3.5

Solving Inequalities Using Multiplication *or* Division

Review Vocabulary

inequality, p. 140
equivalent inequalities,
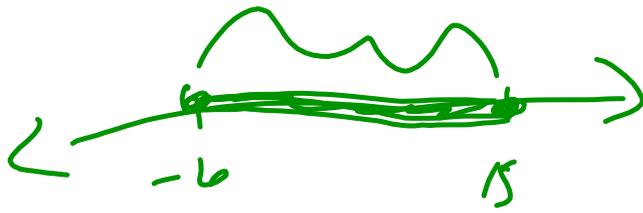p. 141

BEFORE

You solved two-step
equations.

▶ Now

You'll solve inequalities using
multiplication or division.

WHY?

So you can find how fast you
should bike, as in Ex. 38.

$$X \geq -6 \qquad -6 \leq X$$

$$X \leq 15$$

$$\boxed{-6 \leq X \leq 15}$$

$x \geq -1$

$\boxed{x \leq 4}$

Multiplication Property of Inequality

Words Multiplying each side of an inequality by a *positive* number produces an equivalent inequality.

Multiplying each side of an inequality by a *negative* number and *reversing the direction of the inequality symbol* produces an equivalent inequality.

Algebra If $a < b$ and $c > 0$, then $ac < bc$.

If $a < b$ and $c < 0$, then $ac > bc$.

$$\tfrac{1}{3} \cdot 3x \le 27 \cdot \tfrac{1}{3}$$

$$x \le 9$$

$$-\tfrac{1}{3} \cdot -3x \le 27 \cdot -\tfrac{1}{3}$$

$$x \ge -9$$

Division The rules for solving an inequality using division are like the rules for solving an inequality using multiplication.

Division Property of Inequality

Words Dividing each side of an inequality by a *positive* number produces an equivalent inequality.

Dividing each side of an inequality by a *negative* number and *reversing the direction of the inequality symbol* produces an equivalent inequality.

Algebra If $a < b$ and $c > 0$, then $\dfrac{a}{c} < \dfrac{b}{c}$.

If $a < b$ and $c < 0$, then $\dfrac{a}{c} > \dfrac{b}{c}$.

LESSON

3.5

Practice A

For use with pages 145–150

Tell whether the given number is a solution of $\frac{x}{8} \leq -3$.

1. -16 **2.** -24 **3.** 0 **4.** -28

$$\frac{-24}{8} \leq -3$$

$$-3 \leq -3$$

YES
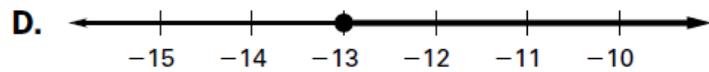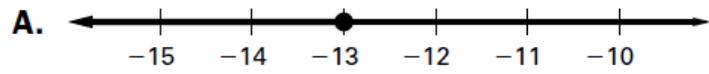
$$\frac{-28}{8} \leq -3$$

$$-3.5 \leq -3$$

YES

Match the inequality with the graph of its solution.

5. $\dfrac{x}{-2} \ge 26$

A.
$$\leftarrow\!\!\!-\!\!\!-\!\!\!-\!\!\!-\!\!\!-\bullet\!-\!\!\!-\!\!\!-\!\!\!-\!\!\!-\!\!\!\rightarrow$$

−15	−14	−13	−12	−11	−10

6. $-2x \ge 26$

B.
$$\leftarrow\!\!\!-\!\!\!-\!\!\!-\bullet\!-\!\!\!-\!\!\!-\!\!\!-\!\!\!\rightarrow$$

−56	−54	−52	−50	−48	−46

7. $\dfrac{x}{-2} \le 26$

C.
$$\leftarrow\!\!\!-\!\!\!-\!\!\!-\bullet\!-\!\!\!-\!\!\!-\!\!\!-\!\!\!\rightarrow$$

−56	−54	−52	−50	−48	−46

8. $-2x \le 26$

D.
$$\leftarrow\!\!\!-\!\!\!-\!\!\!-\bullet\!-\!\!\!-\!\!\!-\!\!\!-\!\!\!\rightarrow$$

−15	−14	−13	−12	−11	−10
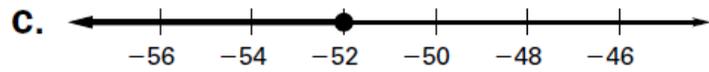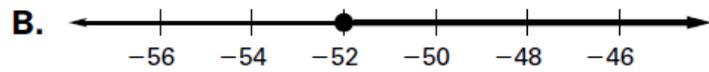
Solve the inequality. Graph your solution.

9. $\frac{x}{3} > -2$ **10.** $\frac{x}{8} \le 8$ **11.** $4x \ge -28$ **12.** $15x < 45$

$8 \cdot \dfrac{x}{8} \le 8 \cdot 8$

$x \le 64$

$\dfrac{1}{15}\ 15x < 45\ \dfrac{1}{15}$

$x < 3$
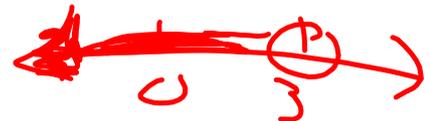
13. $2x > -34$　　　　**14.** $3x \geq 33$　　　　**15.** $\dfrac{x}{9} < 6$　　　　**16.** $\dfrac{x}{-11} \geq -11$

$-11 \cdot \dfrac{x}{-11} \geq -11 = 11$

$x \leq 121$

17. $\frac{x}{10} \geq -1$ **18.** $\frac{x}{-5} < 12$ **19.** $-14x < 84$ **20.** $-5x \leq -45$

$$17. \frac{x}{10} \geq -1 \cdot 10$$

$$x \geq -10$$

21. $-6x \geq 48$ **22.** $-20x > -100$ **23.** $\dfrac{x}{-2} > -7$ **24.** $\dfrac{x}{-13} \leq -4$

$$-2 \cdot \frac{x}{-2} > -7 \cdot 2$$

$$x < 14$$

25. You want to buy some new DVDs and spend less than $75. A store advertises a sale where all DVDs are $15. Write and solve an inequality to find the number of DVDs d you can buy.

$$\frac{1}{15} \cdot 15d < 75 \cdot \frac{1}{15}$$

$$d < 5$$

26. Tickets for a basketball tournament cost $3. The tournament wants to make $1575 the first night in ticket sales. Write and solve an inequality to find the number of tickets t that has to be sold to make at least $1575.

$$\frac{1}{3} \cdot 3t \geq 1575 \cdot \frac{1}{3}$$

$$t \geq 525$$

27. You get a part-time job delivering flowers for a florist. Your average tip is $2.50 for each delivery. Write and solve an inequality to find the number of deliveries d you need to make in order to earn at least $30 in tips.

$$\frac{1}{2.5} \, 2.5d \geq 30 \, \frac{1}{2.5}$$

$$d \geq \frac{30}{2.5}$$

$$d \geq \frac{300}{25}$$

$$d \geq 12$$