Lesson 6-5

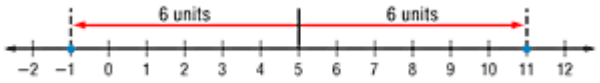
Example 1 Solve an Absolute Value Expression

Solve $|s-5| = 6$.

Method 1 Graphing

$|s-5| = 6$ means that the distance between s and 5 is 6 units. To find s on the number line, start at 5 and move 6 units in either direction.

The distance from 5 to -1 is 6 units.



The distance from 5 to 11 is 6 units.

The solution set is {-1, 11}.

Method 2 Compound Sentence

Write $|s-5| = 6$ as $s - 5 = 6$ or $s - 5 = -6$.

Case 1

$s - 5 = 6$

$s - 5 + 5 = 6 + 5$ Add 5 to each side.

$s = 11$ Simplify.

Case 2

$s - 5 = -6$

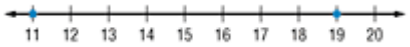
$s - 5 + 5 = -6 + 5$ Add 5 to each side.

$s = -1$ Simplify.

The solution set is {-1, 11}.

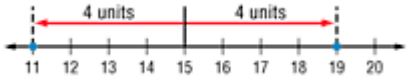
Example 2 Write an Absolute Value Equation

Write an equation involving absolute value for the graph.



Find the point that is the same distance from 11 as the distance from 19. The midpoint between 11 and 19 is 15.

The distance from 11 to 15 is 4 units.



The distance from 19 to 15 is 4 units.

So, an equation is $|x-15| = 4$.

Check Substitute 11 and 19 into $|x-15| = 4$.

$|x-15| = 4$

$|11-15| \stackrel{?}{=} 4$

$|-4| \stackrel{?}{=} 4$

$4 = 4$

$|x-15| = 4$

$|19-15| \stackrel{?}{=} 4$

$|4| \stackrel{?}{=} 4$

$4 = 4$

Example 3 Solve an Absolute Value Inequality (≤)

Solve $|3p-12| \le 9$. Then graph the solution set.

Write $|3p-12| \le 9$ as $3p - 12 \le 9$ and $3p - 12 \ge -9$.

Case 1

$3p - 12 \le 9$	
$3p - 12 + 12 \le 9 + 12$	Add 12 to each side.
$3p \le 21$	Simplify.
$\frac{3p}{3} \le \frac{21}{3}$	Divide each side by 3.
$p \le 7$	Simplify.

Case 2

$3p - 12 \ge -9$	
$3p - 12 + 12 \ge -9 + 12$	Add 12 to each side.
$3p \ge 3$	Simplify.
$\frac{3p}{3} \ge \frac{3}{3}$	Divide each side by 3
$p \ge 1$	Simplify.

The solution set is $\{p \mid 1 \le p \le 7\}$.

Example 4 Solve an Absolute Value Inequality (≥)

Solve $|x-7| \ge 4$. Then graph the solution set.

Write $|x-7| \ge 4$ as $x - 7 \ge 4$ and $x - 7 \le -4$.

Case 1

$x - 7 \ge 4$	
$x - 7 + 7 \ge 4 + 7$	Add 7 to each side.
$x \ge 11$	Simplify.

Case 2

$x - 7 \le -4$	
$x - 7 + 7 \le -4 + 7$	Add 7 to each side.
$x \le 3$	Simplify.

The solution set is $\{x \mid x \le 3 \text{ or } x \ge 11\}$.