

LESSON 5-4 Solving Compound Inequalities

5-Minute Check

Over Lesson 5-3

*more than one...*

**1** Solve  $3x - 15 < 45$ .

A.  $\{x \mid x < 30\}$

B.  $\{x \mid x < 20\}$

C.  $\{x \mid x < 15\}$

D.  $\{x \mid x < 10\}$

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 5-Minute Check

Over Lesson 5-3

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LESSON 5-4 Solving Compound Inequalities

5-Minute Check

Over Lesson 5-3

**3** Solve  $-3 - \frac{x}{4} < 13$ .

A.  $x < 64$

B.  $x < 4$

C.  $x > -64$

D.  $x > -4$

LESSON 5-4 Solving Compound Inequalities


 5-Minute Check

Over Lesson 5-3

**3** Solve  $-3 - \frac{x}{4} < 13$ .

A.  $x < 64$

B.  $x < 4$

 C.  $x > -64$

D.  $x > -4$

## LESSON 5-4 Solving Compound Inequalities

### EXAMPLE 1 Solve and Graph an Intersection

**Solve  $7 < z + 2 \leq 11$ . Graph the solution set.**

First express  $7 < z + 2 \leq 11$  using *and*. Then solve each inequality.  $-2$   $-2$   $-2$

$$7 < z + 2 \quad \text{and} \quad z + 2 \leq 11 \quad \text{Write the inequalities.}$$

$$7 - 2 < z + 2 - 2 \quad z - 2 + 2 \leq 11 - 2 \quad \text{Subtract 2 from each side.}$$

$$5 < z \quad z \leq 9 \quad \text{Simplify.}$$

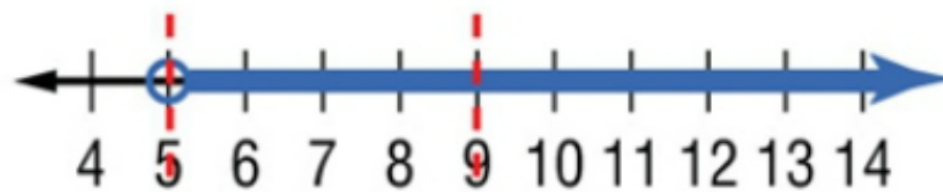
The solution set is  $\{z \mid 5 < z \leq 9\}$ .

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EXAMPLE 1

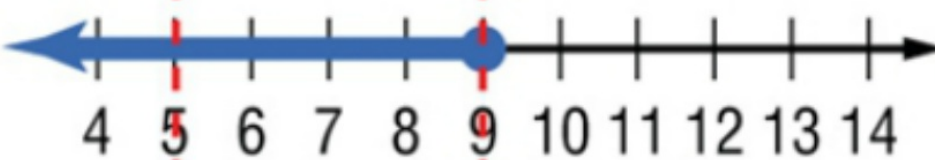
Solve and Graph an Intersection

Graph  $5 < z$  or  $z > 5$ .

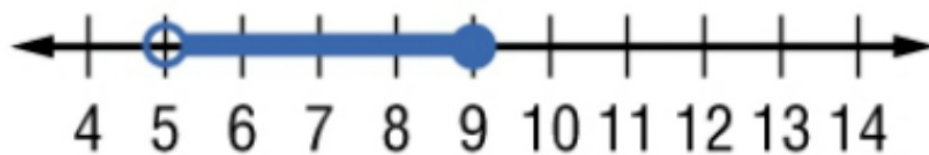


Graph  $z \leq 9$ .

Find the intersection.



Answer:



LESSON 5-4 Solving Compound Inequalities

EXAMPLE 1

✓ Check Your Progress

Solve  $-3 < x - 2 < 5$ . Then graph the solution set.

A.  $\{x \mid -1 < x < 7\}$



B.  $\{x \mid -5 < x < 3\}$



C.  $\{x \mid x < 7\}$



D.  $\{x \mid -1 < x < 3\}$





LESSON 5-4 Solving Compound Inequalities

EXAMPLE 1

✓ Check Your Progress

Solve  $-3 < x - 2 < 5$ . Then graph the solution set.

**A.**  $\{x \mid -1 < x < 7\}$



**B.**  $\{x \mid -5 < x < 3\}$



**C.**  $\{x \mid x < 7\}$



**D.**  $\{x \mid -1 < x < 3\}$





LESSON 5-4 Solving Compound Inequalities

Real-World Example 2

Write and Graph a Compound Inequality

**TRAVEL** A ski resort has several types of hotel rooms and several types of cabins. The hotel rooms cost at most \$89 per night and the cabins cost at least \$109 per night. Write and graph a compound inequality that describes the amount that a guest would pay per night at the resort.

Words

Cost per night is at most \$89 or the cost is at least \$109.

Variable

Let  $n$  be the cost of staying at the resort per night.

Inequality

$n \leq 89$  or  $n \geq 109$

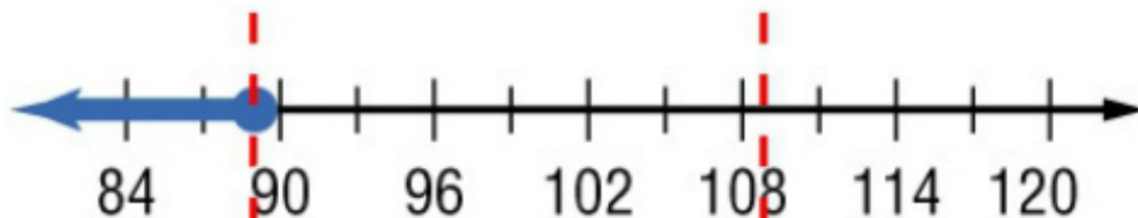
LESSON 5-4 Solving Compound Inequalities

Real-World Example 2

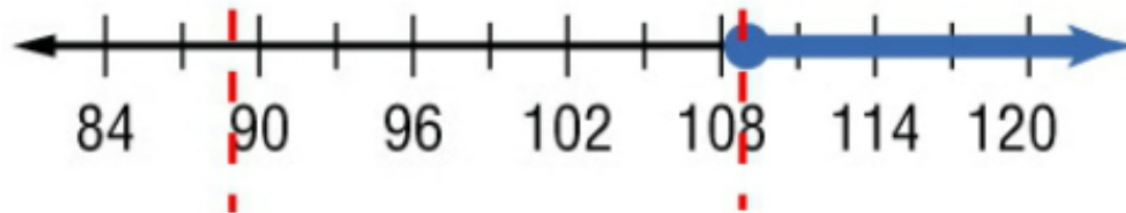
Write and Graph a Compound Inequality

Now graph the solution set.

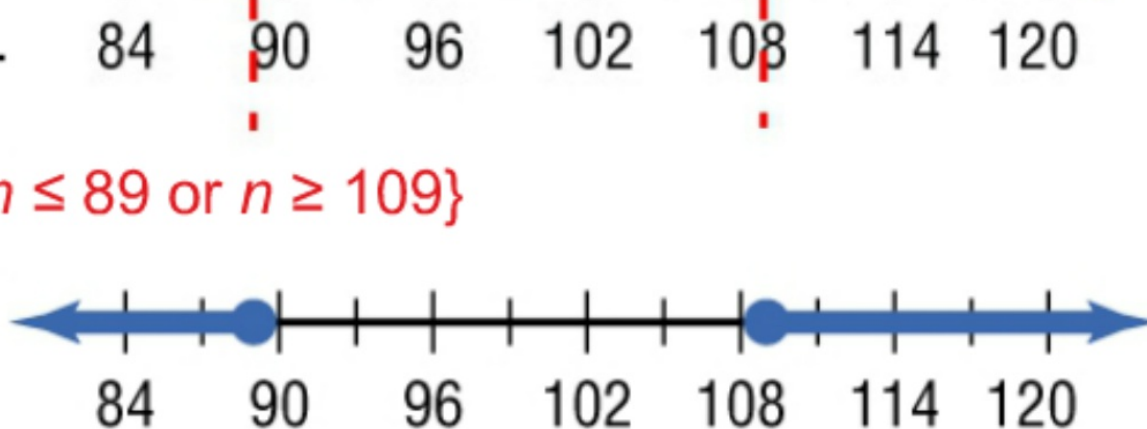
Graph  $n \leq 89$ .



Graph  $n \geq 109$ .



Find the union.



**Answer:**  $\{n \mid n \leq 89 \text{ or } n \geq 109\}$

LESSON 5-4 Solving Compound Inequalities


Real-World Example 2

Check Your Progress

**TICKET SALES** A professional hockey arena has seats available in the Lower Bowl level that cost at most \$65 per seat. The arena also has seats available at the Club Level and above that cost at least \$80 per seat. Write and graph a compound inequality that describes the amount a spectator would pay for a seat at the hockey game.

A.  $c \leq 65$  or  $c \geq 80$  

B.  $c \geq 65$  or  $c \leq 80$  

C.  $c \geq 65$  or  $c \geq 80$  

D.  $c \leq 65$  or  $c \leq 80$  







LESSON 5-4 Solving Compound Inequalities

Real-World Example 2

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**TICKET SALES** A professional hockey arena has seats available in the Lower Bowl level that cost at most \$65 per seat. The arena also has seats available at the Club Level and above that cost at least \$80 per seat. Write and graph a compound inequality that describes the amount a spectator would pay for a seat at the hockey game.

- A.**  $c \leq 65$  or  $c \geq 80$  
- B.**  $c \geq 65$  or  $c \leq 80$  
- C.**  $c \geq 65$  or  $c \geq 80$  
- D.**  $c \leq 65$  or  $c \leq 80$  

LESSON **5-4** Solving Compound Inequalities

**EXAMPLE 3** Solve and Graph a Union

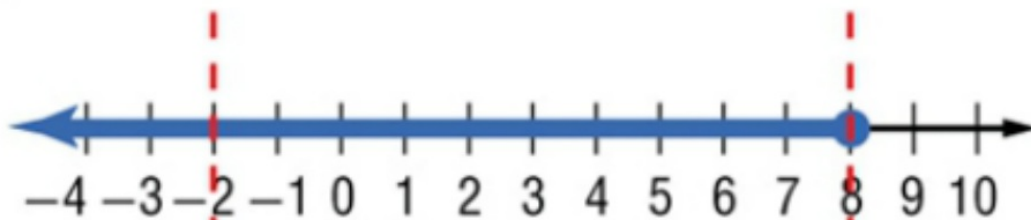
Solve  $4k - 7 \leq 25$  or  $12 - 9k \geq 30$ . Graph the solution set.



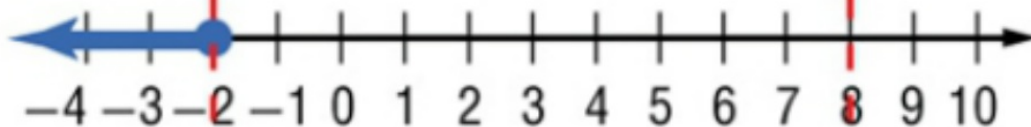
## LESSON 5-4 Solving Compound Inequalities

### EXAMPLE 3 Solve and Graph a Union

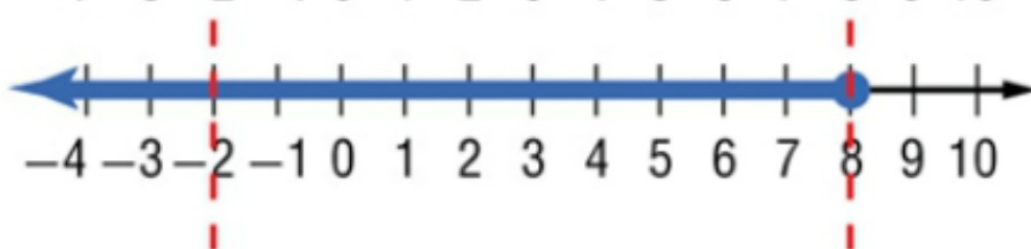
Graph  $k \leq 8$ .



Graph  $k \leq -2$ .



Find the union.



**Answer:** Notice that the graph of  $k \leq 8$  contains every point in the graph of  $k \leq -2$ . So, the union is the graph of  $k \leq 8$ . The solution set is  $\{k \mid k \leq 8\}$ .

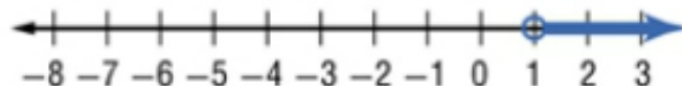
LESSON 5-4 Solving Compound Inequalities

EXAMPLE 3

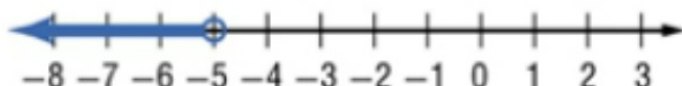
✓ Check Your Progress

Solve  $-2x + 5 < 15$  or  $5x + 15 > 20$ . Then graph the solution set.

A.  $\{x \mid x > 1\}$



B.  $\{x \mid x < -5\}$



C.  $\{x \mid x > -5\}$



D.  $\{x \mid x < 1\}$





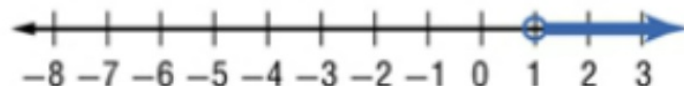
LESSON 5-4 Solving Compound Inequalities

EXAMPLE 3

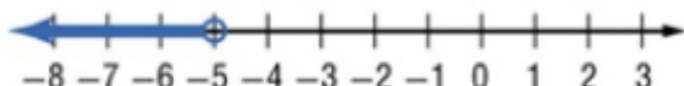
✓ Check Your Progress

Solve  $-2x + 5 < 15$  or  $5x + 15 > 20$ . Then graph the solution set.

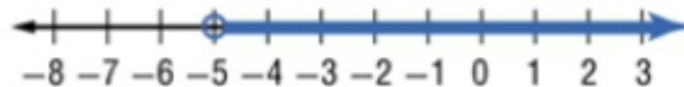
A.  $\{x \mid x > 1\}$



B.  $\{x \mid x < -5\}$



C.  $\{x \mid x > -5\}$



D.  $\{x \mid x < 1\}$



## Check Your Understanding

 = Step-by-Step Solutions begin on page R13.



**Examples 1, 3** Solve each compound inequality. Then graph the solution set.

1–4. See Ch. 5 Answer Appendix.

1.  $4 \leq p - 8$  and  $p - 14 \leq 2$

2.  $r + 6 < -8$  or  $r - 3 > -10$

3.  $4a + 7 \geq 31$  or  $a > 5$

4.  $2 \leq g + 4 < 7$

**Example 2**

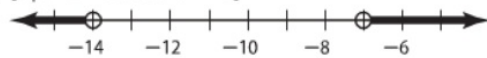
5. **CCSS SENSE-MAKING** The recommended air pressure for the tires of a mountain bike is at least 35 pounds per square inch (psi), but no more than 80 pounds per square inch. If a bike's tires have 24 pounds per square inch, what is the recommended range of air that should be put into the tires?  **$11 \text{ psi} \leq x \leq 56 \text{ psi}$**

### Lesson 5-4

1.  $\{p \mid 12 \leq p \leq 16\}$



2.  $\{r \mid r < -14 \text{ or } r > -7\}$



3.  $\{a \mid a > 5\}$



4.  $\{g \mid -2 \leq g < 3\}$



①  $4 \leq p - 8$  and  $p - 14 \leq 2$

$$\begin{array}{r} +8 \\ \hline 12 \leq p \end{array}$$

$$\begin{array}{r} +14 \\ \hline p \leq 16 \end{array}$$

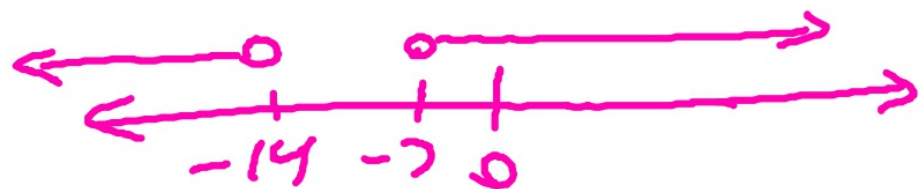
$p \geq 12$



$$2. r + 6 < -8 \text{ or } r - 3 > -10$$

$$\begin{array}{r} -6 \quad -6 \quad +3 \quad +3 \\ \hline \end{array}$$

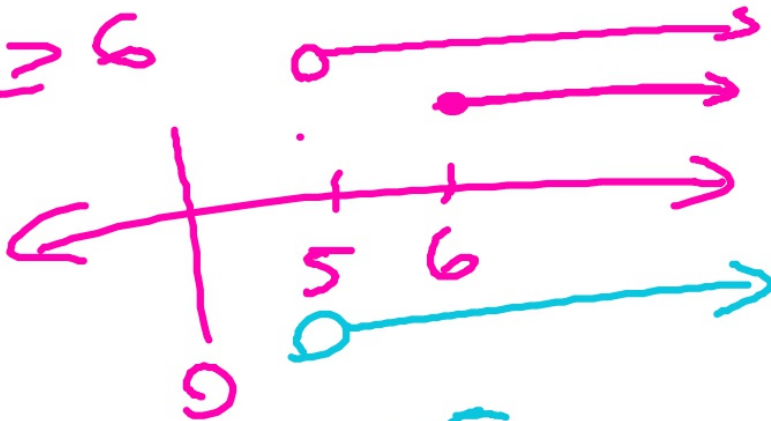
$$r < -14 \quad \text{or} \quad r > -7$$



3.  $4a + 7 \geq 31$  or  $a > 5$

$$\begin{array}{r} \rightarrow -7 \\ \hline 4a \geq 24 \\ \hline 4 \end{array} \quad \text{or} \quad a > 5$$

$$a \geq 6$$



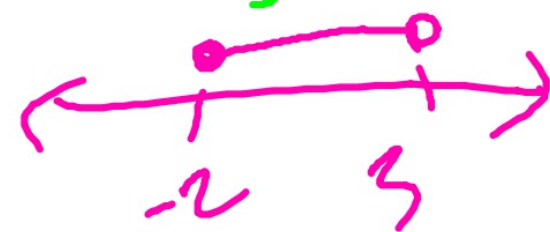
$$a > 5$$

4.  $2 \leq g + 4 < 7$

$$\begin{array}{r} 2 \leq g + 4 \quad \text{and} \quad g + 4 < 7 \\ \hline -4 \quad \quad -4 \quad \quad \quad \quad -4 \quad -4 \\ \hline \hline \end{array}$$

$$-2 \leq g \quad g < 3$$

$$g \geq -2$$



**Examples 1, 3** Solve each compound inequality. Then graph the solution set.

6.  $f - 6 < 5$  and  $f - 4 \geq 2$
7.  $n + 2 \leq -5$  and  $n + 6 \geq -6$
8.  $y - 1 \geq 7$  or  $y + 3 < -1$
9.  $t + 14 \geq 15$  or  $t - 9 < -10$
10.  $-5 < 3p + 7 \leq 22$
11.  $-3 \leq 7c + 4 < 18$
12.  $5h - 4 \geq 6$  and  $7h + 11 < 32$
13.  $22 \geq 4m - 2$  or  $5 - 3m \leq -13$
14.  $-4a + 13 \geq 29$  and  $10 < 6a - 14$
15.  $-y + 5 \geq 9$  or  $3y + 4 < -5$

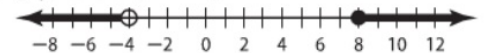
6.  $\{f \mid 6 \leq f < 11\}$



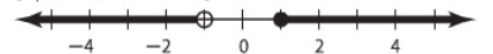
7.  $\{n \mid -12 \leq n \leq -7\}$



8.  $\{y \mid y \geq 8 \text{ or } y < -4\}$



9.  $\{t \mid t \geq 1 \text{ or } t < -1\}$



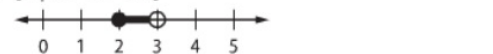
10.  $\{p \mid -4 < p \leq 5\}$



11.  $\{c \mid -1 \leq c < 2\}$



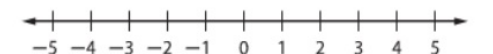
12.  $\{h \mid 2 \leq h < 3\}$



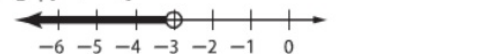
13.  $\{m \mid m \text{ is a real number.}\}$



14.  $\emptyset$



15.  $\{y \mid y < -3\}$



Examples 1, 3 Solve each compound inequality. Then graph the solution set.

6.  $f - 6 < 5$  and  $f - 4 \geq 2$

7.  $n + 2 \leq -5$  and  $n + 6 \geq -6$

8.  $y - 1 \geq 7$  or  $y + 3 < -1$

9.  $t + 14 \geq 15$  or  $t - 9 < -10$

10.  $-5 < 3p + 7 \leq 22$

11.  $-3 \leq 7c + 4 < 18$  **and**

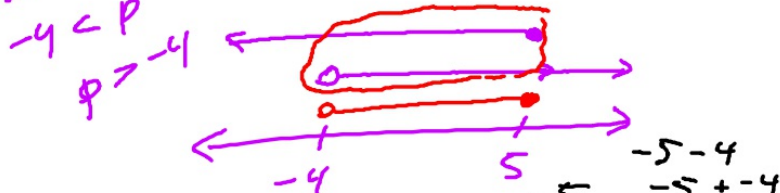
12.  $5h - 4 \geq 6$  and  $7h + 11 < 32$

13.  $22 \geq 4m - 2$  or  $5 - 3m \leq -13$

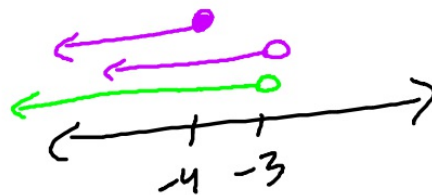
14.  $-4a + 13 \geq 29$  and  $10 < 6a - 14$

15.  $-y + 5 \geq 9$  or  $3y + 4 < -5$

10.  $-5 < 3p + 7$  **and**  $3p + 7 \leq 22$   
 $\xrightarrow{-7}$   $\xrightarrow{-7}$   
 $-12 < 3p$   $3p \leq 15$   
 $\xrightarrow{3}$   $\xrightarrow{3}$   
 $-4 < p$   $p \leq 5$



15.  $-y + 5 \geq 9$  or  $3y + 4 < -5$   
 $\xrightarrow{-5}$   $\xrightarrow{-5}$   $\xrightarrow{-4}$   $\xrightarrow{-4}$   
 $-y \geq 4$   $3y < -9$   
 $y \leq -4$   $\xrightarrow{3}$   $y < -3$   
**or**





Example 2

16. **SPEED** The posted speed limit on an interstate highway is shown. Write an inequality that represents the sign. Graph the inequality.

17. **NUMBER THEORY** Find all sets of two consecutive positive odd integers with a sum that is at least 8 and less than 24. **16-17. See margin.**



16

$$x \geq 40 \text{ and } x \leq 70$$

$$40 \leq x \text{ and } x \leq 70$$

$$40 \leq x \leq 70$$

17

$$\left. \begin{array}{l} x \\ x+2 \end{array} \right\} \text{ odd consecutive} \\ \text{\#s}$$

$$3 \leq x < 11$$

$$\begin{array}{l} x \geq 8 \\ x < 24 \end{array}$$

$$8 \leq x + x + 2 < 24$$

$$\begin{array}{l} \sim \\ \sim \\ \sim \end{array} \frac{6}{2} < \frac{2x}{2} < \frac{22}{2}$$