5.3.1: Solving Absolute Value Equations

Review:

Find the distance between 10 and 7. $10-7=\boxed{3}$

Find the distance between 20 and 24. $20-24=-4$ $\boxed{4}$

Find the distance between 4 and -3. $4--3=4+3=\boxed{7}$

What is absolute value?

The distance between a number and 0.

Evaluate.

$|7|=7$ $|-5|=5$

$|14+8|=|22|=22$ $|10-12|=|-2|=2$

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

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

What are the possible location(s) of Sammi's house? 4 and -4

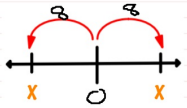
This situation can be represented by: $|x-0|=4$

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

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

Show on a number line.
Show algebraically.

2. $|x|=8$

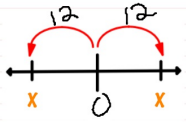


(x) = 8 $\frac{-(x)}{-1}=\frac{8}{-1}$

$x=8, x=-8$

The distance between x and 0 is 8.

3. $|x|=12$



(x) = 12 $\frac{-(x)}{-1}=\frac{12}{-1}$

$x=12, x=-12$

The distance between x and 0 is 12.

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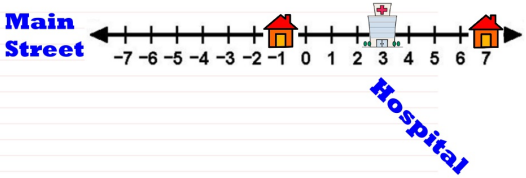
4. Gemma lives on Main Street. Her house is 4 blocks away from the hospital. The hospital is located at 3 Main Street.



Draw the possible locations for Gemma's house.

What are the possible locations of Gemma's house? -1 and 7

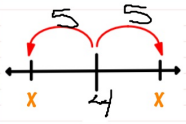
This situation is represented by: $|x-3|=4$

What does this mean? The distance between a number x and 3 is 4.

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

Show on a number line.
Show algebraically.

5. $|x-4|=5$



The distance between x and 4 is 5.

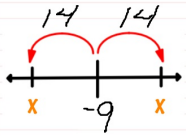
(x - 4) = 5
+4 +4
x = 9

-(x - 4) = 5
-x + 4 = 5
-4 -4
-x = 1
-1 -1
x = -1

x = 9, x = -1

6. $|x+9|=14$

$|x--9|=14$



The distance between x and -9 is 14.

(x + 9) = 14
-9 -9
x = 5

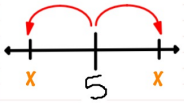
-(x + 9) = 14
-x + -9 = 14
+9 +9
-x = 23
-1 -1
x = -23

x = 5, x = -23

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

Show on a number line.
Show algebraically.

7. $|x-5|=-3$



The distance between x and 5 is -3.

Can a distance be negative?

No Solution

Solve each equation.

8. $|2x-1|=5$

(2x - 1) = 5
+1 +1
2x = 6
2 2
x = 3

-(2x - 1) = 5
-2x + 1 = 5
-1 -1
-2x = 4
-2 -2
x = -2

x = 3, x = -2

9. $|5x+10|-5=25$
+5 +5

$|5x+10|=30$

(5x + 10) = 30
-10 -10
5x = 20
5 5
x = 4

-(5x + 10) = 30
-5x + -10 = 30
+10 +10
-5x = 40
-5 -5
x = -8

x = 4, x = -8