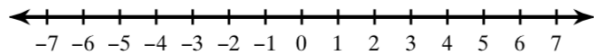
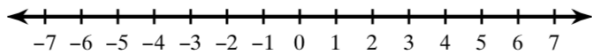


## 2.3 Solving Inequalities Using Multiplication or Division

**Do Now:** Solve and Graph the inequality.

a)  $2x + 6 \geq 10$

b)  $-2x - 8 < -2$



**Critical Thinking:** Did you check your work? What do you notice?

**Example 1:** Multiplying or Dividing by a Positive Number

Solve and graph the following inequalities:

a)  $\frac{x}{8} \geq 10$

b)  $-24 > 3x$

**Example 2:** Multiplying or Dividing by a Positive Number

Solve and graph the following inequalities:

a)  $2 < \frac{x}{-3}$

b)  $-7y \leq -35$

**Example 3:** Modeling with Mathematics

Sony is going to release a new Playstation for \$540 plus 7% sales tax. You check your piggy bank and you only have \$89.80. Your current job pays \$9.25 per hour. Write and solve an inequality that represents the number of hours you need to work to buy the new Playstation.

## 2.3 Exercises

Dynamic Solutions available at [BigIdeasMath.com](http://BigIdeasMath.com)

### Vocabulary and Core Concept Check

- 1. WRITING** Explain how solving  $2x < -8$  is different from solving  $-2x < 8$ .
- 2. OPEN-ENDED** Write an inequality that is solved using the Division Property of Inequality where the inequality symbol needs to be reversed.

### Monitoring Progress and Modeling with Mathematics

In Exercises 3–10, solve the inequality. Graph the solution. (See Example 1.)

- 3.**  $4x < 8$
- 4.**  $3y \leq -9$
- 5.**  $-20 \leq 10n$
- 6.**  $35 < 7t$
- 7.**  $\frac{x}{2} > -2$
- 8.**  $\frac{a}{4} < 10.2$
- 9.**  $20 \geq \frac{4}{5}w$
- 10.**  $-16 \leq \frac{8}{3}t$

In Exercises 11–18, solve the inequality. Graph the solution. (See Example 2.)

- 11.**  $-6t < 12$
- 12.**  $-9y > 9$
- 13.**  $-10 \geq -2z$
- 14.**  $-15 \leq -3c$
- 15.**  $\frac{n}{-3} \geq 1$
- 16.**  $\frac{w}{-5} \leq 16$
- 17.**  $-8 < -\frac{1}{4}m$
- 18.**  $-6 > -\frac{2}{3}y$

- 19. MODELING WITH MATHEMATICS** You have \$12 to buy five goldfish for your new fish tank. Write and solve an inequality that represents the prices you can pay per fish. (See Example 3.)

- 20. MODELING WITH MATHEMATICS** A weather forecaster predicts that the temperature in Antarctica will decrease  $8^\circ\text{F}$  each hour for the next 6 hours. Write and solve an inequality to determine how many hours it will take for the temperature to drop at least  $36^\circ\text{F}$ .

**USING TOOLS** In Exercises 21–26, solve the inequality. Use a graphing calculator to verify your answer.

- 21.**  $36 < 3y$
- 22.**  $17v \geq 51$

$$23. 2 \leq -\frac{2}{9}x$$

$$24. 4 > \frac{n}{-4}$$

$$25. 2x > \frac{3}{4}$$

$$26. 1.1y < 4.4$$

**ERROR ANALYSIS** In Exercises 27 and 28, describe and correct the error in solving the inequality.

**27.**

$$\begin{aligned} -6 &> \frac{2}{3}x \\ \frac{3}{2} \cdot (-6) &< \frac{3}{2} \cdot \frac{2}{3}x \\ -\frac{18}{2} &< x \\ -9 &< x \end{aligned}$$

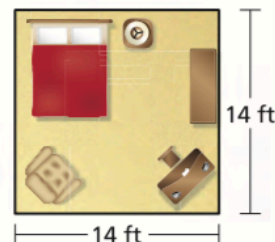
The solution is  $x > -9$ .

**28.**

$$\begin{aligned} -4y &\leq -32 \\ \frac{-4y}{-4} &\leq \frac{-32}{-4} \\ y &\leq 8 \end{aligned}$$

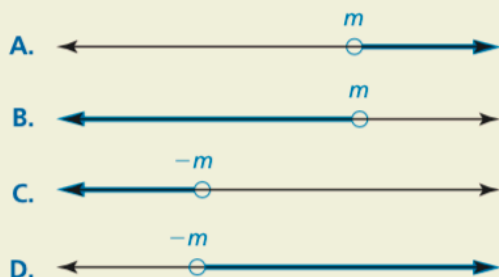
The solution is  $y \leq 8$ .

- 29. ATTENDING TO PRECISION** You have \$700 to buy new carpet for your bedroom. Write and solve an inequality that represents the costs per square foot that you can pay for the new carpet. Specify the units of measure in each step.



30. **HOW DO YOU SEE IT?** Let  $m > 0$ . Match each inequality with its graph. Explain your reasoning.

a.  $\frac{x}{m} < -1$                       b.  $\frac{x}{m} > 1$   
 c.  $\frac{x}{m} < 1$                         d.  $-\frac{x}{m} < 1$

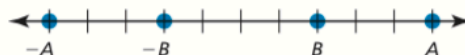


31. **MAKING AN ARGUMENT** You run for 2 hours at a speed no faster than 6.3 miles per hour.
- Write and solve an inequality that represents the possible numbers of miles you run.
  - A marathon is approximately 26.2 miles. Your friend says that if you continue to run at this speed, you will not be able to complete a marathon in less than 4 hours. Is your friend correct? Explain.

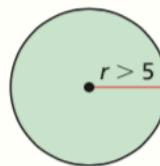
32. **THOUGHT PROVOKING** The inequality  $\frac{x}{4} \leq 5$  has a solution of  $x = p$ . Write a second inequality that also has a solution of  $x = p$ .

33. **PROBLEM SOLVING** The U.S. Mint pays \$0.02 to produce every penny. How many pennies are produced when the U.S. Mint pays more than \$6 million in production costs?
34. **REASONING** Are  $x \leq \frac{2}{3}$  and  $-3x \leq -2$  equivalent? Explain your reasoning.

35. **ANALYZING RELATIONSHIPS** Consider the number line shown.



- Write an inequality relating  $A$  and  $B$ .
  - Write an inequality relating  $-A$  and  $-B$ .
  - Use the results from parts (a) and (b) to explain why the direction of the inequality symbol must be reversed when multiplying or dividing each side of an inequality by the same negative number.
36. **REASONING** Why might solving the inequality  $\frac{4}{x} \geq 2$  by multiplying each side by  $x$  lead to an error? (*Hint:* Consider  $x > 0$  and  $x < 0$ .)
37. **MATHEMATICAL CONNECTIONS** The radius of a circle is represented by the formula  $r = \frac{C}{2\pi}$ . Write and solve an inequality that represents the possible circumferences  $C$  of the circle.



38. **CRITICAL THINKING** A water-skiing instructor recommends that a boat pulling a beginning skier has a speed less than 18 miles per hour. Write and solve an inequality that represents the possible distances  $d$  (in miles) that a beginner can travel in 45 minutes of practice time.
39. **CRITICAL THINKING** A local zoo employs 36 people to take care of the animals each day. At most, 24 of the employees work full time. Write and solve an inequality that represents the fraction of employees who work part time. Graph the solution.

## Maintaining Mathematical Proficiency

Reviewing what you learned in previous grades and lessons

Solve the equation. Check your solution. (*Section 1.2 and Section 1.3*)

40.  $5x + 3 = 13$

41.  $\frac{1}{2}y - 8 = -10$

42.  $-3n + 2 = 2n - 3$

43.  $\frac{1}{2}z + 4 = \frac{5}{2}z - 8$

Tell which number is greater. (*Skills Review Handbook*)

44. 0.8, 85%

45.  $\frac{16}{30}$ , 50%

46. 120%, 0.12

47. 60%,  $\frac{2}{3}$