

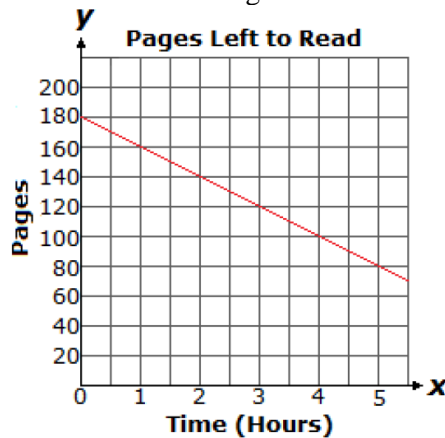
**Rate of Change**

The **rate of change**, or slope, of a linear function is the ratio of the change in  $y$  to the change in  $x$ .

Given two points,  $(x_1, y_1)$  and  $(x_2, y_2)$ , the rate of change can be found by using the following formula.

$$\text{rate of change} = \frac{y_2 - y_1}{x_2 - x_1}$$

- Paula has to read a novel for her English class. The graph below represents the number of pages she has left to read after  $x$  hours of reading.



What is the rate of change of the graph?

- From start to finish, Molly can make batches of cookies at a constant rate. She can make 2 batches in 50 minutes and 4 batches in 100 minutes. Assuming  $x$  represents the number of batches of cookies and  $y$  represents the total time, in minutes, what is the rate of change for Molly's cookie baking?
- Find the slope of a line that is parallel to  $-8 = -6x - 2y$
- Find the slope of a line that is perpendicular to  $4x = y - 5$

5. Find the slope of the function from the table below:

$x$	$f(x)$
4	10
-2	22
-6	30
-12	42

6. Melissa is feeding the ducks at the pond. She is going through her loaf of bread at a constant rate. The table below shows the number of slices of bread remaining in relation to the number of minutes she has been feeding the ducks.

<b>Minutes</b>	1	2	3
<b>Slices of Bread</b>	33	31	29

What is the rate of change of the table?

### 7. Computer Program Loop

If a computer program has a loop in it, the length of time it takes the computer to run the program varies linearly with the number of times it must go through the loop. Suppose a computer takes 8 seconds to run a given program when it goes through the loop 100 times, and 62 seconds when it loops 1000 times.

- Write the slope-intercept equation expressing seconds in terms of loops.
- Predict the length of time needed to loop 30 times; 10,000 times.

### 8. Cost, Revenue, and Profit

A contractor purchases a bulldozer for \$36,500. The bulldozer requires an average expenditure of \$8.25 per hour for fuel and maintenance, and the operator is paid \$19.50 per hour.

- Write a linear equation in slope-intercept form giving the total cost  $C$  of operating the bulldozer for  $t$  hours (include the purchase of the bulldozer).

### 9. Cell Phone Plans

Cellular phone companies often package their products to make them more attractive to potential users.

Package A includes a free phone and 300 minutes. It will cost \$0.12 per minute for each minute over the plan time. Package A has a base rate of \$39.95.

Package B has a phone that costs \$10 and has 350 minutes of time and \$0.08 per minute for each minute over the plan time. Package B has a base rate of \$35.95 not including the phone.

- a. Write an equation in slope-intercept form for Package A.
  
  
  
  
  
  
  
  
  
  
- b. Write an equation in slope-intercept form for Package B.

### 10. Stack of Cups

A stack of 12 cups is 16 cm tall. A stack of 20 of the same cups is 21 cm tall.

- a. Write a linear equation in slope-intercept form for the height of any stack. Show your work.



- b. Describe what the variables represent in your equation above.

### 11. Snow Storm

During a recent snow storm, snow fell at a rate of  $\frac{1}{2}$  inch per hour. Before the storm began, there was already 6 inches of snow on the ground.

- a. Using the above information, create an equation in slope-intercept for that models the depth of snow,  $y$ , on the ground after  $x$  hours.
  
  
  
  
  
  
  
  
  
  
- b. Explain what the  $y$ -intercept and slope represent in this model.

### 12. Summer Spending

Keith has \$500 in a savings account at the beginning of the summer. He wants to have at least \$200 in the account by the end of the summer. He withdraws \$25 each week for food, clothes and movie tickets.

- a. Write an inequality that represents Keith's situation.
  
  
  
  
  
  
  
  
  
  
- b. How many weeks can Keith withdraw money from his account. Justify your answer.

### 13. Tree Height

You are planning a scientific experiment involving the growth of a certain species of tree. The tree starts out 18 inches tall and grows at a rate of 10 inches per year.

- a. Write an equation to represent the height of the tree in terms of years.
  
  
  
  
  
  
  
  
  
  
- b. You need the tree to be between 6 and 10 feet tall to gather the data for your experiment. Write and solve a compound inequality to determine how old the tree must be to qualify for your experiment.

14. Cassidy is going to the country fair with her friends but can only stay at the fair for 3 hours. The fair offers two different pricing structures. Cassidy can purchase an all-day pass with unlimited rides for \$30.00 or she can pay an admission fee of \$6.00 and pay \$3.00 for each ride. If Cassidy rides 15 rides, how much does she save by buying the all-day pass?

15. LeAnne leaves town traveling at an average speed of 54 mph. After 2 hours, Bart leaves town traveling in the same direction at an average speed of 71 mph. Which of the following equations could be used to represent the distance,  $y$ , between LeAnne and Bart after  $x$  hours?

- a)  $y = 17x$
- b)  $y = 108 + 17x$
- c)  $y = 108 - 71x$
- d)  $y = 108 - 17x$

16. Jenny has a job that pays her \$8 per hour plus tips ( $t$ ). Jenny worked for 4 hours on Monday and made \$65 in all. Which equation could be used to find  $t$ , the amount Jenny made in tips?

- a.  $65 = 4t + 8$
- b.  $65 = 8t \div 4$
- c.  $65 = 8t + 4$
- d.  $65 = 8(4) + t$

17. The table at right shows values of  $y$  as a function of  $x$ .

Which linear equation best describes the relationship between  $x$  and  $y$ ?

- a.  $y = 5x$
- b.  $y = 2.5x + 5$
- c.  $y = 3.75x + 2.5$
- d.  $y = 4x + 1$

$x$	$y$
2	10
6	25
14	55
26	100
34	130

18. Jeff's restaurant sells hamburgers. The amount charged for a hamburger ( $h$ ) is based on the cost for a plain hamburger plus an additional charge for each topping ( $t$ ) as shown in the equation below.

$$h = 0.60t + 5$$

What does the number 0.60 represent in the equation?

- a. The number of toppings
- b. The cost of a plain hamburger
- c. The additional cost for each topping
- d. The cost of a hamburger with 1 topping

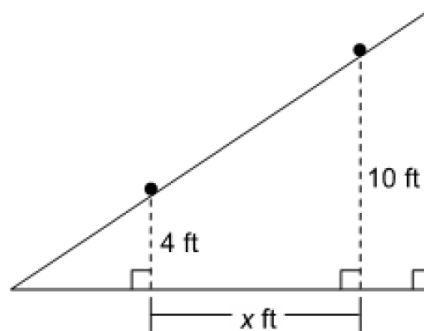
19. A juice machine dispenses the same amount of juice into a cup each time the machine is used. The equation below describes the relationship between the number of cups ( $x$ ) into which juice is dispensed and the gallons of juice ( $y$ ) remaining in the machine.

$$x + 12y = 180$$

How many cups of juice can the machine dispense?

- a. 12
- b. 15
- c. 168
- d. 180

20. A ball rolls down a ramp with a slope of  $\frac{3}{7}$ . At one point the ball is 10 feet high, and at another point the ball is 4 feet high, as shown in the diagram below.



What is the horizontal distance ( $x$ ), in feet, the ball traveled as it rolled down the ramp from 10 feet high to 4 feet high?

- a. 7
- b. 9
- c. 14
- d. 15