Lesson 21

Interpreting the Effects of Changing Slope and *y*-intercept

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

The slope of a graph tells you the rate of change of a function. In applied situations, it tells you how much a change in one variable affects the other. For instance, if the function tells you the total price for a number of items, the slope tells you the price per item.

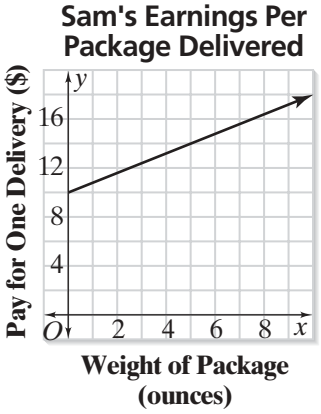
A function crosses the *y*-axis at a point called the *y*-intercept. In applied situations, the *y*-intercept tells you the starting value of a function, when the input, *x*, is zero.

Changes in Slope

Changing the slope of a function will affect its rate of change. If the absolute value of the slope is increased, the values of the function will change more quickly. If the absolute value of the slope is decreased, the values of the function will change more slowly. Keep in mind what the function is describing when determining the meaning of a change in slope.

EXAMPLE 1

Sam works as a bicycle courier. She earns $10.00 for each delivery plus $0.75 for each ounce the package she delivers weighs. The graph of her pay is shown below.



What would it mean if the slope of the graph were doubled?

The slope of a graph tells you the rate of change of the function. In this case, the slope of the graph represents the number of dollars Sam makes, *y* divided by the number of ounces a package weighs, *x*, or dollars per ounce. The slope of the original graph is 0.75, which means that Sam earns $0.75 per ounce (plus $10.00 per delivery). If the slope were doubled, it would indicate that Sam's rate of pay had been doubled: Sam would make $1.50 per ounce plus $10.00 per delivery.

Quick Check 1

1a. What would it mean if the slope of the function were changed to zero?

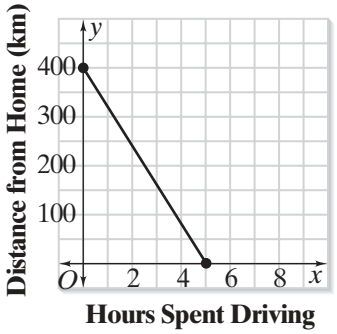
1b. What would it mean if the slope of the function were negative?

Changes in *y*-intercept

A change in *y*-intercept will change the starting value of the function. Remember, the *y*-intercept is the output value of the function when the input is zero. In applied situations, the *y*-intercept is often the starting point, or a flat fee for a product. Changing the *y*-intercept shifts the entire function up or down. Keep the problem situation in mind to determine the meaning of the *y*-intercept.

EXAMPLE 2

Melinda is driving home at a speed of 80 kilometers per hour. Her distance from home is shown on the graph below.



What would it mean if the *y*-intercept of the graph were increased by 40?

The *y*-intercept of the graph is (0, 400). This means that at 0 hours, or when she begins driving, Melinda is at a distance of 400 kilometers from her home. If the *y*-intercept were increased by 40 units, this would mean that she started 40 kilometers further from her home, at a distance of 440 kilometers. It would thus take Melinda a longer time to get home at the same speed.

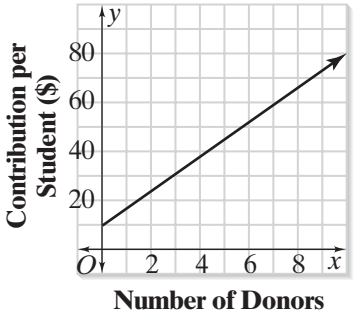
Quick Check 2

2a. If the *y*-intercept were halved, how would the total amount of time it takes Melinda to get home be affected?

2b. Ronnie drives home at a speed of 75 kilometers per hour from a distance of 300 kilometers away. Graph this situation and describe how the graph compares to the graph in Example 2 in terms of its slope and *y*-intercept.

 Name_____Class_____Date_____

1 Gwyneth's school holds a fundraiser to benefit organizations treating diabetes patients. For each student that participates in the fundraiser, the school donates $10. In addition, the students obtain a pledge of $7 from each donor they find. The graph of Gwyneth's contribution in terms of the number of donors she finds is shown below.



If the contribution of each donor were increased to $9, how would the graph change?

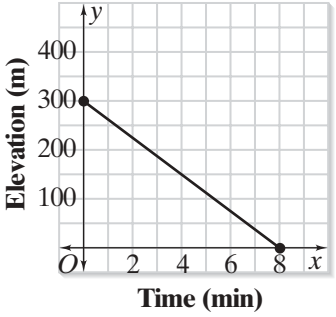
A The slope would increase, causing the line to rise more steeply.

B The line would cross the y-axis at $(0, 9)$ rather than $(0, 10)$.

C The line would cross the x-axis at $(9, 0)$.

D The slope would decrease, causing the line to rise less steeply.

2 The line graphed below represents the elevation of a car as it drives down a hill.



What would be the meaning if the slope of the line were doubled?

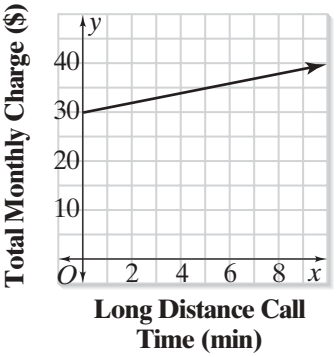
F The hill would be twice as tall.

G The hill would be half as tall.

H The car would be moving twice as fast.

J The car would be moving half as fast.

3 A phone company charges $30.00 per month plus $0.10 for every minute of long distance phone calls. The total charge is graphed below.



Which of the following would increase the charge per long distance minute to $0.20?

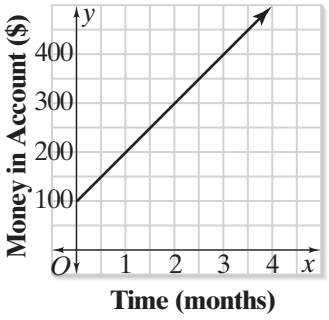
A Halving the y-intercept

B Doubling the y-intercept

C Halving the slope

D Doubling the slope

4 Each month, Rebecca adds money to her bank account. The amount of money in Rebecca's bank account is graphed below.



If the y-intercept of this graph were changed to 75, what would change in the situation?

F Rebecca would have added $75 more to her bank account each month.

G Rebecca would have started with $75 more in her bank account.

H Rebecca would have started with $25 less in her bank account.

J Rebecca would have added $25 less to her bank account each month.