5.3.2: Solving Absolute Value Inequalities

1. Sammi's house is on Main Street, ***more than*** 4 blocks away from the police station. The police station is located at 0.

Draw the possible location(s) for Sammi's house.

What are some possible locations of Sammi's house?

-4.1, -6, 5, 6.3

This situation can be represented by:

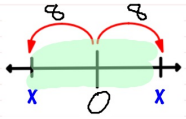
$$|x - 0| > 4$$

which means: The distance between a number x and 0 is greater than 4.

What are the possible values of x that make each equation true? Show on a number line. Show algebraically.

2. $|x| \leq 8$

The distance between x and 0 is less than or equal to 8.



$(x) \leq 8$ $\quad \frac{-(x)}{-1} \leq \frac{8}{-1}$

$x \leq 8$ $\quad x \geq -8$

Solution as a compound inequality: $-8 \leq x \leq 8$

3. $|x| > 12$

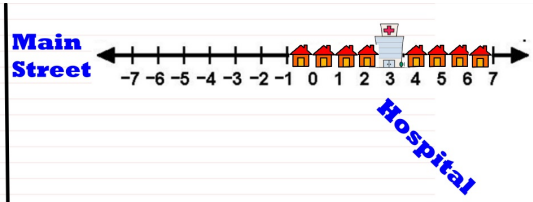
The distance between x and 0 is greater than 12.

$(x) > 12$ $\quad \frac{-(x)}{-1} > \frac{12}{-1}$

$x < -12$

Solution as a compound inequality: $x > 12$ or $x < -12$

4. Gemma lives on Main Street. Her house is ***less than*** 4 blocks away from the hospital. The hospital is located at 3 Main Street.



Draw the possible location(s) for Gemma's house.

What are some possible locations of Gemma's house?

2, -0.5, 5, 6.4

This situation can be represented by:

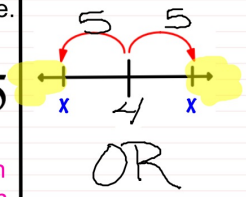
$$|x - 3| < 4$$

which means: The distance between a number x and 3 is less than 4.

What are the possible values of x that make each equation true?

Show on a number line. Show algebraically.

5. $|x - 4| \geq 5$



OR

$(x - 4) \geq 5$

$+4 \quad +4$

$x \geq 9$

$-(x - 4) \geq 5$

$-x + 4 \geq 5$

$-4 \quad -4$

$\frac{-x}{-1} \geq \frac{1}{-1}$

$x \leq -1$

The distance between x and 4 is greater than or equal to 5.

Write your solution as a compound inequality.

$x \leq -1$ or $x \geq 9$

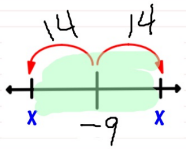
What are the possible values of x that make each equation true?

Show on a number line.
Show algebraically.

6. $|x+9|<14$

$|x--9|<14$

The distance between x and -9 is less than 14.



AND

(x + 9) < 14
-9 -9
$x<5$

-(x + 9) < 14
$-x+-9<14$
+9 +9
$-x<23$
-1 -1
$x>23$

Write your solution as a compound inequality.

$-23<x<5$

Solve each inequality.

7. $|t-3|<-5$

Can the distance between t and 3 be less than -5?

Graph your solutions.

Write your solution as a compound inequality.

NO SOLUTION

Solve each inequality.

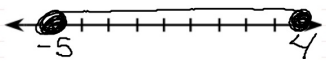
8. $|4x+2|\leq 18$

AND

(4x + 2) ≤ 18
-2 -2
$\frac{4x}{4}\leq\frac{16}{4}$
$x\leq 4$

-(4x + 2) ≤ 18
$-4x+-2\leq 18$
+2 +2
$\frac{-4x}{-4}\geq\frac{20}{-4}$
$x\geq -5$

Graph your solutions.



Write your solution as a compound inequality.

$-5\leq x\leq 4$

Solve each inequality.

9. $\frac{3|2x-3|}{3}>\frac{15}{3}$

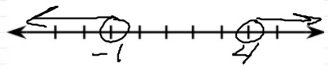
OR

$|2x-3|>5$

(2x - 3) > 5
+3 +3
$\frac{2x}{2}>\frac{8}{2}$
$x>4$

-(2x - 3) > 5
$-2x+3>5$
-3 -3
$\frac{-2x}{-2}>\frac{2}{-2}$
$x<-1$

Graph your solutions.



Write your solution as a compound inequality.

$x<-1$ or $x>4$

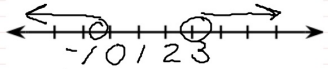
10. $|-4x+5|>7$

OR

(-4x + 5) > 7
-5 -5
$\frac{-4x}{-4}>\frac{2}{-4}$
$x<-\frac{1}{2}$

-(-4x + 5) > 7
$4x+5>7$
-5 -5
$\frac{4x}{4}>\frac{12}{4}$
$x>3$

Graph your solutions.



Write your solution as a compound inequality.

$x<-\frac{1}{2}$ or $x>3$