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HIGH SCHOOL

# Solving Absolute Value Inequalities



## Review of the Steps to Solve a Compound Inequality:

- Example:  $2x + 3 > 2$  and  $5x < 10$
- This is a conjunction because the two inequality statements are joined by the word “**and**”.
- You must solve each part of the inequality.
- The graph of the solution of the conjunction is the intersection of the two inequalities. Both conditions of the inequalities must be met.
  - In other words, the solution is wherever the two inequalities overlap.
  - If the solution does not overlap, there is **no solution**.

- Example:  $3x \leq 15$  or  $-2x+1 \geq 0$
- This is a disjunction because the two inequality statements are joined by the word “or”.
- You must solve each part of the inequality.
- The graph of the solution of the disjunction is the union of the two inequalities. Only one condition of the inequality must be met.
  - In other words, the solution will include each of the graphed lines. The graphs can go in opposite directions or towards each other, thus overlapping.
  - If the inequalities do overlap, the solution is *all reals*.



## “*and*” Statements can be Written in Two Different Ways

- 1.  $8 < m + 6 < 14$
- 2.  $8 < m+6$  and  $m+6 < 14$

These inequalities can be solved using two methods.



# Method One

*Example :  $8 < m + 6 < 14$*

*Rewrite the compound inequality using the word “and”, then solve each inequality.*

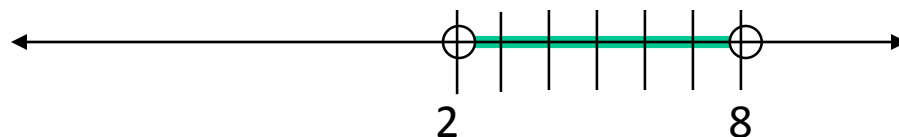
$$8 < m + 6 \quad \text{and} \quad m + 6 < 14$$

$$2 < m \quad \quad \quad m < 8$$

$$m > 2 \quad \quad \quad \text{and} \quad \quad \quad m < 8$$

$$2 < m < 8$$

*Graph the solution:*



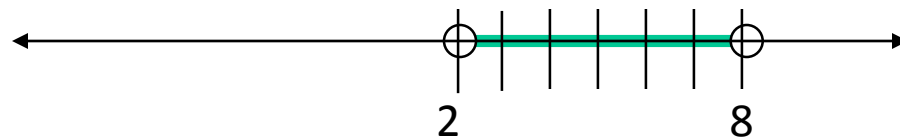
# Method Two

Example:  $8 < m + 6 < 14$

To solve the inequality, isolate the variable by subtracting 6 from all 3 parts.

$$\begin{array}{r} 8 < m + 6 < 14 \\ \underline{-6 \quad -6 \quad -6} \\ 2 < m < 8 \end{array}$$

Graph the solution.



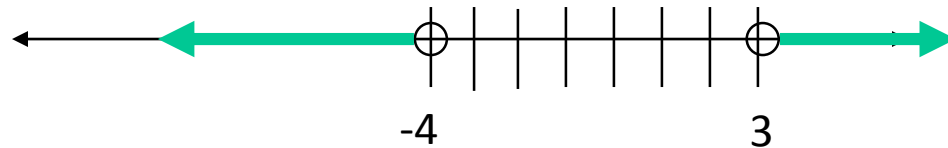


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# 'or' Statements

Example:  $x - 1 > 2$  or  $x + 3 < -1$   
 $x > 3$                        $x < -4$   
 $x < -4$  or  $x > 3$

Graph the solution.





# Solving an Absolute Value Inequality

- Step 1: Rewrite the inequality as a conjunction or a disjunction.
  - If you have a  $<$  or  $<=$  you are working with a conjunction or an 'and' statement.  
Remember: "Less than"
  - If you have a  $>$  or  $\geq$  you are working with a disjunction or an 'or' statement.  
Remember: "Greater"
- Step 2: In the second equation you must negate the right hand side and reverse the direction of the inequality sign.
- Solve as a compound inequality.





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## Example 1:

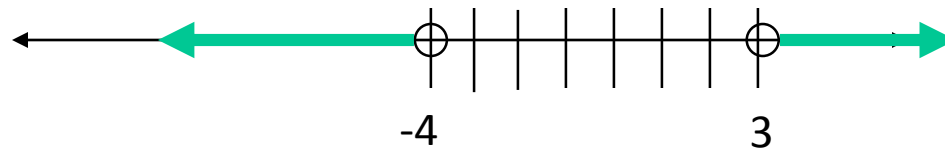
- $|2x + 1| > 7$
- $2x + 1 > 7$  or  $2x + 1 > 7$
- $2x + 1 > 7$  or  $2x + 1 < -7$
- $x > 3$  or  $x < -4$

This is an '*or*' statement.  
(Greater). Rewrite.

In the 2<sup>nd</sup> inequality, *reverse* the  
inequality sign and *negate* the  
right side value.

Solve each inequality.

Graph the solution.





## Example 2:

- $|x - 5| < 3$
- $x - 5 < 3$  and  $x - 5 < 3$
- $x - 5 < 3$  and  $x - 5 > -3$
  
- $x < 8$  and  $x > 2$
- $2 < x < 8$

This is an '*and*' statement.  
(Less than*and*).

Rewrite.

In the 2nd inequality, *reverse* the inequality sign and *negate* the right side value.

Solve each inequality.

Graph the solution.

