Direct Variation

1. Is the following data an example of a direct variation relationship?

x	-2	0	4
y	5	3	1

Write a direct variation equation to model each situation. Then solve the problem.

2. A local restaurant earns $9000 in a four hour period. The total amount of earnings varies directly with the number of hours. Find the total earnings if the restaurant is open for 9 hours.

3. Weight varies directly with a planet's gravity. A Mars rover plus lander weighs 767 pounds on Earth, but only 291 pounds on Mars. The Mars rover without the lander weighs 155 pounds on Mars. How much does the rover without the lander weigh on Earth? Round your answer to the nearest pound.

Write and graph a direct variation equation for each situation. Then use the graph to solve the problem.

4. A group of people are tubing down a river at an average speed of 2 mi/h. Write a direct variation equation that gives the number of miles y that the people will float in x hours. Graph the equation and use the graph to find the distance traveled in 2.5 hours.

5. A plant grows at a constant rate of 2 cm per day. Write a direct variation equation for the height y a plant will grow in x days. Graph the equation and use the graph to find the height of a plant in 7 days.

Error Analysis
6. Two yards to fabric cost $13, and 5 yards of fabric cost $32.50. A student says that the value of k is 19.50. What is the error the student made? What is the correct value of k?

7. Which equation(s) does not represent direct variation?

I. $y = 0.3x$
II. $-y = 2x$
III. $4x - y + 1 = 0$
IV. $6x - y = 0$

8. If y is directly proportional to x and y = 12 when x = 16, what is the value of x when y = 5?

F. $1\frac{1}{3}$ H. $6\frac{2}{3}$

G. $3\frac{3}{4}$ J. $\frac{3}{4}$

Solutions to Linear Functions

1. Is (3, 4) a solution to the equation $-2x + 5y = 26$?

2. If (4, y) is a solution to the equation $3x - 4y = 4$, what is the value of y?

3. Is (-5, 2) a solution to the equation $2x + 6y = 2$?

4. If (x, -3) is a solution to the equation $5x + 10y = -45$, what is the value of y?

5. For one taxi company, the cost y in dollars of a taxi ride is a linear function of the distance x in miles traveled. The initial charge is $2.50, and the charge per mile is $0.35. Find the cost of riding a distance of 10 miles.

6. A chairlift descends from a mountain top to pick up skiers at the bottom. The height in feet of the chairlift is a linear function of the time in minutes since it begins descending as shown in the graph. Find the height of the chairlift 4 minutes after it begins descending.
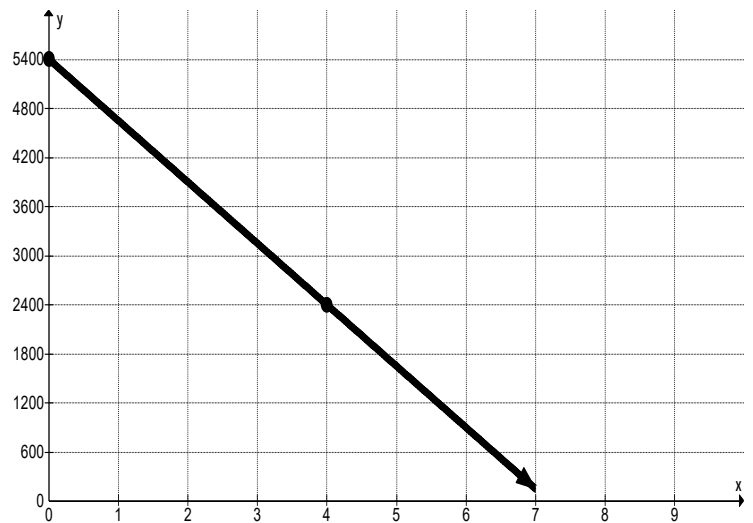
Intercepts

1. Find the x- and y-intercepts of the equation $3x - 2y = 6$.

2. Find the x- and y-intercepts of the equation $-6x - 8y = 24$.

3. Find the x- and y-intercepts of the equation $-3y = 7x - 21$.

4. The Sandia Peak Tramway in Albuquerque, New Mexico, travels a distance of about 4500 meters to the top of Sandia Peak. Its speed is 300 meters per minute. The function $f(x) = 4500 - 300x$ gives the tram's distance in meters from the top of the peak after x minutes. Determine the x and y intercepts and then interpret their meaning.

5. A hot air balloon is 750 meters above the ground and begins to descend at a constant rate of 25 meters per minute. The function $f(x) = 750 - 25x$ represents the height of the hot air balloon after x minutes. Determine the x and y intercepts and then interpret their meaning.

6. A bank employee notices an abandoned checking account with a balance of $360. The bank charges an $8 monthly fee for the account.

   A. Write and graph the equation that gives the balance $f(x)$ in dollars as a function of the number of months, x.

   B. Find and interpret the x- and y-intercepts.

7. Kathryn is walking on a treadmill at a constant pace for 30 minutes. She has programmed the treadmill for a 2-mile walk. The display counts backward to show the distance remaining.

   A. Write and graph the equation that gives the distance $f(x)$ left in miles as a function of the number x of minutes she has been walking.

   B. Find and interpret the x- and y-intercepts.

Slope – Intercept form

Write the equation of each line in slope-intercept form:

1. Slope is 3 and passes through the point (1, 5).

2. Slope is $\frac{1}{4}$ and passes through the point (4, 2).

3. Slope is $-\frac{2}{3}$ and passes through the point (-6, -5).

4. Slope is 3 and passes through the point (1, 5).

5. A figure skating school offers introductory lessons at $25 per session. There is also a registration fee of $30.
    A. Write a linear equation in slope-intercept form that represents the situation.

    B. You want to take at least 6 lessons. Can you pay for those lessons using a $200 gift certificate?

    C. If so, how much money, if any, will be left on the gift certificate? If not explain.

6. John has $2 in his bank account when he gets a job. He begins making $107 dollars a day. A student found that the equation that represents this situation is $y = 2x + 107$, What is wrong with the students equation? Describe and correct the student's error.
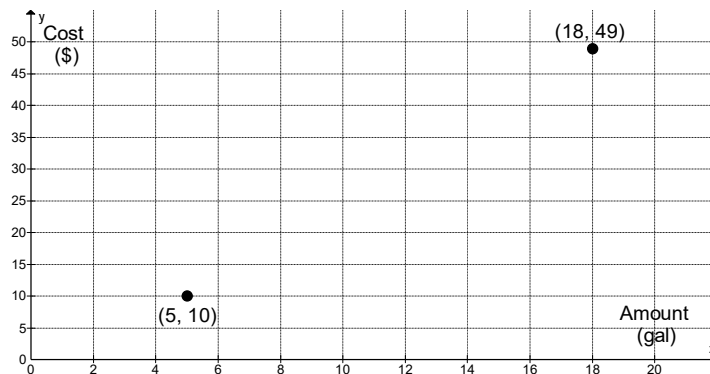
Point – Slope Form

Write the equation of each line in point-slope line.

1. (5, 7) and (3, 1)

2. (-6, 10) and (-3, -2)

3. (6, 6) and (-2, 2)

4. An animal shelter asks all employees to take a training session and then to volunteer for one shift each week. Each shift is the same number of hours. The table shows the numbers of hours Joan and her friend Miguel worked over several weeks.

Volunteer	Weeks Worked	Hours Worked
Joan	6	15
Miguel	10	23

   A. Write an equation in point-slope form.

   B. Another friend, Lili, plans to volunteer for 24 weeks over the next year. How many hours will Lili volunteer?

5. A gas station has a customer loyalty program. The graph shows the amount y dollars that two members paid for x gallons of gas.

   A. Write an equation in point-slope form.

   B. Find the amount a member would pay for 22 gallons of gas.

6. A roller skating rink offers a special rate for birthday parties. On the same day, a party for 10 skaters cost $107 and a party for 15 skaters cost $137.

   A. Write an equation in point-slope form.

   B. How much would a party for 12 skaters cost?

Standard Form

Rewrite each equation in standard form.

1. $y = 6x - 4$

2. $y = \dfrac{4}{3}x - \dfrac{2}{3}$

3. $y - 2 = -(x + 7)$

4. $y - 4 = \dfrac{7}{3}(x - 3)$

Write the equation in standard form.

5. Passing through the points (2, -5) and (-1, 1).

6. Passing through the points (6, 11) and (5, 9).

7. A bathtub that holds 32 gallon of water contains 12 gallons of water. You begin filling it, and after 5 minutes, the tub is full.

8. A barrel of oil was filled at a constant rate of 7.5 gal/min. The barrel has 10 gallons before filling began.

Parallel Lines

1. Write the equation of the line that is parallel to the line $y = 6x$ and passing through the point (8, 5).

2. Write the equation of the line that is parallel to the line $2y = 2x - 5$ and passing through the point (-2, 0).

3. Write the equation of the line that is parallel to the line $-2x + y = 19$ and passing through the point $\left(\dfrac{1}{2}, \dfrac{3}{2}\right)$.

4. Write the equation of the line that is parallel to the line $y = \dfrac{5}{3}$ and passing through the point $\left(\dfrac{3}{2}, 0\right)$.

5. Write the equation of the line that is parallel to the line $x = \dfrac{3}{7}$ and passing through the point $\left(-\dfrac{8}{17}, \dfrac{9}{5}\right)$.

Perpendicular Lines

1. Write the equation of the line that is perpendicular to the line $y + 3 = -2x - 1$ and passing through the point (5, 0).

2. Write the equation of the line that is perpendicular to the line $y = -\dfrac{1}{9}x - \dfrac{1}{3}$ and passing through the point (0, 0).

3. Write the equation of the line that is perpendicular to the line $y = \dfrac{3}{20}x - \dfrac{1}{2}$ and passing through the point $(-15, -3)$.

4. Write the equation of the line that is perpendicular to the line $x = -95$ and passing through the point $(-7.97, 2.35)$.

5. Write the equation of the line that is parallel to the line $y = -\dfrac{5}{8}$ and passing through the point (0, 0).

Transformations

Describe the transformation(s) of the parent function $f(x) = x$ that result in the graph of $g(x)$.

1. $g(x) = -x + 9$

2. $g(x) = 3x$

3. $g(x) = -x - 4$

4. $g(x) = x + 6$

5. $g(x) = -\dfrac{3}{4}x$

Determine what will happen to each parent function when the described changes occur.

6. Once a year the gym offers a special in which the one-time fee for joining is waived for new members. What impact does the special offer have on the group of the original function $C(t) = 25t + 50$?

7. For large parties, a restaurant charges a reservation fee of $25, plus $15 per person. The total charge for a party of x people is $f(x) = 15x + 25$. How will the graph of this function change if the reservation fee is raised to $50 and if the per person charge is lowered to $12?

8. A satellite dish company charges a one-time installation fee of $75 and then a monthly usage charge of $40 as described by the function $C(t) = 40t + 75$. The company reduces its one-time installation fee to $60. What would this change do to the graph of the original function?

MORE Transformations

9. The line represented by the equation $y = \dfrac{3}{2}x + 3$ is graphed below.
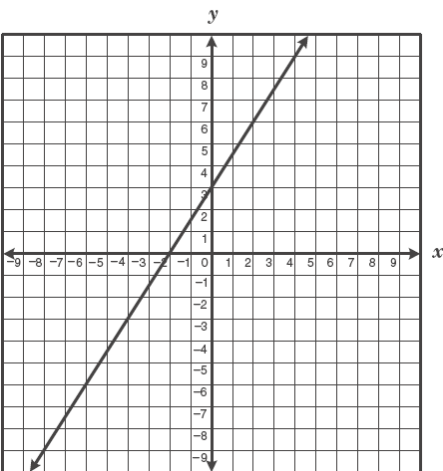
Which of the following best describes the effect on the graph when the slope is doubled?

A   The y-intercept increases.

B   The y-intercept decreases.

C   The x-intercept increases.

D   The x-intercept decreases.

10. Given the function $y = 3.54x - 54.68$, which statement best describes the effect of increasing the y-intercept by 33.14?

A The new line is parallel to the original.

B The new line has a greater rate of change.

C The x-intercept increases.

D The y-intercept decreases.