

4.5 - Compound Inequalities

Vocabulary:

- compound inequality - two inequalities that are joined together by the word "and" or the word "or"

$$x > 3 \text{ and } x < 5$$

$$3 < x \text{ and } x < 5$$

$$3 < x < 5$$

$$x > 2 \text{ or } x < -3$$

1 EXAMPLE Write two compound inequalities that represent each situation.
Graph the solutions.

a. all real numbers that are at least -1 and at most 3 .

① $x \geq -1$ and $x \leq 3$

$-1 \leq x$ and $x \leq 3$

② $-1 \leq x \leq 3$

③



b. all real numbers that are less than 31 , but greater than 25 .

① $x < 31$ and $x > 25$

$31 > x$ and $x > 25$

$25 < x < 31$

② $31 > x > 25$



Write a compound inequality that represents each situation. Graph your solution.

1. all real numbers that are between -4 and 6. $-4 < x < 6$



3. The circumference of a baseball is between 23cm and 23.5cm.

$$23 < x < 23.5$$



2 EXAMPLESolve $5 > 5 - f > 2$. Graph the solution.

$$5 > 5 - f$$

$$\begin{array}{r} 5 \\ -5 \\ \hline 0 \end{array} > \begin{array}{r} 5 - f \\ -5 \\ \hline -f \end{array}$$

$$\begin{array}{r} 0 \\ -1 \\ \hline -1 \end{array} > \begin{array}{r} -f \\ +1 \\ \hline -f \end{array}$$

$$0 < f$$

and

~~$$5 - f > 2$$~~

$$\begin{array}{r} 5 - f \\ -5 \\ \hline -f \end{array} > \begin{array}{r} 2 \\ -5 \\ \hline -3 \end{array}$$

$$\begin{array}{r} -f \\ -1 \\ \hline -f \end{array} > \begin{array}{r} -3 \\ +1 \\ \hline -2 \end{array}$$

$$f < 3$$

and

$$0 < f < 3$$



Solve each compound inequality. Graph your solution.

$$5. \quad -3 < j + 2 < 7$$

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

$$-5 < j < 5$$

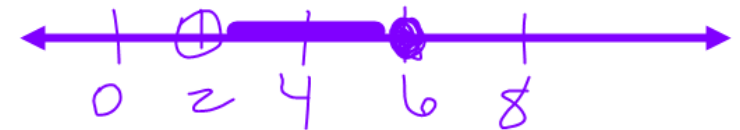


$$7. \quad 2 < 3n - 4 \leq 14$$

$$\quad +4 \quad \quad +4 \quad +4$$

$$\frac{6}{3} < \frac{3n}{3} \leq \frac{18}{3}$$

$$2 < n \leq 6$$



3 EXAMPLE Your test grades in science so far are 83 and 87. What possible grades g can you make on your next test to have an average between 85 and 90?

$$3 \cdot 85 \leq \frac{83 + 87 + x}{3} \leq 90 \cdot 3$$

$$\begin{array}{r} 255 \leq 170 + x \leq 270 \\ -170 \quad -170 \quad -170 \end{array}$$

$$85 \leq x \leq 100$$

39. **Multiple Choice** The force exerted on a spring is proportional to the distance the spring stretches from its relaxed position. Suppose you stretch a spring distance d in inches by applying force F in pounds. For a certain spring, $\frac{d}{F} = 0.8$. You apply forces between 25 and 40 pounds, inclusive. *includes* Which inequality describes the stretch of the spring?

A $25 \leq d \leq 40$

B $20 < d < 32$

C $31.25 \leq d \leq 40$

D $20 \leq d \leq 32$

$$\frac{d}{F} = 0.8$$

~~$$\frac{d}{25} = 0.8 \cdot 25 \quad \text{and} \quad \frac{d}{40} = 0.8 \cdot 40$$~~

$$d = 20$$

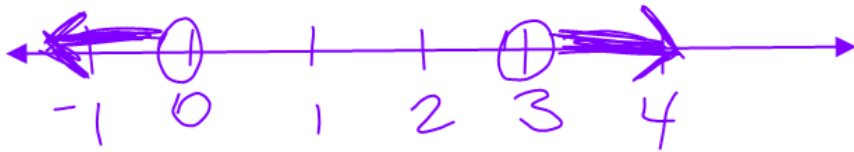
and

$$d = 32$$

4 EXAMPLE Write an inequality that represents each situation.
Graph the solutions.

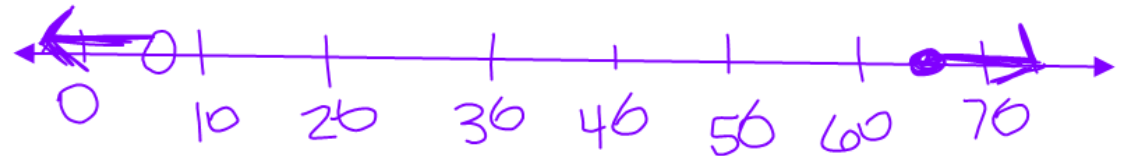
- a. all real numbers that are less than 0 or greater than 3.

$$x < 0 \text{ or } x > 3$$



- b. Discounted tickets are available to children under 7 years old or to adults 65 and older.

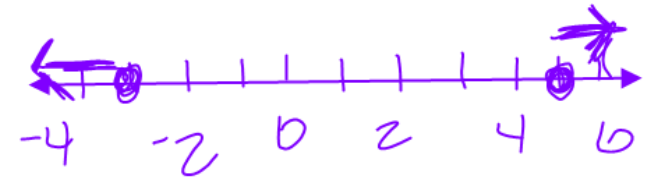
$$x < 7 \text{ or } x \geq 65$$



For each situation write and graph an inequality.

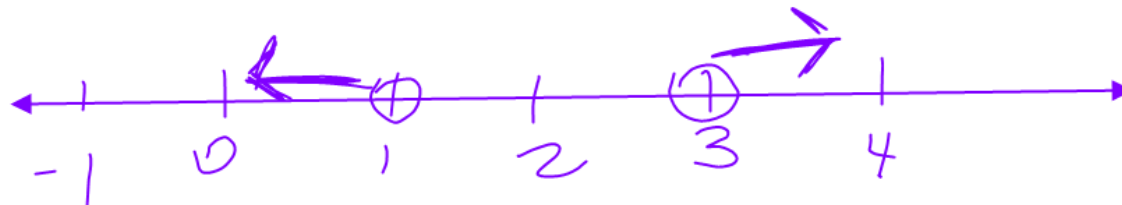
17. all real numbers that are at most -3 or at least 5

$$x \leq -3 \text{ or } x \geq 5$$



19. all real numbers less than 1 or greater than 3

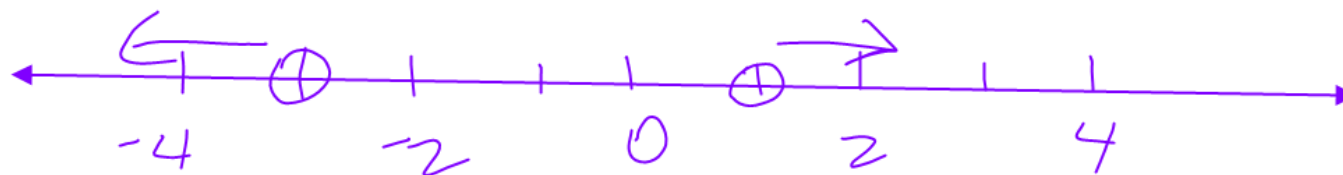
$$x < 1 \text{ or } x > 3$$



5 EXAMPLE Solve the compound inequality $3x + 2 < -7$ or $-4x + 5 < 1$.

Graph the solution.

$$\begin{array}{l}
 \cancel{3}x + \cancel{2} < -7 \quad \text{or} \quad \cancel{-4}x + \cancel{5} < 1 \\
 \hline
 3x < -9 \quad \text{or} \quad -4x < -4 \\
 \hline
 x < -3 \quad \text{or} \quad x > 1
 \end{array}$$

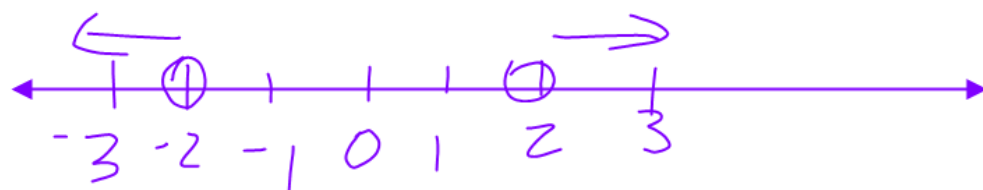


Solve each compound inequality. Graph your solution.

$$21. \quad \begin{array}{cccc} 3b & - & 1 & < & -7 & \text{or} & 4b & + & 1 & > & 9 \\ & & +1 & & +1 & & & & -1 & & -1 \end{array}$$

$$\frac{3b}{3} < \frac{-6}{3} \quad \text{or} \quad \frac{4b}{4} > \frac{8}{4}$$

$$b < -2 \quad \text{or} \quad b > 2$$



Homework: pg. 229 #2, 6, 8, 14, 20, 24, 28, 30, 32, 46, 60