Lesson 3-6: Compound Inequalities

Name: _____

When people plan a house, they often have many requirements in mind that can be written as inequalities. Such requirements could be the dimensions of rooms or the overall size of the house. In this activity, we will investigate what happens when we combine requirements. First, we will graph each requirement separately, then we will graph combinations of those requirements. Here are the basic requirements we will work with:

Dimension Requirements:

Requirement A: $d > 5$ ft

Requirement B: $d \leq 12$ ft

Requirement C: $d < 10$ ft

Area Requirements:

Requirement D: $A \leq 1500$ sq ft

Requirement E: $A > 1200$ sq ft

Requirement F: $A \geq 1800$ sq ft

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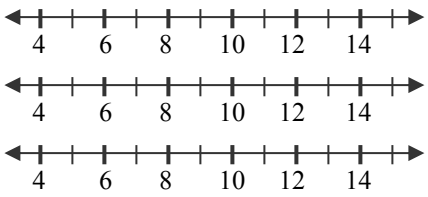
1. First, let's investigate what happens when we combine requirements A & B with "**and**":
   a. Graph the numbers that meet requirement A:
   b. Graph the numbers that meet requirement B:
   c. Graph only the numbers that meet both A **and** B:
   d. Write the solution as an inequality:



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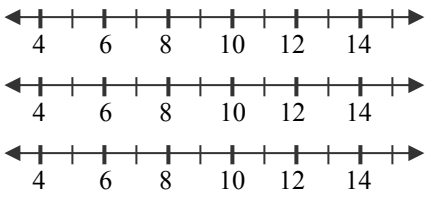
2. Now let's investigate what happens when we combine requirements A & B with "**or**":
   a. Graph the numbers that meet requirement A:
   b. Graph the numbers that meet requirement B:
   c. Graph all the numbers that meet either A **or** B:
   d. Write the solution as an inequality:



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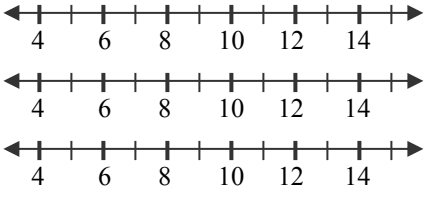
3. Now investigate what happens when we combine requirements A & C with "**and**":
   a. Graph the numbers that meet requirement A:
   b. Graph the numbers that meet requirement C:
   c. Graph only the numbers that meet both A **and** C:
   d. Write the solution as an inequality:



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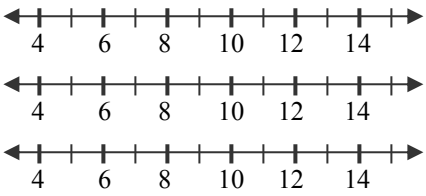
4. Investigate what happens when we combine requirements A & C with "**or**":
   a. Graph the numbers that meet requirement A:
   b. Graph the numbers that meet requirement C:
   c. Graph all the numbers that meet either A **or** C:
   d. Write the solution as an inequality:

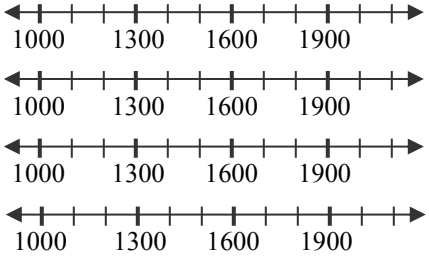


Each graph that you have drawn on a number line represents the **solution set** or **truth set**.

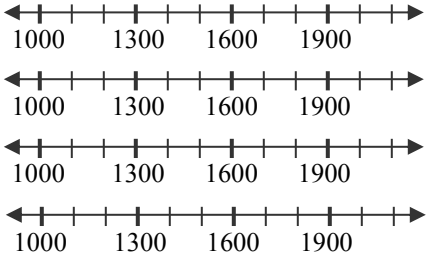
Solution Set (or Truth Set)

A *solution set* is all the numbers that make a statement true.

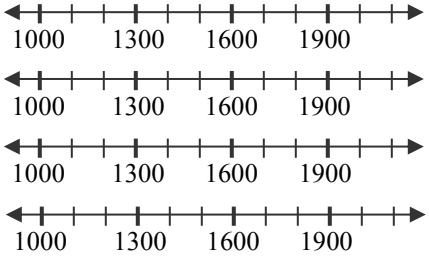
5. Next, combine requirements D & E:
   a. Graph the numbers that meet requirement D:
   b. Graph the numbers that meet requirement E:
   c. Graph the numbers that meet requirements D **and** E:
   d. Graph all the numbers that meet requirement D **or** E:



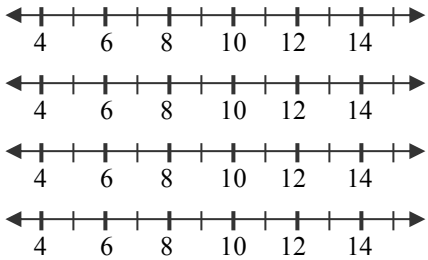
6. Now combine requirements E & F:
   a. Graph the numbers that meet requirement E:
   b. Graph the numbers that meet requirement F:
   c. Graph the numbers that meet requirements E **and** F:
   d. Graph all the numbers that meet requirement E **or** F:



7. Now combine requirements D & F:
   a. Graph the numbers that meet requirement D:
   b. Graph the numbers that meet requirement F:
   c. Graph the numbers that meet requirements D **and** F:
   d. Graph all the numbers that meet requirement D **or** F:



8. Now combine requirements B & C:
   a. Graph the numbers that meet requirement B:
   b. Graph the numbers that meet requirement C:
   c. Graph the numbers that meet requirements B **and** C:
   d. Graph all the numbers that meet requirement B **or** C:



9. Now write some notes to help you remember what you have learned about combining *solution sets* using the words **and** & **or**.

More 3-6: Lines Dancing

Graphing Compound Inequalities

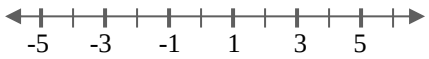
Combining two inequalities with the word "**or**" creates the **union** of the two solution sets. The symbol for the *union* of two sets is "∪". Any value that is in the solution set to either of the original inequalities is in the solution set of compound inequality.

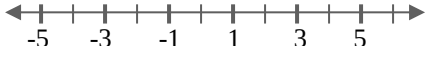
Combining two inequalities with the word "**and**" creates the **intersection** of the two solution sets. The symbol for the *intersection* of two sets is "∩". Only values that are in the solution set to both original inequalities may be in the solution set of the compound inequality.

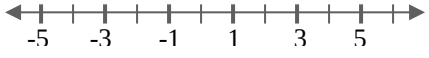
Use the table of inequality requirements below to find each union or intersection. Sketch each individual requirement first, and then sketch the compound inequality on the third number line.

Requirement **A**:	$x > -3$
Requirement **B**:	$x < 2$
Requirement **C**:	$x \geq 0$
Requirement **D**:	$x \leq -1$
Requirement **E**:	$x \leq 4$
Requirement **F**:	$x > 2$
Requirement **G**:	$x < 0$

1. Requirements **A *and* C**.

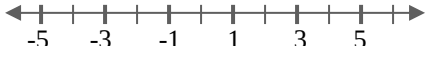
A: 

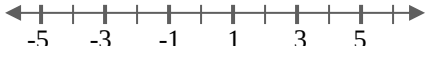
C: 

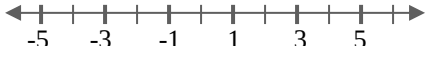
A ∩ C: 

Solution:

2. Requirements **A *or* C**.

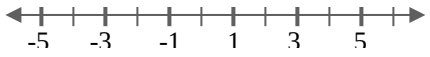
A: 

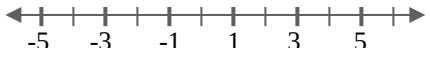
C: 

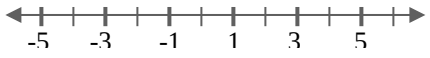
A ∪ C: 

Solution:

3. Requirements **B *and* D**.

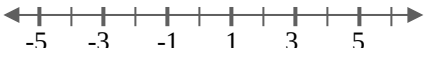
B: 

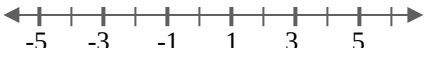
D: 

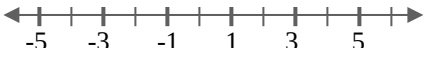
B ∩ D: 

Solution:

4. Requirements **B *or* D**.

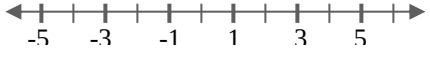
B: 

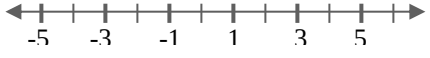
D: 

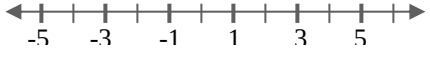
B ∪ D: 

Solution:

5. Requirements **A *and* B**.

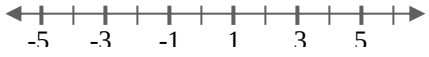
A: 

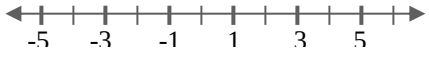
B: 

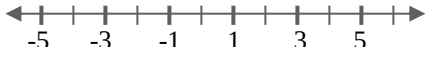
A ∩ B: 

Solution:

6. Requirements **A *or* B**.

A: 

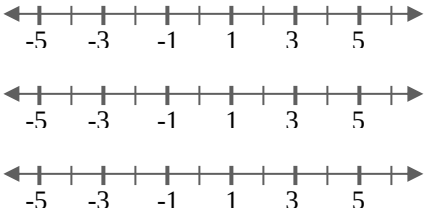
B: 

A ∪ B: 

Solution:

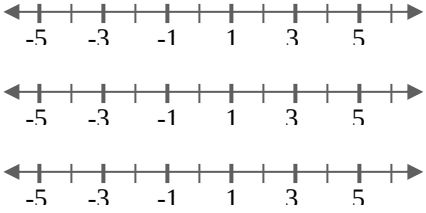
Graph each set of requirements as indicated and write the solution as an inequality. Remember to label each number line!

7. Requirements **E** ***and*** **G**.



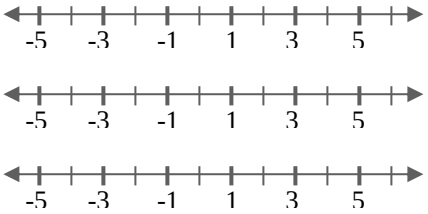
Solution:

8. Requirements **E** ***or*** **G**.



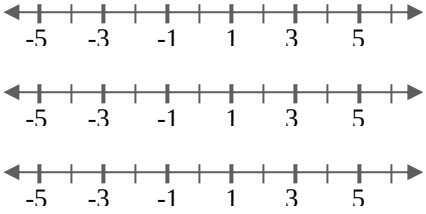
Solution:

9. Requirements **C** ***and*** **D**.



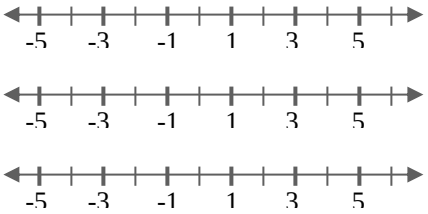
Solution:

10. Requirements **C** ***or*** **D**.



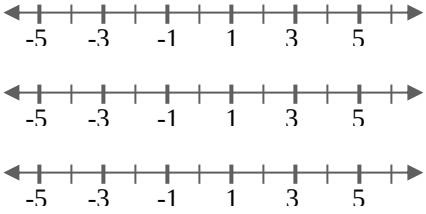
Solution:

11. Requirements **B** ***and*** **C**.



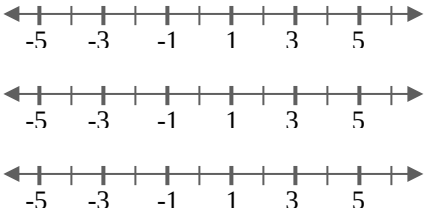
Solution:

12. Requirements **D** ***or*** **F**.



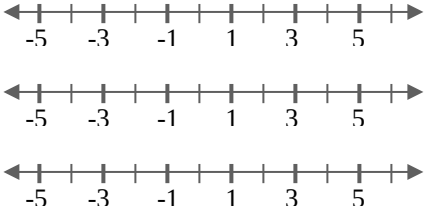
Solution:

13. Requirements **A** ***and*** **F**.



Solution:

14. Requirements **B** ***or*** **F**.



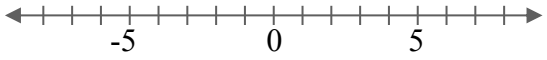
Solution:

15. Based on these graphs, what generalizations can you make about the differences between these two types of compound inequalities (*unions* and *intersections*)?

Even More 3-6: Compounding Inequities

Solve each compound inequality. Graph the solutions on the number line AND state 3 numbers in the solution set. Show all your work!

1. $4m-5>7$ or $4m-5<-9$



Solution:

3 numbers in the solution set:

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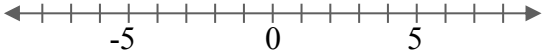
2. $-1\le x+2\le 4$



Solution:

3 numbers in the solution set:

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3. $y+6>-1$ or $y-2\le 4$

Solution:

3 numbers in the solution set:

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4. $2(5-x)>12$ and $7x>4x+9$

Solution:

3 numbers in the solution set:

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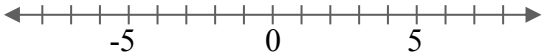
5. $-6\le 2x-2\le 0$



Solution:

3 numbers in the solution set:

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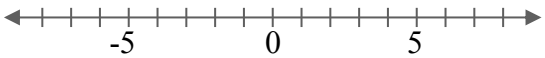
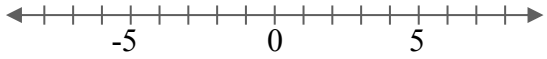
6. $3y+11\ge 14$ or $2y\le 5y-12$



Solution:

3 numbers in the solution set:

7. $3(c+4)<12$ and $c+2>5$



Solution:

3 numbers in the solution set:

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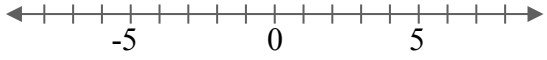
8. $3-2k\le 7$ or $2k+13<1$



Solution:

3 numbers in the solution set:

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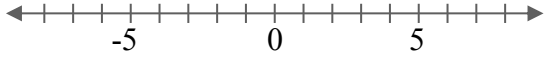
9. $2(3w+5)<7$ or $2w+8<5w-1$



Solution:

3 numbers in the solution set:

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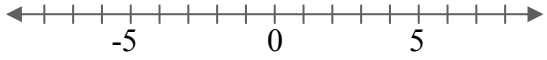
10. $8<2(x+3)-4\le 14$



Solution:

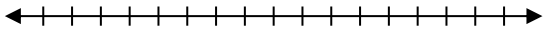
3 numbers in the solution set:

Practice 3-6

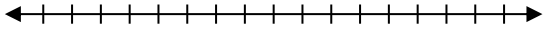
Name:_____
Date:_____ Period:_____

Solve each compound inequality and graph the solution:

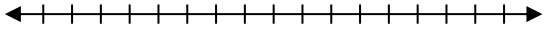
1. $-5 < x + 5 < 5$



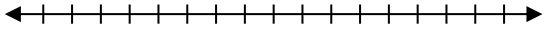
2. $k - 3 > 1$ or $k - 3 < -1$



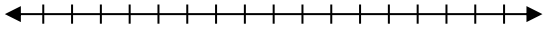
3. $-4d \geq 8$ and $2d \geq -6$



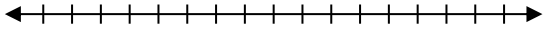
4. $-6 \leq 9 + 3y \leq 6$



5. $4 - 2x > 7$ and $2 - 3(x + 1) < 5$



6. $8(3x - 6) < -24$ or $2(3b - 2) < 4b + 8$



7. $6 - 2(4x + 1) \geq -10$ and $5 - (x - 9) < 2x + 7$