2.3 Solving Inequalities Using Multiplication or Division For use with Exploration 2.3

Essential Question How can you use division to solve an inequality?

EXPLORATION: Writing a Rule

Work with a partner.

a. Complete the table. Decide which graph represents the solution of the inequality 6 < 3x. Write the solution of the inequality.

x	-1	0	1	2	3	4	5
3 <i>x</i>	-3						
6 [?] 3 <i>x</i>	No						



- **b.** Use a table to solve each inequality. Then write a rule that describes how to use division to solve the inequalities.
 - i. 2x < 4

ii. $3 \ge 3x$

iii. 2x < 8

iv.	6	\geq	3 <i>x</i>
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2.3 Solving Inequalities Using Multiplication or Division (continued)

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EXPLORATION: Writing a Rule

Work with a partner.

a. Complete the table. Decide which graph represents the solution of the inequality 6 < -3x. Write the solution of the inequality.



b. Use a table to solve each inequality. Then write a rule that describes how to use division to solve the inequalities.

i.
$$-2x < 4$$

iii. -2x < 8

iv.	6	\geq	-3x
	-		

ii. $3 \ge -3x$

Communicate Your Answer

- 3. How can you use division to solve an inequality?
- **4.** Use the rules you wrote in Explorations 1(b) and 2(b) to solve each inequality.

a. 7x < -21 **b.** $12 \le 4x$ **c.** 10 < -5x **d.** $-3x \le 0$



Core Concepts

Multiplication and Division Properties of Inequality (c > 0)

Words Multiplying or dividing each side of an inequality by the same *positive* number produces an equivalent inequality.

Numbers	-6 < 8	6 > -8
2	$2 \bullet (-6) < 2 \bullet 8$	$\frac{6}{-8} > \frac{-8}{-8}$
	-12 < 16	2 2
		3 > -4

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

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

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

These properties are also true for \leq and \geq .

Notes:

Multiplication and Division Properties of Inequality (c < 0)

Words When multiplying or dividing each side of an inequality by the same *negative* number, the direction of the inequality symbol must be reversed to produce an equivalent inequality.

Numbers	-6 < 8	6 > -8
_	$2 \bullet (-6) > -2 \bullet 8$	$\frac{-6}{-8} < \frac{-8}{-8}$
	12 > -16	-2 -2
		-3 < 4

AlgebraIf a > b and c < 0, then ac < bc.If a > b and c < 0, then $\frac{a}{c} < \frac{b}{c}$.If a < b and c < 0, then ac > bc.If a < b and c < 0, then $\frac{a}{c} > \frac{b}{c}$.

These properties are also true for \leq and \geq .

Notes:

2.3 Practice (continued)

Worked-Out Examples

Example #1

Graph the solution.

$$\frac{n}{-3} \ge 1$$
$$-3 \cdot \frac{n}{-3} \le -3 \cdot 1$$
$$n \le -3$$

The solution is $n \leq -3$.

$$-3$$

Example #2

Graph the solution.

$$-6 > -\frac{2}{3}y$$
$$-\frac{3}{2} \cdot (-6) < -\frac{3}{2} \cdot \left(-\frac{2}{3}y\right)$$
$$9 < y$$

The solution is y > 9.

Practice A

In Exercises 1–8, solve the inequality. Graph the solution.

1. 6x < -30



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9. There are at most 36 red and blue marbles in a bag. The number of red marbles is twice the number of blue marbles. Write and solve an inequality that represents the greatest number of red marbles *r* in the bag.

Practice B

In Exercises 1–6, solve the inequality. Graph the solution.

 1. $56 \le 8b$ 2. -14 < 7t 3. $\frac{x}{2} \le 1.7$

 4. $\frac{p}{2} \ge -3$ 5. $15 > \frac{2}{3}w$ 6. $-22 \le \frac{11}{2}h$

In Exercises 7–12, solve the inequality. Graph the solution.

- **7.** -21 < -7a **8.** -18 > -6u **9.** $\frac{n}{-2} < 3$
- **10.** $\frac{w}{-3} > 3$ **11.** $-7 \le -\frac{1}{3}c$ **12.** $-15 > -\frac{3}{5}a$
- **13.** You are taking tickets at a concert. You have determined that you are taking 16 tickets each minute. Write and solve an inequality to determine how many minutes it will take for you to take at least 136 tickets.

In Exercises 14–16, solve the inequality. Use a graphing calculator to verify your answer.

- **14.** $3 < \frac{t}{-3}$ **15.** $3g \le \frac{2}{5}$ **16.** 1.2v > 7.2
- **17.** You have \$850 to buy new carpet for the game room. The dimensions of the game room are 20 feet by 12 feet. 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.
- **18.** You run for 3 hours at a speed no faster than 8.2 miles per hour.
 - **a.** Write and solve an inequality that represents the possible numbers of miles you run.
 - **b.** 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.
- **19.** The base of a triangle with a height of 7 units is represented by the formula $b = \frac{2}{7}A$. The base of the triangle is less than 10 units. Write and solve an inequality that represents the possible area A of the triangle.