



# Representing Contexts with Equations

Let's write equations that represent situations.

## 16.1 Math Talk: Don't Solve It

Decide mentally whether each solution is positive or negative.

- $(-8.7)(1.4) = a$

- $-8.7b = 1.4$

- $-8.7 + c = -1.4$

- $-8.7 - d = -1.4$

## 16.2

## Warmer or Colder than Before?

1. For each situation, find *two* equations from this list that could represent the situation. (Some equations will not be used.)

$$-3v = 9$$

$$v = -16 + 6$$

$$v = \frac{1}{3} \cdot (-6)$$

$$v + 12 = 4$$

$$-4 \cdot 3 = v$$

$$v = 4 + (-12)$$

$$v = -16 - (6)$$

$$v = 9 + 3$$

$$-4 \cdot -3 = v$$

$$-3v = -6$$

$$-6 + v = -16$$

$$-4 = \frac{1}{3}v$$

$$v = -\frac{1}{3} \cdot 9$$

$$v = -\frac{1}{3} \cdot (-6)$$

$$v = 4 + 12$$

$$4 = 3v$$

- a. Between 6 a.m. and noon, the temperature rises 12 degrees, reaching a final temperature of 4 degrees Fahrenheit.
- b. At midnight the temperature is -6 degrees. By 4 a.m. the temperature has fallen to -16 degrees.
- c. The temperature is 0 degrees at midnight and drops 3 degrees per hour. The temperature is -6 degrees at a certain time.
- d. The temperature is 0 degrees at midnight and drops 3 degrees per hour. The temperature is 9 degrees at a certain time.
- e. The temperature at 9 p.m. is one third the temperature at midnight.



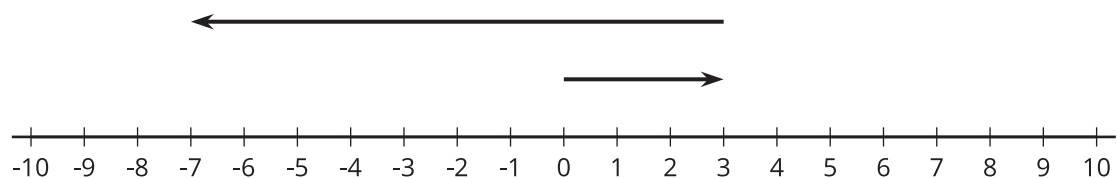
2. Choose one of the situations.
  - a. Explain what the variable represents in the situation.
  - b. Determine the value of the variable that makes the equation true, and explain your reasoning.



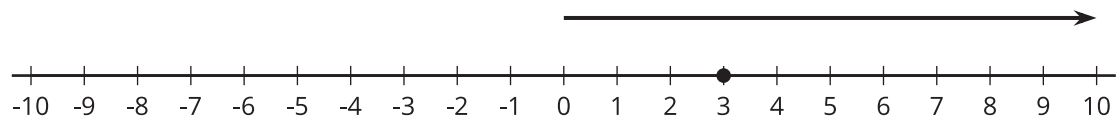
1. Match each situation with a diagram.
  - a. A penguin is standing 3 feet above sea level and then dives down 10 feet. What is its depth?
  - b. A dolphin is swimming 3 feet below sea level and then jumps up 10 feet. What is its height at the top of the jump?
  - c. A sea turtle is swimming 3 feet below sea level and then dives down 10 feet. What is its depth?
  - d. An eagle is flying 10 feet above sea level and then dives down reaching 3 feet above sea level. What is its change in altitude?
  - e. A pelican is flying 10 feet above sea level and then dives down reaching 3 feet below sea level. What is its change in altitude?
  - f. A shark is swimming 10 feet below sea level and then swims up reaching 3 feet below sea level. What is its change in depth?
2. Next, write an equation to represent each animal's situation, and answer the question. Be prepared to explain your reasoning.

## Diagrams

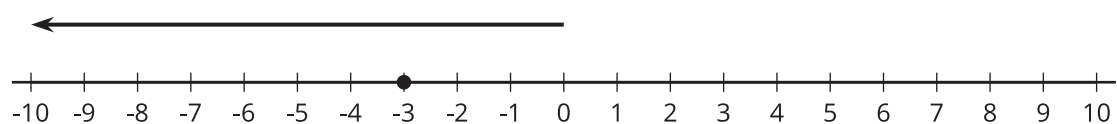
A



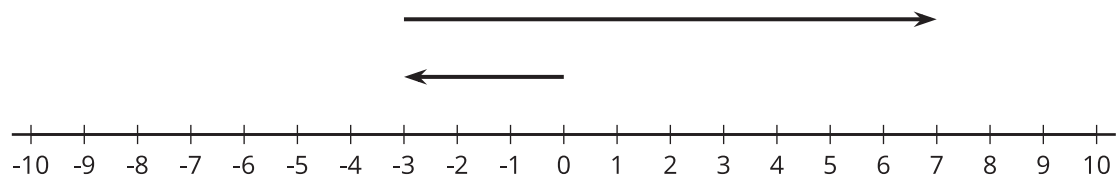
B



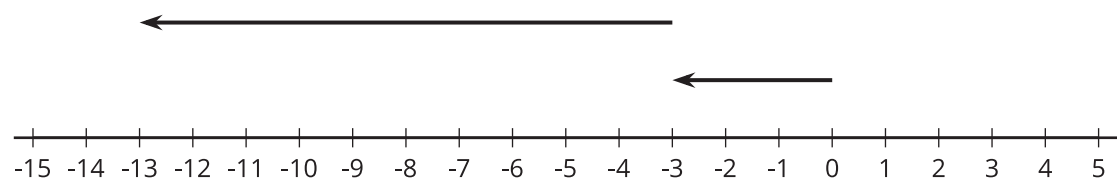
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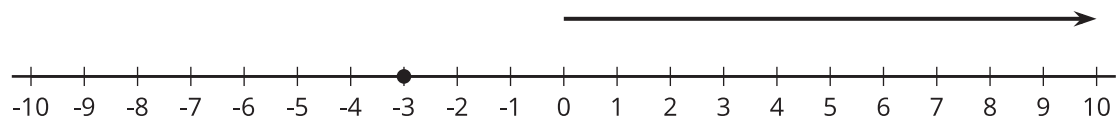
D



E



F



## 16.4

## Equations Tell a Story

Your teacher will assign your group *one* of these situations. Create a visual display about your situation that includes:

- An equation that represents your situation.
  - What your variable and each term in the equation represent.
  - How the operations in the equation represent the relationships in the story.
  - How you use inverses to solve for the unknown quantity.
  - The solution to your equation.
1. As a  $7\frac{1}{4}$ -inch candle burns down, its height decreases  $\frac{3}{4}$  inch each hour. How many hours does it take for the candle to burn completely?
  2. On Monday  $\frac{1}{9}$  of the enrolled students in a school were absent. There were 4,512 students present. How many students are enrolled at the school?
  3. A hiker begins at sea level and descends 25 feet every minute. How long will it take to get to an elevation of -750 feet?
  4. Jada practices the violin for the same amount of time every day. On Tuesday she practices for 35 minutes. How much does Jada practice in a week?
  5. The temperature has been dropping  $2\frac{1}{2}$  degrees every hour, and the current temperature is  $-15^{\circ}\text{F}$ . How many hours ago was the temperature  $0^{\circ}\text{F}$ ?
  6. The population of a school increased by 12%, and now the population is 476. What was the population before the increase?
  7. During a 5%-off sale, Diego pays \$74.10 for a new hockey stick. What was the original price?
  8. A store buys sweaters for \$8 and sells them for \$26. How many sweaters does the store need to sell to make a profit of \$990?



## Are you ready for more?

Diego and Elena are 2 miles apart and begin walking towards each other. Diego walks at a rate of 3.7 miles per hour, and Elena walks 4.3 miles per hour. While they are walking, Elena's dog runs back and forth between the two of them at a rate of 6 miles per hour. Assuming the dog does not lose any time in turning around, how far has the dog run by the time Diego and Elena reach each other?

## Lesson 16 Summary

We can use variables and equations involving signed numbers to represent a story or answer questions about a situation.

For example, if the temperature is  $-3^{\circ}\text{C}$  and then falls to  $-17^{\circ}\text{C}$ , we can let  $x$  represent the temperature change and write the equation:

$$-3 + x = -17$$

We can solve the equation by adding 3 to each side. Since  $-17 + 3 = -14$ , the change is  $-14^{\circ}\text{C}$ .

Here is another example: If a starfish is descending by  $\frac{3}{2}$  feet every hour, then we can solve

$$-\frac{3}{2}h = -6$$

to find out how many hours  $h$  it takes the starfish to go down 6 feet.

We can solve this equation by multiplying each side by  $-\frac{2}{3}$ . Since  $-\frac{2}{3} \cdot -6 = 4$ , we know it will take the starfish 4 hours to descend 6 feet.