<table>
<thead>
<tr>
<th>Date</th>
<th>Homework</th>
<th>Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>M Jan 3</td>
<td>p209 #1,3-13 odd, 14-17,24,36</td>
<td>SwBat identify and plot points in a coordinate plane</td>
</tr>
<tr>
<td>T Jan 4</td>
<td>p219 #1-10,11-21 odd, 23-25</td>
<td>SwBat graph linear equations on a coordinate plane</td>
</tr>
<tr>
<td>W Jan 5</td>
<td>p219 #26-29,35-37,48-55</td>
<td>SwBat graph linear equations on a coordinate plane</td>
</tr>
<tr>
<td>R Jan 6</td>
<td>p229 #4-10, 16-21,28-33</td>
<td>SwBat graph a linear equation using intercepts</td>
</tr>
<tr>
<td>F Jan 7</td>
<td>p229 #37,45,46,51-56</td>
<td>SwBat graph a linear equation using intercepts</td>
</tr>
<tr>
<td>M Jan 10</td>
<td>p232 #1-13 (in class)</td>
<td>SwBat graph equations and points</td>
</tr>
<tr>
<td>T Jan 11</td>
<td>Quiz 4A (50 points) Sections 4.1,4.2,4.3</td>
<td>SwBat graph equations and points</td>
</tr>
<tr>
<td>W Jan 12</td>
<td>p239 #1-18,42-56</td>
<td>SwBat find the slope of a line and interpret slope as a rate of change</td>
</tr>
<tr>
<td>R Jan 13</td>
<td>p240 #19-23,31-33,36-40,57-62</td>
<td>SwBat find the slope of a line and interpret slope as a rate of change</td>
</tr>
<tr>
<td>F Jan 14</td>
<td>p247 #1-13,17-24,30-33,40-43,46-56 even</td>
<td>SwBat graph linear equations using slope intercept form</td>
</tr>
<tr>
<td>M Jan 17</td>
<td>NO SCHOOL</td>
<td></td>
</tr>
<tr>
<td>T Jan 18</td>
<td>p257# 3-9odd,11-22even,23-27,40-43,48-62even</td>
<td>SwBat write and graph direct variation equations</td>
</tr>
<tr>
<td>W Jan 19</td>
<td>p941 #27-52 all (in class)</td>
<td>SwBat graph lines using slope intercept form and direct variation.</td>
</tr>
<tr>
<td>R Jan 20</td>
<td>Quiz 4B (50 points) Sections 4.4,4.5,4.6</td>
<td>SwBat graph lines using slope intercept form and direct variation.</td>
</tr>
<tr>
<td>F Jan 21</td>
<td>p275 #1-18,21-23 (in class)</td>
<td>SwBat graph equations and points using a variety of methods.</td>
</tr>
<tr>
<td>M Jan 24</td>
<td>Chapter 4 Test (100 Points)</td>
<td>SwBat graph equations and points using a variety of methods.</td>
</tr>
</tbody>
</table>
4.1 Plot Points in a Coordinate Plane

Goal - Identify and plot points in a coordinate plane.

Your Notes

VOCABULARY

Quadrant

Example 1 Name points in a coordinate plane

Give the coordinates of the point.

a. A  b. B

Solution

a. Point A is ___ units to the _____ of the origin and ___ units ____.
   The x-coordinate is ____.
   The y-coordinate is ____.
   The coordinates are ________.

b. Point B is ___ units to the _____ of the origin and ___ units ____.
   The x-coordinate is ____.
   The y-coordinate is ____.
   The coordinates are ________.

✔ Checkpoint Complete the following exercise.

1. Use the coordinate plane in Example 1 to give the coordinates of points C, D, and E.
**Example 2**  *Plot points in a coordinate plane*

Plot the point in a coordinate plane. Describe the location of the point.

a. $A(0, 3)$  

b. $B(1, -2)$  

c. $C(-3, -4)$

**Solution**

a. Begin at the _______.  
   Move ___ units ___.  
   Point A is on the _______.

b. Begin at the _______.  
   Move ___ unit to the _______.  
   Move ___ units _______.  
   Point B is in Quadrant ____.

c. Begin at the _______.  
   Move ___ units to the _____.  
   Move ___ units _______.  
   Point C is in Quadrant ____.

**Checkpoint**  
Plot the point in a coordinate plane. Describe the location of the point.

2. $A(-4, -4)$  

3. $B(2, 0)$
Example 3  Graph a function

Graph the function \( y = x + 1 \) with domain \(-2, -1, 0, 1, 2\). Then identify the range of the function.

Solution
Step 1 Make a table.

\[
\begin{array}{c|c}
 x & y = x + 1 \\
-2 & y = -2 + 1 = ____ \\
1 & y = -1 + 1 = ____ \\
0 & y = 0 + 1 = ____ \\
1 & y = 1 + 1 = ____ \\
2 & y = 2 + 1 = ____ \\
\end{array}
\]

Step 2 List the ordered pairs:

\((-2, ____), (-1, ____), (0, ____), (1, ____), (2, ____).\)

Then graph the function.

Step 3 Identify the range: ____________.

Checkpoint Complete the following exercise.

4. Graph the function \( y = -\frac{1}{2}x + 3 \) with domain \(-4, -2, 0, 2, \) and 4. Then identify the range.
Mammals

Biology Cows, dogs, humans, and lions are all mammals. Mammals are different from most other types of animals in five ways.

- Mammals have hair at some time in their lives.
- Mammals are warm-blooded. This means that the body temperatures of mammals are about the same all of the time, even though the temperature of their environment changes.
- Mammals have brains that are larger and better developed than other animals.
- Mammals train and protect their young more than other animals.
- Mammals nurse their babies.

Before a mammal can nurse its baby, the mother carries its unborn young while it develops from conception to birth. This is called the gestation period. The length of the gestation period differs with the species, and may even vary with individual births of the same animal. The following table shows a mammal, its average gestation period (in days), and the average birth weight (in pounds).

<table>
<thead>
<tr>
<th>Mammal</th>
<th>Cow</th>
<th>Dog</th>
<th>Elephant</th>
<th>Giraffe</th>
<th>Horse</th>
<th>Human</th>
<th>Lion</th>
<th>Mouse</th>
<th>Rabbit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average gestation period (days)</td>
<td>284</td>
<td>61</td>
<td>641</td>
<td>410</td>
<td>337</td>
<td>267</td>
<td>108</td>
<td>19</td>
<td>31</td>
</tr>
<tr>
<td>Average birth weight (pounds)</td>
<td>50</td>
<td>0.5</td>
<td>243</td>
<td>132</td>
<td>50</td>
<td>7.5</td>
<td>3.5</td>
<td>0.0025</td>
<td>0.125</td>
</tr>
</tbody>
</table>

1. Graph the function represented by the table for the average gestation periods and the average birth weights for the nine mammals. Use the horizontal axis to represent the gestation period.

2. What is the heaviest average birth weight shown in the graph? What is the lightest?

3. Describe the relationship between the average gestation period and the average birth weight.
Graph Linear Equations

Goal
• Graph linear equations in a coordinate plane.

VOCABULARY
Solution of an equation in two variables

Graph of an equation in two variables

Linear equation

Standard form of a linear equation

Linear function

Example 1
Graph an equation

Graph the equation \( x + y = 4 \).

Solution
Step 1 Solve the equation for \( y \).
\[
x + y = 4
\]
\[
y = \underline{\quad}
\]
Step 2 Make a table.
Choose a few values for \( x \) and find the values for \( y \).

<table>
<thead>
<tr>
<th>( x )</th>
<th>(-2)</th>
<th>(-1)</th>
<th>(0)</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Use convenient values for \( x \) when making a table. These should include a combination of negative values, zero, and positive values.
Your Notes

Step 3 Plot the points.

Step 4 Connect the points by drawing a line through them. Use arrows to indicate that the graph goes on without end.

Example 2 Graph \( y = b \) and \( x = a \)

Graph (a) \( y = -3 \) and (b) \( x = 2 \).

Solution

a. Regardless of the value of \( x \), the value of \( y \) is always ______. The graph of \( y = -3 \) is a ______ line 3 units ______ the \( x \)-axis.

b. Regardless of the value of \( y \), the value of \( x \) is always ______. The graph of \( x = 2 \) is a ______ line 2 units to the ______ of the \( y \)-axis.
**Checkpoint** Graph the equation.

1. $y = 2x - 1$
   ![Graph of $y = 2x - 1$](image)

2. $x = 0.5$
   ![Graph of $x = 0.5$](image)

3. $y = -4x + 1$
   ![Graph of $y = -4x + 1$](image)

4. $y = -1.5$
   ![Graph of $y = -1.5$](image)

**EQUATIONS OF HORIZONTAL AND VERTICAL LINES**

1. The graph of $y = b$ is a ________ line.
2. The line of graph $y = b$ passes through the point _____.
3. The graph of $x = a$ is a ________ line.
4. The line of graph $x = a$ passes through the point _____.
Example 3  **Graph a linear function**

Graph the function \( y = 2x + 2 \) with domain \( x \geq 0 \). Then identify the range of the function.

**Solution**

Step 1 Make a _____.

<table>
<thead>
<tr>
<th>( x )</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Step 2 Plot the _______.

Step 3 Connect the points with a ____ because the domain is __________.

Step 4 Identify the range. From the graph, you can see that all points have a y-coordinate of __________, so the range of the function is _____.

**Checkpoint** Complete the following exercise.

5. Graph the function \( y = -x + 4 \) with domain \( x \geq 0 \). Then identify the range of the function.

**Homework**
Investigating Algebra Activity: Linear Equations

For use before Lesson 4.2

Materials: ruler, graph paper, pencil

QUESTION What can you observe about the graph of the ordered pairs that are solutions to a linear equation?

An example of a linear equation in \( x \) and \( y \) is \( 3x - 2y = 8 \). A solution of a linear equation is an ordered pair \((x, y)\) that makes the equation true. For example, \((4, 2)\) is a solution of the equation \( 3x - 2y = 8 \) because \( 3(4) - 2(2) = 12 - 4 = 8 \).

EXPLORE Determine solutions of a linear equation

Given that \((4, 2)\) and \((0, -4)\) are solutions of the equation \( 3x - 2y = 8 \), determine whether each point is also a solution.

a. \(A(6, 5)\)  
   b. \(B(1, 0)\)  
   c. \(C(-5, -8)\)  
   d. \(D(-2, -7)\)

STEP 1 Plot solutions

Plot the given solution \((4, 2)\) and \((0, -4)\) on a coordinate grid. Draw a line through them. This is the graph of the linear equation \( 3x - 2y = 8 \).

STEP 2 Plot points \(A, B, C,\) and \(D\)

Plot points \(A, B, C,\) and \(D\) on the same coordinate grid.

STEP 3 Determine solutions

Look at the graph in Step 2. The points that lie on the same line as the given solutions, points \(A\) and \(D\), are also solutions of the equation \( 3x - 2y = 8 \). Points \(B\) and \(C\) do not lie on the line, so they are not solutions of the equation.

DRAW CONCLUSIONS Plot the solution points \(A\) and \(B\) and draw the line that connects them. Then plot the given points \(C, D,\) and \(E\) and use the graph to determine which points are also solutions to the equation. Verify your answers by substituting in the equation.

1. Equation: \(2x + y = 5\)
   Solutions: \(A(2, 1), B(-1, 7)\)
   Points: \(C(5, -5), D(3, -4), E(0, 5)\)

2. Equation: \(-x + 2y = -6\)
   Solutions: \(A(0, -3), B(6, 0)\)
   Points: \(C(2, -2), D(-4, -4), E(-8, -8)\)
4.3 Graph Using Intercepts

**Goal**  
- Graph a linear equation using intercepts.

**VOCABULARY**

- x-intercept
- y-intercept

---

**Example 1**  
*Find the intercepts of the graph of an equation*

Find the x-intercept and the y-intercept of the graph of $8x - 2y = 32$.

**Solution**

1. Substitute ___ for $y$ and solve for $x$.
   
   $8x - 2y = 32$  
   
   $8x - 2(\_\_\_) = 32$  
   
   $x = \text{___} = \_\_\_\_\_$  
   
   Write original equation.

2. Substitute ___ for $x$ and solve for $y$.
   
   $8x - 2y = 32$  
   
   $8(\_\_\_) - 2y = 32$  
   
   $y = \text{___} = \text{_____}$  
   
   Solve for ___.

The x-intercept is ___. The y-intercept is _____.

---

80 Lesson 4.3 • Algebra 1 Notetaking Guide  
Copyright © McDougal Littell/Houghton Mifflin Company.
**Your Notes**

**Checkpoint** Find the x-intercept and y-intercept of the graph of the equation.

1. \(2x + 3y = 18\)  
2. \(-12x - 4y = 36\)

---

**Example 2** *Use intercepts to graph an equation*

Graph \(3.5x + 2y = 14\). Label the points where the line crosses the axis.

**Solution**

**Step 1** Find the \___________.

\[
\begin{align*}
3.5x + 2y &= 14 & 3.5x + 2y &= 14 \\
3.5x + 2(\_\_) &= 14 & 3.5(\_\_) + 2y &= 14 \\
x &= \_\_\_ = \_\_ & y &= \_\_\_ = \_\_ \\
&
\end{align*}
\]

**Step 2** Plot the points that correspond to the intercepts.

The x-intercept is \_\_, so plot the point \_______.

The y-intercept is \_\_, so plot the point \_______.

**Step 3** \__________ the points by drawing a line through them.

---

**CHECK**

You can check the graph of the equation by using a third point. When \(x = 2\), \(y = \_\_\_\_), so the ordered pair \_________ is a third solution of the equation. You can see that \________ lies on the graph, so the graph is correct.
Example 3  Use a graph to find the intercepts

Identify the $x$-intercept and $y$-intercept of the graph.

Solution

To find the $x$-intercept, look to see where the graph crosses the ________. The $x$-intercept is _____. To find the $y$-intercept, look to see where the graph crosses the ________. The $y$-intercept is _____.

Checkpoint  Complete the following exercises.

3. Graph $2x - 7y = 14$. Label the points where the line crosses the axes.
4.4 Find Slope and Rate of Change

**Goal**
- Find the slope of a line and interpret slope as a rate of change.

**VOCABULARY**

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slope</td>
<td>_______</td>
</tr>
<tr>
<td>Rate of change</td>
<td>_______</td>
</tr>
</tbody>
</table>

**FINDING THE SLOPE OF A LINE**

<table>
<thead>
<tr>
<th>Words</th>
<th>Symbols</th>
</tr>
</thead>
<tbody>
<tr>
<td>The slope of the nonvertical line passing through the two points $(x_1, y_1)$ and $(x_2, y_2)$ is the ratio of the ____ (change in $y$) to the ____ (change in $x$).</td>
<td>$m = \frac{y_2 - y_1}{x_2 - x_1}$</td>
</tr>
</tbody>
</table>

slope = \[
\begin{array}{c|c}
\text{rise} & \text{run} \\
\hline
y_2 - y_1 & x_2 - x_1 \\
\end{array}
\] = \[
\begin{array}{c|c}
\text{change in y} & \text{change in x} \\
\end{array}
\]

**Graph**

[Diagram showing a line with labeled points $(x_1, y_1)$ and $(x_2, y_2)$, rise $y_2 - y_1$, run $x_2 - x_1$.]
Example 1   Find a slope

Find the slope of the line shown.

a. Let \((x_1, y_1) = (-1, 2)\) and \((x_2, y_2) = (3, 5)\).

b. Let \((x_1, y_1) = (1, 4)\) and \((x_2, y_2) = (3, -2)\).

\[
\text{Solution}
\]

\[
a. \quad m = \frac{y_2 - y_1}{x_2 - x_1}
\]

\[
= \frac{-2}{-1}
\]

\[
= 2
\]

The line ______ from left to right. The slope is ________.

b. \[
\]

\[
\]

\[
\]

\[
\]

The line ______ from left to right. The slope is ________.

✔ Checkpoint  Find the slope of the line passing through the points.

1. \((-3, -1)\) and \((-2, 1)\)

2. \((-6, 3)\) and \((5, -2)\)
Example 2  Find the slope of a line

Find the slope of the line shown.

a. Let \((x_1, y_1) = (2, 5)\) and \((x_2, y_2) = (-4, 5)\).

b. Let \((x_1, y_1) = (4, -2)\) and \((x_2, y_2) = (4, 3)\).

Solution

a. \[
m = \frac{y_2 - y_1}{x_2 - x_1}
\]
Write formula for slope.

\[
= \frac{5 - \_}{4 - \_}
\]
Substitute.

\[
= \_
\]
Simplify.

The line is \_______. The slope is \_______.

b. \[
m = \frac{y_2 - y_1}{x_2 - x_1}
\]
Write formula for slope.

\[
= \frac{3 - \_}{4 - \_}
\]
Substitute.

\[
= \_
\]
Simplify.

The line is \_______. The slope is \_______.

Checkpoint  Find the slope of the line passing through the points. Then classify the line by its slope.

3. \((1, -2)\) and \((1, 3)\)  
4. \((-3, 7)\) and \((4, 7)\)
Example 3  Find a rate of change

Gas Prices  The table shows the cost of a gallon of gas for a number of days. Find the rate of change with respect to time.

<table>
<thead>
<tr>
<th>Time (days)</th>
<th>Day 1</th>
<th>Day 3</th>
<th>Day 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price/gal ($)</td>
<td>1.99</td>
<td>2.09</td>
<td>2.19</td>
</tr>
</tbody>
</table>

\[
\text{Rate of change} = \frac{\text{change in cost}}{\text{change in time}}
\]

\[
= \frac{2.09 - 1.99}{3 - 1}
\]

\[
= \frac{0.10}{2}
\]

\[
= 0.05
\]

The rate of change in price is _______ per day.

Checkpoint

5. The table shows the change in temperature over time. Find the rate of change in degrees Fahrenheit with respect to time.

<table>
<thead>
<tr>
<th>Temperature (°F)</th>
<th>Time (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>38</td>
<td>0</td>
</tr>
<tr>
<td>43</td>
<td>2</td>
</tr>
<tr>
<td>48</td>
<td>4</td>
</tr>
<tr>
<td>53</td>
<td>6</td>
</tr>
</tbody>
</table>
Minimum Wage

History  The smallest amount of money an employer may legally pay a worker per hour is called a minimum wage. In 1938, President Franklin D. Roosevelt signed the Fair Labor Standards Act. At the time, the act was limited to a few industries and only affected about one-fifth of the labor force. The act established in these industries a minimum wage of 25 cents per hour, banned child labor, and set other standards. Through the years, the act has been amended several times to cover more workers and raise the minimum wage. The minimum wage has increased over the years. For example, the per hour minimum wage was $1.00 in 1956, $2.00 in 1974, $3.10 in 1980, $4.25 in 1991, and $5.15 in 1997. It should be noted that when a state requires a higher minimum wage than the federal standard, the worker is paid the state minimum wage.

In Exercises 1–4, use the graph at the right.

1. Estimate the average rate of change in the minimum wage from 1955 to 1995 in dollars per year.

2. Estimate the average rate of change in the minimum wage from 1990 to 1997 in dollars per year.

3. Which five-year period had the biggest wage increase?

4. Use the graph to estimate the minimum wage in 2000. Compare your estimate with the actual minimum wage in 2000. Why might your estimate be different from the actual wage?

5. The table below shows the value of the minimum wage from 1955 to 2004 in 1996 dollars. Graph the function represented by the table.

Minimum wage (in 1996 Dollars)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>$4.39</td>
<td>$5.77</td>
<td>$5.58</td>
<td>$5.43</td>
<td>$5.39</td>
<td>$5.30</td>
<td>$6.03</td>
<td>$5.97</td>
<td>$6.41</td>
<td>$6.33</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>$6.23</td>
<td>$6.05</td>
<td>$6.58</td>
<td>$7.21</td>
<td>$6.84</td>
<td>$6.47</td>
<td>$6.20</td>
<td>$6.01</td>
<td>$5.65</td>
<td>$6.37</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>$6.12</td>
<td>$6.34</td>
<td>$5.95</td>
<td>$6.38</td>
<td>$6.27</td>
<td>$5.90</td>
<td>$5.78</td>
<td>$5.45</td>
<td>$5.28</td>
<td>$5.06</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>$4.88</td>
<td>$4.80</td>
<td>$4.63</td>
<td>$4.44</td>
<td>$4.24</td>
<td>$4.56</td>
<td>$4.90</td>
<td>$4.75</td>
<td>$4.61</td>
<td>$4.50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>$4.38</td>
<td>$4.75</td>
<td>$5.03</td>
<td>$4.96</td>
<td>$4.85</td>
<td>$4.69</td>
<td>$4.56</td>
<td>$4.49</td>
<td>$4.39</td>
<td>$4.28</td>
</tr>
</tbody>
</table>
4.5 Graph Using Slope-Intercept Form

**Goal**
- Graph linear equations using slope-intercept form.

---

**VOCABULARY**

Slope-intercept form

Parallel

---

**FINDING THE SLOPE AND Y-INTERCEPT OF A LINE**

**Words**

A linear equation of the form \( y = mx + b \) is written in

where ____ is the slope and ____ is the y-intercept of the equation's graph.

**Graph**

![Graph](image)

**Symbols**

\( y = mx + b \)

\( y = 2x + 1 \)
Example 1  Identify slope and y-intercept

Identify the slope and y-intercept of the line with the given equation.

a. \( y = x + 3 \)  
b. \(-2x + y = 5\)

Solution

a. The equation is in the form \( y = \_\_\_\_\_\_\_\_\_x + \_\_\_\_\_\_\_\_\_ \). So, the slope of the line is \( \_\_\_\_\_\_\_\_\_ \), and the y-intercept is \( \_\_\_\_\_\_\_\_\_ \).

b. Rewrite the equation in slope-intercept form by solving for \( y \).

\[
-2x + y = 5
\]

Write original equation.

\[
y = \_\_\_\_\_\_\_\_\_ \]

Subtract \( \_\_\_\_\_\_\_\_\_ \) from each side.

The line has a slope of \( \_\_\_\_\_\_\_\_\_ \) and a y-intercept of \( \_\_\_\_\_\_\_\_\_ \).

Checkpoint  Identify the slope and y-intercept of the line with the given equation.

1. \( y = 4x - 1 \)  
2. \( 4x - 2y = 8 \)

3. \( 4y = 3x + 16 \)  
4. \( 6x + 3y = -21 \)
Example 2  
**Graph an equation using slope-intercept form**

**Graph the equation** $4x + y = 2$.

**Solution**

Step 1 **Rewrite** the equation in slope-intercept form.

\[ y = mx + b \]

Step 2 **_________** the slope and the $y$-intercept.

\[ m = \quad b = \quad \]

Step 3 **_____** the point that corresponds to the $y$-intercept, (**___**).

Step 4 **Use** the slope to locate a second point on the line. Draw a line through the two points.

![Graph of the equation $4x + y = 2$.](image)

**Checkpoint**  Complete the following exercise.

5. Graph the equation $-\frac{1}{2}x + y = 1$.

![Graph of the equation $-\frac{1}{2}x + y = 1$.](image)
Example 3  Identify parallel lines

Determine which of the lines are parallel.

Solution

Find the slope of each line.

Line $a$: $m = \frac{-3}{-4} = \frac{3}{4} = ___$

Line $b$: $m = \frac{-4}{-2} = \frac{2}{1} = ___$

Line $c$: $m = \frac{-2}{-6} = \frac{1}{3} = ___$

Lines ___ and ___ have the same slope. They are parallel.

Checkpoint  Complete the following exercise.

6. Determine which lines are parallel.
   - Line $a$: through $(2, 5)$ and $(-2, 2)$
   - Line $b$: through $(4, 1)$ and $(-3, -4)$
   - Line $c$: through $(2, 3)$ and $(-2, 0)$
LESSON 4.5
Graphing Calculator Activity:
Identifying Parallel Lines
For use before Lesson 4.5

**QUESTION** How can you use a graphing calculator to identify parallel lines?

Two different lines in the same plane are parallel if they do not intersect.

**EXAMPLE** Identify parallel lines

Use a graphing calculator to determine which of the following lines are parallel.

Line $a$: $-3x + 2y = -4$  
Line $b$: $-4x + 2y = 6$  
Line $c$: $-2x + y = -1$

**STEP 1** Rewrite equations

Write each equation in slope-intercept form.

Line $a$: $-3x + 2y = -4$  
Line $b$: $-4x + 2y = 6$  
Line $c$: $-2x + y = -1$

$2y = 3x - 4$  
$2y = 4x + 6$  
$y = 2x - 1$

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

**STEP 2** Enter equations

Enter the equations into the Y= screen.

**STEP 3** Graph equations

Graph the equations in the standard viewing window.

**STEP 4** Analyze graphs

You can see from the graph that lines $a$ and $c$ intersect. Use the intersect feature in the calc menu to determine whether lines $a$ and $b$ intersect and whether lines $b$ and $c$ intersect. The calculator will give you an error if the lines do not intersect. Using this method, you will find that lines $b$ and $c$ do not intersect. So, lines $b$ and $c$ are parallel.

**PRACTICE** Use a graphing calculator to determine whether the graphs of the two equations are parallel lines.

1. $y = -x + 5$  
   $y + x = -2$

2. $y = 10 + 3x$

3. $y + 6x + 7 = 0$

4. $2y = 12x + 4$

5. $y = -10 - 4x$

6. $9y + 9 = 6x$

7. In Exercises 1–6, what do you notice about the equations of the lines that are parallel?
4.6 Model Direct Variation

**Goal**  
- Write and graph direct variation equations.

**VOCABULARY**

- Direct variation
- Constant of variation

**Example 1** Identify direct variation equations

Tell whether the equation represents direct variation. If so, identify the constant of variation.

a. \(4x + 2y = 0\)  
b. \(-2x + y = 3\)

**Solution**

To tell whether an equation represents direct variation, try to rewrite the equation in the form \(y = ax\).

a. \(4x + 2y = 0\)
   - Write original equation.
   - \(2y = \) Subtract \(\) from each side.
   - \(y = \) Simplify.
   - Because the equation \(4x + 2y = 0\) \(\) be rewritten in the form \(y = ax\), it \(\) direct variation. The constant of variation is \(\).

b. \(-2x + y = 3\)
   - Write original equation.
   - \(y = \) Add \(\) to each side.
   - Because the equation \(-2x + y = 3\) \(\) be rewritten in the form \(y = ax\), it \(\) direct variation.
**Checkpoint** Tell whether the equation represents direct variation. If so, identify the constant of variation.

1. $3x + 4y = 0$
2. $5x + y = 1$

**Example 2** Graph direct variation equations

Graph the direct variation equation.

a. $y = -5x$

b. $y = \frac{3}{5}x$

**Solution**

a. Plot a point at the origin. The slope is equal to the constant of variation, or ____. Find and plot a second point, then draw a line through the points.

b. Plot a point at the origin. The slope is equal to the constant of variation, or ____. Find and plot a second point, then draw a line through the points.
The graph of a direct variation equation is shown.

a. Write the direct variation equation.

b. Find the value of $y$ when $x = 80$.

Solution

a. Because $y$ varies directly with $x$, the equation has the form $y = ax$. Use the fact that $y = -3$ when $x = -4$ to find $a$.

\[
y = ax
\]

Write direct variation equation.

\[
_____ = a(____)
\]

Substitute.

\[
_____ = a
\]

Solve for $a$.

A direct variation equation that relates $x$ and $y$ is

\[
y = 
\]

b. When $x = 80$, $y = _____ = ____$. 

Checkpoint Complete the following exercises.

3. Graph the direct variation equation $y = \frac{1}{2}x$.

4. The graph of a direct variation equation passes through the point $(3, -4)$. Write the direct variation equation and find the value of $y$ when $x = 15$. 

Homework
Gasoline Prices

In Sacramento, California, gasoline prices fluctuated dramatically during the first half of 1999. After recording near record lows of $1.05 per gallon in February, fires and mechanical failures that shut down four California refineries drove up prices to around $1.67 per gallon in April. Because of California’s strict clean-air specifications set by the California Air Resources Board (CARB), obtaining gas from other refineries was not an option. Wholesale distributors, fearing they would run out of gasoline that met CARB specifications, bid up gasoline prices. After the refineries re-opened, prices once again began falling and dropped to around $1.42 per gallon by May. Increases in worldwide crude oil prices, the main factor in driving gasoline prices up (or down), kept the price of gasoline from returning to the pre-crisis levels.

In Exercises 1–3, use the following information.

The cost of gasoline (in dollars) at a gas station varies directly with the number of gallons of gasoline that you pump. It costs $27.95 to fill your 13-gallon tank at a station in Sacramento.

1. Write a direct variation model that relates the number of gallons \( g \) to the total cost \( c \) (in dollars) to fill the tank.

2. Use your model from Exercise 1 to determine how much it will cost to fill up a car with a 19-gallon tank.

3. If you decide to buy a higher grade of gasoline, what will change in your model?

In Exercises 4 and 5, use the following information.

In many collegiate towns, gasoline stations raise their prices when students return to campus in August. The cost of gasoline (in dollars) and the number of gallons pumped by selected customers in eight university towns in Indiana are shown in the table below.

<table>
<thead>
<tr>
<th>University</th>
<th>Town</th>
<th>Total Cost</th>
<th>Number of Gallons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ball State</td>
<td>Muncie</td>
<td>$19.71</td>
<td>9</td>
</tr>
<tr>
<td>DePauw</td>
<td>Greencastle</td>
<td>$48.18</td>
<td>22</td>
</tr>
<tr>
<td>Indiana State</td>
<td>Terre Haute</td>
<td>$41.61</td>
<td>19</td>
</tr>
<tr>
<td>Indiana</td>
<td>Bloomington</td>
<td>$70.08</td>
<td>32</td>
</tr>
<tr>
<td>Purdue</td>
<td>West Lafayette</td>
<td>$28.47</td>
<td>13</td>
</tr>
<tr>
<td>Taylor</td>
<td>Fort Wayne</td>
<td>$35.04</td>
<td>16</td>
</tr>
<tr>
<td>Notre Dame</td>
<td>South Bend</td>
<td>$54.75</td>
<td>25</td>
</tr>
</tbody>
</table>

4. Write a ratio model that relates the total cost for gasoline to the number of gallons pumped.

5. Estimate the total cost for a car that needs 18 gallons of gasoline to fill the tank.