Lesson 15A: 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.

1. Right now, I am in math class and English class. b. Right now, I am in math class or English class.
2. $3 + 5 = 8$ and $5 < 7 – 1$. d. $10 + 2 \ne 12$ and $8 – 3 > 0$.
3. $3 < 5 + 4$ or 6 + 4 = 9. f. $16 – 20 > 1$ or $5.5 + 4.5 = 11$

These are all examples of declarative compound sentences.

1. When the two declarations in the sentences above were separated by “and,” what had to be true to make the statement true?
2. When the two declarations in the sentences above were separated by “or,” what had to be true to make the statement true?

**Write an inequality that describes each condition.**

|  |  |
| --- | --- |
| Water is a liquid when the temperature is greater than 32°F and less than 212° F. | A refrigerator is designed to work on an electric line carrying from 115 volts to 120 volts. |
| The radio frequencies of an FM radio band ranges from 88 to 108 megahertz. | On Pennsylvania’s interstate highway, the speed limit is 65 mi/h. The minimum speed is 45 mi/h. What is the compound inequality that represents the speeds at which it is legal to drive? |
| A pizza restaurant offers a buffet. Children under age 12 eat for a reduced price. Adults over age 65 also eat for a reduced price. Write a compound inequality to describe the age of those people who can eat for a reduced price. |

Exercise 2

1. Using a colored pencil, graph the inequality $x < 3$ on the number line below.



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



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



1. Using a colored pencil, graph the inequality $x < -4$ on the number line below.



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



1. ****Using a third colored pencil, darken the section of the number line where $x < -4$ *or*$ x > 0$.
2. Graph the compound sentence $x > -2$ or $x = -2$ on the number line below.



1. How could we abbreviate the sentence $x > -2$ or $x = -2$?
2.  Rewrite $x \leq 4$ as a compound sentence and graph the solutions to the sentence on the number line below.

If an equation has the word “**or**”, then we **graph both parts**.

If an equation has the word “**and**”, then we must look at both inequalities and only graph the **overlap** of the two.

|  |  |
| --- | --- |
| **x < 2 and x > -1** | **m < -3 or m > 5** |
| **x is less than 1 and x is greater than or equal to –1** | **c is less than -2 or c is greater than or equal to 2.** |
| **-2 < b < 3** | **m < -3 or m > 5** |

**Write the inequality for the graph.**

 **0 1 2 3 4 5 6 -2 -1 0 1 2 3**

Problem Set 15A

**Example 1**

Graph each compound sentence on a number line.

1.  $x = 2$ or $x > 6$ b. $x \leq -5$ or $x \geq 2$
2.  $1 \leq x \leq 3$

**Example 2**

Consider the inequality $0 < x < 3$.

* 1. Rewrite the inequality as a compound sentence.



* 1. Graph the inequality on a number line.
	2. How many solutions are there to the inequality? Explain.
	3. What are the largest and smallest possible values for $x$? Explain.
	4. If the inequality is changed to $0 \leq x \leq 3$, then what are the largest and smallest possible values for $x$?

**Example 3**

**Write a compound inequality for each graph.**

a. b.

**Example 4**

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

a. The scores on the last test ranged from $65\%$ to $100\%$.

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

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

**Example 5**

Consider the following two scenarios. For each example, write a compound inequality that represents the scenario given. Draw its solution set on a number line.

|  |  |  |
| --- | --- | --- |
| Scenario | 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.  |  |  |

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

Classwork

**Example 1**

Solve each system of equations and inequalities.

1. $x + 8 = 3$ or $x-6 = 2$ b. $4x- 9 = 0$ or $3x + 5 = 2$

1. $x-6 = 1$ and $x + 2 = 9$ d. $2w-8 = 10$ and $w>9$.

**Solving Compound Inequalities**

**“And”**

Solve and graph.



-3 < x – 1 < 5



4 <2c < 8



19 < -3r +1 < 22-

**Solving Compound Inequalities**

**“Or”**

x + 6 > 9 or x – 5 < -3

8 < 2x + 2 or -2x + 3 < 5



9 < -b + 2 or -b + 2 < -4

**Translate and solve each compound inequality**

a. -5 is less than2v **–** 1 and 2v **–** 1 is less than or equal to -3.

b. 2d is less than or equal to -2 or 3d is greater than 3.

c. Fifteen is less than or equal to -3h + 6 and 21 is greater than or equal to -3h + 6.

Problem Set 15B

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

1. $x < -8$ or $x > -8$ 2. $0 < x \leq 10$



****Write a compound inequality for each graph.

3. 4.

Write a compound inequality for each statement.

5. 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.

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

**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 $x \ne 0$



1. $x \leq -8$ or $x \geq -1$ 10. $3(x-6) = 3$ or $5-x = 2$



1. $x < 9$ and $x > 7$ 12. $x + 5 < 7$ or $x = 2$



13. –6 < d + 1 < -3 14. –2 < -2t < 6



15. –4 < 3m – 4 < 5 16. 9 < -b < 12



17 x – 1 > 2 or x – 1 < -2 18. -3b + 3 < 12 or -4b > 20

