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2.4 Solving Multi-Step Inequalities
For use with Exploration 2.4

Essential Question How can you solve a multi-step inequality?

1 EXPLORATION: Solving a Multi-Step Inequality

Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.

Work with a partner.

- Use what you already know about solving equations and inequalities to solve each multi-step inequality. Justify each step.

a. $2x + 3 \leq x + 5$ **b.** $-2x + 3 > x + 9$

c. $27 \geq 5x + 4x$ **d.** $-8x + 2x - 16 < -5x + 7x$

e. $3(x - 3) - 5x > -3x - 6$ **f.** $-5x - 6x \leq 8 - 8x - x$

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2.4   Solving Multi-Step Inequalities (continued)

1 **EXPLORATION:** Solving a Multi-Step Inequality (continued)

- Match each inequality with its graph. Use a graphing calculator to check your answer.
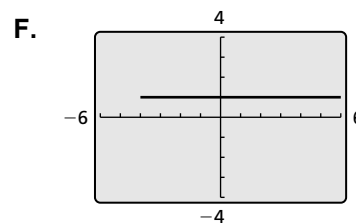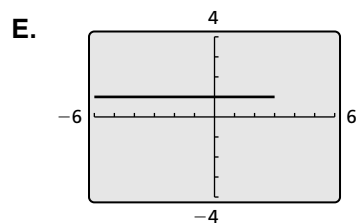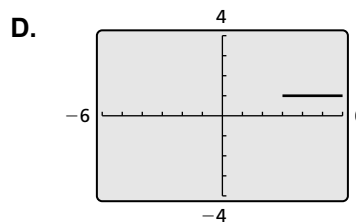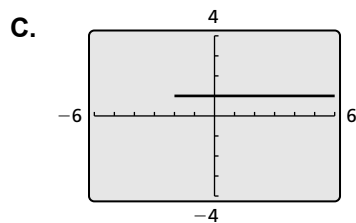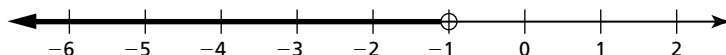
a. $2x + 3 \leq x + 5$

b. $-2x + 3 > x + 9$

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e. $3(x - 3) - 5x > -3x - 6$

f. $-5x - 6x \leq 8 - 8x - x$

A.

B.

C.

D.

E.

F.
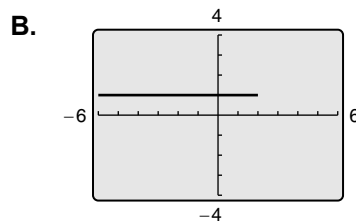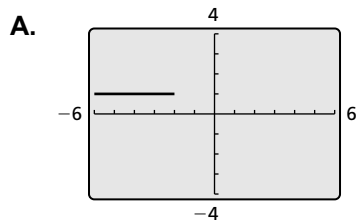
Communicate Your Answer

2. How can you solve a multi-step inequality?

3. Write two different multi-step inequalities whose solutions are represented by the graph.

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Notes:

Worked-Out Examples

Example #1

Solve the inequality. Graph the solution.

$$-9 \leq \quad 7 - 8v$$
$$\underline{-7 \quad -7}$$
$$-16 \leq -8v$$
$$\frac{-16}{-8} \geq \frac{-8v}{-8}$$
$$2 \geq v$$

The solution is $v \leq 2$.
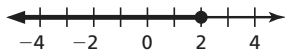
Example #2

Solve the inequality.

$$3w - 5 > 2w + w - 7$$
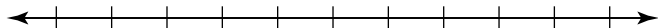$$3w - 5 > \quad 3w - 7$$
$$\underline{-3w \qquad -3w}$$
$$-5 > -7$$

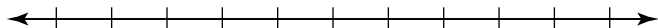The inequality $-5 > -7$ is true. So, all real numbers are solutions.

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Practice A

In Exercises 1–5, solve the inequality. Graph the solution.

1. $3x - 2 < 10$

$$\longleftarrow\!+\!-\!+\!-\!+\!-\!+\!-\!+\!-\!+\!-\!+\!-\!+\!-\!+\!-\!+\!\longrightarrow$$

2. $4a + 8 \geq 0$

$$\longleftarrow\!+\!-\!+\!-\!+\!-\!+\!-\!+\!-\!+\!-\!+\!-\!+\!-\!+\!-\!+\!\longrightarrow$$

3. $2 + \dfrac{b}{-3} \leq 3$

$$\longleftarrow\!+\!-\!+\!-\!+\!-\!+\!-\!+\!-\!+\!-\!+\!-\!+\!-\!+\!-\!+\!\longrightarrow$$

4. $-\dfrac{c}{2} - 6 > -8$

$$\longleftarrow\!+\!-\!+\!-\!+\!-\!+\!-\!+\!-\!+\!-\!+\!-\!+\!-\!+\!-\!+\!\longrightarrow$$

5. $8 \leq -4(d + 1)$

$$\longleftarrow\!+\!-\!+\!-\!+\!-\!+\!-\!+\!-\!+\!-\!+\!-\!+\!-\!+\!-\!+\!\longrightarrow$$

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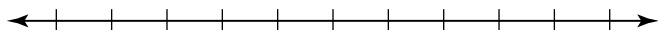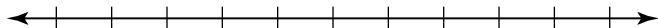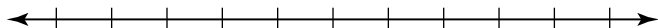
In Exercises 6–10, solve the inequality.

6. $5 - 2n > 8 - 4n$

7. $6h - 18 < 6h + 1$

8. $3p + 4 \geq -4p + 25$

9. $7j - 4j + 6 < -2 + 3j$

10. $12\left(\frac{1}{4}w + 3\right) \leq 3(w - 4)$

11. Find the value of k for which the solution of the inequality $k(4r - 5) \geq -12r - 9$ is all real numbers.

12. Find the value of k that makes the inequality $2kx - 3k < 2x + 4 + 3kx$ have no solution.
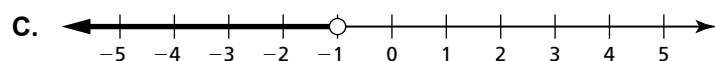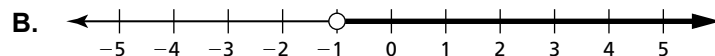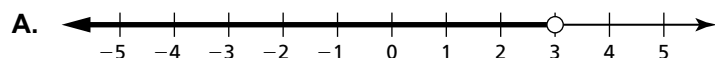
Practice B

In Exercises 1–3, match the inequality with its graph.

1. $5(4 - y) < 25$

2. $-9k + 5 > 14$

3. $2(x - 7) < -8$

A.

B.

C.

In Exercises 4–9, solve the inequality. Graph the solution.

4. $6 < -5t - 4$

5. $\dfrac{m}{4} + 2 < 3$

6. $5 + \dfrac{k}{-2} \geq 2$

7. $\dfrac{d}{-6} + 7 < 11$

8. $4 < -2(y + 3)$

9. $24 \geq 6(w - 2)$

In Exercises 10–15, solve the inequality.

10. $-5n - 4 > 7n + 20$

11. $4k - 6 < 3k + k - 1$

12. $10h - 3h + 6 \geq 11 + 7h$

13. $6(t - 1) \leq 2(3t - 5)$

14. $12(x - 2) > 3(4x - 8)$

15. $6\left(\dfrac{1}{3}d + 4\right) > 2(d + 12)$

16. You must maintain a minimum balance of $50 in your checking account. You currently have a balance of $280.

    a. Write and solve an inequality that represents how many $20 bills you can withdraw from the account without going below the minimum balance.

    b. Your bank charges an ATM fee of $2.50, which is charged each time you withdraw $20. Write and solve an inequality that represents how many $20 bills you can withdraw from the account without going below the minimum balance in this situation.