

# 6-3 Solving Multi-Step Inequalities (Pages 332–337)

Inequalities involving more than one operation can be solved by undoing the operations in reverse order in the same way you would solve an equation with more than one operation. The important exception is that multiplying or dividing an inequality by a negative number reverses the sign of the inequality.

### Example

Solve  $-3f - 7 \geq -f + 9$ .

$$\begin{aligned}
 -3f - 7 &\geq -f + 9 \\
 -3f - 7 + f &\geq -f + 9 + f && \text{Add } f \text{ to each side.} \\
 -2f - 7 &\geq 9 && \text{Combine like terms.} \\
 -2f - 7 + 7 &\geq 9 + 7 && \text{Add } 7 \text{ to each side.} \\
 -2f &\geq 16 && \text{Combine like terms.} \\
 \frac{-2f}{-2} &\leq \frac{16}{-2} && \text{Divide each side by } -2 \text{ and change } \geq \text{ to } \leq. \\
 f &\leq -8 && \text{Simplify.}
 \end{aligned}$$

The solution set is  $\{f | f \leq -8\}$ .

### Try These Together

Solve each inequality. Then check your solution.

1.  $2a - 18 \leq 5a + 3$

*HINT: Begin by collecting all the terms with a on one side of the equality sign.*

2.  $x - 2 < \frac{x + 4}{4}$

*HINT: Begin by multiplying each side by 4.*

### Practice

Solve each inequality. Then check your solution.

3.  $\frac{1}{4}z - 1 \geq 3$

4.  $-7x - 8 > 1 - 2x$

5.  $2m + 3 > 11$

6.  $2w - 3 \geq 8w + 69$

7.  $-4 - 2p > 8$

8.  $\frac{3h + 1}{4} > -2$

9.  $5q - 4 \geq 12 - 3q$

10.  $8 + v \geq 2v - 1$

11.  $\frac{4(x - 1)}{3} \leq 12$

12. **Money Matters** Sarah does not want to spend more than \$20 for a backpack. At a certain store all backpacks are on sale for 30% off. If she pays 5% sales tax after the discount, what is the regular price of the most expensive backpack she can buy? Define a variable, write an inequality, and then solve.

13. **Standardized Test Practice** Solve  $-\frac{1}{3}x + 3 \geq 0$ .

A  $\{x | x \leq -9\}$

B  $\{x | x \geq -9\}$

C  $\{x | x \leq 9\}$

D  $\{x | x \geq 9\}$

Answers: 1.  $\{a | a \geq -7\}$  2.  $\{x | x < 4\}$  3.  $\{z | z \geq 16\}$  4.  $\{x | x < -1.8\}$  5.  $\{m | m > 4\}$  6.  $\{w | w \leq -12\}$  7.  $\{p | p < -6\}$  8.  $\{h | h < -3\}$  9.  $\{q | q \geq 2\}$  10.  $\{v | v \leq 9\}$  11.  $\{x | x \leq 10\}$  12.  $x = \text{cost of backpack}; x - 0.30x + 0.05(x - 0.30x) \leq 20; \$27.21$  13. C