$$|x+6| + 4 \leq 1$$

$$|x+6| \leq -3 \quad \text{NO SOL}$$

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$$|x+6| + 7 \geq 1$$

$$|x+6| \geq -6 \quad \text{Q}$$