

# EQUATIONS WITH VARIABLES ON BOTH SIDES

## Additional Examples

## Lesson 2-4

**1 EXAMPLE** The measure of an angle is  $(5x - 3)^\circ$ . Its vertical angle has a measure of  $(2x + 12)^\circ$ . Find the value of  $x$ .

$$\begin{aligned} 5x - 3 &= 2x + 12 \\ 5x - 3 - 2x &= 2x + 12 - 2x \\ 3x - 3 &= 12 \\ 3x - 3 + 3 &= 12 + 3 \\ 3x &= 15 \\ \frac{3x}{3} &= \frac{15}{3} \\ x &= 5 \end{aligned}$$

Vertical angles are congruent.  $=$

Subtract  $2x$  from each side.

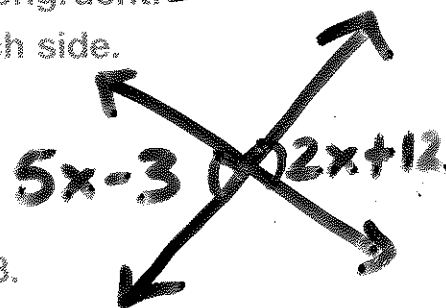
Combine like terms.

Add 3 to each side.

Simplify.

Divide each side by 3.

Simplify.



**2 EXAMPLE** You can buy a skateboard for \$60 from a friend and rent the safety equipment for \$1.50 per hour. Or you can rent all items you need for \$5.50 per hour. How many hours must you use your skateboard to justify buying your friend's skateboard?

Relate: cost of friend's skateboard plus equipment rental equals skateboard and equipment rental

Define: Let  $h$  = the number of hours you must skateboard.

Write:  $60 + 1.5h = 5.5h$

$$60 + 1.5h = 5.5h$$

$$60 + 1.5h - 1.5h = 5.5h - 1.5h$$

$$60 = 4h$$

$$\frac{60}{4} = \frac{4h}{4}$$

$$15 = h$$

Subtract  $1.5h$  from each side.

Combine like terms.

Divide each side by 4.

Simplify.

You must use your skateboard for more than 15 hours to justify buying the skateboard.

**3 EXAMPLE** Solve each equation.

a.  $-6z + 8 = z + 10 - 7z$

$$-6z + 8 = z + 10 - 7z$$

$$-6z + 8 = -6z + 10$$

~~$$-6z + 8 + 6z = -6z + 10 + 6z$$~~

$$8 = 10$$

**NO SOLUTION**

Combine like terms.

Add 6z to each side.

Not true for any value of z!

This equation has no solution.

b.  $4 - 4y = -2(2y - 2)$

~~$$4 - 4y = -2(2y - 2)$$~~

$$4 - 4y = -4y + 4$$

~~$$4 - 4y + 4y = -4y + 4 + 4y$$~~

$$4 = 4$$

**IDENTITY**

Use the Distributive Property.

Add 4y to each side.

Always true!

The equation is true for every value of y, so the equation is an identity.