Module 3 Linear Equations

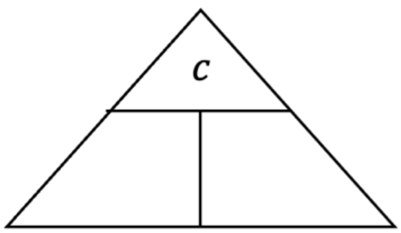
Section 3.1 The Math Triangle

Practice Problems 3.1

For Problem 1-4 use the given information to solve the problem.

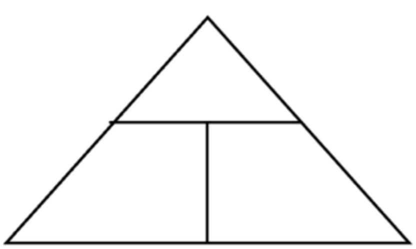
In science, λ (the Greek letter *lambda*) represents wavelength. This is literally the length of one wave between two successive crests or peaks of a wave. In our formula, λ stands for wavelength of light. The variable v (the Greek letter *nu)* represents frequency, which is how many waves go by a certain point per second. The variable c represents speed of light, which is 3×10^8 m/s, or 300,000,000 meters per second (this is why the expression “speed of light” is used).

1. Complete the triangle using the formula $\lambda v = c$ (wavelength $\times$ frequency = speed of light).



2. Speed of light is a constant; it is $c = 3 \times 10^8$ m/s in a vacuum. Light may travel slower than that through water or other mediums but it never goes faster than 3×10^8 m/s in any situation. Because c is constant, there are two variables, wavelength (λ) and frequency (v). Write the three formulas, including one for wavelength, and one for frequency using the math triangle from Problem 1.

3. If a wave with a wavelength of 3 meters goes by at a speed of 12 meters per second, what is its frequency? Use the formula $f\lambda = v$ (In this equation, v is the velocity of speed and f is the frequency). Complete the math triangle first to find the correct equation.



4. If IAMG radio station broadcasts Bible lessons into a country at a frequency of $660\ kHz$, what is the length of the radio waves? Fill in the missing parts of the equation $\lambda = \frac{c}{v}$. The speed of light is $c = 3 \times 10^8$ m/s and frequency is $v = 660 \times 10^3\ Hz$ (Hz Is Hertz, which means *per second*).

$$\lambda = \frac{3 \times \square \ \text{m/s}}{660 \times \square \ \text{s}}$$

$$\lambda = \frac{3}{\square} \times \frac{\square}{10^3} \text{ m.}$$

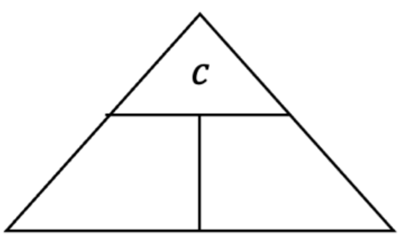
$$\lambda = \square \times 10^{\square} \text{ m.}$$

For Problem 5-7, use the given information to solve the problem.

In science, the formula for the mechanical advantage of a screw is as follows:

$$\text{Mechanical Advantage} = \text{circumference} \div \text{pitch}$$

5. Given SMA is the mechanical advantage of a screw, c is the circumference, and p is pitch, complete the math triangle.



6. Use the formula for mechanical advantage of a screw (SMA) and the mathematics triangle to find the other two formulas: one for circumference (c), and the other for pitch (p).

7. If the circumference of a screw is 0.94248 inches and the mechanical advantage is 18.8496, what is the pitch of the screw (distance between the threads)?

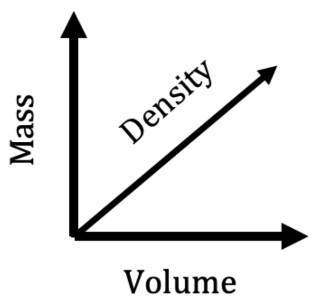
For Problem 8-12, use the given formula for density to solve the problem.

$$\text{density } (d) = \frac{\text{mass } (m)}{\text{volume } (v)}$$

8. What is the equation for mass in terms of density and volume?

9. What is the equation for volume in terms of density and mass?

10. Because $d = \frac{m}{v}$, density is the ____________________ of the graph below.



11. The density of silver is $10.49\ \mathrm{g/cm^3}$. Write an equation for the mass in terms of volume for silver.

12. Write an equation for the volume of silver in terms of mass.

For Problem 13-15, use the given information and your previous knowledge to solve the problem.

Abraham was from the city of Ur in the Chaldeans, which was founded 5,000 years ago in Mesopotamia. Ur was excavated in the early 1900s and archaeologists found a cemetery among it.

13. One of the artifacts found in the cemetery of Ur has a silver mass of $2{,}100$ grams. What is the volume of this piece?

14. Another artifact found has a volume of $200\ \text{cm}^3$. What is the mass of this piece?

15. One artifact found in the cemetery of Ur was bronze. It has a volume of $10\ \text{cm}^3$ and a mass of 88 grams. What is the density of this bronze artifact?

For Problem 16-20, use your previous knowledge to solve the word problem.

16. Estimate the density of 10 grams of silver that have a volume of $0.953\ \text{cm}^3$.

17. Estimate the density of 8 ounces of silver that have a volume of $2.16 \times 10^{-5}\text{m}^3$.

18. Estimate the density of 8 ounces of silver that have a volume of $1.319\ \text{in}^3$.

19. The density of gold is $19.32\ \text{g/cm}^3$. If a golden earring has a volume of $1.1\ \text{cm}^3$, what is the mass of the earring?

20. Knowing the density of gold from Problem 19, if a golden earring has a mass of 14.39 g, what is the volume of the earring?

Section 3.2 More Than One Variable

Practice Problems 3.2

For Problem 1-3, write an expression for the situation given.

1. A policeman drives several hours at 65 mph. How far did he drive?

2. A young lady bought a few blouses on sale for $8.95 each. How much did she spend?

3. A missions board shipped several pounds of medical supplies overseas. The cost per pound to ship the supplies was $0.85. What were the total shipping fees?

For Problem 4-10, solve the problem by writing an equation or finding the solution.

4. A school orders classroom sets of textbooks at $79.95 each. How much did the school spend on textbooks? (Write an equation.)

5. Using the information from Problem 4, if 104 textbooks are purchased, what is the total amount of money the school will spend? (Find the solution.)

6. If skate rental is $2.50 for each pair of skates, what is the total cost for a group to rent skates? (Write an equation.)

7. Using the information from Problem 6, if a mother has $20.00, how many friends may her son invite to the skating rink? (Find the solution.)

8. The cost of shoe rental at a bowling alley is $2.75 a pair; what is the total cost for a youth group to rent bowling shoes? (Write an equation.)

9. Using the information from Problem 8, if there are twelve members in the youth group that go bowling, how much is the bowling shoe rental? (Find the solution.)

10. A group of retirees goes bowling and spends $57.75 on shoe rental; how many adults are in the group? (Find the solution.)

For Problem 11-14, tell what the variables represent, then write an equation to model the situation given.

11. The total cost of corn if each can costs $0.89

12. The total amount of fence to enclose a backyard is 45 times the width of the yard

13. The amount of change left from $20.00 if you spend some of it on a gift

14. The number of nickels in a banker's cash drawer if you know the total value of the nickels

For Problem 15-17, use the given table to solve the problem.

Number of Haircuts	**Total Amount Earned**
1	
2	$16
3	$24

15. What is the relationship between the number of haircuts and the amount earned?

16. Which of the equations represents the information in the table if $n =$ number of haircuts and $a =$ amount earned?

a) $a = 8n$

b) $a = n + \$8$

c) $a - 8n$

d) $a = \$24 - \$26$

17. What is the missing number in the table and what does it represent?

For Problem 18 and 19, solve the multiple-choice problem given.

18. Suppose you buy a 64-ounce bottle of orange juice. Which of the equations models the ounces remaining in the bottle (r) after you have poured a glass of p ounces?

a) $r - p = 64$

b) $p - r = 64$

c) $64 - p = r$

d) $64 - p = r$

19. Suppose there are 3 petals on each boutineer (boutonnière) made of roses at a shop. Which of the equations models the total number of petals (t) on b boutineers?

a) $t = 3b$

b) $3t = b$

c) $\frac{b}{t} = 3$

d) $\frac{t}{b} = 3$

For Problem 20, use the given table and the information from Problem 19 to solve the problem.

Number of Boutineers (b)	**Total Number of Petals (p)**
1	
2	
3	
b	

20. Complete the table for the number of petals on each boutineer.

Section 3.3 Interpreting Situations

Practice Problems 3.3

For Problem 1-5, use the given table to solve the problem.

Number of Boards	**Total Length in Feet**
1	3.3
2	6.6
3	9.9
4	13.2

1. If $n =$ number of boards, write an equation for the total length of the boards (in feet). Let $t =$ total length of boards.

2. How long will the boards be (in feet) if there are $7\frac{1}{2}$ boards in total?

3. If the total length in boards is 62.7 feet, how many boards would there be?

4. If there are no boards, how many feet would that be? Where would it be found on the table?

5. What is the *rate of change* (slope) of the equation in Problem 2?

For Problem 6-8 use the table and/or information given to solve the problem.

6. What is the *rate of change* (slope) of the table? How does the number of plants in the garden increase as the number of rows in the garden increase?

Rows in Garden (r)	**Number of Plants (p)**
1	6
2	12
4	24
7	42
r	?

7. How many ceiling fans are built by each worker? This is the *rate of change* (slope). Where is the *rate of change* found in the equation?

Number of Workers (n)	**Ceiling Fans Built (f)**
1	2.5
2	5
3	7.5
n	

8. If you are given a table and you cannot calculate the slope, what would you need to know in order to know the *rate of change* is constant?

For Problem 9-20, use the given table and information to solve the problem.

The Renaissance Club sells donuts for $3 each.

9. Complete the table below.

x (**Number of Donuts Sold**)	y (**Total Sales In Money**)
0	
1	
2	
3	
4	
5	
x	

10. What is the equation that represents total sales (y) after x number of donuts are sold?

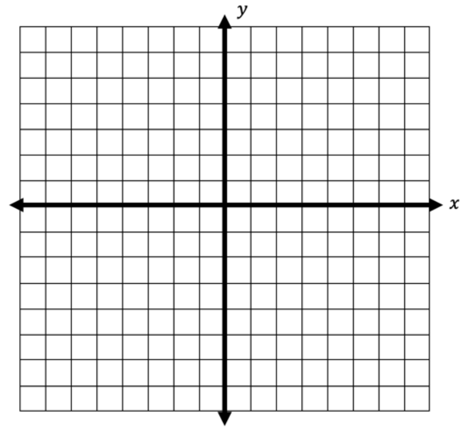
11. Using the equation from Problem 10, how much money would be earned after 34 donuts are sold?

12. If the Renaissance Club makes a profit of $294, how many donuts did they sell?

13. What is the slope of the linear equation formed by the numbers in the table? What does it represent?

14. What is the y-intercept of the linear equation formed by the numbers in the table? What does it represent?

15. Draw a linear graph that represents donut sales. Let the x-axis be the number of donuts sold and the y-axis be the total amount of money made through sales.



16. The Renaissance Club got a $5.00 donation from someone who did not like donuts.

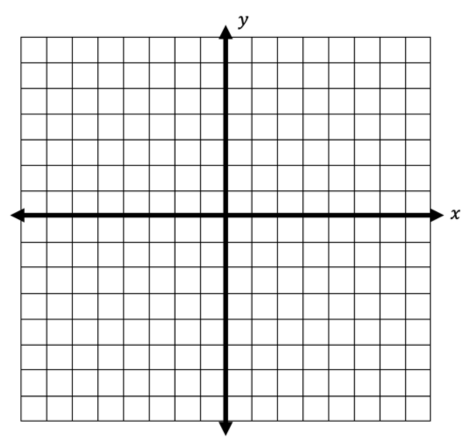
a) How does this donation change the table?

x (**Number of Donuts Sold**)	y (**Total Sales In Money**)
0	
1	
2	
3	
4	

b) How does this donation change the y-intercept?

c) How does this donation change the equation?

17. What does the new graph of the equation for number of donuts sold and total sales in money look like after the donation from Problem 16? How has it shifted from the original graph?



18. The Renaissance Club had to spend $10.00 on a sign to advertise donut sales.

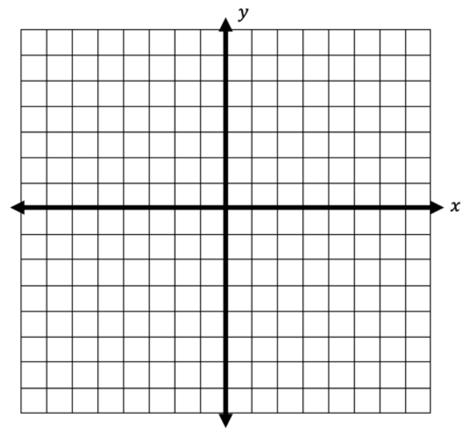
a) How does this cost change the table?

x (**Number of Donuts Sold**)	y (**Total Sales In Money**)
0	
1	
2	
3	
4	

b) How does this cost change the y-intercept?

c) How does this cost change the equation?

19. What does the graph of the new equation for number of donuts sold and total sales in money look like after the cost from Problem 18?



20. How many donuts would the Renaissance Club have to sell to begin to make a profit?

Section 3.4 Generating Tables

Practice Problems 3.4

For Problem 1-7, use the information given to solve the problem.

1. Solve the equation $-4x + y = 2$ (a standard form equation) for x in terms of y. (In other words, isolate the x in the equation.)

$x =$ ____________________

2. Solve the equation $-4x + y = 2$ for y in terms of x. (In other words, isolate the y variable in the equation.)

$y =$ __________________

3. Substitute the y-values from the table in the equation from Problem 1 to complete the table.

$\boldsymbol{y}$	$\boldsymbol{x}$
0	
1	
2	

4. Substitute the x-values from the table in Problem 3 in the equation from Problem 2 to complete the table.

$\boldsymbol{x}$	$\boldsymbol{y}$

5. Are any values from the table in Problem 3 the same as the values in Problem 4?

6. How do you know the equation for *x* in Problem 2 and the equation for *y* in Problem 4 are the same as the equation $-4x + y = 2$?

7. Why do we use the equation from Problem 2 rather the equation from Problem 1 to complete Input-Output tables?

For Problem 8-12, solve for x in terms of y and complete the table.

8. $-3x + 2y = 10$

x	y
-2	
0	
2	

9. $2x + 2y = 10$

x	y
-2	
0	
2	

10. $x + y = -9.2$

x	y
-1	
0	
1	

11. $y - 5x = -20$

x	y
-10	
-5	
0	
5	
10	

12. $12x - 4y = -44$

x	y
-4	
-2	
0	
2	
4	

For Problem 13-16, find y when $x = -1, x = 0$ and $x = 1$.

13. $y = -2x + 3$

14. $y = \frac{3}{2}x - 2$

15. $y = -x + 8.2$

16. $y = 5x - 3$

For Problem 17-20, use the given information to solve the problem.

Noah's walking rate is 6.87 ft./sec.

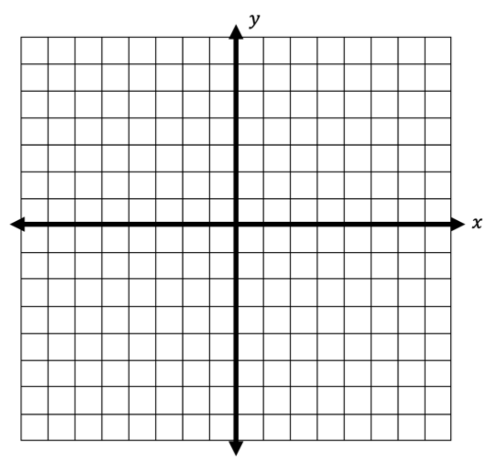
17. Complete the table to the right. Let x be seconds and y be total feet walked.

18. What is the equation that represents the total distance (y) when Noah walked any number of seconds (x)?

$\boldsymbol{x}$ (**seconds**)	$\boldsymbol{y}$ (**total feet walked**)
0	
1	
2	
3	
4	
5	
x	

19. What is the slope of the linear equation? What does it represent?

20. Draw the linear graph that represents Noah's walking rate. Let the x-axis be seconds and the y-axis be total feet walked.



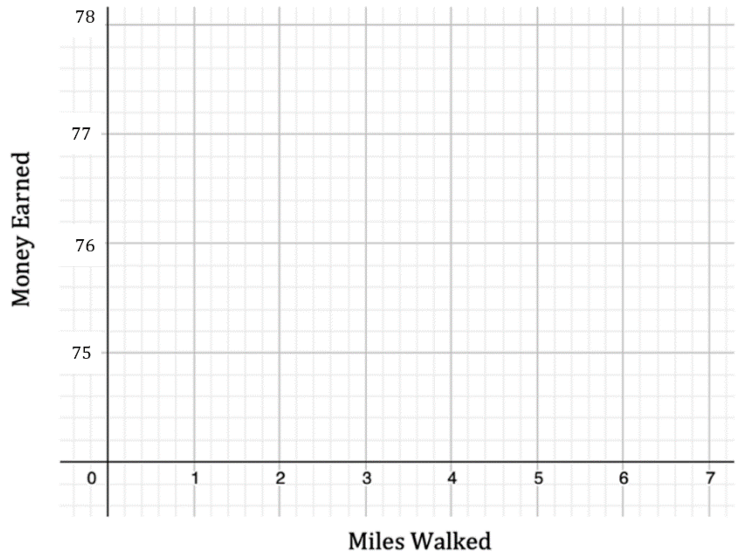
Section 3.5 Graphing Linear Equations

Practice Problem 3.5

For Problem 1-6, use the information from Section 3 of this module (the walk-a-thon) to solve the problem. We will be using x and y rather than m and t because we will be graphing the information on the xy-plane.

1. Hanna's equation was $y = \$0.50x + \$75.00$. The table below represents Hanna's equation. Draw the graph for Hanna's information.

Miles Walked (x)	Money Earned (y)
0	\$75.00
1	\$75.50
2	\$76.00
3	\$76.50
4	\$77.00
5	\$77.50
6	\$78.00



2. Use Problem 1 to answer the questions given.
   a) How can you find the slope from the equation and the table?

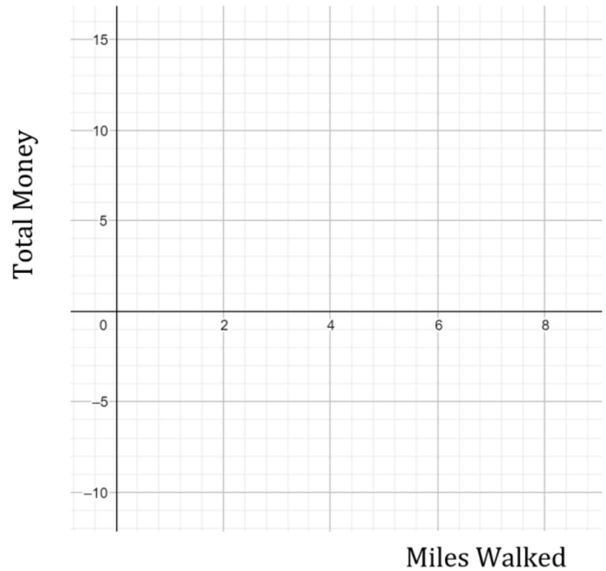
   b) How can you find the y-intercept from the equation and the graph?

   c) Write the equation in standard form.

   d) Is it a direct variation?

3. Evan's equation was $y = \$3.00x - \$10.00$. The table below represents Evan's equation. Draw the graph for Evan's information.

Miles Walked (x)	**Money Earned (y)**
0	−$10.00
1	−$7.00
2	−$4.00
3	−$1.00
4	$2.00
5	$5.00
6	$8.00



4. Use Problem 3 to answer the questions given.
   a) How can you find the slope from the equation and the table?

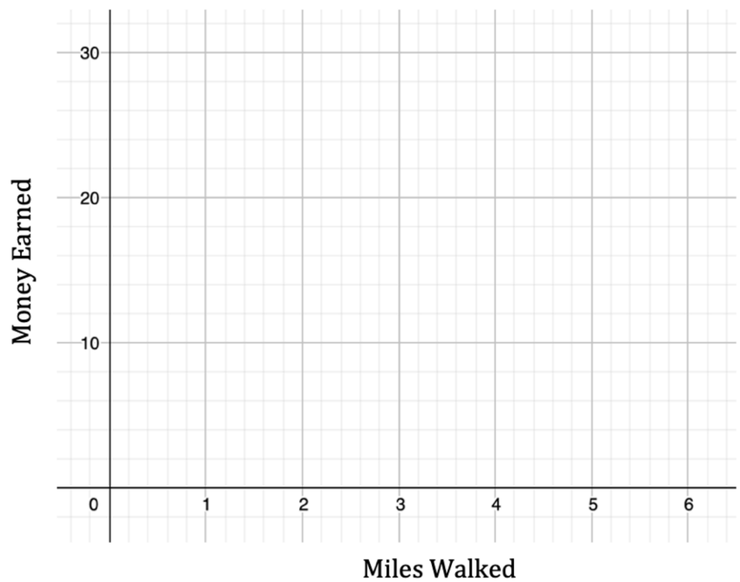
   b) How can you find the y-intercept from the equation and the graph?

   c) Write the equation in standard form.

   d) How can you tell by looking at the equation, table, and graph that it is not a direct variation equation?

5. Norton's equation was $y = \$4.25x$. The table below represents Norton's equation. Draw the graph for Norton's information.

Miles Walked (x)	**Money Earned (y)**
0	0
1	\$4.25
2	\$8.50
3	\$12.75
4	\$17.00
5	\$21.25
6	\$25.50



6. Use Problem 5 to answer the questions given.

a) How can you find the slope from the equation and the table?

b) How can you find the y-intercept from the equation and the graph?

c) Write the equation in standard form.

d) How can you tell by looking at the equation, table, and graph that it is a direct variation equation?

For Problem 7-10, use the information given to solve the problem.

7. Given the equation $y = -2x + 6$, complete the table.

x	-3	-2	-1	0	1	2	3
y							

8. a) In Problem 7, where do you see the x-intercept on the table?

b) In Problem 7, where do you see the y-intercept on the table?

9. How do find the slope and y-intercept of the table below?

x	-2	-1	0	1	2	3
y	-3	0	3	6	9	12

10. Write the equation for the table in Problem 9.

For Problem 11-15, given the equation, name its slope and y-intercept.

11. $y = -3x + 4.2$

12. $y = 4x - \frac{1}{3}$

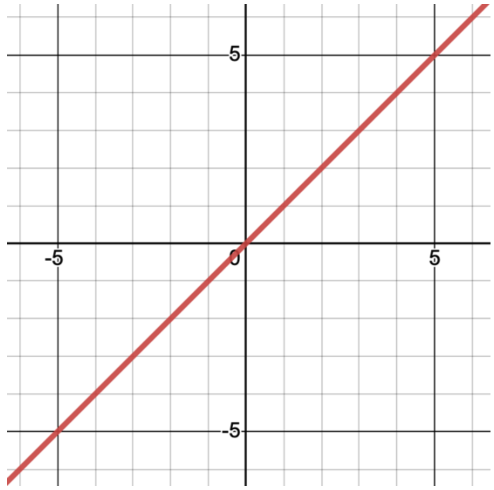
13. $y = 15x$

14. $y = 7$

15. $2y = 4x - 2$

For Problem 16-20, use the information given to solve the problem.

16. Given the graph below, identify the slope and y-intercept.



17. What is the equation of the line in the graph of Problem 16?

18. If the graph from Problem 16 is shifted up two points on the y-axis, does that change the slope or y-intercept?

19. What is the new equation for the shifted graph from Problem 18?

20. Find the slope and y-intercept of the equation $2x - 3y = 6$.

Section 3.6 Finding the x and y-intercepts

Practice Problems 3.6

For Problem 1-3, given the slope-intercept equation, find the following:

a) the slope b) the y-intercept c) the x-intercept

1. $y = 2x - 3$

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

3. $y = 3x + 9$

For Problem 4 and 5, write the standard form equation given in slope-intercept form and find the following:

a) the slope b) the y-intercept

4. $3x + y = 6$

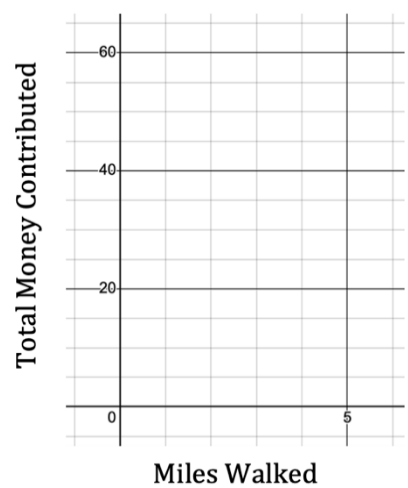
5. $5x - 10y = 15$

For Problem 6, use the given information to solve the problem.

Allison paid the entry fee of $10.00 each for Hanna, Evan, and Norton to walk in the cancer awareness walk-a-thon. She also gave each of them $2.00 for each mile they walked.

6. Given each participant walks the same number of miles, write the equation for the amount of money contributed to cancer awareness from Allison. Complete the table given for the equation, graph all the points, and draw the line.

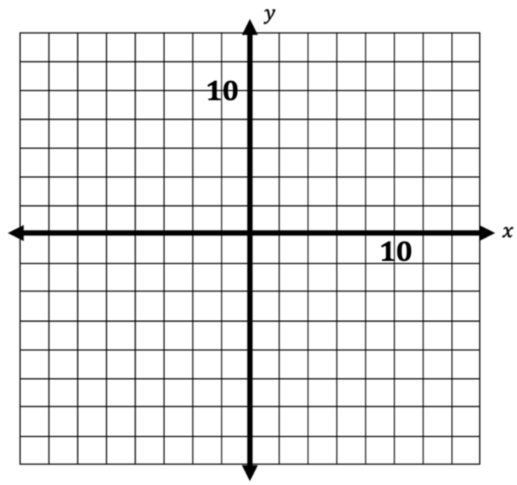
Miles Walked (x)	**Total Money Contributed (y)**
0	
1	
2	
3	
4	
5	



For Problem 7-13, use the equation $y = 2x + 4$ (which we used in the Lesson Notes) to solve the problem given.

7. Complete the table.

x	y
-4	
-3	
-2	
-1	
0	
1	
2	
3	
4	



8. Plot the points on the graph and connect them. Is it a straight line? Why or why not?

9. In the table in Problem 7, find the x and y-intercepts and write them as ordered pairs.

10. How can you look at the graph and find the value of y when $x = 2$? Write the ordered pair at this point.

11. How can you look at the graph and find the value of x when $y = -2$? Where is that on the table?

12. Name at least two ways to graph a line if you know the equation.

13. Name at least two ways to find the x and y-intercept without looking at a table or graph.

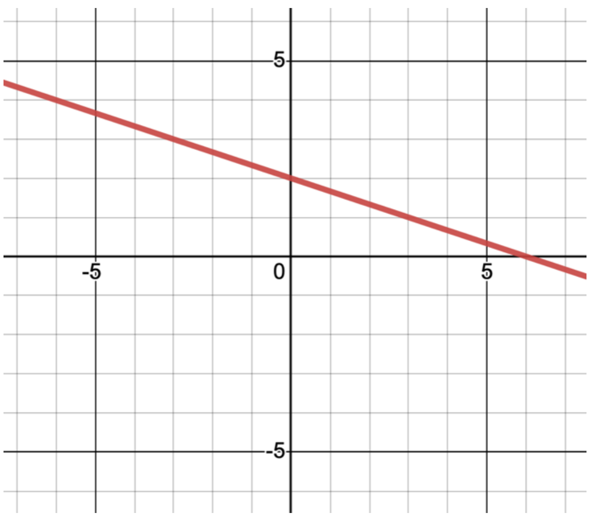
For Problem 14 and 15, use the given table to solve the problem.

x	y
-3	-6
-2	-4
-1	-2
0	0
1	2
2	4
3	6

14. Identify the x and y-intercepts from the table.

15. Find the slope of the table and write the equation for it.

For Problem 16 and 17, use the given graph to solve the problem.



16. Identify the x and y-intercepts from the graph.

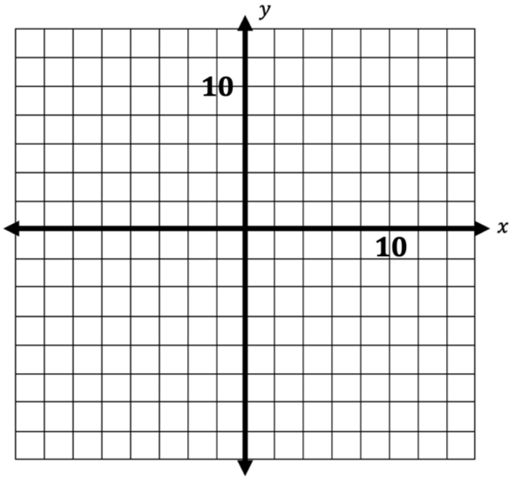
17. Find the slope of the graph and write the equation for it.

For Problem 18-20, use the given table to solve the problem given.

x	y
-3	-8
-2	-6
-1	-4
0	-2
1	0
2	2
3	4

18. Identify the x and y-intercepts from the table.

19. Draw the graph of the table in Problem 18 and circle the x and y-intercepts. What is the slope of the line?



20. What is the equation for the table and graph from Problem 18 and 19?

Section 3.7 Isolating the Variable

Practice Problems 3.7

For Problem 1-4, solve for x in terms of y.

1. $-2x + 4y = -10$
2. $3x + 6y = -12$
3. $-2x + 5y = -25$
4. $x - 3y = -15$

For Problem 5-8, write the standard form equation given in slope-intercept form and identify the slope (m) and y-intercept (b).

5. $2x + y = 1$
6. $-6x + 3y = -12$
7. $2y + 9x = 0$
8. $-3x + 3y = -2x + 1$

For Problem 9 and 10, solve the word problem given.

9. On the first day of mathematics class, Brenda White saw her friends Shari Green and Nancy Brown. When she realized Shari and Nancy did not know each other, she introduced them. She said it was odd that none of them wore the same color as their own last name, yet each had on a color of one of the others' last names. The one in green dress replied that it did seem strange. What color did each girl wear?

10. Three high school seniors work at a grocery store after school. They either stock shelves or bag groceries. Vickie Keller, the manager, assigns them their job each day according to the following three rules:

1. Either Laurie or Faye will stock shelves, but not both.
2. If Laurie stocks shelves, then Cindy will bag groceries.
3. Cindy and Faye will not both bag groceries.

According to the rules, which one of the workers could have both stocked shelves yesterday and bagged groceries today?

For Problem 11-13, solve the literal equation given (solving a literal equation is another name for isolating the variable).

11. Solve for w in the perimeter formula: $p = 2l + 2w$

12. Solve for h in the area formula: $A = \frac{1}{2}bh$

13. Solve for h in the area formula: $A = \frac{1}{2}(b_1 + b_2)h$

For Problem 14 and 15, find the mistake in the work and correct it.

14. Find the mistake in Peyton's work in solving for T and correct it:

$$M = (T + 6)3$$

$$M - T = 18$$

$$-T = 18 - M$$

$$T = -18 + M$$

15. Find the mistake in Brianna's work in solving for T and correct it:

$$M = (T + 6)3$$

$$M - 6 = (T)3$$

$$\frac{M - 6}{3} = T$$

For Problem 16-20, solve the word problem given.

16. If n is a number and the number after it is $n + 1$, what is the number before it?

17. Consecutive integers are next to one another. Solve for n in $(n) + (n + 1) + (n + 2) = 66$ given the integer totals in parenthesis are three consecutive integers.

18. Find two consecutive numbers that have a sum of 19.

19. Let n be an even number. What is the next even number after n given their sum is 22?

20. Let n be an odd number. What is the next odd number after n given their sum is 16?

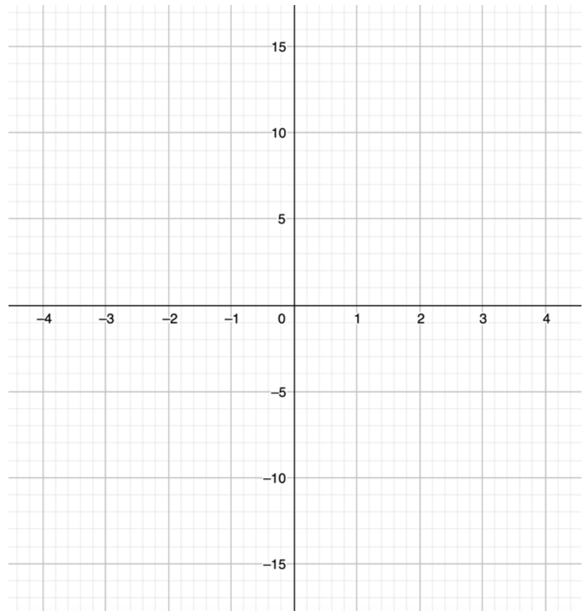
Section 3.8 Slope as a Ratio

Practice Problems 3.8

For Problem 1 and 2, follow the instructions given to solve the problem.

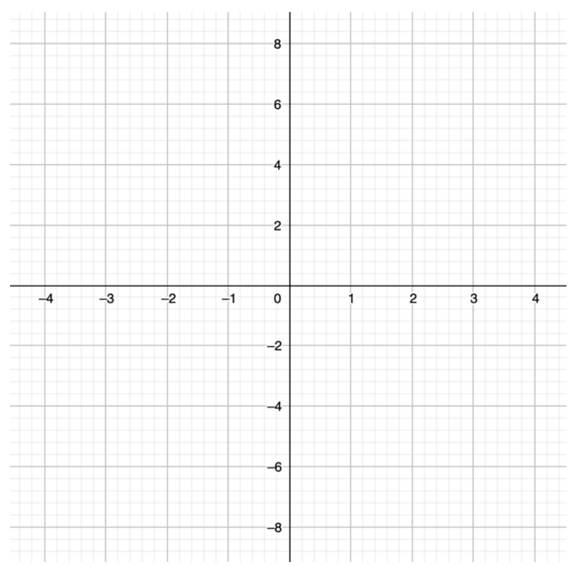
1. Complete the extended table for $y = 4x$ and draw slope triangles for the first four points on the graph. Calculate the slope using $\frac{\text{rise}}{\text{run}}$.

x	y
-4	
-3	
-2	
-1	
0	0
1	4
2	8
3	12
4	16



2. Complete the table for $y = -2x + 1$ and draw the graph. On the graph, draw the slope triangles between each point and calculate the slope using $\frac{\text{rise}}{\text{run}}$.

x	y
-3	
-2	
-1	
0	
1	
2	
3	



For Problem 3-6, use the formula $m = \frac{y_2 - y_1}{x_2 - y_1}$ to find the slope between the two points on each line.

3. $(4, 8)$ and $(2, 6)$

4. $(0, 6)$ and $(-1, -8)$

5. $(1, 7)$ and $(8, 15)$

6. $(0, 0)$ and $(3, 7)$

For Problem 7, use the given information to solve the problem.

Destiny used the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$ to find the slope of a line with two points $(4, 4)$ and $(8, 8)$. She then drew the graph with a slope triangle and counted $\frac{\text{rise}}{\text{run}}$. She got two different solutions.

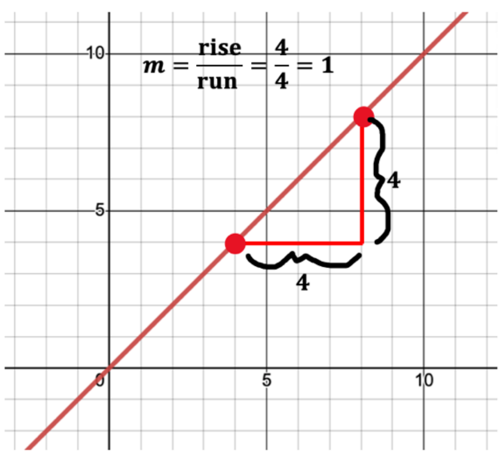
7. Which solution is correct? Where did Destiny's math go wrong?

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{4 - 4}{8 - 8}$$

$$m = \frac{0}{0}$$

$$m = 0$$



For Problem 8-11, tell whether the lines that contain the two points given are parallel or not. (If lines are parallel in a plane, they never meet or cross, they are equidistant from each other at all points and have the same slope.)

8. $(2, 4)$ and $(8, 10)$
   $(-1, -2)$ and $(7, 9)$

9. $(4, -2)$ and $(7, 11)$
   $(1, 9)$ and $(4, -4)$

10. $(1, 1)$ and $(5, 9)$
    $(-3, 4)$ and $(1, 12)$

11. $(0, 2)$ and $(-4, 1)$
    $(3, 4)$ and $(7, 5)$

For Problem 12 and 13, tell whether the line given is vertical (no slope) or horizontal ($\text{slope} = 0$) given two points on the line.

12. $(7, 2)$ and $(10, 2)$

13. $(-9, 14)$ and $(-9, -3)$

For Problem 14-20, solve the word problem given.

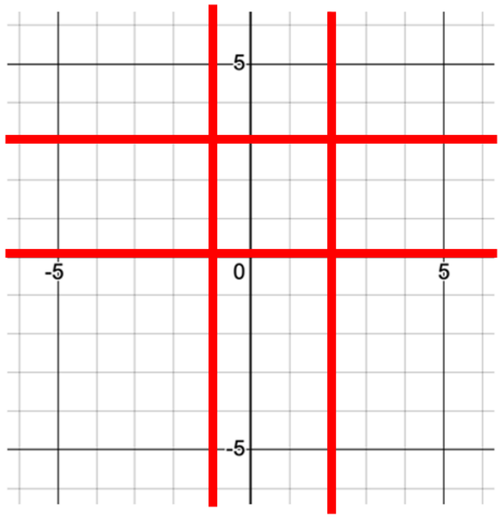
14. If lines are perpendicular, they meet at $90°$ right angles that look like Ls; their slopes are opposite reciprocals, meaning the slopes are m and $-\frac{1}{m}$. Is the line through the points $(4, 3)$ and $(-2, 8)$ perpendicular to the line through the points $(3, -2)$ and $(8, 4)$?

15. One line has a slope of $\frac{3}{4}$. Another line goes through the points $(5, 9)$ and $(-2, 7)$. Are the lines parallel, perpendicular, or neither?

16. Kingston thinks the slope-intercept equation for the standard form equation $2x + 3y = 6$ is $y = \frac{2}{3}x + 2$. What error did Kingston make?

17. What is the slope of $ax + by = c$?

18. Write four equations that form the quadrilateral on the graph given.



19. What is the slope of the equation $3 - y = x + 4$?

20. Write the equation $y = \frac{1}{4}x - 6$ in standard form.

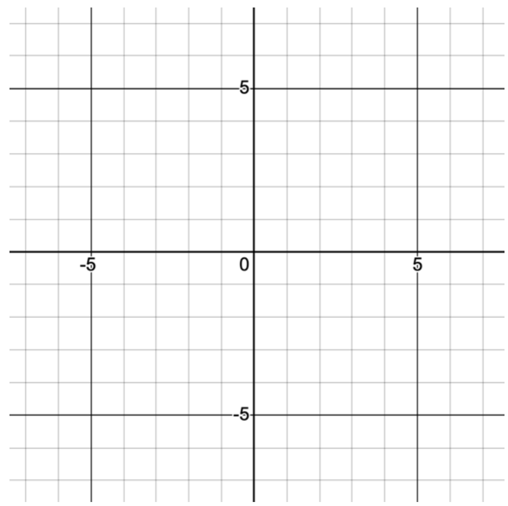
Section 3.9 Direction and Steepness of Slope

Practice Problems 3.9

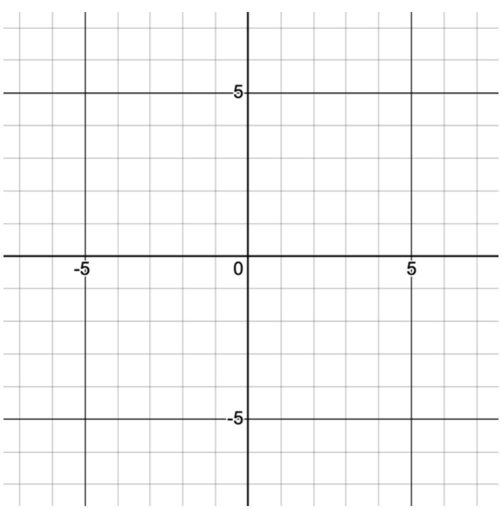
For Problem 1-3, solve the problem given.

1. If you are walking on flat ground, you are walking on a line with 0 slope; there is zero incline. You know that a hill with a slope of 2 is steeper than a hill with a slope of $\frac{1}{2}$. The two equations $y = 2x$ and $y = \frac{1}{2}x$ have the same slopes as $y = 2x + 3$ and $y = \frac{1}{2}x + 3$. How would they differ if you graphed them?

2. Graph the two equations $y = 2x$ and $y = \frac{1}{2}x$ using a table. Now, draw what you think the line $y = x$ with a slope of 1 would look like.



3. Draw the line $x = 3$. What do think the slope of $x = 3$ is?



For Problem 4-8, by looking at the slope, tell whether the line is increasing from left to right or decreasing from left to right.

4. $y = -3x + 18$

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

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

7. $y = 7x - 9$

8. $x = 3$

For Problem 9-20, solve the word problem given.

9. If a line is increasing from left to right, does it have a positive slope or a negative slope?

10. If a line has a negative slope, is it increasing from left to right or decreasing?

11. A 140-pound person burns 550 calories per hour running. Write an equation to show how many calories (y) a 140-pound person burns in x hours.

12. What is the slope (rate of change) of the line in the equation from Problem 11 and what does it represent?

13. What is the y-intercept in the equation from Problem 11 and 12 and what does it represent?

14. A 140-pound person bikes for several hours (b) and burns 600 calories per hour. The same person then swims for several hours (s) and burns 430 calories per hour. The total calories burned is 2,490 calories. Write the equation that represents this situation.

15. If the total calories burned is 3,040, how would that change the equation?

16. Students wash cars to raise money for their school. Each car (c) costs \$5 to wash and each van (v) costs \$8 to wash. If the group raises \$560, write the equation that represents this situation.

17. If 16 cars were washed during the car wash in Problem 16, how many vans were washed?

18. Which slope is the steepest?

$m = \frac{1}{2}$ $\quad m = -\frac{1}{2}$ $\quad m = 4$

19. Which slope is the least slope?

$m = \frac{1}{2}$ $\quad m = -\frac{1}{2}$ $\quad m = 4$

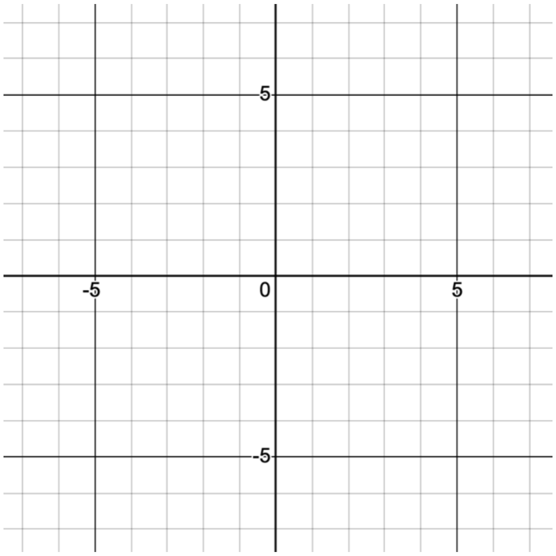
20. Suppose you buy turkey by the pound (t) for \$6.29 per pound and ham by the pound (h) for \$5.99 per pound. Write an equation for the total amount of meats you can buy for \$24.99.

Section 3.10 Comparing Slope and y-intercept

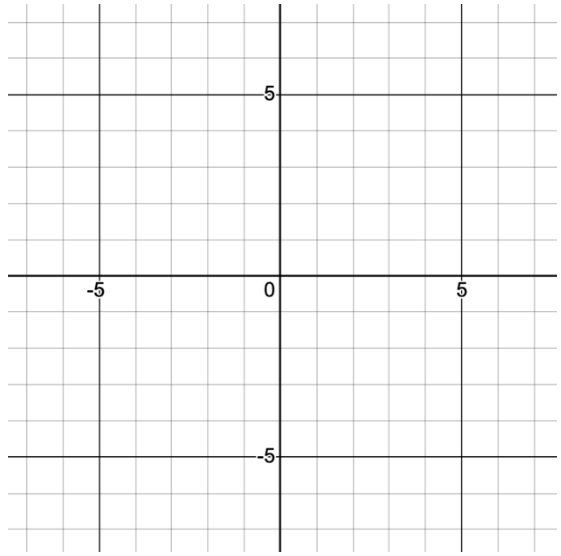
Practice Problems 3.10

For Problem 1-4, find the slope and y-intercept and graph the line with the equation given.

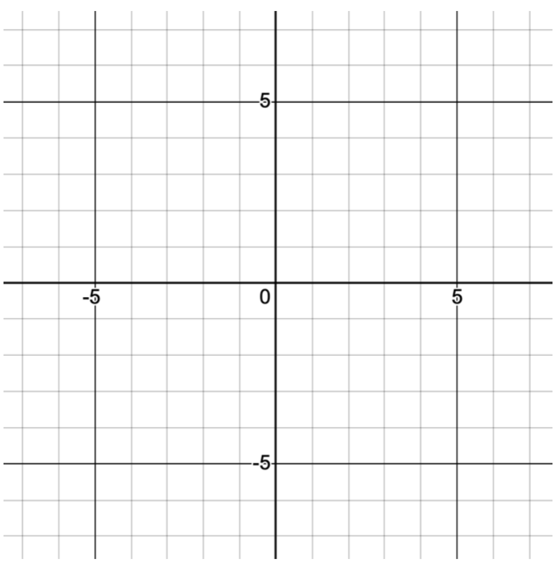
1. $y = 2x + 4$



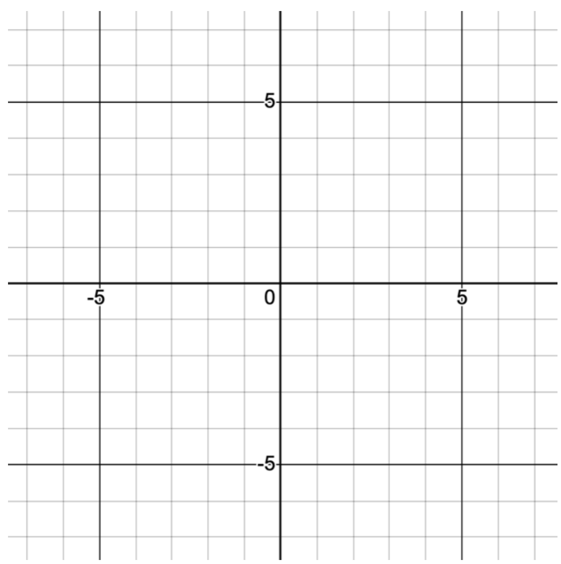
2. $y = \frac{1}{3}x - 2$



3. $y = \frac{3}{5}x + 1.5$



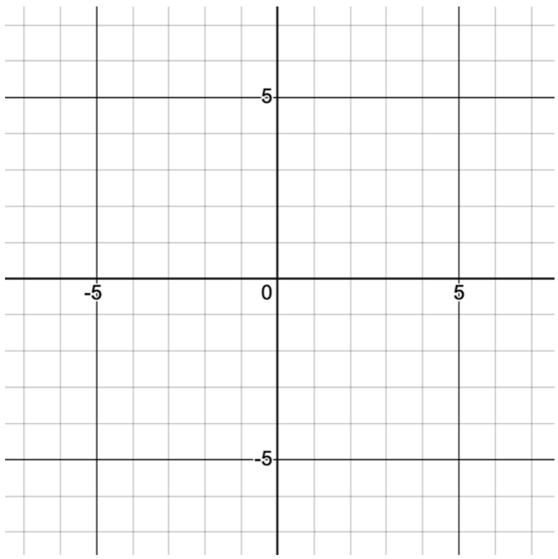
4. $y = -3x + 5$



For Problem 5 and 6, write the slope-intercept equation and the graph the line with the slope and y-intercept given.

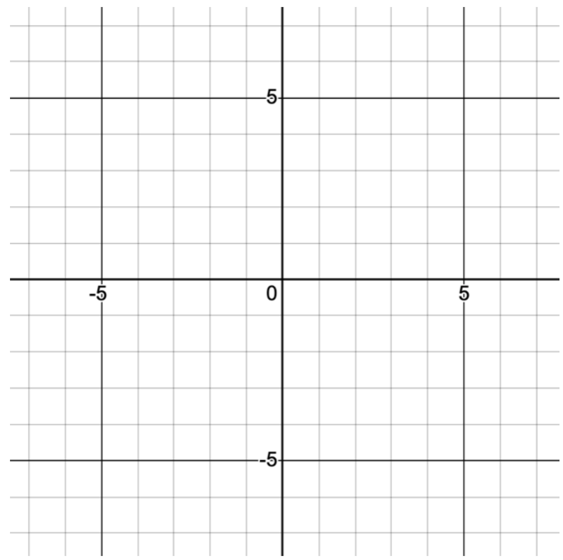
5. $m = 1$

$b = -6$



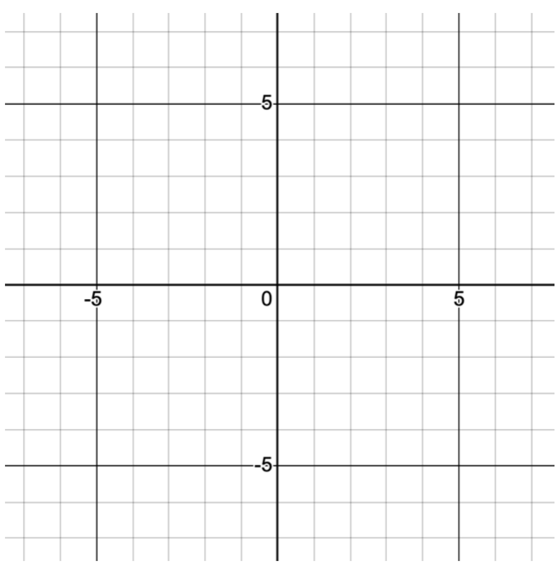
6. $m = -\frac{1}{2}$

$b = -\frac{1}{2}$

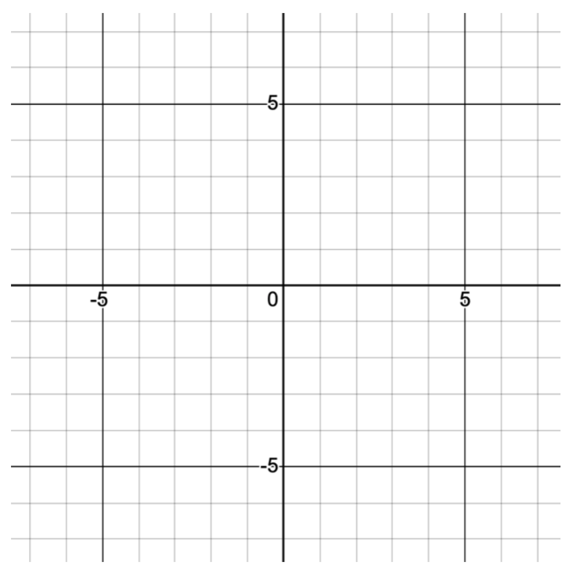


For Problem 7 and 8, use the graph/information to solve the problem given.

7. Graph a line with no slope that has an x-intercept of $\frac{2}{3}$.



8. Where do the two lines $x = 0$ and $y = 0$ cross each other?



For Problem 9-12, solve the word problem given.

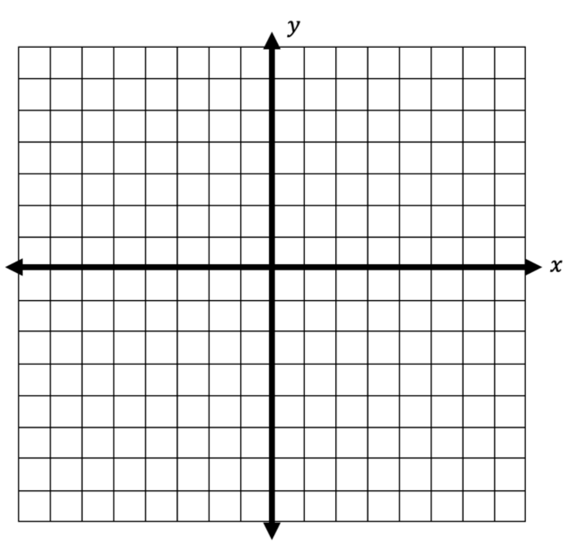
9. At what point do the lines $x = -4$ and $y = 6$ cross?

10. If $b = 5$ and $m = \frac{1}{2}$ for a line, is the line increasing from left to right or decreasing?

11. If $b = -3$ and $m = \frac{1}{2}$ for a line, is the line increasing from left to right or decreasing?

12. If $b = 2$ and $m = \frac{1}{4}$ for a line, what is the slope of the line perpendicular to it through the same point?

For Problem 13-15, use colored pencils to graph the information given below to the left.



13. Graph the line $y = 3x + 5$ using the slope and y-intercept in one color.

14. Graph the line $y = -\frac{1}{2}x + 2$ using the slope and y-intercept in a second color.

15. Graph the line $2x - 2y = 8$ by first finding the slope and y-intercept in a third color.

For Problem 16 and 17, solve the word problem given.

16. Does $x + y = 8$ have a positive or negative slope?

17. In the equation $4x + 2y = 10$, is the line increasing or decreasing from left to right?

For Problem 18-20, match the equation on the left given to its description on the right given.

18.	$x = -6$	a)	Vertical Line
19.	$x + 2y = 8$	b)	Horizontal Line
20.	$y = \frac{1}{2}$	c)	Diagonal Line

Section 3.11 Writing an Equation in Standard Form

Practice Problems 3.11

For Problem 1-4, convert the standard form equation given to slope-intercept form.

1. $3x + 4y = -10$

2. $2x + 4y = 8$

3. $4y = -100$

4. $20x + 14y = -2$

For Problem 5 and 6, solve the word problem given.

5. Convert $y = mx + b$ to standard form. What are A, B, and C?

6. How would you simplify $-\frac{5}{4}x = 20$ in order to graph it?

For Problem 7-9, using the given information, convert the slope-intercept form equation to standard form.

7. $y = 2x - 8.4$

8. $y = -\frac{1}{2}x + 11$

9. $y = -3x - 9$

For Problem 10-12, convert the Celsius temperature given to Fahrenheit.

10. 60°C

11. 45°C

12. 15°C

For Problem 13-15, convert the Fahrenheit temperature given to Celsius.

13. 59°F

14. 68°F

15. 104°F

For Problem 16-20, identify A, B, and C of the standard form of the equation given. (Note: A, B, and C cannot be fractions and A must be positive.)

16. $3x - 8y = 5$

17. $-6x + 7y = 27$

18. $2x = 20$

19. $5y = -10$

20. $-4.2x + 0.9y = 10.3$

Section 3.12 Using Slope and Intercept to Find an Equation

Practice Problems 3.12

For Problem 1-4, find the standard form equation of the line given a point on the line and the slope of the line.

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

2. $m = 5; (-6, -8)$

3. $m = -3.1; (7, -2)$

4. $m = 1; (1, 1)$

For Problem 5-7, find the standard form equation of the line given the slope and the x-intercept of the line.

5. $m = -4$; x-intercept: -5

6. $m = \frac{4}{5}$; x-intercept: 4

7. $m = 9$; x-intercept: 9

For Problem 8-12, find the standard form equation of the line given the slope and y-intercept of the line.

8. $m = 14$; y-intercept: 2

9. $m = 3$; y-intercept: 6

10. $m = -\frac{1}{3}$; y-intercept: -3

11. $m = 4$; y-intercept: $\frac{1}{4}$

12. $m = -2$; y-intercept: 0

For Problem 13-20, solve the word problem given.

13. Is $(2, -3)$ a point on the line $y = x - 1$?

14. Is $(4, 0)$ a point on the line $3x + 2y = 12$?

15. Is $(-1, -1)$ a point on the line $2x - y = -5$?

16. Show that $4x + 3y = -10$ is parallel to $8x + 6y = 4$.

17. Show that $2x + y = 8$ is perpendicular to $y = \frac{1}{2}x + 1$.

18. Which is a steeper line and why, the data in Table 1 or Table 2?

Table 1	
x	***y***
2	4
3	7
4	10
5	13

Table 2	
x	***y***
−2	5
−1	10
0	15
1	20

19. If $\frac{y-4}{x-1} = 5$ is the slope of a line, what is one point on the line?

20. The point-slope form of the equation $\frac{y-4}{x-1} = 5$ is $y - 4 = 5(x - 1)$. Use the distributive property to write $y - 4 = 5(x - 1)$ in standard form.

Section 3.13 Using Point-Slope Form to Find an Equation

Practice Problems 3.13

For Problem 1 and 2, use the given information to solve the problem.

Jacob used the slope-intercept method to solve the problem. Andrew used the point-slope method to solve the same problem.

Given the points $(-1, 0)$ *and* $(1, 2)$, *find the standard form equation of the line that goes through both points.*

Both Jacob and Andrew got the slope first, using the method below. Their further steps are shown to the sides.

$$m = \frac{2-0}{1-(-1)}$$

$$m = \frac{2}{1+(+1)}$$

$$m = \frac{2}{2}$$

$$m = 1$$

Jacob

$$y = mx + b$$

Use the second point for (x, y)

$$2 = 1(1) + b$$

$$2 = 2 + b$$

$$-2 \quad -2$$

$$0 = b$$

$$y = 1x + 0$$

$$-1x \quad -1x$$

$$-1(-x + y) = 0$$

$$x + -y = 0$$

$$x - y = 0$$

Andrew

$$y - y_1 = m(x - x_1)$$

Use the first point for (x, y)

$$y - 0 = 1(x - (-1))$$

$$y = 1(x + (+1))$$

$$y = x + 1$$

$$-x \quad -x$$

$$-x + y = 1$$

$$-1(-x + y) = 1(-1)$$

$$-1(-x) + -1(y) = -1$$

$$x + -y = -1$$

$$x - y = -1$$

1. Which of Jacob and Andrew has the correct solutions and why?

2. How could you use one of the two points given to see if either Jacob or Andrew has the correct solution?

For Problem 3-5, use the given information to solve the problem.

3. Sebastian was given two points $(4, -2)$ and $(1, -8)$ on the line of an equation. He found the slope using the method shown below. Is Sebastian correct?

$$m = \frac{-2 - (-8)}{4 - 1}$$

$$m = \frac{-2 + (+8)}{3}$$

$$m = \frac{6}{3}$$

$$m = 2$$

4. Sebastian then used the slope-intercept form to find the equation. Is Sebastian correct?

$$y = mx + b$$

$$y = 2x + 10$$

$$-2x = -2x$$

$$-2x + y = 10$$

$$-1(-2 + y) = 10(-1)$$

$$-1(-2x) + -1(y) = -10$$

$$2x + -y = -10$$

$$2x - y = -10$$

5. If the equation for Problem 4 is correct, substitute one of the two points from Problem 3 into the equation and simplify it to show that it is a solution. If it is not a solution, find the correct equation, substitute in one of the points, and then solve the equation.

For Problem 6 and 7, use the given information to solve the problem.
The slope of an equation is 6 and $(3, -4)$ is a point on the line.

6. Use the point-slope form to find the equation of the line in standard form.

7. Substitute the point $(3, -4)$ into the equation to show that it is a solution. If it does not work, find your mistake, then write the correct equation for the line in Problem 6.

For Problem 8-12, use the given table to solve the problem.

x	y
-1	4
0	6
1	8
2	10

8. Use the slope and the first point from the table to write the equation in point-slope form.

9. Write the equation from Problem 8 in standard form.

10. Use the slope and last point on the table to write the equation in point-slope form.

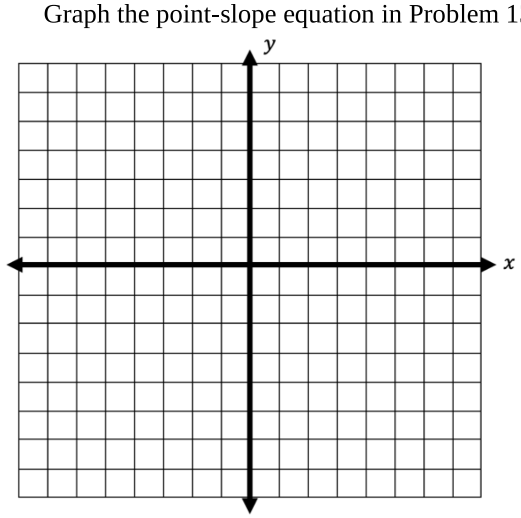
11. Write the equation from Problem 10 in standard form.

12. What do you notice about the equation in Problem 9 and Problem 11 and why do you think this is so?

For Problem 13 and 14, given the point-slope equation $y - 3 = (x - 3)$, solve the problem.

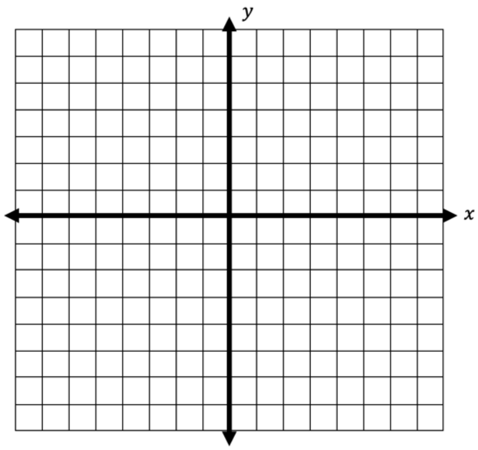
13. What is the slope and what is one point on the line?

14. Graph the point-slope equation in Problem 13.

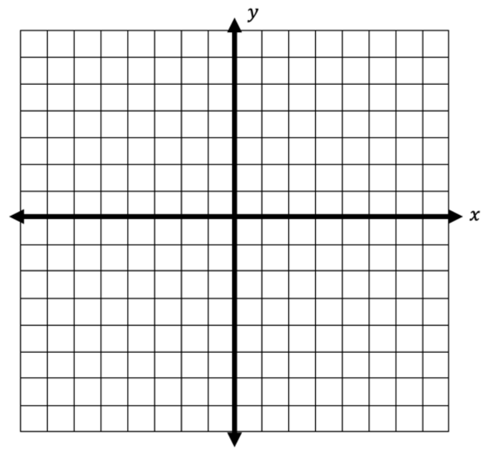


For Problem 15-17, graph the equation given in point-slope form.

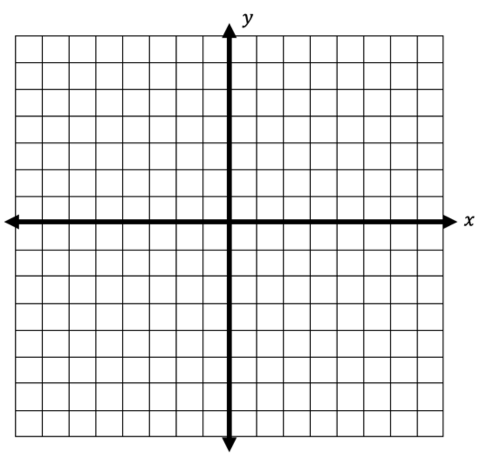
15. $y - 3 = 2(x - 5)$



16. $y + 2 = \frac{1}{2}(x - 3)$



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



For Problem 18-20, given two points on a line that passes through them, find the slope of the line and use one point to write the point-slope form of the equation, then convert your equation to standard form.

18. $(1, 0)$ and $(2, 1)$

19. $(2, 4)$ and $(3, -5)$

20. $(2, 7)$ and $(3, 4)$

Section 3.14 Module Review

For Problem 1-9, solve the word problem given.

1. Use the math triangle to find two other equations for $C = \pi d$ (Circumference $=$ pi $\times$ diameter).

2. Use $\pi = 3.14$ to find the circumference of a circle with a diameter of 2.1 inches.

3. Find the diameter of a circle if the circumference of the circle is 15.7 inches.

4. Show that $\pi = 3.14$ for a circle with a circumference of 6.594 cm. and a diameter of 2.1 cm.

5. If your average step is 2.5 feet, write a formula for how far you would travel in feet after a given number of steps.

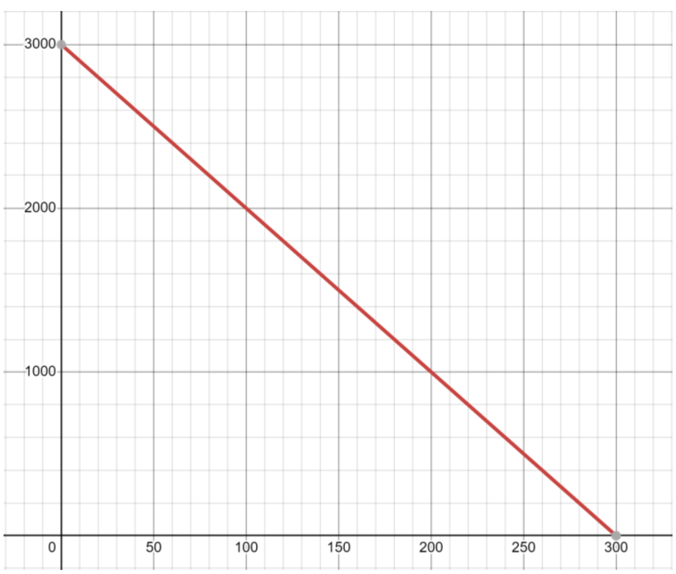
6. Using the information in Problem 5, find the number of steps you would have taken given you had already walked 110 feet.

7. Suppose your friend walks approximately 2.9 feet per step. (Your average is 2.5 feet per step.) If your friend starts walking when you are 10 feet ahead, you will both be at the same place after 25 steps. How many feet is that?

8. Your friend from Problem 7 travels 298.7 feet. How many steps has your friend taken?

9. One night, Raphine walks with a pedometer and counts 7,650 steps in exactly one hour. If he walked a step length of 2.5 feet, what is his walking rate in feet per hour?

For Problem 10-18, use the given information and graph to solve the problem.
The graph shows the altitude of a drone coming in for a landing. The x-axis represents the time (in seconds) and the y-axis represents the altitude (in feet).



10. What is the rate of change (slope) and what does it mean?

11. Why is the slope negative?

12. What does the point $(120, 1{,}800)$ represent?

13. What is the y-intercept and what does it represent?

14. What is the x-intercept and what does it represent?

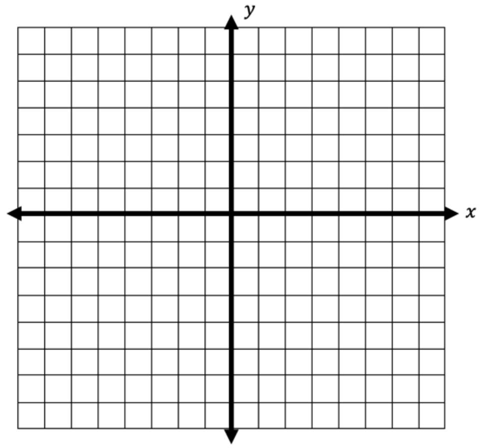
15. Write the slope-intercept form of the equation that models the drone landing.

16. Write the equation that models the drone landing in standard form.

17. Use the slope-intercept form of the equation to find the altitude of the drone at 150 seconds into the descent.

18. When the drone has descended to $1{,}000$ feet above the ground, how many seconds are left before it lands?

19. Given a point $(2, 4)$ and a slope of -2, find the equation of the line and a draw the graph of the equation.



20. Given two points of the equation, $(-4, 10)$ and $(6, 5)$, find the equation using:

a) Point-Slope Form

b) Slope-Intercept Form

c) Standard Form

Section 3.15 Module Test

For Problem 1-4, use the math triangle to solve the problem.

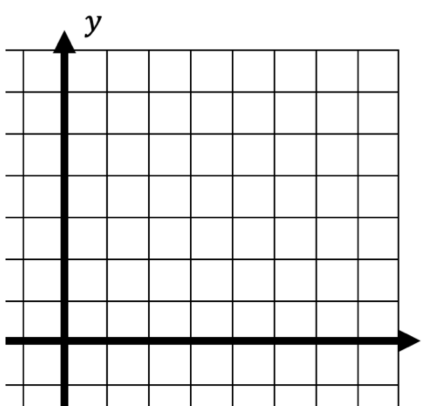
1. Find two other equations for $d = rt$.

For Problem 2-4, complete the given table using the equations from Problem 1.

Time (Hours)	**Rate (Miles Per Hour)**	**Distance (Miles)**	**Formula Used**
2	65	4)	
2)	65	260	
20	3)	1,000	

For Problem 5-9, use the given information and graph to solve the problem.

Your father leaves home with 6 gallons of gas in your car. After driving 100 miles, he is down to 2 gallons. Let $x =$ miles and $y =$ gallons of gas in your tank.



5. Write an equation and graph the situation.

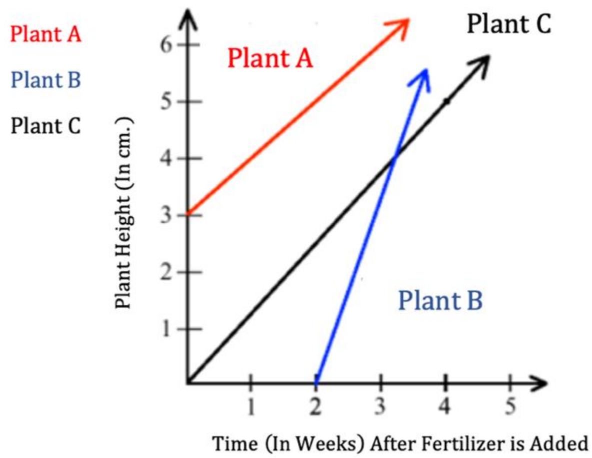
6. What is your father's average rate (miles per gallon)?

7. What is the slope and what does that ratio represent?

8. After how many miles will your father be out of gas?

9. At this rate, if your father travels 400 miles, how many gallons of gas will he use?

For Problem 10-18, use the given information and graph to solve the problem.
The graph shows three plants in Biology class that were grown using three different fertilizers. They had been planted previously. The x-axis represents the weeks after the fertilizer was added and the y-axis represents the growth in centimeters after fertilization.



10. Which plant was already 3 cm. tall the week the fertilizer was added?

11. Which plant began growing the week the fertilizer was added?

12. Which plant did not start growing until 2 weeks after the fertilizer was added?

13. Which plant had the fastest rate of growth? How do you know?

14. What is the rate of change (slope) of Plant A? What does it mean?

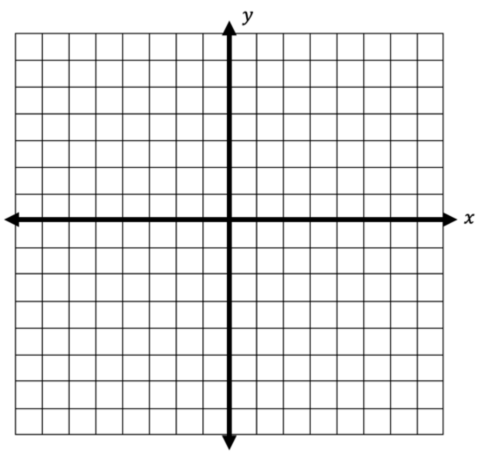
15. What is the equation for Plant A?

16. The lines for Plant B and Plant C cross after 3 weeks. What does this intersection mean?

17. Will the graphs continue indefinitely?

18. Why is the graph only in Quadrant I? Why are there no negative numbers on the graph?

19. Given the point $(5, 2)$ and a slope of $-\frac{1}{2}$, find and draw the graph of the equation.



20. Given the two points $(-7, 1)$ and $(7, 8)$, find the standard form equation of the line. Find the slope and the slope-intercept equations first.