Chapter 13

Name_____ Date _____

# Chapter 13 — Graphing and Writing Linear Equations

Dear Family,

Selling refreshments is a popular way to raise money at school events. You or your student may have volunteered to work at the refreshment table to help support a favorite activity or team.

Suppose you are working at a bake sale. The food is donated, so any sales are all profit. The cash box starts with $30 for making change. You can figure out how much money should be in the cash box with a linear equation.

Amount in cashbox = Initial amount + (Cookie price) × (Cookies sold)

$$y = 30 + 0.5x$$

In a graph of the equation, the line slopes upward because the amount of money in the cash box is increasing. The slope is positive and equal to the unit price: $0.50 per cookie or 0.5.
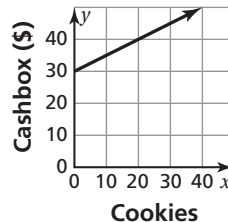
Suppose you give your student $5 to spend on snacks with a group of friends. The amount of money remaining depends on how many items they have already purchased.

Amount remaining = Initial amount − (Cookie price) × (Cookies bought)

$$y = 5 - 0.5x$$

In a graph of the equation, the line slopes downward because the money left to spend is decreasing. The slope is negative and equal to the cost of one cookie: -0.5. The intercepts $(0, 5)$ and $(10, 0)$ correspond to the starting point (no cookies and $5) and the possible ending point (10 cookies and no money remaining).
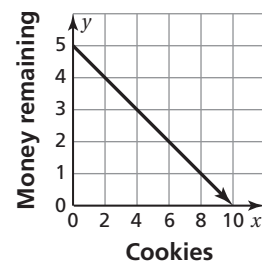
Enjoy your bake sale or snack bar work!

# Capítulo 13 Graficando y Escribiendo Ecuaciones Lineales

Estimada Familia:

Vender refrescos es una forma popular de obtener dinero en eventos escolares. Usted o su estudiante pueden haberse presentado como voluntarios para trabajar en la mesa de refrescos y ayudar a apoyar un equipo o actividad favorita.

Supongamos que están trabajando en una venta de pasteles. La comida es donada, así que cualquier venta que hagan se considera como ganancia completa. La caja con efectivo empieza con $30 para dar vuelto. Se puede averiguar cuánto dinero debe haber en la caja con una ecuación lineal.

$$\text{Cantidad en caja con efectivo} = \text{Cantidad inicial} + (\text{Precio de la galleta})$$
$$\times (\text{Galletas vendidas})$$

$$y = 30 + 0.5x$$

En un gráfico de la ecuación, la línea va hacia arriba porque la cantidad de dinero en la caja está aumentando. La pendiente es positiva e igual al precio unitario: $0.50 por galleta ó 0.5.
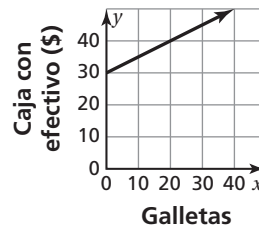
Supongamos que le entrega a su estudiante $5 para gastar en refrigerios con un grupo de amigos. La cantidad de dinero restante depende del número de objetos que ya han comprado.

$$\text{Cantidad restante} = \text{Cantidad inicial} - (\text{Precio de la galleta}) \times (\text{Galletas compradas})$$
$$y = 5 - 0.5x$$

En un gráfico de la ecuación, la línea va hacia abajo porque el dinero que queda para gastar está disminuyendo. La pendiente es negativa e igual al costo de una galleta: -0.5. Las intersecciones $(0, 5)$ y $(10, 0)$ corresponden al punto de inicio (sin galletas y $5) y el posible punto final (10 galletas y nada de dinero restante).
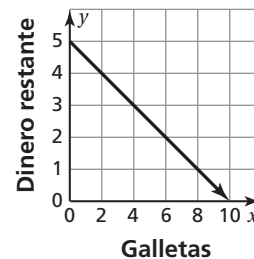
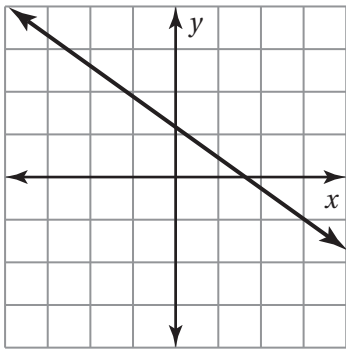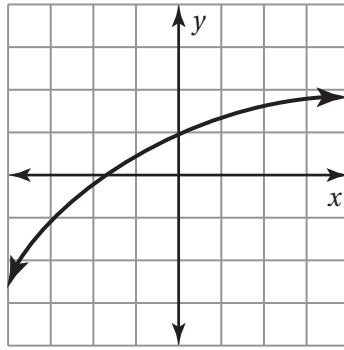¡Disfruten su trabajo con la venta de pasteles o trabajo en la cafetería!

Start Thinking!

For use before Activity 13.1

Which of the following graphs do you think show *linear* equations? Explain.

A.

B.

C.
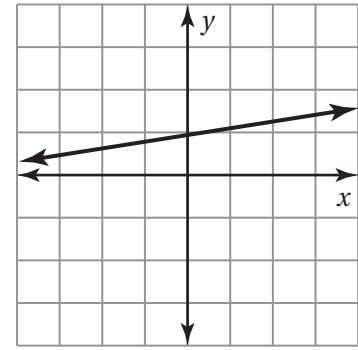
Warm Up

For use before Activity 13.1

Copy and complete the table using the given equation.

1. $y = 2x - 3$

x	−1	0	1	2
y				

2. $y = -x + 1$

x	−1	0	1	2
y				

3. $y = x + 5$

x	−1	0	1	2
y				

4. $y = \dfrac{1}{2}x + 2$

x	−1	0	1	2
y				

Think about how much energy you have on an average day.

Graph your energy level (on a scale of 0 to 10) throughout an average day.

Are any sections of your graph linear?

Copy and complete the table. Plot the two solution points and draw a line *exactly* through the two points. Find a different solution point on the line.

1.

x		
$y = 4x - 2$		

2.

x		
$y = -x + 5$		

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13.1 Practice A

Copy and complete the table. Plot the two solution points and draw a line *exactly* through the two points. Find a different solution point on the line.

1.

x		
$y = 4x + 3$		

2.

x		
$y = \dfrac{3}{2}x - 1$		

Graph the linear equation. Use a graphing calculator to check your graph.

3. $y = -2x$

4. $y = \dfrac{2}{5}x$

5. $y = -4$

6. $y = x + 2$

7. $y = -5x + 3$

8. $y = \dfrac{x}{2} + 1$

9. The equation $y = \dfrac{2}{3}x$ represents the cost y (in dollars) for x pounds of bananas.

   a. Graph the equation.

   b. Use the graph to estimate the cost of 8 pounds of bananas.

   c. Use the equation to find the exact cost of 8 pounds of bananas.

Solve for *y*. Then graph the equation. Use a graphing calculator to check your graph.

10. $y - 2x = 5$

11. $6x + 5y = 15$

12. You have $110 in your lunch account and plan to spend $2.75 each school day.

   a. Write and graph a linear equation that represents the balance in your lunch account.

   b. How many school days will it take to spend all of the money in your lunch account?

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Graph the linear equation. Use a graphing calculator to check your graph, if possible.

1. $y = 3.5$

2. $y = \dfrac{4}{5}x$

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

4. $y = -\dfrac{1}{10}x + 4$

5. $y = \dfrac{10}{3}x$

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

7. The equation $y = 1.5x + 35$ represents the cost y (in dollars) of the family meal when the food costs \$35 and x beverages are purchased.

 a. Graph the equation.

 b. Use the graph to estimate the cost of the family meal when 5 beverages are purchased.

 c. Use the equation to find the exact cost of the family meal when 5 beverages are purchased.

Solve for _y_. Then graph the equation. Use a graphing calculator to check your graph.

8. $2y + 3x = -6$

9. $x + 0.25y = 1.5$

10. There are 10 coconuts at the base of your tree. The coconuts are falling off the tree at a rate of 6 coconuts per week. Assume that you do not pick up any coconuts.

 a. Write and graph a linear equation that represents the number of coconuts at the base of your tree after x weeks.

 b. The tree will have no coconuts on it when there are 52 coconuts at the base of the tree. After how many weeks will this occur?

11. The sum s of the first n positive integers is $s = \dfrac{1}{2}n(n + 1)$. Plot four points $(n,\ s)$ that satisfy the equation. Is the graph of the equation a line?

13.1 Enrichment and Extension

Graphing Equations

You have studied the properties of linear equations. Now you will learn about two additional types of equations, the quadratic equation and the absolute value equation.

Copy and complete the table. Then plot the points and draw a graph of the equation.

1. $y = -2x + 3$

x	y
−2	7
−1	
0	
1	
2	

2. $y = 3x^2 - 1$

x	y
−2	11
−1	
0	
1	
2	

3. $y = -|x| + 2$

x	y
−2	0
−1	
0	
1	
2	

4. Linear equations have the form $y = mx + b$. Which of the given equations is linear?

5. An equation of the form $y = ax^2 + b$ is called a quadratic equation. Which of the given equations is quadratic? Describe the graph of the quadratic equation.

6. An equation of the form $y = a|x| + b$ is called an absolute value equation. Which of the given equations is an absolute value equation? Describe the graph of the absolute value equation.

7. Compare and contrast the three different types of graphs.

8. How would each graph change if a different b value was selected?

13.1 Puzzle Time

What Arctic Bird Can Be Found In A Bakery?

Write the letter of each answer in the box containing the exercise number.

Find the values of *y* that correspond to the given values of *x* for the linear equation.

1. $y = 4x + 3$ for $x = -1, 0, 1$

2. $y = -\dfrac{3}{2}x + 5$ for $x = 0, 2, 4$

3. $y = -9$ for $x = 0, 1, 2$

4. $y = -7x + 8$ for $x = -1, 0, 1$

5. $y = \dfrac{5}{3}x - 6$ for $x = -3, 0, 3$

6. $y = 1.4x - 9$ for $x = 0, 1, 2$

Solve for *y*. Then find the values of *y* that correspond to the given values of *x* for the linear equation.

7. $y + 8x = -2$ for $x = 0, 1, 2$

8. $12x + 3y = 15$ for $x = -1, 0, 1$

9. $\dfrac{1}{4}y - 3x = 9$ for $x = -2, 0, 2$

10. $0.4y + 2x = 1.2$ for $x = -3, 0, 3$

Answers
E. $y = -9, -7.6, -6.2$
F. $y = 12, 36, 60$
P. $y = 18, 3, -12$
I. $y = -2, -10, -18$
A. $y = 15, 8, 1$
F. $y = 6, 5, 4$
M. $y = 10, 9.5, 9$
U. $y = -11, -6, -1$
C. $y = 9, 5, 1$
N. $y = 5, 2, -1$
R. $y = -9, -9, -9$
A. $y = -1, 3, 7$

11. The equation $22 = 2y + x$ represents the perimeter of a flower garden with length *y* (in feet) and width *x* (in feet). Solve for *y*. Then find the length of the flower garden when the width is 2 feet, 3 feet, and 4 feet.

12. The equation $0.60 = 0.05x + 0.10y$ represents the number of nickels *x* and dimes *y* needed to add up to 60 cents. Solve for *y*. Then find the number of dimes that are needed to make 60 cents when the number of nickels is 0, 2, and 4.

1		8	3	6	4	11		10	5	9	12	7	2

Activity 13.2

Start Thinking!

For use before Activity 13.2

Use the definition of ski slope to help you think of what the slope of a line is in mathematics.

Activity 13.2

Warm Up

For use before Activity 13.2

Write the fraction in simplest form.

1. $\dfrac{6}{2}$

2. $\dfrac{8}{28}$

3. $\dfrac{10}{25}$

4. $\dfrac{10}{8}$

5. $\dfrac{6}{9}$

6. $\dfrac{16}{12}$

Start Thinking!
For use before Lesson 13.2

Choose a partner. Each student must choose an ordered pair and work together to find the slope of the line joining your two points. Use a graph to help you. Repeat the process several times with different ordered pairs.

Were any of the slopes positive? negative? zero?

Warm Up
For use before Lesson 13.2

Draw a line through each point using the given slope. What do you notice about the two lines?
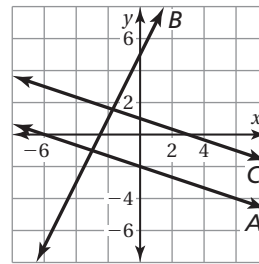
1. Slope $= 2$

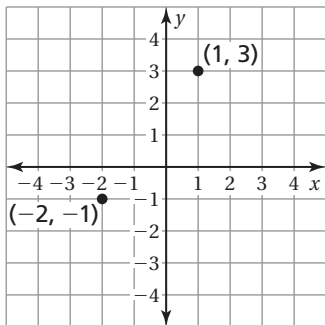**2.** Slope $= -2$

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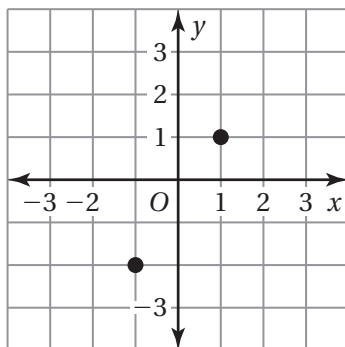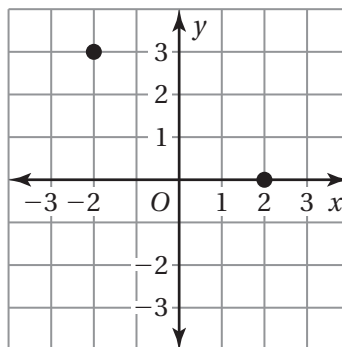
13.2 Practice A

1. Refer to the graph.

   a. Which lines have negative slopes?

   b. Which line has the steepest slope?
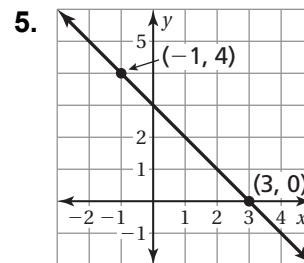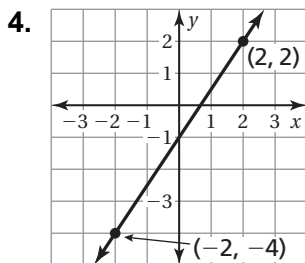
   c. Are any two of the lines parallel? Explain.

Draw a line through each point using the given slope. What do you notice about the two lines?

2. Slope $= -2$

3. Slope $= \dfrac{1}{2}$

Find the slope of the line.

4.

5.
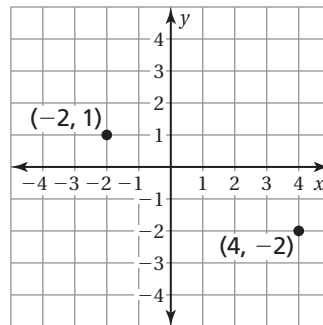
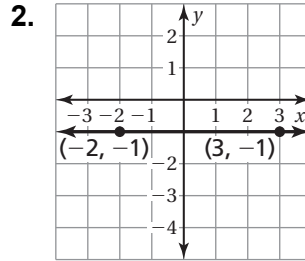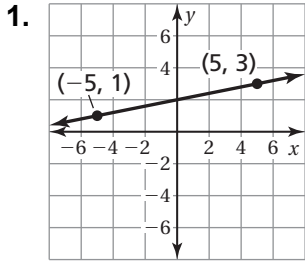**Find the slope of the line through the given points.**

6. $(-1, -4), (1, 4)$

7. $(1, 2), (-3, 2)$

8. An awning covers a window that is 4 feet high. When the awning is opened, it extends 2 feet from the base of the window. Find the slope of the awning.

Name _____ Date _____

13.2 Practice B

Find the slope of the line.

1.

2.

Find the slope of the line through the given points.

3. $(1, -6), (-1, 6)$

4. $(-3, -6), (6, 6)$

The points in the table lie on a line. Find the slope of the line.

5.

x	0	2	4	6
y	−4	−1	2	5

**6.**

x	−4	−1	0	3
y	7	4	3	0

7. A ramp used to remove furniture from a moving truck has a slope of $\dfrac{2}{5}$.

The height of the ramp is 4 feet. How far does the base of the ramp extend from the end of the truck?

8. The graph shows the cost of a long distance phone call.

   a. Find the slope of the line.

   b. Explain the meaning of the slope as a rate of change.

   c. How much money is added to the phone bill if you talk for 5 extra minutes?

   d. How many minutes did you talk if the phone call costs $3?

Cost of a Long Distance Phone Call

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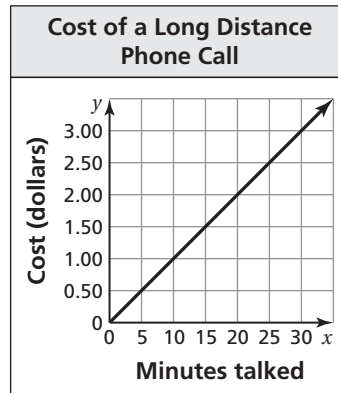
13.2 Enrichment and Extension

Slope of a Line

1. Draw an octagon in a coordinate plane with the vertices $(5, 2)$, $(2, 5)$, $(-2, 5)$, $(-5, 2)$, $(-5, -2)$, $(-2, -5)$, $(2, -5)$, and $(5, -2)$.

2. Without doing any calculations, do you think any of the line segments have the same slope? If so, which ones? Explain.

3. Calculate the slope of each side of the octagon. Were your predictions in Exercise 2 correct?

4. Two different lines are *parallel* if they do not intersect and have the same slope. Are any line segments in the graph parallel? Explain.

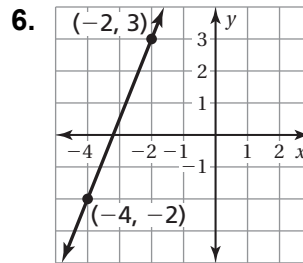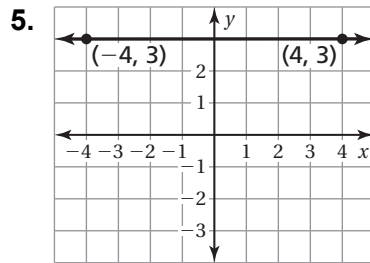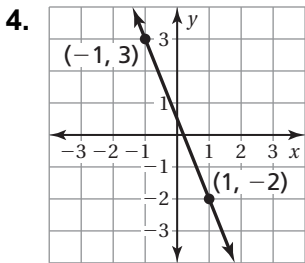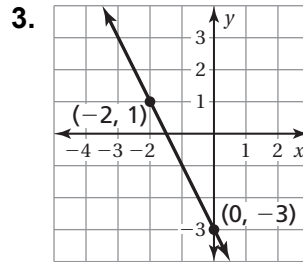**In Exercises 5–7, use the graph of the star.**
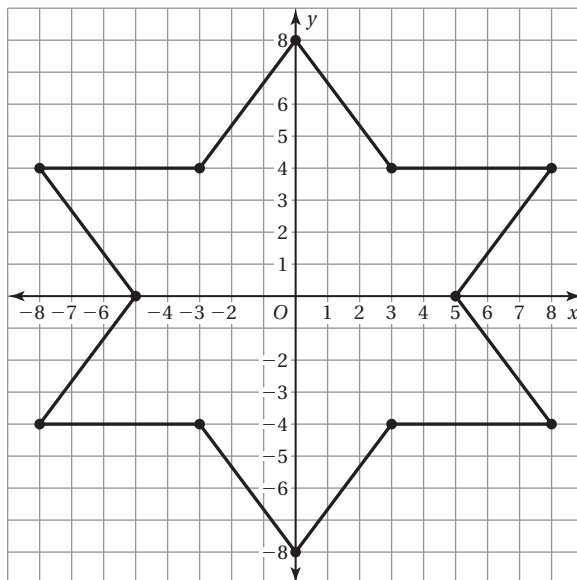
5. Without doing any calculations, do you think any of the line segments have the same slope? If so, which ones?

6. Calculate the slope of each line segment in the graph. Were your predictions in Exercise 5 correct?

7. Two lines in the same plane that intersect to form right angles are *perpendicular*. Two nonvertical lines are perpendicular if and only if the product of their slopes is −1. Are any line segments in the star perpendicular? Explain.

13.2 Puzzle Time

What Did One Poppy Seed Say To The Other?

Circle the letter of each correct answer in the boxes below. The circled letters will spell out the answer to the riddle.

Find the slope of the line through the given points.

1.

2.

3.

4.

5.

6.
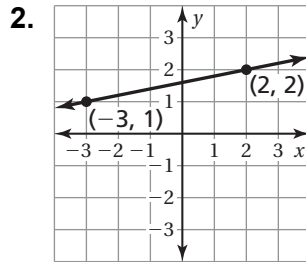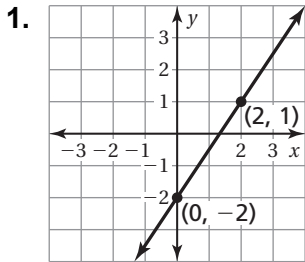
7. $(1, 4), (3, -2)$

8. $(1, 2), (1, -2)$

9.

x	−5	−3	3	5
y	15	7	−17	−25

I	T	M	S	A	O	N	H	A	P	L	R	O	M	E	L	S	L
-2	$\dfrac{2}{5}$	0	$\dfrac{1}{6}$	$\dfrac{4}{3}$	$\dfrac{1}{5}$	-3	$\dfrac{1}{4}$	$\dfrac{3}{2}$	$\dfrac{1}{50}$	1	-4	$\dfrac{5}{2}$	$-\dfrac{1}{3}$	2	$-\dfrac{5}{2}$	5	und.

Start Thinking!

For use before Extension 13.2

Graph the linear equations $y = 3x + 2$ and $y = 3x - 4$ in a coordinate plane. What do you notice?

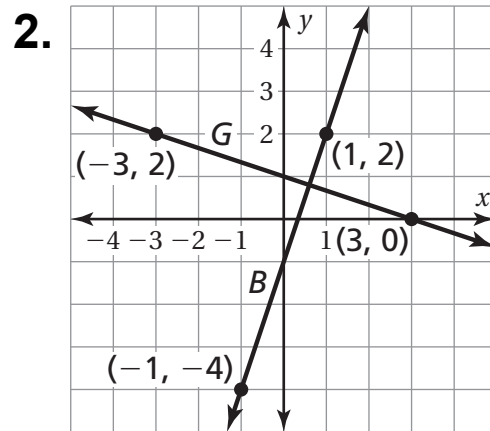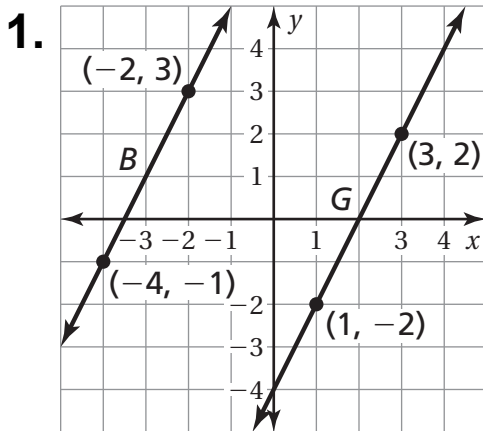Graph the linear equations $y = -\dfrac{1}{2}x + 1$ and $y = 2x - 2$ in a coordinate plane. What do you notice?
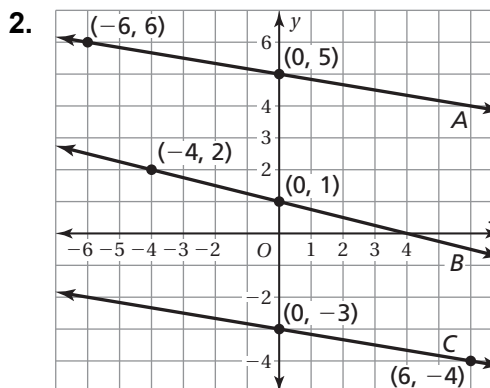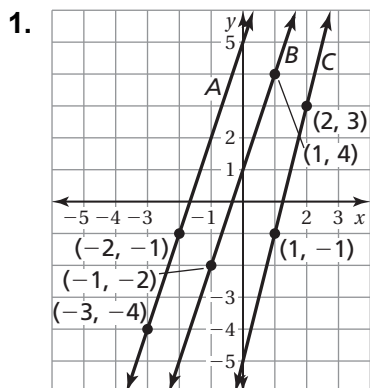
Extension
13.2

Warm Up

For use before Extension 13.2

Find the slope of each line.

1.

2.

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Which lines are parallel? How do you know?

1.

2.

Are the given lines parallel? Explain your reasoning.

3. $x = -1, y = 2$ **4.** $x = 0, x = -3$ **5.** $y = 1, y = 5$

6. The vertices of a quadrilateral are $A(-4, -2)$, $B(-2, 1)$, $C(3, 2)$, and $D(1, -1)$. Is it a parallelogram? Justify your answer.

Which lines are perpendicular? How do you know?

7.

8.
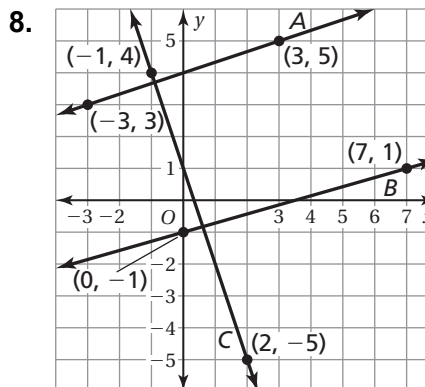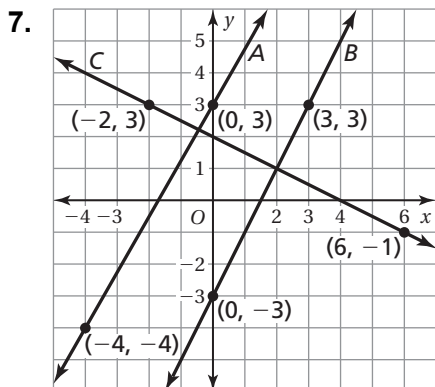
Are the given lines perpendicular? Explain your reasoning.

9. $x = 1, y = 0$ **10.** $y = -3, y = 2$ **11.** $x = -2, y = 2$

12. The vertices of a parallelogram are $J(2, 5)$, $K(5.5, 5)$, $L(0.5, -5)$, and $M(-3, -5)$. Is it a rectangle? Justify your answer.

Start Thinking!

For use before Activity 13.3

Review with a partner how to graph the equation
$y = 2x + 2$ using -1, 0, and 1 for the values of x.

Activity
13.3

Warm Up

For use before Activity 13.3

Find the value of *x*.

1. $\dfrac{1}{2} = \dfrac{6}{x}$

2. $\dfrac{3}{4} = \dfrac{x}{24}$

3. $\dfrac{2}{x} = \dfrac{6}{18}$

4. $\dfrac{8}{12} = \dfrac{x}{3}$

5. $\dfrac{x}{21} = \dfrac{3}{9}$

6. $\dfrac{4}{x} = \dfrac{8}{20}$

Start Thinking!

Graph a line that passes through the origin. Next, graph a line that does not pass through the origin.

Which graph will have an equation in the form of $y = mx$?

Warm Up

Tell whether *x* and *y* are in a proportional relationship. Explain your reasoning. If so, write an equation that represents the relationship.

1.

2.
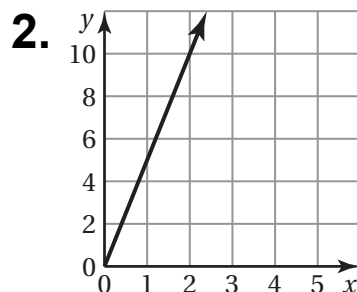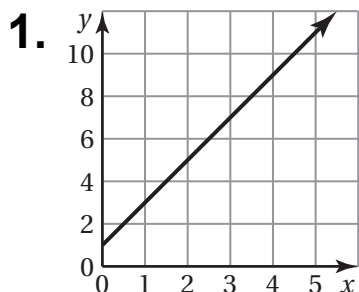
3.

x	4	8	12	16
y	2	4	6	8

4.

x	1	3	6	8
y	3	6	8	11

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13.3 Practice A

Tell whether *x* and *y* are in a proportional relationship. Explain your reasoning. If so, write an equation that represents the relationship.

1.

2.
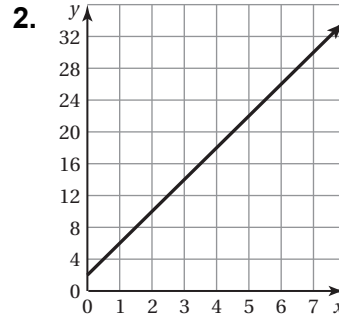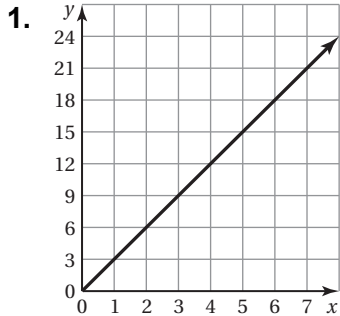
3.

x	5	10	15	20
y	1	3	5	7

4.

x	4	8	12	16
y	1	2	3	4

5. The distance your friend travels y (in miles) running x hours is represented by the equation $y = 7.5x$.

   a. Graph the equation and interpret the slope.

   b. How many minutes does it take for your friend to run one mile?

6. At a concession stand, hamburgers are selling at a rate of 160 hamburgers per hour. The table shows the rate at which wraps are selling.

Minutes	1	2	3	4
Wraps Sold	2.5	5	7.5	10

   a. Do hamburgers or wraps sell faster? Explain.

   b. Graph equations that represent the growth rates of hamburgers sold and wraps sold in the same coordinate plane. Compare the steepness of the graphs. What does this mean in the context of the problem?

Name _____ Date _____

13.3 Practice B

Tell whether *x* and *y* are in a proportional relationship. Explain your reasoning. If so, write an equation that represents the relationship.

1.
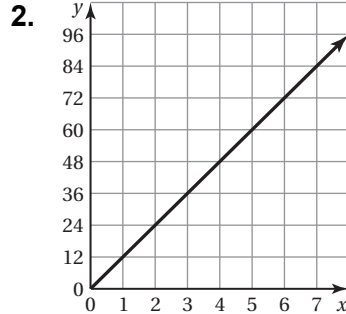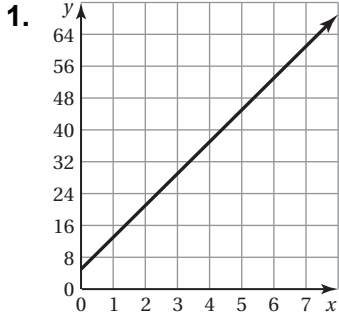

2.

3.

x	2	5	8	11
y	8	20	32	44

4.

x	3	6	9	12
y	2	4	6	8

5. The cost *y* (in dollars) to rent a lane at the bowling alley is proportional to the number *x* of hours that you rent the lane. It costs $18 to rent the lane for 2 hours.

   a. Write an equation that represents the situation.

   b. Interpret the slope.

   c. How much does it cost to rent the lane for 3 hours?

6. The graph relates the height of the water in a tank *y* (in inches) to the volume of the water *x* (in gallons).

   a. Is the relationship proportional? Explain.

   b. Write an equation of the line. Interpret the slope.

   c. What is the height of the water in the tank when the volume is 250 gallons?
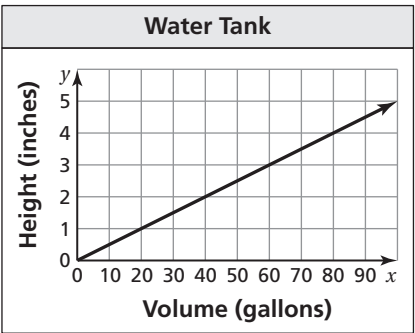
13.3 Enrichment and Extension

Inverse Variation

Two quantities x and y show *inverse variation* when $y = \dfrac{k}{x}$, where k is a nonzero constant.

1. Consider the inverse variation equation $y = \dfrac{1}{x}$.

    a. As x increases, does y increase or decrease?

    b. As x decreases, does y increase or decrease?

    c. What do you know about the product of x and y for any point (x, y) on the graph of the equation?

2. Is the graph of an inverse variation equation a line? Explain your reasoning.

Tell whether *x* and *y* show *direct variation*, *inverse variation*, or *neither*.

3. $y = \dfrac{x}{4}$ **4.** $y = \dfrac{10}{x}$ **5.** $y = 3x - 2$

6. $x = \dfrac{1}{y} + 5$ **7.** $y = 1.5x$ **8.** $8 - xy$

Tell whether the two quantities show *direct variation* or *inverse variation*. Write an equation that relates the variables.

9. You bring 200 cookies to a party. Let n represent the number of people at the party and c represent the number of cookies each person receives.

10. You work at a restaurant for 20 hours. Let r represent your hourly pay rate and p represent the total amount you earn.

13.3 Puzzle Time

What Do Ants Use For Hula Hoops?

Write the letter of each answer in the box containing the exercise number.

The cost _y_ (in dollars) to spend an evening bowling is proportional to the number of games _x_ that are bowled. It costs $16 to bowl 4 games.

1. Write an equation that represents the situation.

2. How much does it cost (in dollars) to bowl 6 games?

The gasoline _y_ (in fluid ounces) is proportional to the number of fluid ounces of oil _x_ used to run a 2-cycle motor. It takes 75 fluid ounces of gasoline for 3 fluid ounces of oil.

3. Write an equation that represents the situation.

4. How much gasoline (in fluid ounces) is needed for 8 fluid ounces of oil?

The number of pancakes _y_ is proportional to the cups of pancake mix _x_ that is used to make the pancake batter. The pancake batter will make 10 pancakes when 2 cups of pancake mix is used.

5. Write an equation that represents the situation.

6. How many pancakes are made when 5 cups of pancake mix are used in the pancake batter?

The toll charge _y_ (in dollars) is proportional to the number of miles _x_ traveled on the interstate. It cost $9 to travel 60 miles.

7. Write an equation that represents the situation.

8. How much does the toll charge cost (in dollars) when you travel 100 miles?

Answers
H. $y = 5x$
S. $y = 25x$
I. $y = 4x$
E. $y = 0.15x$
O. 25
C. 15
R. 200
E. 24

8	5	2	7	4	1	6	3

Start Thinking!
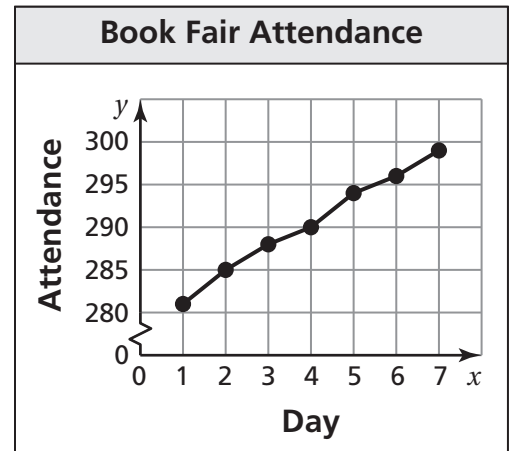**For use before Activity 13.4**

The graph shows the attendance of a book fair over the last 7 days.

Explain what some points on the graph mean.

Is the graph linear?

What is the approximate slope? What does it represent?

Book Fair Attendance

Warm Up
For use before Activity 13.4

Graph the linear equation using the input-output table.

1. $y = x - 1$

x	0	1	2	3
y				

2. $y = \dfrac{1}{2}x + 2$

x	–2	0	2	4
y				

Start Thinking!

For use before Lesson 13.4

Describe a situation involving online shopping that can be modeled with a linear equation.

What is the slope?

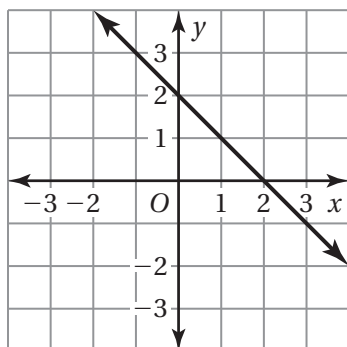What is the *y*-intercept?

Warm Up

For use before Lesson 13.4

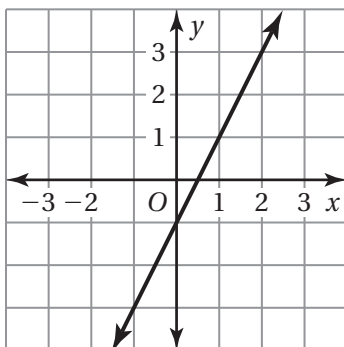**Match the equation with its graph. Identify the slope and *y*-intercept.**
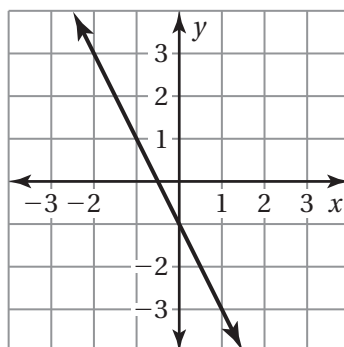
1. $y = 2x - 1$

2. $y = -x + 2$

3. $y = -2x - 1$

A.

B.

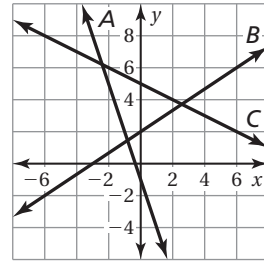
C.

Name_____ Date _____

13.4 Practice A

Match the equation with its graph. Identify the slope and *y*-intercept.

1. $y = -\dfrac{1}{2}x + 5$

2. $y = -3x - 1$

3. $y = \dfrac{2}{3}x + 2$

Find the slope and the *y*-intercept of the graph of the linear equation.

4. $y = x + 4$

5. $y = -8x + 3$

6. $y = -\dfrac{5}{7}x - 2$

7. $y = 1.75x - 1$

8. $y - 2 = 6x$

9. $y + 7 = \dfrac{1}{9}x$

10. The depreciated value y (in dollars) of a business car after x years is $y = -4200x + 21{,}000$.

   a. Graph the equation.

   b. Interpret the slope.

   c. Interpret the *y*-intercept.

   d. Interpret the *x*-intercept.

Graph the linear equation. Identify the *x*-intercept. Use a graphing calculator to check your answer.

11. $y = 3x - 6$

12. $y = -\dfrac{1}{4}x + 12$

13. $y = 3.2x + 9.6$

14. $y - 2 = 5x$

15. The amount of fertilizer y (in cups) that is needed for x square feet of grass is $y = \dfrac{1}{4}x$.

   a. Graph the equation.

   b. Interpret the slope.

Big Ideas Math Red Accelerated **99**
Resources by Chapter

Name _____ Date _____

Find the slope and the *y*-intercept of the graph of the linear equation.

1. $y = -\dfrac{3}{8}x + 10$

2. $y = 4.5x + 7$

3. $y = -\dfrac{4}{5}x - \dfrac{1}{5}$

4. $y + 2.5 = 5.5x$

5. $y - \dfrac{2}{7} = 4x$

6. $y + 5 = \dfrac{2}{3}x$

Graph the linear equation. Identify the *x*-intercept. Use a graphing calculator to check your answer.

7. $y = \dfrac{5}{3}x - 2$

**8.** $y = -1.2x + 9$

9. $y - 6.6 = 1.1x$

10. $y + 3 = -\dfrac{6}{7}x$

11. There is a $10 monthly membership fee to download music. There is a $0.50 fee for each song downloaded.

    a. Write a linear equation that models the cost of downloading *x* songs per month.

    b. Graph the equation.

    c. What is the cost of downloading 15 songs?

12. An entrepreneur is opening a business to market pies and pie fillings based on her family's recipes. The price of every item in the store is $6.

    a. Write a linear equation that models the amount of revenue *y* (in dollars) taken in for selling *x* items.

    b. Graph the equation.

    c. The monthly cost of rent and utilities for the store space is $1100. What is the minimum number of items that must be sold each month in order to make a profit?

    d. Assuming 4 weeks in a month, what is the average number of items that need to be sold each week in order to turn a profit?

Name_____ Date _____

13.4 Enrichment and Extension

Matching Slopes and Intercepts

Each of the equations below is missing a *b*-value. Use each value in the B-hive only once to complete the seven linear equations below. The graph of each linear equation should pass through two of the given points on the graph. No two equations pass through the same given point.
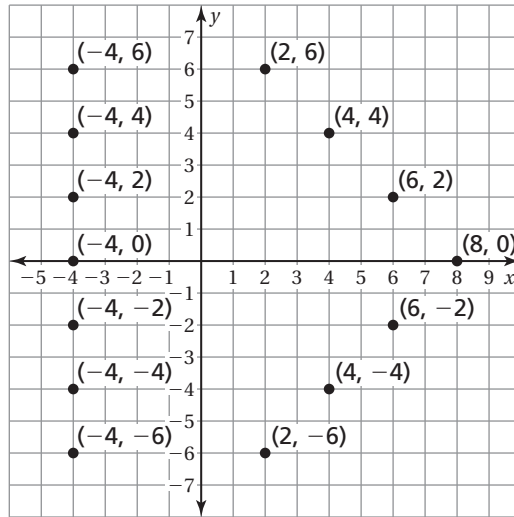
1. $y = -\dfrac{5}{4}x + \boxed{}$

2. $y = x + \boxed{}$

3. $y = \dfrac{3}{5}x + \boxed{}$

4. $y = \dfrac{1}{2}x + \boxed{}$

5. $y = \dfrac{1}{4}x + \boxed{}$

6. $y = \boxed{}$

7. $y = -\dfrac{5}{3}x + \boxed{}$

B-Hive

$-1\dfrac{3}{5}$ -4

4 3 -2

1 $-2\dfrac{2}{3}$
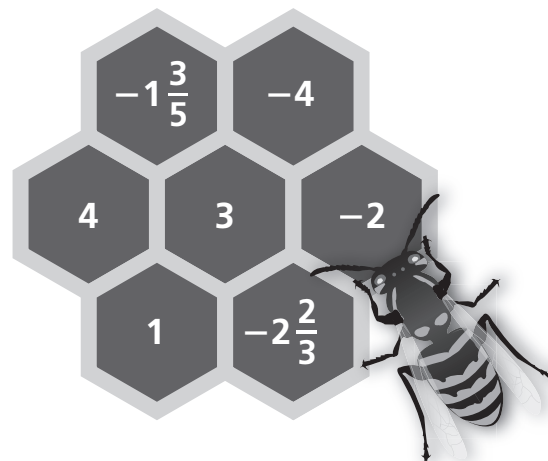
Name _____ Date _____

Did You Hear About...

A	B	C	D	E	F
G	H	I	J	K	L
M	N	O	P		

Complete each exercise. Find the answer in the answer column. Write the word under the answer in the box containing the exercise letter.

$\frac{3}{2}$ **MANY**
$-\frac{1}{2}$ **WHO**
-12 **THAT**
-7 **SO**
0.25 **SEASON**
-5 **GAVE**
-2 **FOR**
16 **TICKETS**
$\frac{2}{3}$ **THE**
-8 **DRIVING**

Find the slope of the graph of the linear equation.

A. $3y = 2x + 3$ **B.** $y = -x - 2$

C. $4y = -2x + 12$ **D.** $5y - 10 = x$

Find the y-intercept of the graph of the linear equation.

E. $y = 4x - 4$ **F.** $2y = x - 4$

G. $y - 12 = -9x$ **H.** $7 + y = 4.3x$

Find the x-intercept of the graph of the linear equation.

I. $y = 6x - 9$ **J.** $3y = 2x + 36$

K. $2y = -5x + 7$ **L.** $3y - 9 = 4x$

M. $y = 1.6x + 8$ **N.** $y + 15 = 12.5x$

O. Shannon's hair is 12 inches long and grows 0.25 inch per month. In an equation that represents the length y of her hair after x months, what number represents the slope?

P. You have a $20 gift card to a coffee shop. Each time you go there, you get chai tea for $1.25. The equation $y = -1.25x + 20$ represents how much you have left on the gift card after x visits. How many chai teas can you purchase before the balance on your card runs out?

-4 **STOPPED**
5 **HAD**
$-\frac{9}{4}$ **POLICE**
-1 **LADY**
22 **CAR**
$\frac{7}{5}$ **THE**
-18 **TIMES**
$\frac{1}{5}$ **GOT**
1.2 **HER**
12 **SPEEDING**

Start Thinking!

For use before Activity 13.5

Consider the equation $y = -\dfrac{2}{5}x + 2$.

Which of the following is an equivalent equation?

$5x + 2y = 10$ or $2x + 5y = 10$

How do you know?

Warm Up

For use before Activity 13.5

Solve the equation for *y*.

1. $x + y = 4$

2. $2x + y = 10$

3. $3x + 4y = 12$

4. $-5x + 10y = 8$

5. $-4x + 2y = 10$

6. $-x + 2y = 4$

You have $40 to spend on turkey and cheese for a party. At the deli, turkey is $10 per pound and cheese is $6 per pound.

Is it easier to write an equation to represent the situation in *slope-intercept form* or *standard form*? Why?

Define two variables for the verbal model. Write an equation in slope-intercept form that relates the variables. Graph the equation.

1.

$$\frac{25 \text{ miles}}{\text{hour}} \cdot \text{Non-highway hours} + \frac{60 \text{ miles}}{\text{hour}}$$

$$\cdot \text{Highway hours} = 240 \text{ miles}$$

2.

$$\frac{\$5.00}{\text{hat}} \cdot \text{Number of hats} + \frac{\$10.00}{\text{T-shirt}}$$

$$\cdot \text{Number of T-shirts} = \$30$$

Name_____ Date_____

13.5 Practice A

Write the linear equation in slope-intercept form.
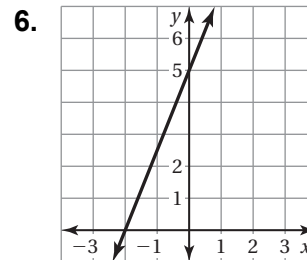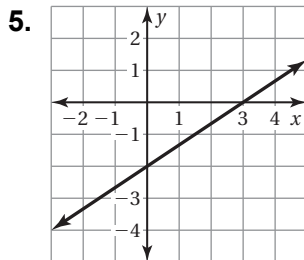
1. $4x + y = 10$

2. $3x - y = 7$

Graph the linear equation. Use a graphing calculator to check your graph.

3. $2x - 3y = 6$

4. $5x - 3y = 15$

Use the graph to find the x- and y-intercepts.

5.

6.

Graph the linear equation using intercepts. Use a graphing calculator to check your graph.

7. $4x + y = 8$

8. $3x - 2y = 12$

9. The total amount of fiber (in grams) in a package containing x apples and y oranges is given by the equation $5x + 10y = 110$.

  a. Find and interpret the y-intercept.

  b. Find and interpret the x-intercept.

  c. How many grams of fiber does an orange contain?

  d. How many grams of fiber does an apple contain?

  e. Is it possible for the package to contain 15 apples? Explain.

10. You have two jobs. You earn $8 for each hour x that you work as a restaurant host and $6 for each hour y that you work as a hair washer. Your earnings for the pay period are $144.

  a. Write an equation in standard form that models your earnings.

  b. Find the x- and y-intercepts.

  c. Graph the equation.

  d. You worked 10 hours as a hair washer. How many hours did you work as a host?

13.5 Practice B

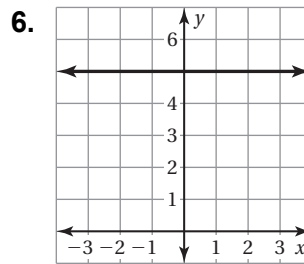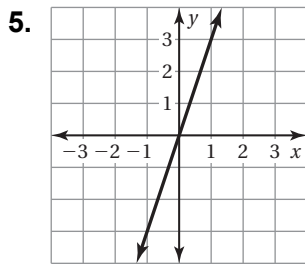**Write the linear equation in slope-intercept form.**

1. $\frac{2}{3}x + y = 4$

2. $4x - 2y = 10$

Graph the linear equation. Use a graphing calculator to check your graph.

3. $4.5x - 0.5y = 3$

4. $\frac{2}{3}x + \frac{1}{3}y = 2$

Use the graph to find the *x*- and *y*-intercepts.

5.

6.

Graph the linear equation using intercepts. Use a graphing calculator to check your graph.

7. $\frac{1}{5}x + \frac{1}{10}y = \frac{2}{5}$

8. $2.5x - 1.25y = 5$

9. Your family is on a ski vacation. Lift tickets for the family cost $80 per day. Snowboard rentals cost $40 per day. You purchase lift tickets for *x* days and snowboard rentals for *y* days and spend $480.

    a. Write an equation in standard form that represents the situation.

    b. Find the *x*- and *y*-intercepts.

    c. Graph the equation.

    d. You rent snowboards for 2 days. How many days did you purchase lift tickets?

10. An electrician charges $80 plus $32 per hour.

    a. Write an equation that represents the total fee *y* (in dollars) charged by the electrician for a job lasting *x* hours.

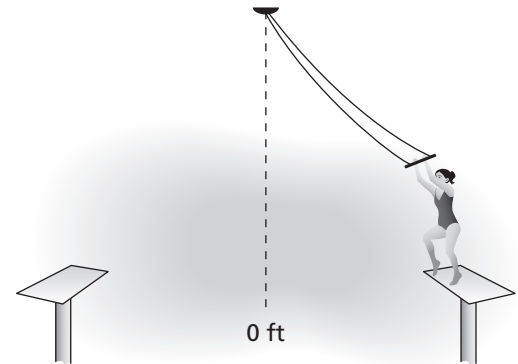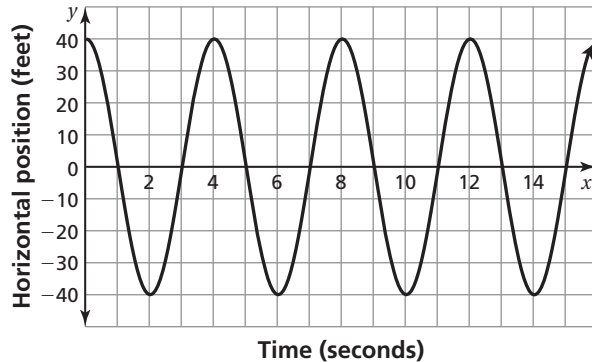   **b.** Find the *x*- and *y*-intercepts.

    c. Graph the equation.

    d. Is the value of the *x*-intercept applicable to the electrician? Explain.

13.5 Enrichment and Extension

Interpreting Intercepts

The graph shows the horizontal position *y* (in feet)
of a trapeze artist after *x* seconds during an act.

1. Does the graph represent a linear equation? Explain.

2. What is the *y*-intercept of the graph?

3. Interpret the *y*-intercept.

4. How many *x*-intercepts does the graph have?

5. Why does the graph have more than one *x*-intercept?

6. How many seconds does the trapeze act last?

7. How many feet apart are the platforms?

8. Do you think the graph is a realistic representation of the situation? Why or why not?

9. Would it be a good idea to include Quadrants II and III in a realistic graph of the situation? Why or why not?

13.5 Puzzle Time

How Do Kangaroos Travel Across The Ocean?

Write the letter of each answer in the box containing the exercise number.

Write the linear equation in slope-intercept form.

1. $3x + y = 8$

2. $9x - y = \dfrac{1}{3}$

3. $-\dfrac{1}{4}x + y = 3$

4. $2x - 7y = 12$

Find the x- and y-intercepts of the linear equation.

5. $-3x + 5y = 15$

6. $2x - y = 4$

7. $4x - 9y = 36$

8. $x + \dfrac{1}{3}y = -3$

9. $\dfrac{2}{5}x - \dfrac{3}{4}y = 12$

10. $7.6x + 15.2y = 38$

11. The booster club sells popcorn at basketball games for $0.75 per bag. Their cost for supplies is $12. The equation $-0.75x + y = -12$ represents the booster club's income y after selling x bags of popcorn. Find the x- and y-intercepts of the linear equation.

12. You upload digital photos to an online photo processing website. You can print 4-inch-by-6-inch photos for $0.30 each and 5-inch-by-7-inch photos for $0.75 each. The linear equation $0.30x + 0.75y = 15$ represents the ways you can print x 4-inch-by-6-inch photos and y 5-inch-by-7-inch photos for $15. Find the x- and y-intercepts of the linear equation.

**Answers**

H. $y = \dfrac{2}{7}x - \dfrac{12}{7}$

S. x-intercept: 5; y-intercept: 2.5

H. x-intercept: -3; y-intercept: -9

J. x-intercept: 50; y-intercept: 20

M. x-intercept: 2; y-intercept: -4

Y. x-intercept: 30; y-intercept: -16

U. x-intercept: 9; y-intercept: -4

P. x-intercept: 16; y-intercept: -12

T. $y = -3x + 8$

E. x-intercept: -5; y-intercept: 3

P. $y = 9x - \dfrac{1}{3}$

I. $y = \dfrac{1}{4}x + 3$

1	4	5	9		12	7	6	2		10	8	3	11

Start Thinking!
For use before Activity 13.6

Use the graph to answer the questions.

Oven Temperature
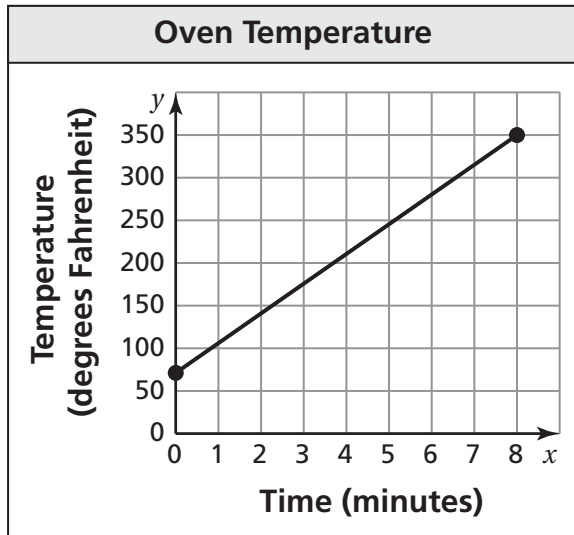
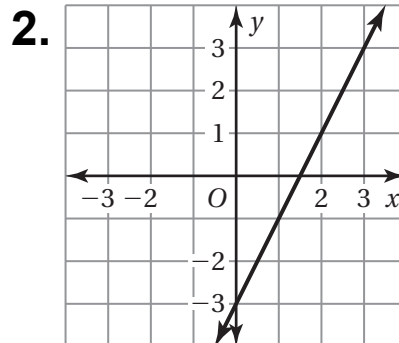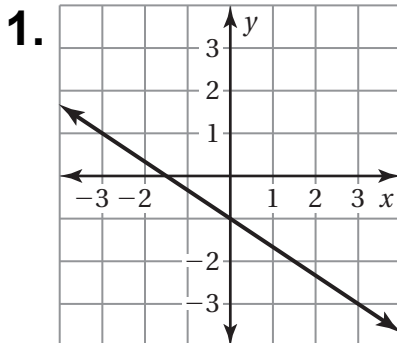What does the graph show?

Estimate the *y*-intercept. What does it represent?

Estimate the slope. What does it represent?

Activity
13.6

Warm Up
For use before Activity 13.6

Find the slope of the line.

1.

2.

A gym membership has a $20 enrollment fee and costs $40 per month.

Write an equation in slope-intercept form that represents the cost y after x months of joining the gym.

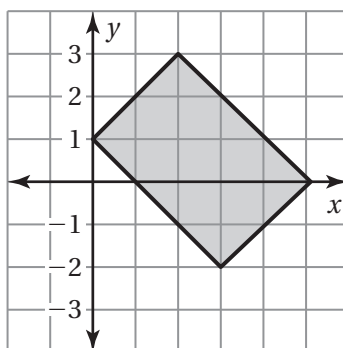What does the slope represent?

What does the y-intercept represent?

Write an equation that represents each side of the figure.
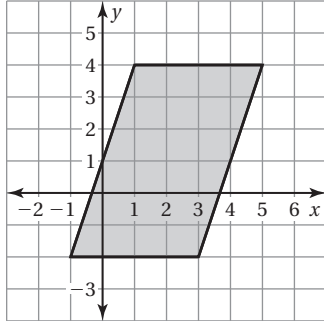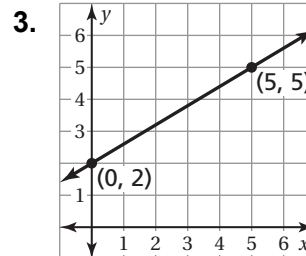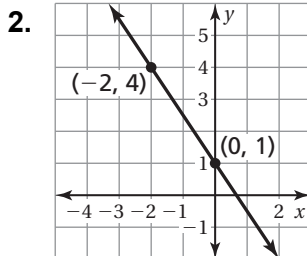
1.

2.

Name_____ Date _____
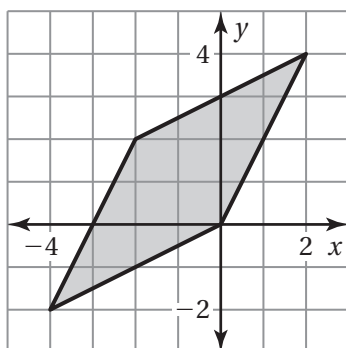
13.6 Practice A

1. Write an equation that represents each side of the figure.

Write an equation of the line in slope-intercept form.

2.

3.

4. A plant is 3 inches tall when you purchase it and grows 2 inches per month. Write an equation that represents the height y (in inches) of a plant that you purchased x months ago.

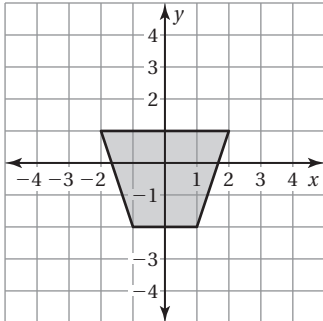**Write an equation of the line that passes through the points.**

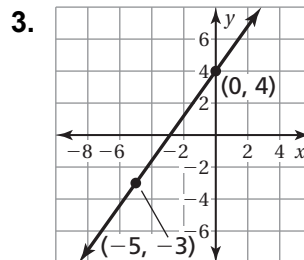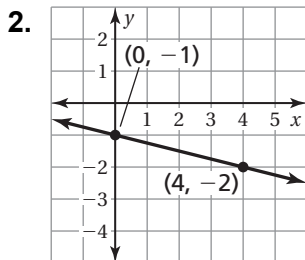5. $(0, 0), (4, -2)$

6. $(-2, 6), (0, 3)$

7. A bucket is empty. You are filling the bucket with water at a rate of 3 inches per second.

   a. Plot the points $(0, 0)$ and $(5, 15)$.

   b. What do the points in part (a) represent?

   c. Draw a line through the points.

   d. What does the line represent?

   e. Write an equation of the line.

Name _____ Date _____

1. Write an equation that represents each side of the figure.

Write an equation of the line in slope-intercept form.

2.

3.

4. Your hair is 6 inches long and grows at a rate of 144 millimeters per year.

   a. Convert 144 millimeters per year to inches per year. Round your answer to the nearest tenth.

   b. Write an equation that represents the length y (in inches) of your hair after x years.

   c. How long is your hair after 4 years?

Write an equation of the line that passes through the points.

5. $(-4, -1), (0, 5)$

6. $(0, -3), (1, -5)$

7. Yesterday, you typed 8 pages in 48 minutes. Today, you typed 20 pages in 2 hours.

   a. Plot the two points (x, y), where x is the time (in minutes) and y is the number of pages.

   b. What is the rate of typing?

   c. Write an equation that represents the number of pages in terms of the number of minutes.

Name_____ Date _____

13.6 Enrichment and Extension

Matching Equations and Graphs

Copy the equations and graphs onto index cards. Mix the cards up and lay them face down. With a friend, take turns turning over pairs of cards. If you find a matching graph and equation, remove the pair and take another turn. If the pair doesn't match, turn both cards face down again. Continue until all pairs are removed. The player with the most pairs wins.

$y = \dfrac{1}{3}x + 2$	$y = 2x - 2$	$y = -x + 3$
$y = 4x$	$y = -\dfrac{2}{5}x + 1$	$y = \dfrac{3}{4}x - 3$
$y = -\dfrac{1}{2}x - 1$	$y = -3x$	$y = \dfrac{3}{5}x - 4$
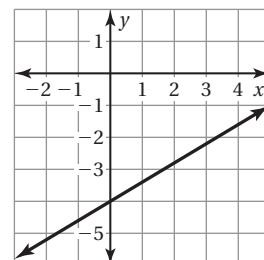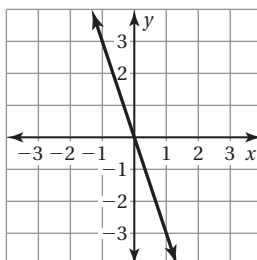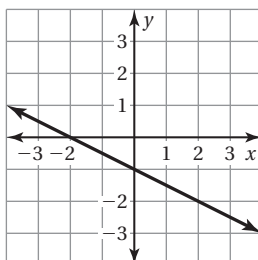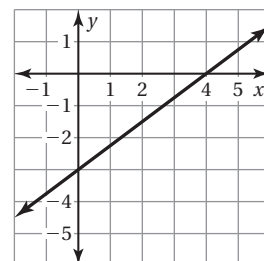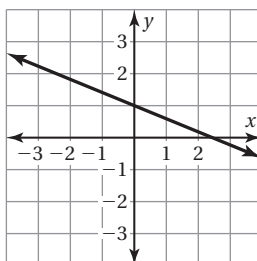
13.6 Puzzle Time

What Should You Know If You Want To Become A Lion Tamer?

Write the letter of each answer in the box containing the exercise number.

Write an equation of the line that passes through the points.

1. $(0, 3), (1, 4)$

2. $(0, 0), (5, -2)$

3. $(-2, 0), (0, 4)$

4. $(-3, 2), (0, -3)$

5. $(-7, 4), (0, 4)$

6. $(0, -8), (4, 8)$

7. $(0, -2), (-5, -2)$

8. $(-12, -9), (0, -3)$

9. $(0, 10), (5, 0)$

10. $(-14, 12), (0, 6)$
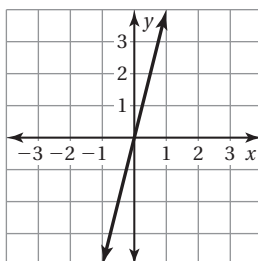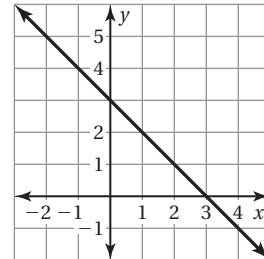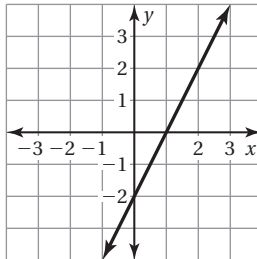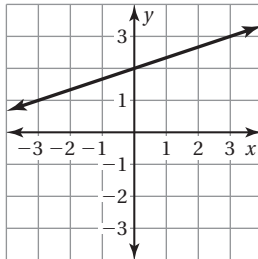
11. $(0, -6), (6, -24)$

12. $(0, -15), (5, 0)$

13. You are planning to make a scrapbook. The album costs $20 and each of the scrapbook papers costs an additional $1. Write an equation that represents the cost of the completed scrapbook where x represents the number of scrapbook papers you purchase.

14. A hot tub that holds 300 gallons of water drains at a rate of 8 gallons per minute. Write an equation that represents how many gallons of water are left in the tub after it has drained for x minutes.

15. An elevator in a tall building is at a point 180 feet above the ground. The elevator descends at a rate of 12 feet per second. Write an equation that represents how far above the ground the elevator is after descending for x seconds.

Answers

T. $y = -2x + 10$

N. $y = \dfrac{1}{2}x - 3$

H. $y = x + 3$

R. $y = -12x + 180$

E. $y = 2x + 4$

A. $y = -\dfrac{2}{5}x$

H. $y = -\dfrac{3}{7}x + 6$

N. $y = x + 20$

E. $y = 4$

T. $y = 4x - 8$

I. $y = 3x - 15$

L. $y = -3x - 6$

M. $y = -8x + 300$

O. $y = -2$

O. $y = -\dfrac{5}{3}x - 3$

14	7	15	3		6	10	2	13		9	1	5		11	12	4	8

Choose an ordered pair that is not on the y-axis.
Choose a slope.

Can you write an equation of a line with the
slope you chose that goes through the point you
chose? If so, explain the method you used. If
not, explain why not.

Graph the linear equation.

1. $y = 2x + 3$

2. $y = -x + 2$

3. $y = \dfrac{2}{3}x - 1$

4. $y = -\dfrac{1}{2}x + 4$

5. $y = 5x - 10$

6. $y = -\dfrac{5}{7}x + 14$
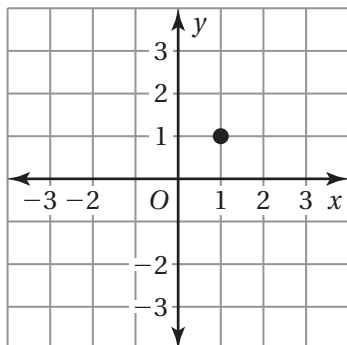
How is writing the equation of a line given
the slope and a point on the line similar to
writing the equation of a line given the
slope and y-intercept? How is it different?

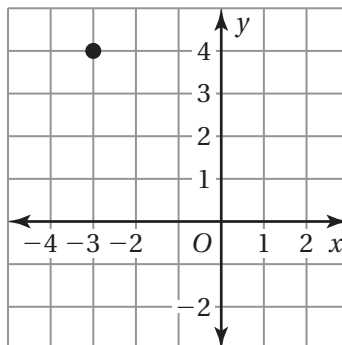**Use the point-slope form to write an equation of the line with the given slope that passes through the given point.**

1. $m = 2$

2. $m = -1$

3. $m = -\dfrac{1}{2}$

4. $m = \dfrac{2}{3}$

Name_____ Date _____
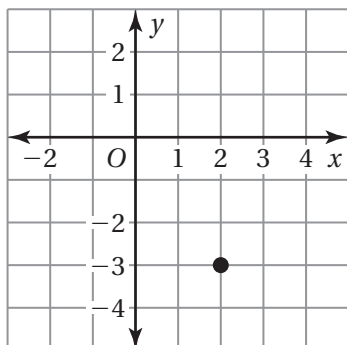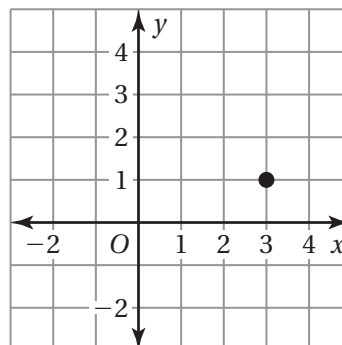
13.7 Practice A

Use the point-slope form to write an equation of the line with the given slope that passes through the given point.

1. $m = 3$
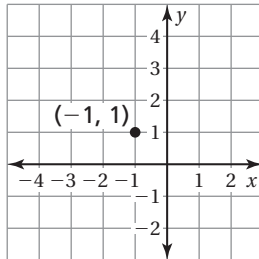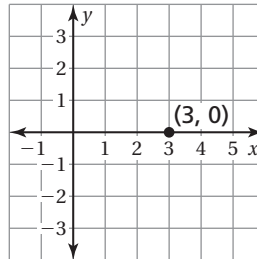
(−1, 1)

2. $m = -\dfrac{2}{3}$

(3, 0)

Write in point-slope form an equation of the line that passes through the given point and has the given slope.

3. $(4, -2);\ m = \dfrac{1}{4}$

4. $(-3, 5);\ m = -\dfrac{4}{3}$

5. $(2, 2);\ m = -1$

6. $(-1, -5);\ m = 4$

Write in slope-intercept form an equation of the line that passes through the given points.

7. $(-3, -4),\ (6, -1)$

8. $(-4, 12),\ (2, -3)$

9. $(-1, -2),\ (1, -6)$

10. $(-2, -9),\ (1, 6)$

11. After a laptop is purchased, its value decreases by $150 each year. After 2 years, the laptop is worth $600.

   a. Write an equation that represents the value V (in dollars) of the laptop x years after it is purchased.

   b. What was the original value of the laptop?

   c. What is the value of the laptop 5 years after it is purchased?

Name_____ Date _____

13.7 Practice B

Write an equation of the line with the given slope that passes through the given point.

1. $m = \dfrac{5}{4}$
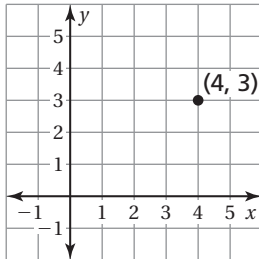
2. $m = -4$
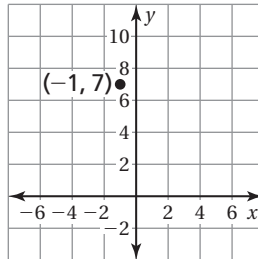
(4, 3)

(−1, 7)

Write in point-slope form an equation of the line that passes through the given point and has the given slope.

3. $(-6, 3); \; m = \dfrac{1}{3}$

4. $(8, -7); \; m = -\dfrac{3}{4}$

5. $(-1, -5); \; m = 2$

6. $(-2, 8); \; m = -3$

Write in slope-intercept form an equation of the line that passes through the given points.

7. $(2, 3), (3, 7)$

8. $(-5, -8), (10, 4)$

9. $(-6, 4), (6, 0)$

10. $(2, 4), (4, 9)$

11. You are pulling a kite back to the ground at a rate of 2 feet per second. After 4 seconds, the kite is 16 feet above the ground.

    a. Write an equation that represents the height y (in feet) above the ground after x seconds.

    b. At what height was the kite when you started pulling it in?

    c. When does the kite touch the ground?

13.7 Enrichment and Extension

Ski Slopes

The grade of a ski trail describes the steepness of the ski slope. A skier can calculate the grade by dividing the vertical decrease (in meters) of the slope by the horizontal distance (in meters) it covers.

Frosty's Ski Center	
Trail	**Grade of Trail**
Bunny Slope	4%
Medium Trail	15%
Expert Route	30%

1. How does the grade of a trail relate to the slope of a line?

2. What is the slope of each of the ski trails?

3. There is a first aid station located at the point $(750, 28)$ on the Bunny Slope. Write an equation that describes the Bunny Slope.

4. What is the y-intercept of your equation? What does the y-intercept mean in terms of the Bunny Slope?

5. What is the x-intercept of your equation? What does the x-intercept mean in terms of the Bunny Slope?

6. The halfway point on the Medium Trail is located at $(5100, 765)$. Write an equation that describes the Medium Trail.

7. The Expert Route passes by the ski lodge located at the point $(15,000, 1500)$. Write an equation that describes the Expert Route.

8. Beginner slopes for new skiers have a maximum grade of 5%. Two skiers on a trail are located at the points $(700, 30)$ and $(450, 50)$. Is the trail a beginner slope? Explain.

13.7 Puzzle Time

What Do You Call A Ghost Cheerleader?

Write the letter of each answer in the box containing the exercise number.

Write in point-slope form an equation of the line that passes through the given point and has the given slope.

1. $(1, 5)$; $m = 2$

2. $(-2, 4)$; $m = -3$

3. $(4, 2)$; $m = 3$

4. $(-1, 5)$; $m = -2$

5. $(2, -4)$; $m = -3$

6. $(-5, 1)$; $m = 2$

Write in slope-intercept form an equation of the line that passes through the given points.

7. $(-5\ -5)$, $(5, -7)$

8. $(-3, -4)$, $(3, 0)$

9. $(-2, -7)$, $(2, -1)$

10. $(-6, -4)$, $(6, 4)$

11. You go to an arcade and purchase a card with game credits. After playing 5 games, you have 33 credits left. You play 4 more games and have 21 credits left. Write an equation that represents the number of credits y on the card after x games.

12. You go to a school dance. There is an entrance fee, and there are slices of pizza for sale. After having 1 slice of pizza, you have spent a total of $6. After having 2 more slices of pizza, you have spent a total of $10. Write an equation that represents the total cost y after buying x slices of pizza at the dance.

13. You make 2 headbands and have 6 feet of ribbon left. You make 1 more headband and have 4 feet of ribbon left. Write an equation that represents the amount of ribbon y you have left after making x headbands.

Answers

R. $y - 4 = -3(x + 2)$

M. $y = \dfrac{2}{3}x$

E. $y = 2x + 4$

I. $y + 4 = -3(x - 2)$

P. $y = -2x + 10$

I. $y = -3x + 48$

A. $y - 2 = 3(x - 4)$

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

E. $y - 5 = 2(x - 1)$

T. $y - 1 = 2(x + 5)$

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

T. $y - 5 = -2(x + 1)$

H. $y = -\dfrac{1}{5}x - 6$

4	7	1		6	12	3	10		9	13	5	2	11	8

Name_____ Date_____

Finding Slope

Use a calculator to find the slope of a line, given two points on the line.

EXAMPLE Find the slope of the line that passes through the points (8, 3) and (2, 5).

    SOLUTION

    Press $(\boxed{5} \boxed{-} \boxed{3}) \boxed{\div} (\boxed{2} \boxed{-} \boxed{8}) \boxed{=}$.

    ANSWER $-0.33...$

You need to keep track of where you use each value. Either point can be used as (x_1, y_1). But the y-values or x-values cannot be switched.

In this set of exercises, you will explore what happens when the values are switched.

    1. Find the slope of the line that passes through the points $(3, 1)$ and $(5, 4)$.

    2. What happens when you change the order of the points in mid-calculation?

      a. Press $(\boxed{4} \boxed{-} \boxed{1}) \boxed{\div} (\boxed{3} \boxed{-} \boxed{5}) \boxed{=}$.

      b. Compare your answer in part (a) to your answer to Exercise 1. How are the slopes related?

      c. Describe a quick check you can use to ensure that you do not accidentally make this mistake when entering the problem.

    3. What happens when you find the run over the rise?

      a. Press $(\boxed{5} \boxed{-} \boxed{3}) \boxed{\div} (\boxed{4} \boxed{-} \boxed{1}) \boxed{=}$.

      b. Compare your answer in part (a) to your answer to Exercise 1. How are the slopes related?

      c. Describe a quick check you can use to ensure that you do not accidentally make this mistake when entering the problem.

Use a calculator to find the slope. Round to the nearest hundredth.

    4. $(7, -3)$ and $(0, 1)$ **5.** $(-1, -1)$ and $(2, 9)$

    6. $(3, 9)$ and $(5, 9)$ **7.** $(6, 3)$ and $(5, -2)$

            Big Ideas Math Red Accelerated
                                                        Resources by Chapter