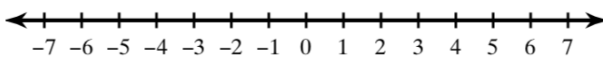


2.5 Solving Compound Inequalities

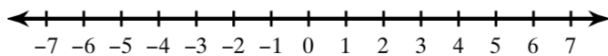
Do Now: Solve and graph the inequality.

$$-5 > \frac{7-2x}{-3}$$
A horizontal number line with arrows at both ends, labeled with integers from -7 to 7.

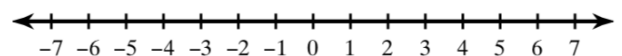
Critical thinking: In chemistry water is considered a chemical compound. Why?

What do you think a **compound inequality** is? _____

AND
Graph: $x \geq -2$ and $x < 5$

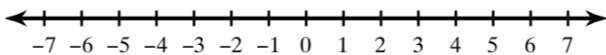


OR
Graph $x \geq 5$ or $x < -2$

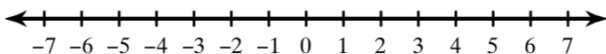


Example 1: Writing a compound inequality

- a) A number w is greater than -8 and less than or equal to 4 .



- b) A number h is at most 0 or at least 2 .

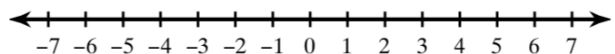
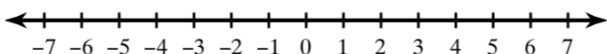


Example 2: Solving compound Inequalities with “AND”

Solve each inequality then graph the solution.

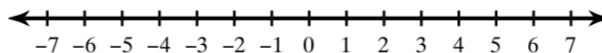
a) $-4 < x - 2 \leq 3$

b) $-3 < -2x - 1 < 9$



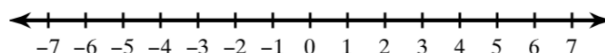
Try on your own: Solve and graph the inequality

1) $-3 < 2k - 5 \leq 7$



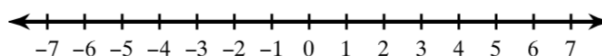
Example 3: Solving a Compound Inequality with “OR”
Solve each inequality then graph the solution.

a) $3y - 5 < -8$ or $2y - 1 \geq 5$



Try on your own: Solve and graph the inequality

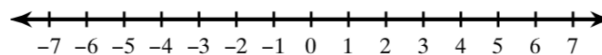
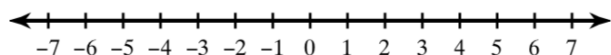
1) $2p + 1 \leq -7$ or $3 - 2p < -1$



Critical Thinking: Compare the following inequalities

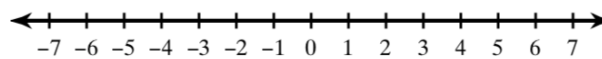
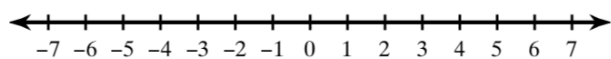
A) $x \geq 5$ or $x \leq -2$

C) $x \geq 5$ or $x > -2$



B) $x \geq 5$ and $x \leq -2$

D) $x \geq 5$ and $x > -2$



Example 4: Modeling with mathematics.

In order for an iPhone to function correctly it must have a core temperature between 0°C and 35°C . Write a compound inequality that represents the possible operating temperatures (in degrees Fahrenheit) of the smartphone.

Try on your own:

A pair of snow boots has a temperature rating between -40°F to 59°F . Write and solve a compound inequality that represents the temperature rating (in degrees Celsius) of the pair of winter boots.

Homework:

3-6, 9, 10, 12, 14*, 15, 19, 20, 24, 27, 29, 33*, 36

2.5 Exercises

Dynamic Solutions available at BigIdeasMath.com

Vocabulary and Core Concept Check

- WRITING** Compare the graph of $-6 \leq x \leq -4$ with the graph of $x \leq -6$ or $x \geq -4$.
- WHICH ONE DOESN'T BELONG?** Which compound inequality does *not* belong with the other three? Explain your reasoning.

$$a > 4 \text{ or } a < -3$$

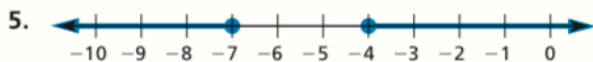
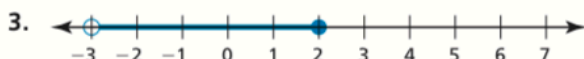
$$a < -2 \text{ or } a > 8$$

$$a > 7 \text{ or } a < -5$$

$$a < 6 \text{ or } a > -9$$

Monitoring Progress and Modeling with Mathematics

In Exercises 3–6, write a compound inequality that is represented by the graph.



In Exercises 7–10, write the sentence as an inequality. Graph the inequality. (See Example 1.)

- A number p is less than 6 and greater than 2.
- A number n is less than or equal to -7 or greater than 12.
- A number m is more than $-7\frac{2}{3}$ or at most -10 .
- A number r is no less than -1.5 and fewer than 9.5.

11. MODELING WITH MATHEMATICS

Slitsnails are large mollusks that live in deep waters. They have been found in the range of elevations shown. Write and graph a compound inequality that represents this range.



- 12. MODELING WITH MATHEMATICS** The life zones on Mount Rainier, a mountain in Washington, can be approximately classified by elevation, as follows.

Low-elevation forest: above 1700 feet to 2500 feet

Mid-elevation forest: above 2500 feet to 4000 feet

Subalpine: above 4000 feet to 6500 feet

Alpine: above 6500 feet to the summit



Elevation of Mount Rainier: 14,410 ft


Write a compound inequality that represents the elevation range for each type of plant life.

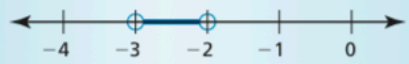
- trees in the low-elevation forest zone
- flowers in the subalpine and alpine zones


In Exercises 13–20, solve the inequality. Graph the solution. (See Examples 2 and 3.)

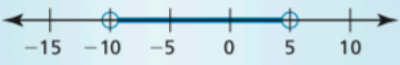
- $6 < x + 5 \leq 11$
- $24 > -3r \geq -9$
- $v + 8 < 3$ or $-8v < -40$
- $-14 > w + 3$ or $3w \geq -27$
- $2r + 3 < 7$ or $-r + 9 \leq 2$
- $-6 < 3n + 9 < 21$
- $-12 < \frac{1}{2}(4x + 16) < 18$
- $35 < 7(2 - b)$ or $\frac{1}{3}(15b - 12) \geq 21$

ERROR ANALYSIS In Exercises 21 and 22, describe and correct the error in solving the inequality or graphing the solution.

21.  $4 < -2x + 3 < 9$
 $4 < -2x < 6$
 $-2 > x > -3$



22.  $x - 2 > 3$ or $x + 8 < -2$
 $x > 5$ or $x < -10$



23. MODELING WITH MATHEMATICS

Write and solve a compound inequality that represents the possible temperatures (in degrees Fahrenheit) of the interior of the iceberg. (See Example 4.)




24. PROBLEM SOLVING A ski shop sells skis with lengths ranging from 150 centimeters to 220 centimeters. The shop says the length of the skis should be about 1.16 times a skier's height (in centimeters). Write and solve a compound inequality that represents the heights of skiers the shop does *not* provide skis for.

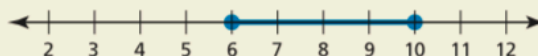
In Exercises 25–30, solve the inequality. Graph the solution, if possible.

25. $22 < -3c + 4 < 14$
 26. $2m - 1 \geq 5$ or $5m > -25$
 27. $-y + 3 \leq 8$ and $y + 2 > 9$
 28. $x - 8 \leq 4$ or $2x + 3 > 9$
 29. $2n + 19 \leq 10 + n$ or $-3n + 3 < -2n + 33$

30. $3x - 18 < 4x - 23$ and $x - 16 < -22$

31. REASONING Fill in the compound inequality $4(x - 6)$  $2(x - 10)$ and $5(x + 2) \geq 2(x + 8)$ with $<$, \leq , $>$, or \geq so that the solution is only one value.

32. THOUGHT PROVOKING Write a real-life story that can be modeled by the graph.



33. MAKING AN ARGUMENT

The sum of the lengths of any two sides of a triangle is greater than the length of the third side. Use the triangle shown to write and solve three inequalities. Your friend claims the value of x can be 1. Is your friend correct? Explain.



34. HOW DO YOU SEE IT? The graph shows the annual profits of a company from 2006 to 2013.



- a. Write a compound inequality that represents the annual profits from 2006 to 2013.
 b. You can use the formula $P = R - C$ to find the profit P , where R is the revenue and C is the cost. From 2006 to 2013, the company's annual cost was about \$125 million. Is it possible the company had an annual revenue of \$160 million from 2006 to 2013? Explain.

Maintaining Mathematical Proficiency

Reviewing what you learned in previous grades and lessons

Solve the equation. Graph the solutions, if possible. (Section 1.4)

35. $\left|\frac{d}{9}\right| = 6$ 36. $7|5p - 7| = -21$ 37. $|r + 2| = |3r - 4|$ 38. $\left|\frac{1}{2}w - 6\right| = |w + 7|$

Find and interpret the mean absolute deviation of the data. (Skills Review Handbook)

39. 1, 1, 2, 5, 6, 8, 10, 12, 12, 13 40. 24, 26, 28, 28, 30, 30, 32, 32, 34, 36