Skill check
Solve the equation for y:

4x - 5 = 7 +4y

2-2
Solving Inequalities Using addition or subtraction

Equivalent Inequalities:
Are inequalities that have the same solution

Addition Property of Inequality

Words   Adding the same number to each side of an inequality produces
an equivalent inequality.

Numbers $-3 < 2$ $-3 \geq -10$

$\underline{+4}$ $\underline{+4}$ $\underline{+3}$ $\underline{+3}$

$1 < 6$ $0 \geq -7$

EXAMPLE 1 **Solving an Inequality Using Addition**

Solve $x - 6 \geq -10$. Graph the solution.

SOLUTION

$x - 6 \geq -10$	Write the inequality.
$+6 \quad +6$	Add 6 to each side.
$x \geq -4$	Simplify.

▶ The solution is $x \geq -4$.

$x \geq -4$

```
  ←——+——+——+——+——●——+——+——+——+——+——+——→
    -8  -7  -6  -5  -4  -3  -2  -1   0   1   2
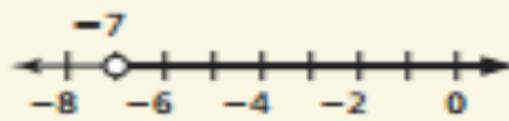```
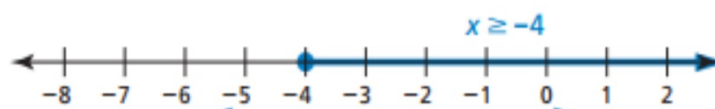
$x = -5$ is *not* a solution.

$x = 0$ is a solution.

**Solve the inequality. Graph the solution.**

**1.** $b - 2 > -9$

**2.** $m - 3 \leq 5$

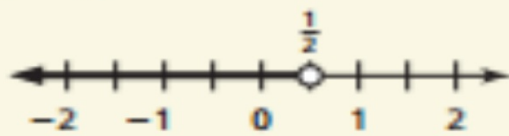**3.** $\frac{1}{4} > y - \frac{1}{4}$

**1.** $b > -7$

$$-7$$

```
<--+--o--+--+--+--+--+--+--+-->
   -8    -6    -4    -2     0
```

2. $m \leq 8$

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<--+--+--+--+--+--+--+--+--•--+-->
   0     2     4     6     8
```

3. $y < \frac{1}{2}$

$$\frac{1}{2}$$
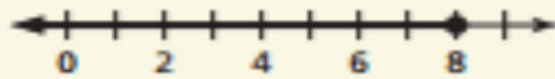
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<--+--+--+--+--+--o--+--+--+-->
   -2    -1     0     1     2
```

Subtraction Property of Inequality

Words Subtracting the same number from each side of an inequality produces an equivalent inequality.

Numbers $-3 \le 1$ $7 > -20$

$\underline{-5}$ $\underline{-5}$ $\underline{-7}$ $\underline{-7}$

$-8 \le -4$ $0 > -27$

Algebra   If $a > b$, then $a - c > b - c$.   If $a \ge b$, then $a - c \ge b - c$.

If $a < b$, then $a - c < b - c$.   If $a \le b$, then $a - c \le b - c$.

EXAMPLE 2   Solving an Inequality Using Subtraction

Solve each inequality. Graph the solution.

a. $y + 8 \leq 5$ **b.** $-8 < 1.4 + m$
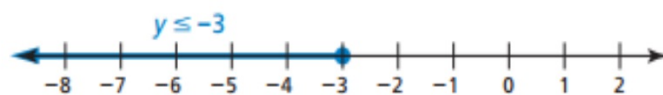
SOLUTION

a. $y + 8 \leq 5$ Write the inequality.

$\underline{-8 \quad -8}$ Subtract 8 from each side.

$y \leq -3$ Simplify.

▶ The solution is $y \leq -3$.

$y \leq -3$

```
◄————————————————•————————————————►
  -8  -7  -6  -5  -4  -3  -2  -1  0   1   2
```

b. $-8 < 1.4 + m$ Write the inequality.

$\underline{-1.4 \quad -1.4}$ Subtract 1.4 from each side.

$-9.4 < m$ Simplify.

▶ The solution is $m > -9.4$.

$m > -9.4$

```
◄————————————○————————————————————►
 -9.9 -9.8 -9.7 -9.6 -9.5 -9.4 -9.3 -9.2 -9.1 -9.0 -8.9
```
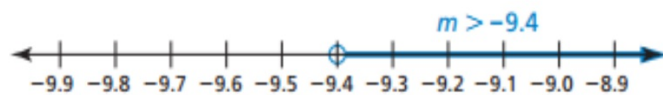
Solve the inequality. Graph the solution.

4. $k + 5 \leq -3$ 5. $\frac{5}{6} \leq z + \frac{1}{6}$ 6. $p + 0.7 > -2.3$

Solving Real-Life Problems

EXAMPLE 3 Modeling with Mathematics

A circuit overloads at 1800 watts of electricity. You plug a microwave oven that uses 1100 watts of electricity into the circuit.

a. Write and solve an inequality that represents how many watts you can add to the circuit without overloading the circuit.

b. In addition to the microwave oven, which of the following appliances can you plug into the circuit at the same time without overloading the circuit?

Appliance	Watts
Clock radio	50
Blender	300
Hot plate	1200
Toaster	800

SOLUTION

SOLUTION

1. **Understand the Problem** You know that the microwave oven uses 1100 watts out of a possible 1800 watts. You are asked to write and solve an inequality that represents how many watts you can add without overloading the circuit. You also know the numbers of watts used by four other appliances. You are asked to identify the appliances you can plug in at the same time without overloading the circuit.

2. **Make a Plan** Use a verbal model to write an inequality. Then solve the inequality and identify other appliances that you can plug into the circuit at the same time without overloading the circuit.

3. **Solve the Problem**

Words	Watts used by microwave oven	$+$	Additional watts	$<$	Overload wattage

Variable   Let w be the additional watts you can add to the circuit.

Inequality 1100 $+$ w $<$ 1800

$$1100 + w < 1800 \qquad \text{Write the inequality.}$$
$$\underline{-\,1100} \qquad \underline{-\,1100} \qquad \text{Subtract 1100 from each side.}$$
$$w < 700 \qquad \text{Simplify.}$$

▶ You can add up to 700 watts to the circuit, which means that you can also plug in the clock radio and the blender.

4. **Look Back** You can check that your answer is correct by adding the numbers of watts used by the microwave oven, clock radio, and blender.

$$1100 + 50 + 300 = 1450$$

The circuit will not overload because the total wattage is less than 1800 watts.