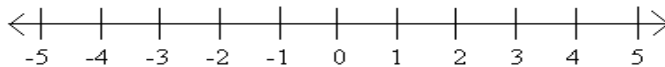


**Unit 2: Solving Equations and Inequalities**  
**Lesson 6: Solving Absolute Value Equations and Compound Inequalities**

**RECALL:** Absolute value is the distance from zero. Therefore  $|x| = 3$  asks which x-values are 3 units from 0?



Each absolute value can have up to two different solutions.

When **evaluating** expressions, absolute value bars act as a grouping symbol. Perform any operations inside the absolute value bars first.

Example: Evaluate  $|2x - 3| + 4$  if  $x=3$

Evaluate  $|2x - 3| + 4$  if  $x= -2$

Since absolute value equations always have a positive and negative answer. We must consider both sides when solving absolute values.

Example:

$$|x - 4| = 7$$

Case 1

$$x - 4 = 7$$

$$x - 4 + 4 = 7 + 4$$

$$x = 11$$

Case 2

$$x - 4 = -7$$

$$x - 4 + 4 = -7 + 4$$

$$x = 3$$

**Remember:** Check your solutions.

Practice: Solve Algebraically:

a)  $|x - 13| = 4$

b)  $|a - 5| + 6 = 7$

What is the solution of  $|x| = -4$

c)  $|3x - 6| + 3 = 2$

d)  $|3x + 2| = 11$

e)  $|x + 6| = 3x - 2$

The absolute value of an equation gives the distance from a given center point.

Application:

Most meat thermometers are accurate to within plus or minus 2°F.

- a. If a meat thermometer reads 150°F, write an equation to determine the least and greatest possible temperatures of the meat.
  
  
  
  
  
  
  
  
  
  
- b. Solve your equation.
  
  
  
  
  
  
  
  
  
  
- c. Ham needs to reach an internal temperature of 150°F to be fully cooked. To what temperature reading should you cook a ham to ensure that the minimum temperature is reached? Explain.

## Solving Compound Inequalities

### Vocabulary

Compound inequality:

Union:

Intersection:

- A number is a solution to an **AND** inequality when the number is a solution to **BOTH** inequalities. This is where the two solutions overlap.
- A number is a solution to a **OR** inequality if the number is a solution to **EITHER** inequality.

Ways to write a compound inequality

AND	OR
$5 < x - 3 < 10$	$2x + 4 \leq 7$ or $x < -10$
$x - 3 < 10$ and $x - 3 > 5$	

Let's Solve a Compound Inequality

Solve:  $13 < 2x + 7 \leq 17$

Method 1: Solve both parts at the same time

$$13 < 2x + 7 \leq 17$$

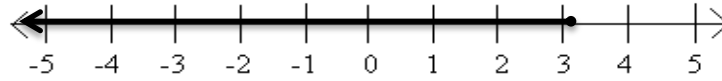
Method 2: Solve each inequality separately

$$2x + 7 \leq 17$$

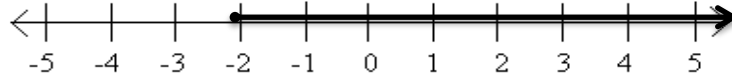
$$2x + 7 > 13$$

To check your answers, Graph the solution for each inequality on the number line and find its intersection.

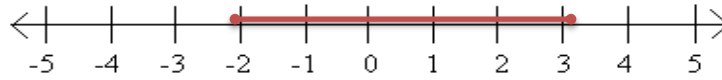
$$x \leq 3$$



$$x > -2$$



$$-2 < x \leq 3$$



What does this solution mean?

**PRACTICE:** Solve these compound inequalities.

a.  $p + 5 < 8$  **or**  $p - 3 > 1$

b.  $-4 \leq 3x - 1 < 14$

c.  $\frac{3}{4}x - 2 < 1$  **and**  $\frac{1}{2}x - 4 \geq -2$

### Application:

Perri is building a fence around a rectangular plot. The space allows for a perimeter of 17-20 yards. The width of the plot is 5 yards.

a. Write a compound inequality to describe the range of possible lengths of the plot.

b. Solve your inequality.