

## OUTPUT 2.05 CONTINUED

1. Express each sentence using variables.
  - a. Dividing is the same as multiplying by the reciprocal.
  - b. Subtracting is the same as adding the opposite.
  - c. If you have a product of two numbers, and you find the products of the opposites of the numbers, you get the same result.
  - d. If you multiply two numbers together and the result is 1, then the numbers are reciprocals.
2. The Zero-Product Property states that if the product of two numbers is zero, then one of the numbers equals zero. You can write the property using symbols this way.

$$\text{If } ab = 0, \text{ then } a = 0 \text{ or } b = 0.$$

The steps show you a proof of this property. Start with the equation  $ab = 0$ .

- a. If  $a = 0$ , then you can stop doing the proof. Explain.
- b. Assume  $a \neq 0$ . Then  $a$  has a reciprocal. Explain.
- c. Since  $a$  has a reciprocal  $(\frac{1}{a})$ , you can use a basic rule and multiply both sides of the equation by this reciprocal. What effect does this have on the left side of the equation? On the right side of the equation?
- d. Explain why these steps prove the Zero-Product Property.

### On Your Own

3. The binary operation  $\heartsuit$  is defined by the following rule.
$$x \heartsuit y = 3x + y$$
  - a. Explain how to find  $4 \heartsuit 6 = 18$ .
  - b. Evaluate  $6 \heartsuit 4$ .
  - c. Is  $\heartsuit$  commutative? In other words, does  $\heartsuit$  have an any-order property?
4. The binary operation  $\spadesuit$  is defined by the rule  $x \spadesuit y = -3(x + y)$ .
  - a. Is  $\spadesuit$  commutative? In other words, does  $\spadesuit$  have an any-order property? Explain.
  - b. Is  $\spadesuit$  associative? In other words, does  $\spadesuit$  have an any-grouping property? Explain.

### Remember...

Sometimes you will see the term *negative* or *additive inverse* instead of *opposite*. They all mean the same thing.

### On Your Own

The prefix *bi-* means "two." A **binary operation** takes two numbers and produces one number.

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