Skill Check:

Solve the inequality:
4 - 2m > 7 - 3m

Vocabulary:

Compound Inequality:

Is an inequality formed by joining two inequalities with the work "and" or the word "or"

EXAMPLE 1 **Writing and Graphing Compound Inequalities**

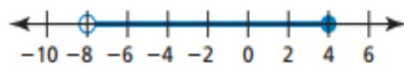Write each sentence as an inequality. Graph each inequality.

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

b. A number y is at most 0 or at least 2.

SOLUTION

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

$$x > -8 \qquad and \qquad x \le 4$$

▶ An inequality is $-8 < x \le 4$.
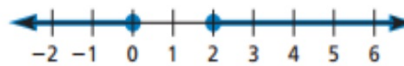

Graph the intersection of the graphs of $x > -8$ and $x \le 4$.

b. A number y is at most 0 or at least 2.

$$y \le 0 \qquad or \qquad y \ge 2$$

▶ An inequality is $y \le 0$ or $y \ge 2$.

Graph the union of the graphs of $y \le 0$ and $y \ge 2$.

EXAMPLE 2 Solving Compound Inequalities with "And"

Solve each inequality. Graph each solution.

a. $-4 < x - 2 < 3$

b. $-3 < -2x + 1 \le 9$

SOLUTION

a. Separate the compound inequality into two inequalities, then solve.

$$-4 < x - 2 \quad and \quad x - 2 < \ \ 3 \qquad \text{Write two inequalities.}$$

$$\underline{+\ 2} \quad \underline{+\ 2} \qquad\qquad \underline{+\ 2} \quad \underline{+\ 2} \qquad \text{Add 2 to each side.}$$

$$-2 < x \quad\quad and \quad\quad x < 5 \qquad \text{Simplify.}$$

▶ The solution is $-2 < x < 5$.

$$\begin{array}{ccccccccc} -3 & -2 & -1 & 0 & 1 & 2 & 3 & 4 & 5 \end{array}$$

b. $-3 < -2x + 1 \leq \ \ 9$ Write the inequality.
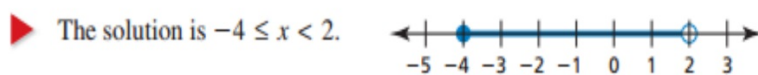
$$\underline{-\ 1} \qquad\ \ \underline{-\ 1} \ \ \underline{-\ 1} \qquad \text{Subtract 1 from each expression.}$$

$$-4 < -2x \quad\ \leq\ \ 8 \qquad \text{Simplify.}$$

$$\frac{-4}{-2} > \frac{-2x}{-2} \quad \geq\ \frac{8}{-2} \qquad \begin{array}{l}\text{Divide each expression by } -2. \\ \text{Reverse each inequality symbol.}\end{array}$$

$$2 > \quad x \quad \geq -4 \qquad \text{Simplify.}$$

▶ The solution is $-4 \leq x < 2$.

$$\begin{array}{ccccccccc} -5 & -4 & -3 & -2 & -1 & 0 & 1 & 2 & 3 \end{array}$$

EXAMPLE 3   **Solving a Compound Inequality with "Or"**

Solve $3y - 5 < -8$ *or* $2y - 1 > 5$. Graph the solution.

SOLUTION

$3y - 5 < -8$	*or* $\quad 2y - 1 > 5$	Write the inequality.
$\underline{+5 \quad +5}$	$\underline{+1 \quad +1}$	Addition Property of Inequality
$3y < -3$	$2y > 6$	Simplify.
$\dfrac{3y}{3} < \dfrac{-3}{3}$	$\dfrac{2y}{2} > \dfrac{6}{2}$	Division Property of Inequality
$y < -1 \quad$ *or*	$y > 3$	Simplify.

▶ The solution is $y < -1$ *or* $y > 3$.
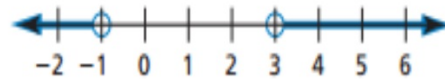
Solve the inequality. Graph the solution.

3. $5 \le m + 4 < 10$

4. $-3 < 2k - 5 < 7$

5. $4c + 3 \le -5 \ or \ c - 8 > -1$

6. $2p + 1 < -7 \ or \ 3 - 2p \le -1$

3. $1 \leq m < 6$

```
        1
  +--+--●--+--+--+--+--○--+--+-->
     0     2     4     6     8
```

4. $1 < k < 6$

```
        1
  +--+--○--+--+--+--+--○--+--+-->
     0     2     4     6     8
```

5. $c \leq -2 \ or \ c > 7$

```
            -2           7
  +--+--+--●--+--+--+--+○--+--+-->
        -4     0     4     8
```

6. $p < -4 \ or \ p \geq 2$

```
                      2
  +--+--○--+--+--●--+--+--+-->
     -8   -4     0     4     8
```
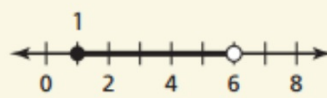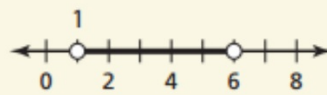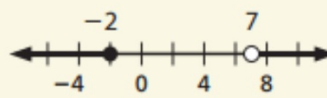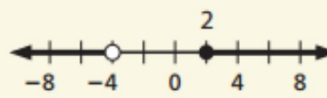
Solving Real-Life Problems

EXAMPLE 4   **Modeling with Mathematics**

Electrical devices should operate effectively within a specified temperature range. Outside the operating temperature range, the device may fail.

a. Write and solve a compound inequality that represents the possible operating temperatures (in degrees Fahrenheit) of the smartphone.

b. Describe one situation in which the surrounding temperature could be below the operating range and one in which it could be above.