5-Minute Check Over Lesson 5–2

2 Solve $\frac{5}{7}p > -20$.

A. $\{p \mid p > 28\}$

B. $\{p \mid p < 28\}$

C. $\left\{p \mid p > -19\frac{2}{7}\right\}$

D. $\{p \mid p > -28\}$

5-Minute Check Over Lesson 5–2

2 Solve $\frac{5}{7}p > -20$.

A. $\{p \mid p > 28\}$

B. $\{p \mid p < 28\}$

C. $\left\{p \mid p > -19\frac{2}{7}\right\}$

D. $\{p \mid p > -28\}$

5-Minute Check

Over Lesson 5–2

3 Solve $-9v \geq -108$.

$\frac{-9v}{-9} \quad \frac{-108}{-9}$

A. $\{v \mid v \geq 99\}$

B. $\{v \mid v \leq 12\}$

C. $\{v \mid v \geq 12\}$

D. $\{v \mid v \geq -12\}$

5-Minute Check Over Lesson 5–2

3 Solve $-9v \geq -108$.

$\frac{-9v}{-9} \quad \frac{-108}{-9}$

A. $\{v \mid v \geq 99\}$

B. $\{v \mid v \leq 12\}$

C. $\{v \mid v \geq 12\}$

D. $\{v \mid v \geq -12\}$

5-Minute Check Over Lesson 5–2

4 Solve $\frac{2c}{-3} \leq \frac{5}{9}$.

A. $\{c \mid c \leq -5\}$

B. $\{c \mid c \leq -2\}$

C. $\left\{c \mid c \leq \frac{5}{6}\right\}$

D. $\left\{c \mid c \geq -\frac{5}{6}\right\}$

5-Minute Check Over Lesson 5–2

4 Solve $\frac{2c}{-3} \leq \frac{5}{9}$.

A. $\{c \mid c \leq -5\}$

B. $\{c \mid c \leq -2\}$

C. $\left\{c \mid c \leq \frac{5}{6}\right\}$

D. $\left\{c \mid c \geq -\frac{5}{6}\right\}$

Real-World Example 1 Solve a Multi-Step Inequality

SALES **Write and solve an inequality to find the sales Mrs. Jones needs if she earns a monthly salary of $2000 plus a 10% commission on her sales. Her goal is to make at least $4000 per month. What sales does she need to meet her goal?**

base salary + (commission × sales) ≥ income needed

$$2000 + 0.10x \geq 4000 \quad \text{Substitution}$$
$$0.10x \geq 2000 \quad \text{Subtract 2000 from each side.}$$
$$x \geq 20{,}000 \quad \text{Divide each side by 0.10.}$$

She must make at least $20,000 in sales to meet her monthly goal.

$4x + 60 \leq 800$

GuidedPractice

1. **FINANCIAL LITERACY** The Print Shop advertises a special to print 400 flyers for less than the competition. The price includes a $3.50 set-up fee. If the competition charges $35.50, what does the Print Shop charge for each flyer?

less than 8¢

$11.95 + 9.99x + 10 \leq 50$

Check Your Understanding

= Step-by-Step Solutions begin on page R13.

Example 1

1. **CANOEING** If four people plan to use the canoe with 60 pounds of supplies, write and solve an inequality to find the allowable average weight per person.

$4n + 60 \leq 800$; $n \leq 185$; at most 185 lb per person

2. **SHOPPING** Rita is ordering a movie for $11.95 and a few CDs. She has $50 to spend. Shipping and sales tax will be $10. If each CD costs $9.99, write and solve an inequality to find the greatest number of CDs that she can buy.

$9.99x + 11.95 + 10 \leq 50$; $x \leq 2.8$; Rita can buy 2 CDs.

EXAMPLE 2 Inequality Involving a Negative Coefficient

Solve $13 - 11d \geq 79$.

$13 - 11d \geq 79$	Original inequality
$13 - 11d - 13 \geq 79 - 13$	Subtract 13 from each side.
$-11d \geq 66$	Simplify.
$\frac{-11d}{-11} \leq \frac{66}{-11}$	Divide each side by –11 and change ≥ to ≤.
$d \leq -6$	Simplify.

Answer: The solution set is $\{d \mid d \leq -6\}$.

EXAMPLE 2 Check Your Progress

Solve $-8y + 3 > -5$.

A. $\{y \mid y < -1\}$

B. $\{y \mid y > 1\}$

C. $\{y \mid y > -1\}$

D. $\{y \mid y < 1\}$

EXAMPLE 2 Check Your Progress

Solve $-8y + 3 > -5$.

A. $\{y \mid y < -1\}$

B. $\{y \mid y > 1\}$

C. $\{y \mid y > -1\}$

D. $\{y \mid y < 1\}$

Example 2 CCSS **STRUCTURE** Solve each inequality. Graph the solution on a number line.

3. $6h - 10 \geq 32$ $\{h \mid h \geq 7\}$

4. $-3 \leq \frac{2}{3}r + 9$ $\{r \mid r \geq -18\}$

5. $-3x + 7 > 43$

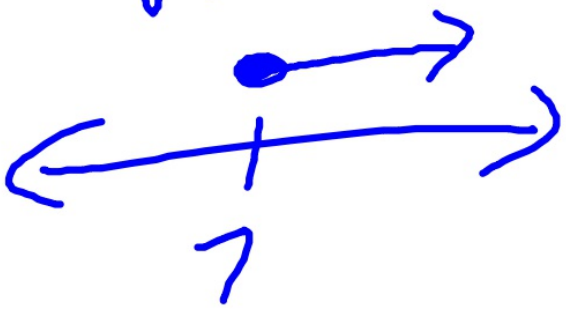
6. $4m - 17 < 6m + 25$

(3) $6h - 10 \geq 32$

$+10 \quad +10$

$\frac{6h}{6} \geq \frac{42}{6}$

$h \geq 7$



(4) $-3 \leq \frac{2}{3}r + 9$

$-9 \quad -9$

-6

$\frac{3}{2}(-12) \leq \frac{3}{2}\left(\frac{2}{3}r\right)$

$-18 \leq r$

$r \geq -18$

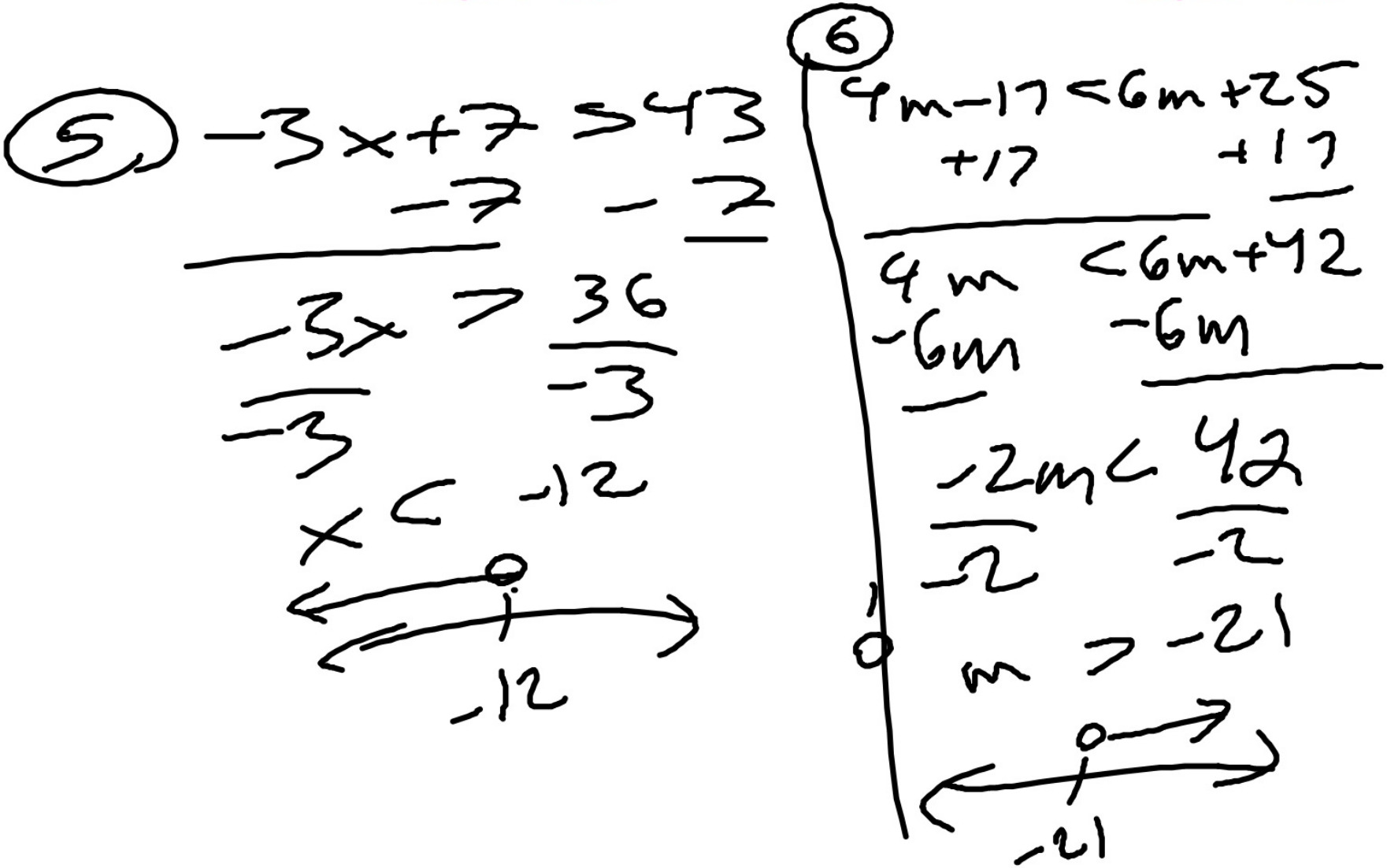
Example 2 CCSS **STRUCTURE** Solve each inequality. Graph the solution on a number line.

3. $6h - 10 \geq 32$ $\{h \mid h \geq 7\}$

4. $-3 \leq \frac{2}{3}r + 9$ $\{r \mid r \geq -18\}$

5. $-3x + 7 > 43$ $\{x \mid x < -12\}$

6. $4m - 17 < 6m + 25$ $\{m \mid m > -21\}$



EXAMPLE 3 Write and Solve an Inequality

Define a variable, write an inequality, and solve the problem below.

Four times a number plus twelve is less than the number minus three.

EXAMPLE 3 Write and Solve an Inequality

$4n + 12 < n - 3$ Original inequality

EXAMPLE 3 **Check Your Progress**

Write an inequality for the sentence below. Then solve the inequality.

6 times a number is greater than 4 times the number minus 2.

A. $6n > 4n - 2; \{n \mid n > -1\}$

B. $6n < 4n - 2; \{n \mid n < -1\}$

C. $6n > 4n + 2; \{n \mid n > 1\}$

D. $6n > 2 - 4n; \left\{n \mid n < -\frac{1}{5}\right\}$

EXAMPLE 3 **Check Your Progress**

Write an inequality for the sentence below. Then solve the inequality.

6 times a number is greater than 4 times the number minus 2.

A. $6n > 4n - 2; \{n \mid n > -1\}$

B. $6n < 4n - 2; \{n \mid n < -1\}$

C. $6n > 4n + 2; \{n \mid n > 1\}$

D. $6n > 2 - 4n; \left\{n \mid n < -\frac{1}{5}\right\}$

Example 3 **Define a variable, write an inequality, and solve each problem. Then check your solution.** 7. Sample answer: Let n = the number; $4n - 6 > 8 + 2n$; $\{n \mid n > 7\}$.

7. **Four times a number minus 6 is greater than eight plus two times the number.**

8. **Negative three times a number plus 4 is less than five times the number plus 8.**

Sample answer: Let n = the number; $-3n + 4 < 5n + 8$; $\left\{n \middle| n > -\frac{1}{2}\right\}$.

(7) $4x - 6 > 8 + 2x$

$-2x \quad +6 \quad +6 \quad -2x$

$\frac{2x}{2} > \frac{14}{2}$

$x > 7$

EXAMPLE 4 Distributive Property

Solve $6c + 3(2 - c) \geq -2c + 1$.

EXAMPLE 4 Check Your Progress

Solve $3p - 2(p - 4) < p - (2 - 3p)$.

A. $\left\{p \mid p > \frac{10}{3}\right\}$

B. $\left\{p \mid p < \frac{10}{3}\right\}$

C. $\left\{p \mid p > -\frac{10}{3}\right\}$

D. $\left\{p \mid p < -\frac{10}{3}\right\}$

EXAMPLE 4 Check Your Progress

Solve $3p - 2(p - 4) < p - (2 - 3p)$.

A. $\left\{p \mid p > \frac{10}{3}\right\}$

B. $\left\{p \mid p < \frac{10}{3}\right\}$

C. $\left\{p \mid p > -\frac{10}{3}\right\}$

D. $\left\{p \mid p < -\frac{10}{3}\right\}$

EXAMPLE 5 Empty Set and All Reals

A. Solve $-7(s + 4) + 11s \geq 8s - 2(2s + 1)$.

$-7(s + 4) + 11s \geq 8s - 2(2s + 1)$	Original inequality
$-7s - 28 + 11s \geq 8s - 4s - 2$	Distributive Property
$4s - 28 \geq 4s - 2$	Combine like terms.
$4s - 28 - 4s \geq 4s - 2 - 4s$	Subtract $4s$ from each side.
$-28 \geq -2$	Simplify.

Answer: Since the inequality results in a false statement, the solution set is the empty set, Ø.

EXAMPLE 5 Empty Set and All Reals

B. Solve $2(4r + 3) \leq 22 + 8(r - 2)$.

$2(4r + 3) \leq 22 + 8(r - 2)$	Original inequality
$8r + 6 \leq 22 + 8r - 16$	Distributive Property
$8r + 6 \leq 6 + 8r$	Simplify.
$8r + 6 - 8r \leq 6 + 8r - 8r$	Subtract $8r$ from each side.
$6 \leq 6$	Simplify.

Answer: All values of r make the inequality true.
All real numbers are the solution.
$\{r \mid r \text{ is a real number.}\}$

Examples 4–5 Solve each inequality. Graph the solution on a number line. **9–11.** See margin for graphs.

9. $-6 \le 3(5v - 2)$ $\{v \mid v \ge 0\}$

10. $-5(g + 4) > 3(g - 4)$ $\{g \mid g < -1\}$

11. $3 - 8x \ge 9 + 2(1 - 4x)$ $\varnothing$

(9)

$-6 \le 15v - 6$

$+6 \quad +6$

$0 \le 15v$

$\frac{0}{15} \le \frac{15v}{15}$

$0 \le v$

$v \ge 0$

(11)

$3 - 8x \ge 9 + 2 - 8x$

$3 - 8x \ge 11 - 8x$

$+8x \quad +8x$

$3 \ge 11$ false

No Solution

$\varnothing$

Practice and Problem Solving

Extra Practice is on page no.

Examples 1 and 2

CCSS **STRUCTURE** Solve each inequality. Graph the solution on a number line.

12. $5b - 1 \geq -11$ $\{b \mid b \geq -2\}$
13. $21 > 15 + 2a$ $\{a \mid a < 3\}$
14. $-9 \geq \frac{2}{5}m + 7$ $\{m \mid m \leq -40\}$
15. $\frac{w}{8} - 13 > -6$ $\{w \mid w > 56\}$
16. $-a + 6 \leq 5$ $\{a \mid a \geq 1\}$
17. $37 < 7 - 10w$ $\{w \mid w < -3\}$
18. $8 - \frac{z}{3} \geq 11$ $\{z \mid z \leq -9\}$
19. $-\frac{5}{4}p + 6 < 12$ $\left\{p \mid p > -\frac{24}{5}\right\}$
20. $3b - 6 \geq 15 + 24b$ $\{b \mid b \leq -1\}$
21. $15h + 30 < 10h - 45$ $\{h \mid h < -15\}$

12–21. See Ch. 5 Answer Appendix for graphs.

22. Three fourths of a number decreased by nine is at least forty-two.
23. Two thirds of a number added to six is at least twenty-two.
24. Seven tenths of a number plus 14 is less than forty-nine.
25. Eight times a number minus twenty-seven is no more than the negative of that number plus eighteen. Sample answer: Let n = the number; $8n - 27 \leq -n + 18$; $\{n \mid n \leq 5\}$
26. Ten is no more than 4 times the sum of twice a number and three. See margin.
27. Three times the sum of a number and seven is greater than five times the number less thirteen. Sample answer: Let n = the number; $3(n + 7) > 5n - 13$; $\{n \mid n < 17\}$
28. The sum of nine times a number and fifteen is less than or equal to the sum of twenty-four and ten times the number. Sample answer: Let n = the number; $9n + 15 \leq 24 + 10n$; $\{n \mid n \geq -9\}$

Examples 4 and 5

CCSS **STRUCTURE** Solve each inequality. Graph the solution on a number line.

29. $-3(7n + 3) < 6n$ $\left\{n \mid n > -\frac{1}{3}\right\}$
30. $21 \geq 3(a - 7) + 9$ $\{a \mid a \leq 11\}$
31. $2y + 4 > 2(3 + y)$ $\varnothing$
32. $3(2 - b) < 10 - 3(b - 6)$ $\{b \mid b \text{ is a real number.}\}$
33. $7 + t \leq 2(t + 3) + 2$ $\{t \mid t \geq -1\}$
34. $8a + 2(1 - 5a) \leq 20$ $\{a \mid a \geq -9\}$

29–34. See margin for graphs.

22. Sample answer: Let n = the number; $\frac{3}{4}n - 9 \geq 42$; $\{n \mid n \geq 68\}$
23. Sample answer: Let n = the number; $\frac{2}{3}n + 6 \geq 22$; $\{n \mid n \geq 24\}$
24. Sample answer: Let n = the number; $\frac{7}{10}n + 14 < 49$; $\{n \mid n < 50\}$