

warm up: page 45

Example 4: Application

A troop of girl scouts votes to give 25 cents to a homeless shelter for each box of cookies they sell. How many boxes of cookies do they need to sell to reach or exceed their goal of \$120?

let $x =$
of boxes
sold

\$ get
for selling
 x boxes
of cookies

$$\geq 120$$

$$.25x \geq 120$$

$$x \geq 480$$

you have sell at least 480
boxes of cookies

✓ Understanding Check:

Students in the school band are selling calendars. They earn \$.80 on each calendar they sell. Their goal is to earn more than \$400. Write and solve an inequality to find the fewest number of calendars they can sell and still reach their goal.

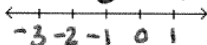
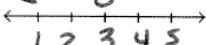
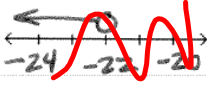

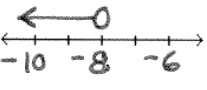
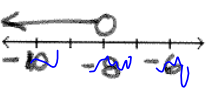
let $c =$ # of calendars sold

$$.80c > 400$$

$$c > 500$$

They have to sell more than 500 calendars.

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<p>1. $5w + 9 \geq 3w + 7$</p> $\begin{array}{r} -3w \quad \quad -9 \\ \hline \frac{2w}{2} \geq \frac{-2}{2} \\ \boxed{w \geq -1} \end{array}$ 	<p>2. $6p - 1 < 3p + 8$</p> $\begin{array}{r} -3p \quad \quad +1 \\ \hline \frac{3p}{3} < \frac{9}{3} \\ \boxed{p < 3} \end{array}$ 
<p>3. $3w + 16 > 6 + 4w$</p> $\begin{array}{r} -4w \quad \quad +16 \\ \hline -w > -10 \\ \frac{-w}{-1} > \frac{-10}{-1} \\ \boxed{w < 10} \end{array}$ <p><i>w < 10</i></p> 	<p>4. $2k - 3 \leq 5k + 12$</p> $\begin{array}{r} -5k \quad \quad +3 \\ \hline -3k \leq 15 \\ \frac{-3k}{-3} \geq \frac{15}{-3} \\ \boxed{k \geq -5} \end{array}$ 
<p>5. $2(p - 8) > -8 + 3p$</p> $\begin{array}{r} 2p - 16 > -8 + 3p \\ -3p \quad \quad +16 \\ \hline -p > 8 \\ \frac{-p}{-1} > \frac{8}{-1} \\ \boxed{p < -8} \end{array}$ 	<p>6. $3m + 6 < -5(m + 2)$</p> $\begin{array}{r} 3m + 6 < -5m - 10 \\ +5m \quad \quad -6 \\ \hline 8m < -16 \\ \frac{8m}{8} < \frac{-16}{8} \\ \boxed{m < -2} \end{array}$  <p><i>m < -2</i></p>

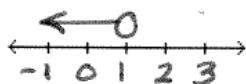
7. $4(3y - 1) < 2(y + 3)$

$$12y - 4 < 2y + 6$$

$$-2y \quad \swarrow \quad \searrow \quad +4$$

$$\frac{10y}{10} < \frac{10}{10}$$

$$\boxed{y < 1}$$



8. $2(3x + 7) \leq 4(-2x + 7)$

$$6x + 14 \leq -8x + 28$$

$$+8x \quad \swarrow \quad \searrow \quad -14$$

$$\frac{14x}{14} \leq \frac{14}{14}$$

$$\boxed{x \leq 1}$$



9. $22 - (4x - 2) > 2(x + 3)$

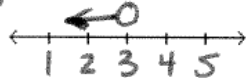
$$22 - 4x + 2 > 2x + 6$$

$$-4x + 24 > 2x + 6$$

$$-2x \quad \swarrow \quad \searrow \quad -24$$

$$\frac{-6x}{-6} > \frac{-18}{-6}$$

$$\boxed{x < 3}$$



10. $5c + 4(c - 1) \geq 2 + 5(c + 2)$

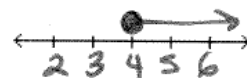
$$5c + 4c - 4 \geq 2 + 5c + 10$$

$$9c - 4 \geq 5c + 12$$

$$-5c \quad \swarrow \quad \searrow \quad +4$$

$$\frac{4c}{4} \geq \frac{16}{4}$$

$$\boxed{c \geq 4}$$



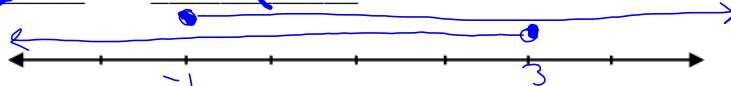
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3-5 Compound Inequalities

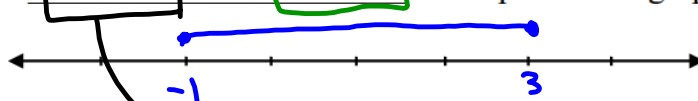
Two inequalities that are joined by the word and or the word or form a compound inequality.

Example:

Graph $x > -1$ and $x \leq 3$ on the same number line.



The solution of $x \geq -1$ and $x \leq 3$ is the part of the graph that overlaps.

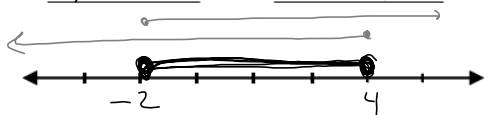


This compound inequality can also be written as: $-1 \leq x \leq 3$

Example 1: Writing a Compound Inequality with "and"

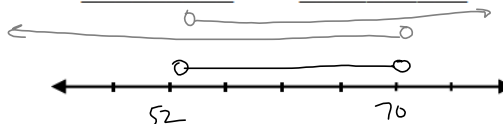
Write a compound inequality that represents each situation. Graph the solutions.

- a. all real numbers that are at least -2 and at most 4
 $x \geq -2$ and $x \leq 4$



$$-2 \leq x \leq 4$$

- b. Today's temperatures will be above 52°F , but not as high as 70°F
 $T > 52$ and $T < 70$



$$52 < T < 70$$

Understanding Check:

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

- a. all real numbers greater than -3 but less than 7
 _____ and _____



$$-3 < x < 7$$

- b. The books were priced between $\$4.50$ and $\$8.00$, inclusive.
 _____ and _____



$$4.50 \leq x \leq 8.00$$

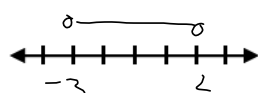
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Example 2: Writing in Interval Notation

Another way to make an **open** point is with **parenthesis**.

Another way to make a **closed** point is with **brackets**.

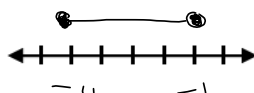
Examples: a. $-3 < x < 2$



Interval
Notation:

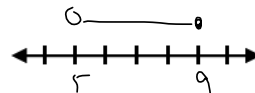
$(-3, 2)$

b. $-4 \leq x \leq -1$



$[-4, -1]$

c. $5 < x \leq 9$

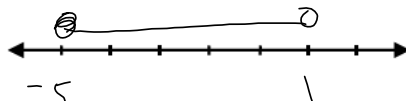


$(5, 9]$

✓ Understanding Check:

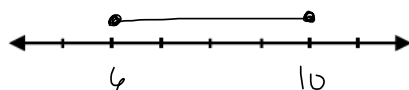
Graph each compound inequality on the number line and then write the inequality in interval notation.

a. $-5 < x < 1$



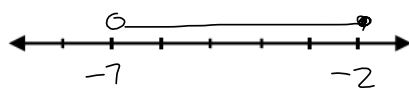
$(-5, 1)$

b. $6 \leq x \leq 10$



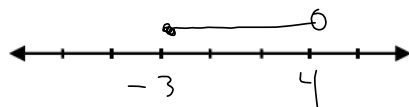
$[6, 10]$

c. $-7 < x \leq -2$



$(-7, -2]$

d. $-3 \leq x < 4$



$[-3, 4)$

Going backwards! Write a compound inequality for each interval given:

Example: $[-2, 3]$ $-2 \leq x \leq 3$

a. $[-6, -1]$

b. $(4, 11)$

c. $[-3, 5)$

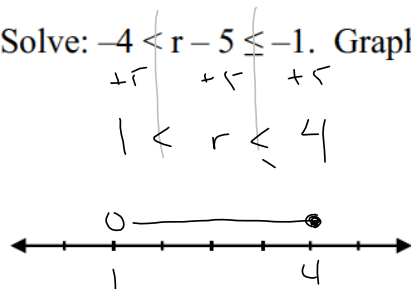
d. $(-2, 4]$

$$-6 \leq x \leq -1 \quad 4 < x < 11$$

Example 2: Solving a Compound Inequality Containing "and"

Solve: $-4 < r - 5 \leq -1$. Graph your solution. Shortcut: Use the properties of equality to solve all three parts at the same time!

Step 1: add 5 to the left, right, and middle. Graph.

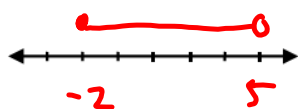
**✓ Understanding Check:**

Solve each compound inequality using the shortcut. Graph your solution.

a. $-6 \leq 3x < 15$

$$\begin{array}{ccc} +2 & +2 & +2 \\ -6 & & 15 \\ \hline -2 & & 5 \end{array}$$

$$-2 \leq x < 5$$

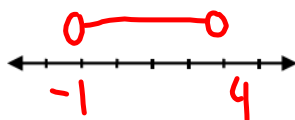


b. $-3 < 2x - 1 < 7$

$$\begin{array}{ccc} +1 & +1 & +1 \\ -3 & & 7 \\ \hline -2 & & 8 \\ -1 & & 4 \end{array}$$

$$-2 < 2x < 8$$

$$-1 < x < 4$$

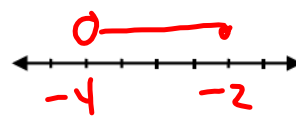


c. $13 > -3n + 1 \geq 7$

$$\begin{array}{ccc} -1 & -1 & -1 \\ 13 & & 7 \\ \hline 12 & & 6 \\ -4 & & -2 \end{array}$$

$$12 > -3n \geq 6$$

$$-4 < n \leq -2$$



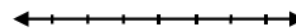
d. $1 < \frac{x}{2} + 3 < 4$



e. $14 \geq -8x - 2 \geq -10$



f. $-17 < -4x + 3 < -5$



p 52

$$-1 < x < 3$$

Example 3: Application

The acidity of the water in a swimming pool is considered normal if the average of three pH readings is between 7.2 and 7.8, inclusive. The first two readings for a swimming pool are 7.4 and 7.9. What possible values for the third reading (p) will make the pH normal?

$7.2 \leq \text{Average} \leq 7.8$

↓

let $x = 3^{\text{rd}}$ reading

$$7.2 \leq \frac{7.4 + 7.9 + x}{3} \leq 7.8$$

$$3 \cdot 7.2 \leq \left(\frac{15.3 + x}{3} \right) \cdot 3 \leq 7.8 \cdot 3$$

$$21.6 \leq 15.3 + x \leq 23.4$$

$$6.3 \leq x \leq 8.1$$

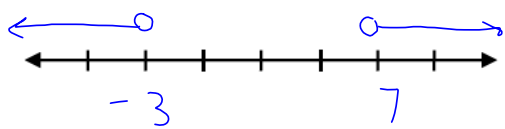
y

Example 4: Writing Compound Inequalities with “or”

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

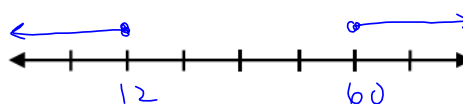
- a. All real numbers that are less than -3 or greater than 7 .

$$x < -3 \text{ or } x > 7$$



- b. Discounted fares are available to children 12 and under or to adults at least 60 years of age.

$$x \leq 12 \text{ or } x \geq 60$$

**✓ Understanding Check:**

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

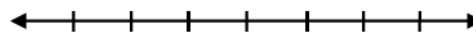
- a. All real numbers at most -5 or at least 3 .

_____ or _____



- b. All real numbers below -12 or above -8 .

_____ or _____



Example 5: Solving a Compound Inequality Containing "or"

Solve the compound inequality. Graph the solution.

$$4v + 3 < -5 \quad \text{OR} \quad -2v + 7 < 1.$$

$$4v < -8 \quad -2v < -6$$

$$v < -2 \quad v > 3$$

Step 1: Solve each inequality
separately
 Step 2: Graph.

