Lesson 17

Meanings of Slope and Intercepts

TAKS Grade 9 Objective 3 (A.6)(B)

Recall that the slope of a line represents the rate of change in one quantity with respect to another.

New Vocabulary

- *x*-intercept
- *y*-intercept

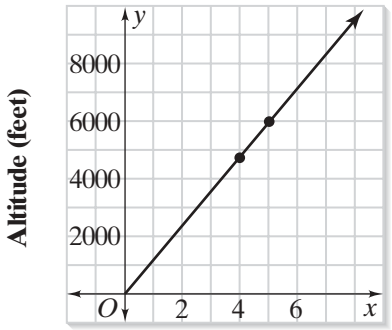
Meaning of Slope

In a real-world situation, the slope of a line will tell you about the rate of change of the two quantities the graph represents.

EXAMPLE 1

Alejandro is stuffing envelopes for a political campaign. On Tuesday, he stuffed 4800 envelopes in 4 hours. On Wednesday, he stuffed 6000 envelopes in 5 hours. Draw a graph showing the relationship between number of envelopes stuffed and time, and find its slope. Describe the meaning of the slope of your graph.

In the situation above, the number of envelopes Alejandro can stuff *depends* on the time. Put the dependent variable, number of envelopes, on the *y*-axis. Put the independent variable, time, on the *x*-axis. Then graph the two points (4, 4800) and (5, 6000).



Connect the points to make a line.

Find the slope:

$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{6000 - 4800}{5 - 4}$$

$$= \frac{1200}{1}$$

$$= 1200$$

The slope is the ratio of the change in *y*, the number of envelopes stuffed, to the change in *x*, the time in hours. A slope of $\frac{1200}{1}$ means that Alejandro stuffs 1200 envelopes per hour.

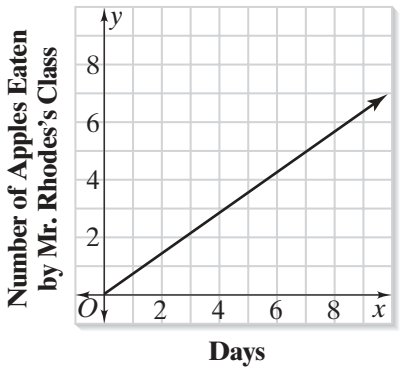
TAKS TIP

Because the slope is a rate of change, you can use it to identify the independent and dependent variables. For example, if the slope is in miles per hour, then you know that miles depends on hours. Therefore, the dependent variable is miles, and the independent variable is hours.

Quick Check 1

1a. Andrew can type 400 words in 5 minutes. He can type 1200 words in 15 minutes. Draw a graph representing this situation. Then find the slope and explain what it means.

1b. Find the slope of the line at the right and describe its meaning.



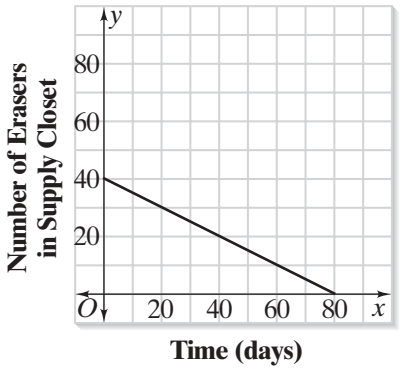
Meaning of Intercepts

The ***y*-intercept** of a function represents the point where the graph of the function intersects the y-axis, when the value of the independent variable, x, is equal to 0.

The ***x*-intercept** of a function represents the point where the graph of the function intersects the x-axis, when value of the dependent variable, y, is equal to 0.

EXAMPLE 2

At the beginning of each school year, Principal Sao stocks the teachers' supply closet with new erasers. The graph below shows the change in number of erasers in the supply closet over time. The relationship can be represented by the equation $y = -\frac{1}{2}x + 40$.



Find the x- and y-intercepts of the graph. Explain what each intercept means in the context of the problem.

Use the graph.

The line crosses the y-axis at the point $(0, 40)$. Thus, the value of y when $x = 0$ is 40.

The line crosses the x-axis at the point $(80, 0)$. Thus, the value of x when $y = 0$ is 80.

The y-intercept, 40, shows how many erasers are in the closet when time equals 0, or when Principal Sao first stocks the supply closet. So, the original number of erasers was 40.

The x-intercept, 80, shows the time that has passed when the number of erasers in the closet is 0. So, it takes 80 days to run completely out of erasers.

TAKS TIP

If the intercepts cannot be clearly seen from the graph, or if just an equation is given, you can use the equation to find the x- and y-intercepts.

Example: Use the equation $y = -\frac{1}{2}x + 40$ to find the x- and y-intercepts.

Solve for x when y = 0:

$$0 = -\frac{1}{2}x + 40$$
$$-40 = -\frac{1}{2}x$$
$$80 = x$$

The x-intercept is (80, 0).

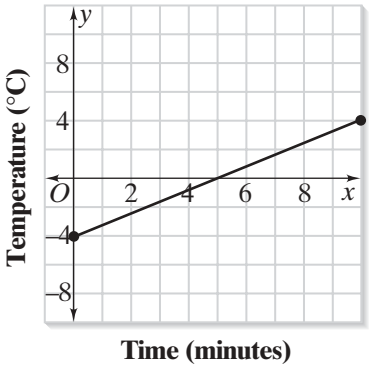
Solve for y when x = 0:

$$y = -\frac{1}{2}(0) + 40$$
$$y = 0 + 40$$
$$y = 40$$

The y-intercept is (0, 40).

Quick Check 2

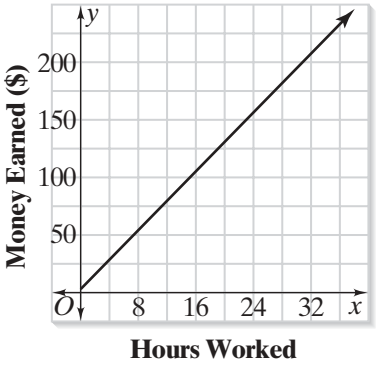
2a. The graph at right represents the relationship between time and temperature of a solution during a chemical reaction. Find the x- and y-intercepts, and explain what they mean in the situation.



2b. The equation $t = -4x + 100$ represents the relationship between total score on a quiz, t, and questions counted incorrect, x. Find the intercepts of the equation, and explain what they mean in the situation.

TAKS Tune-Up Name_____Class_____Date_____

1 The line segment of the graph shows the wages earned by a cashier during a week. Which of the following best describes the slope of the line segment?



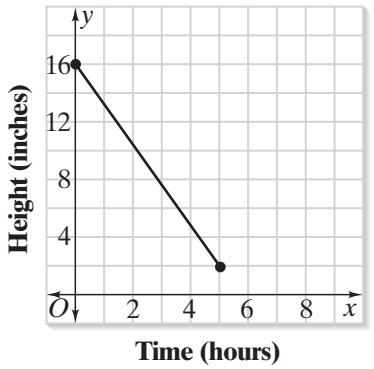
A The cashier earns $6 per hour.

B The cashier earns $6.25 per hour.

C The cashier earns $12 per hour.

D The cashier earns $12.50 per hour.

2 The graph shows the height of a candle as it burns. Which of the following best describes the *y*-intercept?



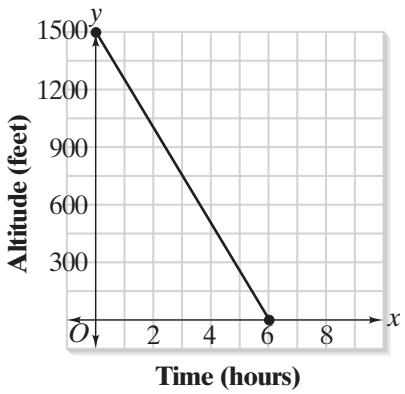
F The height of the candle before it burned was 16 inches.

G The height of the candle after it burned was 2 inches.

H The candle burned in 5 hours.

J The candle burned at a rate of 3 inches per minute.

3 The graph shows the altitude of a car as a driver descends a mountain. What is the meaning of the *x*-intercept?



A The height at which the driver started was 1500 ft.

B The height at which the driver stopped was 6 feet above sea level.

C The driver descended at 300 ft an hour.

D The driver reached the base of the mountain after 6 hours.

4 Some students collected the data below. They will graph the data. What will the slope of the graph represent?

Month	Average Temperature (°F)
January	42
February	56
March	70
April	84

F The change in average temperature per day.

G The change in average temperature per month.

H The high temperature for the sampling period.

J The range of temperatures for the sampling period.