Compound Inequalities

- more than one inequality
  $<, \leq, >, \geq$

OR
- union

AND
- intersection

Activity

EXPLORE & REASON

Hana has some blue paint. She wants to lighten the shade, so she mixes in 1 cup of white paint. The color is still too dark, so Hana keeps mixing in 1 cup of white paint at a time. After adding 4 cups, she decides the color is too light.

1-6 Compound Inequalities

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C is greater than 1 cup of white

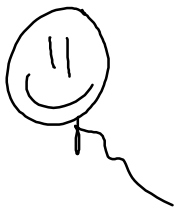
A. Explain in words how much paint Hana should have added initially to get the shade she wants.

$1 < C < 4$ ← $C > 1$ and $C < 4$

Intersection
- must be true for both

C is less than 4 cups of white

B. **Model With Mathematics** Represent your answer to part A with one or more inequalities. MP.4



C. Hana decides that she likes the shades of blue that appear in between adding 1 cup and 4 cups of white paint. How can you represent the number of cups of white paint that yield the shades Hana prefers?

HABITS OF MIND

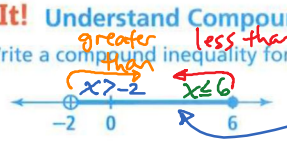
Mathematical Modeling If the solution to an inequality includes all the values that are in between two values, how can you show that on a number line? MP.4

Notes

Assess

EXAMPLE 1 Try It! Understand Compound Inequalities

1. Write a compound inequality for the graph.



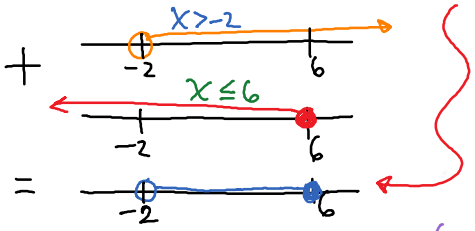
segment

open closed

$-2 < x \leq 6$ aka $x > -2$ and $x \leq 6$

intersection

• "overlap"



or

EXAMPLE 2 Try It! Solve a Compound Inequality Involving *Or*

2. Solve the compound inequality $-3x + 2 > -7$ or $2(x - 2) \geq 6$. Graph the solution.

or

• union

graph everything

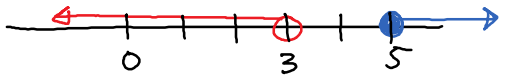
$-3x + 2 > -7$ or $2(x-2) \geq 6$

$-2 \quad -2$ $\quad$ $2 \quad 2$

$-3x > -9$ $\quad$ $(x-2) \geq 3$

$\div -3 \quad -3$ $\quad$ $+2 \quad +2$

$x < 3$ open or $x \geq 5$ closed



or

HABITS OF MIND

Make Sense of Problems How does representing a compound inequality solution on a graph help show the solution accurately? MP.1

Notes

Assess

EXAMPLE 3 **Try It! Solve a Compound Inequality Involving *And***

3. Solve the compound inequality $-2(x + 1) < 4$ and $4x + 1 \leq -3$. Graph the solution.

intersection - overlap

$-2(x+1) < 4$

$*-2 \quad -2$

$x+1 > -2$

$-1 \quad -1$

$x > -3$

and

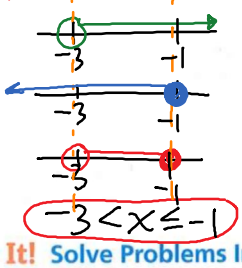
$4x+1 \leq -3$

$-1 \quad -1$

$\frac{4x}{4} \leq \frac{-4}{4}$

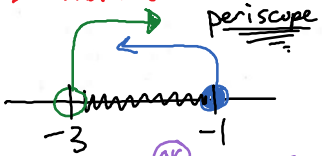
$x \leq -1$

"Sandwich" overlap



$-3 < x \leq -1$

"Submarine"



or

EXAMPLE 4 **Try It! Solve Problems Involving Compound Inequalities**

4. Suppose River has new treats that are 10 calories each. How many of the new treats can she have and remain in her calorie range?

HABITS OF MIND

Communicate Precisely Describe the solution of an inequality involving *or* and an inequality involving *and*. MP.6

Assess

Do You UNDERSTAND?

1. ESSENTIAL QUESTION What are compound inequalities and how are their solutions represented?

2. **Look for Relationships** When $a < b$, how is the graph of $x > a$ and $x < b$ similar to the graph of $x > a$? How is it different? MP.7

3. **Vocabulary** A *compound* is defined as a *mixture*. Make a conjecture as to why the term *compound inequality* includes the word *compound*.

4. **Error Analysis** Kona graphed the compound inequality $x > 2$ or $x > 3$ by graphing $x > 3$. Explain Kona's error. MP.3

Do You KNOW HOW?

Write a compound inequality for each graph.

5. 

$x \leq -4$ or $x \geq -1$

union

6. 

$2 \leq x < 8$

aka intersection

$x \geq 2$ and $x < 8$

Solve each compound inequality and graph the solution.

7. $4x - 1 > 3$ and $-2(3x - 4) \geq -16$

8. $2(4x + 3) \geq -10$ or $-5x - 15 > 5$

9. Nadeem plans to ride her bike between 12 mi and at most 15 mi. Write and solve an inequality to model how many hours Nadeem will be riding.

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