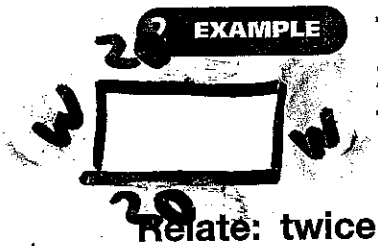
Solving Multi-Step Inequalities

Additional Examples — Lesson 3-4

1 EXAMPLE Solve $5 + 4b < 21$.

$\cancel{5} + 4b \cancel{-5} < 21 - 5$	Subtract 5 from each side.
$4b < 16$	Simplify.
$\frac{\cancel{4}b}{\cancel{4}} < \frac{16}{4}$	Divide each side by 4.
$b < 4$	Simplify.
Check: $5 + 4b = 21$	Check the computation.
$5 + 4(4) \stackrel{?}{=} 21$	Substitute 4 for b.
$21 = 21$ ✔	
$5 + 4b < 21$	Check the direction of the inequality.
$5 + 4(3) < 21$	Substitute 3 for b.
$17 < 21$ ✔	

2 EXAMPLE The band is making a rectangular banner that is 20 feet long with trim around the edges. What are the possible widths the banner can be if there is no more than 48 feet of trim?



Relate: twice the length plus twice the width $\boxed{\text{can be no more than}}$ the length of trim

Write: $2(20) + 2w \boxed{\le} 48$

$2(20) + 2w \le 48$	
$40 + 2w \le 48$	Simplify 2(20).
$\cancel{40} + 2w \cancel{-40} \le 48 - 40$	Subtract 40 from each side.
$2w \le 8$	Simplify.
$\frac{\cancel{2}w}{\cancel{2}} \le \frac{8}{2}$	Divide each side by 2.
$w \le 4$	Simplify.

The banner's width must be 4 feet or less.

3 EXAMPLE Solve $3x + 4(6 - x) < 2$.

$3x + 24 - 4x < 2$	Use the Distributive Property.
$-x + 24 < 2$	Combine like terms.
$-x + \cancel{24} - \cancel{24} < 2 - 24$	Subtract 24 from each side.
$-x < -22$	Simplify.
$\frac{\cancel{-1}x}{\cancel{-1}} > \frac{-22}{-1}$	Divide each side by -1. Reverse the inequality symbol.
$x > 22$	Simplify.

4 EXAMPLE Solve $8z - 6 < 3z + 12$.

$8z - 6 - 3z < \cancel{3z} + 12 - \cancel{3z}$	Subtract $3z$ from each side.
$5z - 6 < 12$	Combine like terms.
$5z \cancel{- 6} \cancel{+ 6} < 12 + 6$	Add 6 to each side.
$5z < 18$	Simplify.
$\frac{\cancel{5}z}{\cancel{5}} < \frac{18}{5}$	Divide each side by 5.
$z < 3\frac{3}{5}$	Simplify.

5 EXAMPLE Solve $5(-3 + d) \le 3(3d - 2)$.

$-15 + 5d \le 9d - 6$	Use the Distributive Property.
$-15 + 5d - 9d \le \cancel{9d} - 6 \cancel{- 9d}$	Subtract $9d$ from each side.
$-15 - 4d \le -6$	Combine like terms.
$\cancel{-15} - 4d \cancel{+ 15} \le -6 + 15$	Add 15 to each side.
$-4d \le 9$	Simplify.
$\frac{\cancel{-4}d}{\cancel{-4}} \ge \frac{9}{-4}$	Divide each side by -4. Reverse the inequality symbol.
$d \ge -2\frac{1}{4}$	Simplify.