Lesson 15: Solution Sets of Two or More Equations (or Inequalities) Joined by "And" or "Or"

Classwork

Exercise 1

Determine whether each claim given below is true or false.

a. Right now, I am in math class and English class.

b. Right now, I am in math class or English class.

c. $3 + 5 = 8$ and $5 < 7 - 1$

d. $10 + 2 \neq 12$ and $8 - 3 > 0$

e. $3 < 5 + 4$ or $6 + 4 = 9$

f. $16 - 20 > 1$ or $5.5 + 4.5 = 11$

These are all examples of declarative compound sentences.

g. When the two declarations in the sentences above were separated by "and," what had to be true to make the statement true?

h. When the two declarations in the sentences above were separated by "or," what had to be true to make the statement true?

Example 1

Solve each system of equations and inequalities.
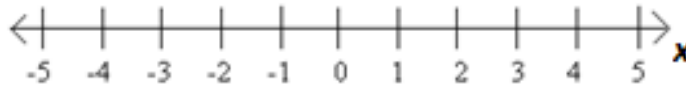
a. $x + 8 = 3$ or $x - 6 = 2$

b. $4x - 9 = 0$ or $3x + 5 = 2$

c. $x - 6 = 1$ and $x + 2 = 9$

d. $2w - 8 = 10$ and $w > 9$

Exercise 2

a. Using a colored pencil, graph the inequality $x < 3$ on the number line below part (c).

b. Using a different colored pencil, graph the inequality $x > -1$ on the same number line.

c. Using a third colored pencil, darken the section of the number line where $x < 3$ and $x > -1$.

d. Using a colored pencil, graph the inequality $x < -4$ on the number line below part (f).

e. Using a different colored pencil, graph the inequality $x > 0$ on the same number line.

f. Using a third colored pencil, darken the section of the number line where $x < -4$ or $x > 0$.
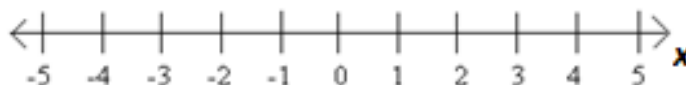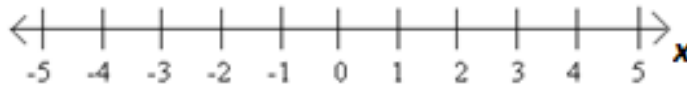
g. Graph the compound sentence $x > -2$ or $x = -2$ on the number line below.
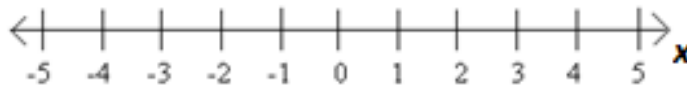
h. How could we abbreviate the sentence $x > -2$ or $x = -2$?

i. Rewrite $x \leq 4$ as a compound sentence, and graph the solutions to the sentence on the number line below.

Example 2

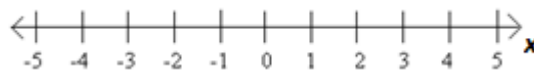Graph each compound sentence on a number line.

a. $x = 2$ or $x > 6$

b. $x \leq -5$ or $x \geq 2$

Rewrite as a compound sentence, and graph the sentence on a number line.

c. $1 \leq x \leq 3$

Exercise 3

Consider the following two scenarios. For each, specify the variable and say, "W is the width of the rectangle," for example, and write a compound inequality that represents the scenario given. Draw its solution set on a number line.

Scenario	Variable	Inequality	Graph
a. Students are to present a persuasive speech in English class. The guidelines state that the speech must be at least 7 minutes but not exceed 12 minutes.			
b. Children and senior citizens receive a discount on tickets at the movie theater. To receive a discount, a person must be between the ages of 2 and 12, including 2 and 12, or 60 years of age or older.			

Exercise 4

Determine if each sentence is true or false. Explain your reasoning.

a. $8 + 6 \leq 14$ and $\frac{1}{3} < \frac{1}{2}$

b. $5 - 8 < 0$ or $10 + 13 \neq 23$

Solve each system, and graph the solution on a number line.
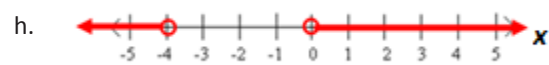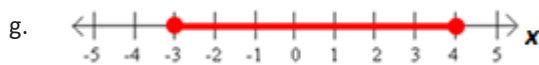
c. $x - 9 = 0$ or $x + 15 = 0$

d. $5x - 8 = -23$ or $x + 1 = -10$

Graph the solution set to each compound inequality on a number line.

e. $x < -8$ or $x > -8$

f. $0 < x \le 10$

Write a compound inequality for each graph.

g.

h.

i.   A poll shows that a candidate is projected to receive 57% of the votes. If the margin for error is plus or minus 3%, write a compound inequality for the percentage of votes the candidate can expect to get.

j.   Mercury is one of only two elements that are liquid at room temperature. Mercury is nonliquid for temperatures less than $-38.0°F$ or greater than $673.8°F$. Write a compound inequality for the temperatures at which mercury is nonliquid.

Lesson Summary

In mathematical sentences, like in English sentences, a compound sentence separated by

AND is true if _____ .

OR is true if _____ .

Problem Set

1. Consider the inequality $0 < x < 3$.
   a. Rewrite the inequality as a compound sentence.
   b. Graph the inequality on a number line.
   c. How many solutions are there to the inequality? Explain.
   d. What are the largest and smallest possible values for x? Explain.
   e. If the inequality is changed to $0 \le x \le 3$, then what are the largest and smallest possible values for x?

Write a compound inequality for each graph.

2.

3.
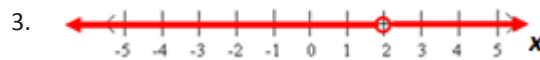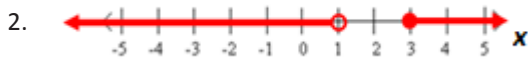
Write a single or compound inequality for each scenario.

4. The scores on the last test ranged from 65% to 100%.

5. To ride the roller coaster, one must be at least 4 feet tall.

6. Unsafe body temperatures are those lower than 96°F or above 104°F.

Graph the solution(s) to each of the following on a number line.

7. $x - 4 = 0$ and $3x + 6 = 18$

8. $x < 5$ and $x \ne 0$

9. $x \le -8$ or $x \ge -1$

10. $3(x - 6) = 3$ or $5 - x = 2$

11. $x < 9$ and $x > 7$

12. $x + 5 < 7$ or $x = 2$