**5-6 Graphing Inequalities in Two Variables**

**Graph each inequality.**

1. \( y > x + 3 \)

   **SOLUTION:**
   
   \( y > x + 3 \)

   Because the inequality involves >, graph the boundary using a dashed line. Choose (0, 0) as a test point.

   \[
   0 > (0) + 3 \\
   0 > 3
   \]

   Since 0 is not greater than 3, shade the half-plane that does not contain (0, 0).

   ![Graph of y > x + 3](image)

2. \( y \geq -8 \)

   **SOLUTION:**
   
   \( y \geq -8 \)

   Because the inequality involves \( \geq \), graph the boundary using a solid line. Choose (0, 0) as a test point.

   \[
   0 \geq -8
   \]

   Since 0 is greater than or equal to −8, shade the half-plane that contains (0, 0).

   ![Graph of y \geq -8](image)
3. \( x + y > 1 \)

**SOLUTION:**
Solve for \( y \) in terms of \( x \).

\[
\begin{align*}
x + y & > 1 \\
x - x + y & > 1 - x \\
y & > -x + 1
\end{align*}
\]

Because the inequality involves \( > \), graph the boundary using a dashed line. Choose \((0, 0)\) as a test point.

\[
0 > -(0) + 1
\]

\( 0 \neq 1 \)

Since 0 is not greater than 1, shade the half-plane that does not contain \((0, 0)\).
4. \( y \leq x - 6 \)

**SOLUTION:**

\( y \leq x - 6 \)

Because the inequality involves \( \leq \), graph the boundary using a solid line. Choose \((0, 0)\) as a test point.

\[
0 \leq (0) - 6
\]

\[
0 \leq -6
\]

Since 0 is not less than or equal to \(-6\), shade the half-plane that does not contain \((0, 0)\).

![Graph of \( y \leq x - 6 \)](image)

5. \( y < 2x - 4 \)

**SOLUTION:**

\( y < 2x - 4 \)

Because the inequality involves \(<\), graph the boundary using a dashed line. Choose \((0, 0)\) as a test point.

\[
0 < 2(0) - 4
\]

\[
0 < -4
\]

Since 0 is not less than \(-4\), shade the half-plane that does not contain \((0, 0)\).

![Graph of \( y < 2x - 4 \)](image)
6. \( x - y \leq 4 \)

**SOLUTION:**

Solve for \( y \) in terms of \( x \).

\[
\begin{align*}
  x - y & \leq 4 \\
  x - x - y & \leq 4 - x \\
  -y & \leq -x + 4 \\
  -1 & \leq -1 \\
  y & \geq x - 4
\end{align*}
\]

Because the inequality involves \( \geq \), graph the boundary using a solid line. Choose \((0, 0)\) as a test point.

\[
\begin{align*}
  0 - 0 & \leq 4 \\
  0 & \leq 4
\end{align*}
\]

Since 0 is less than or equal to 4, shade the half-plane that contains \((0, 0)\).
5-6 Graphing Inequalities in Two Variables

Use a graph to solve each inequality.
7. \(7x + 1 < 15\)

**SOLUTION:**
Graph the boundary, which is the related function. Replace the inequality sign with an equal sign, and get 0 on a side by itself.

\[
\begin{align*}
7x + 1 &< 15 \\
7x + 1 &= 15 \\
7x &= 15 - 1 \\
7x &= 14 \\
\frac{7x}{7} &= \frac{14}{7} \\
x &= 2
\end{align*}
\]

Because the inequality involves <, graph \(x = 2\) using a dashed line. Choose \((0, 0)\) as a test point in the original inequality.

\[
\begin{align*}
7x + 1 &< 15 \\
7(0) + 1 &< 15 \\
0 + 1 &< 15 \\
1 &< 15
\end{align*}
\]

Since 1 is less than 15, shade the half-plane that contains the point \((0, 0)\). Notice that the \(x\)-intercept of the graph is at 2. Since the half-plane to the left of the \(x\)-intercept is shaded, the solution is \(x < 2\).
5-6 Graphing Inequalities in Two Variables

8. \(-3x - 2 \geq 11\)

**SOLUTION:**
Graph the boundary, which is the related function. Replace the inequality sign with an equal sign, and get 0 on a side by itself.

\[
\begin{align*}
-3x - 2 & \geq 11 \\
-3x - 2 &= 11 \\
-3x &= 11 + 2 \\
-3x &= 13 \\
\frac{-3x}{-3} &= \frac{13}{-3} \\
x &= -\frac{13}{3}
\end{align*}
\]

Because the inequality involves \(\geq\), graph \(x = -\frac{13}{3}\) with a solid line.

Choose \((0, 0)\) as a test point in the original inequality.

\[
\begin{align*}
-3x - 2 & \geq 11 \\
-3(0) - 2 & \geq 11 \\
0 - 2 & \geq 11 \\
-2 & \ngeq 11
\end{align*}
\]

Since \(-2\) is not greater than or equal to 11, shade the half-plane that does not contain the point \((0, 0)\).

Notice that the \(x\)-intercept of the graph is at \(-\frac{13}{3}\). Since the half-plane to the left of the \(x\)-intercept is shaded, the solution is \(x \leq -4\frac{1}{3}\).
5-6 Graphing Inequalities in Two Variables

9. $3y - 5 \leq 34$

**SOLUTION:**
Graph the boundary, which is the related function. Replace the inequality sign with an equal sign and solve for $y$.

$$3y - 5 \leq 34$$
$$3y - 5 = 34$$
$$3y - 5 + 5 = 34 + 5$$
$$3y = 39$$
$$\frac{3y}{3} = \frac{39}{3}$$
$$y = 13$$

Because the inequality involves $\leq$, graph $y = 13$ using a solid line. Choose $(0, 0)$ as a test point in the original inequality.

$$3y - 5 \leq 34$$
$$3(0) - 5 \leq 34$$
$$0 - 5 \leq 34$$
$$-5 \leq 34$$

Since $-5$ is less than or equal 34, shade the half-plane that contains the point $(0, 0)$. Notice that the $y$–intercept of the graph is at 13. Since the half-plane below the $y$–intercept is shaded, the solution is $y \leq 13$. 

![Graph of inequality](image)
5-6 Graphing Inequalities in Two Variables

10. \(4y - 21 > 1\)

**SOLUTION:**
Graph the boundary, which is the related function. Replace the inequality sign with an equal sign, and solve for \(y\).

\[
\begin{align*}
4y - 21 &> 1 \\
4y - 21 &= 1 \\
4y - 21 + 21 &= 1 + 21 \\
4y &= 22 \\
\frac{4y}{4} &= \frac{22}{4} \\
y &= \frac{51}{2}
\end{align*}
\]

Because the inequality involves \(>\), graph \(y = \frac{51}{2}\) using a dashed line.
Choose \((0, 0)\) as a test point in the original inequality.

\[
\begin{align*}
4y - 21 &> 1 \\
4(0) - 21 &> 1 \\
0 - 21 &> 1 \\
-21 &> 1
\end{align*}
\]

Since \(-21\) not is greater than \(1\), shade the half-plane that does not contain the point \((0, 0)\).

Notice that the \(y\)-intercept of the graph is at \(\frac{51}{2}\). Since the half-plane above the \(y\)-intercept is shaded, the solution is \(y > \frac{51}{2}\).

11. **FINANCIAL LITERACY** The surf shop has a weekly overhead of $2300.
   a. Write an inequality to represent the number of skimboards and longboards the shop sells each week to make a profit.
   b. How many skimboards and longboards must the shop sell each week to make a profit?
5-6 Graphing Inequalities in Two Variables

**SOLUTION:**

a. Let \( x \) represent the skimboards and \( y \) represent the longboards. \( 115x + 685y \geq 2300 \)

b. To graph the inequality, first solve for \( x \).

\[
115x + 685y \geq 2300
\]

\[
115x - 115x + 685y = 2300 - 115x
\]

\[
685y = 2300 - 115x
\]

\[
\frac{685}{685}y = \frac{2300 - 115x}{685}
\]

\[
y = \frac{2300 - 115x}{685}
\]

Graph, then use the test point \((0, 0)\) to determine the shading. The point \((0, 0)\) results in \(0 \geq 2300\) which is false. Shade the side that does not include the origin.

One possible solution would be to sell 1 skim board. Calculate how many longboards must be sold when just 1 skim boards are sold.

\[
y \geq \frac{2300 - 115x}{685}
\]

\[
y \geq \frac{2300 - 115(1)}{685}
\]

\[
y \geq \frac{1185}{685}
\]

\[
y \geq 1.73
\]

So, the shop would have to sell 1 skim board and 4 longboard surf boards.
5-6 Graphing Inequalities in Two Variables

Graph each inequality.

12. \( y < x - 3 \)

**SOLUTION:**

\( y < x - 3 \)

Because the inequality involves <, graph the boundary using a dashed line. Choose \((0, 0)\) as a test point.

\[
0 < (0) - 3
\]

\( 0 < -3 \)

Since 0 is not less than \(-3\), shade the half-plane that does not contain \((0, 0)\).

13. \( y > x + 12 \)

**SOLUTION:**

\( y > x + 12 \)

Because the inequality involves >, graph the boundary using a dashed line. Choose \((0, 0)\) as a test point.

\[
0 > (0) + 12
\]

\( 0 > 12 \)

Since 0 is not less than 12, shade the half-plane that does not contain \((0, 0)\).
5-6 Graphing Inequalities in Two Variables

14. \( y \geq 3x - 1 \)

**SOLUTION:**

\[ y \geq 3x - 1 \]

Because the inequality involves \( \geq \), graph the boundary using a solid line. Choose \((0, 0)\) as a test point.

\[ 0 \geq 3(0) - 1 \]
\[ 0 \geq -1 \]

Since 0 is greater than or equal to –1, shade the half-plane that contains \((0, 0)\).

15. \( y \leq -4x + 12 \)

**SOLUTION:**

\[ y \leq -4x + 12 \]

Because the inequality involves \( \leq \), graph the boundary using a solid line. Choose \((0, 0)\) as a test point.

\[ 0 \leq -4(0) + 12 \]
\[ 0 \leq 12 \]

Since 0 is less than or equal to 12, shade the half-plane that contains \((0, 0)\).
16. $6x + 3y > 12$

**SOLUTION:**
Solve for $y$ in terms of $x$.

\[
6x + 3y > 12
\]
\[
6x - 6x + 3y > 12 - 6x
\]
\[
3y > -6x + 12
\]
\[
\frac{3y}{3} > \frac{-6x + 12}{3}
\]
\[
y > -2x + 4
\]

Because the inequality involves $>$, graph the boundary using a dashed line. Choose $(0, 0)$ as a test point.

\[
y > -2x + 4
\]
\[
0 > -2(0) + 4
\]

Since 0 is not greater than 4, shade the half–plane that does not contain $(0, 0)$.
5-6 Graphing Inequalities in Two Variables

17. $2x + 2y < 18$

*SOLUTION:*

Solve for $y$ in terms of $x$.

\[
\begin{align*}
2x + 2y &< 18 \\
2x - 2x + 2y &< 18 - 2x \\
2y &< -2x + 18 \\
\frac{2y}{2} &< \frac{-2x + 18}{2} \\
y &< -x + 9
\end{align*}
\]

Because the inequality involves $<$, graph the boundary using a dashed line. Choose $(0, 0)$ as a test point.

\[
y < -x + 9 \\
0 < -(0) + 9 \\
0 < 9
\]

Since 0 is less than 9, shade the half-plane that contains $(0, 0)$. 

![Graph of the inequality](image)
5-6 Graphing Inequalities in Two Variables

18. $5x + y > 10$

**SOLUTION:**
Solve for $y$ in terms of $x$.

\[
5x + y > 10 \\
5x - 5x + y > 10 - 5x \\
y > -5x + 10
\]

Because the inequality involves $>$, graph the boundary using a dashed line. Choose $(0, 0)$ as a test point.

\[
y > -5x + 10 \\
0 > -5(0) + 10 \\
0 > 10
\]

Since 0 is not greater than 10, shade the half-plane that does not contain $(0, 0)$. 

[Graph of the inequality $5x + y > 10$]
19. $2x + y < -3$

**SOLUTION:**
Solve for $y$ in terms of $x$.

\[
2x + y < -3 \\
2x - 2x + y < -3 - 2x \\
y < -2x - 3
\]

Because the inequality involves $<$, graph the boundary using a dashed line. Choose $(0, 0)$ as a test point.

\[
y < -2x - 3 \\
0 < -2(0) - 3 \\
0 < -3
\]

Since 0 is not less than $−3$, shade the half-plane that does not contain $(0, 0)$. 

![Graph of the inequality $2x + y < -3$]
5-6 Graphing Inequalities in Two Variables

20. $-2x + y \geq -4$

**SOLUTION:**
Solve for $y$ in terms of $x$.

\[
-2x + y \geq -4 \\
-2x + 2x + y \geq -4 + 2x \\
y \geq 2x - 4
\]

Because the inequality involves $\geq$, graph the boundary using a solid line. Choose $(0, 0)$ as a test point.

\[
y \geq 2x - 4 \\
0 \geq 2(0) - 4 \\
0 \geq -4
\]

Since 0 is greater than or equal to $-4$, shade the half–plane that contains $(0, 0)$. 

![Graph of the inequality](image)
5-6 Graphing Inequalities in Two Variables

21. $8x + y \leq 6$

**SOLUTION:**
Solve for $y$ in terms of $x$.

\[
\begin{align*}
8x + y & \leq 6 \\
8x - 8x + y & \leq 6 - 8x \\
y & \leq -8x + 6
\end{align*}
\]

Because the inequality involves $\leq$, graph the boundary using a solid line. Choose $(0, 0)$ as a test point.

\[
\begin{align*}
y & \leq -8x + 6 \\
0 & \leq -8(0) + 6 \\
0 & \leq 6
\end{align*}
\]

Since 0 is less than or equal to 6, shade the half-plane that contains $(0, 0)$. 

![Graph of the inequality](image)
22. $10x + 2y \leq 14$

**SOLUTION:**
Solve for $y$ in terms of $x$.

\[
10x + 2y \leq 14 \\
10x - 10x + 2y \leq 14 - 10x \\
2y \leq -10x + 14 \\
\frac{2y}{2} \leq \frac{-10x + 14}{2} \\
y \leq -5x + 7
\]

Because the inequality involves $\leq$, graph the boundary using a solid line. Choose (0, 0) as a test point.

\[
y \leq -5x + 7 \\
0 \leq -5(0) + 7 \\
0 \leq 7
\]

Since 0 is less than or equal to 7, shade the half-plane that contains (0, 0).
5-6 Graphing Inequalities in Two Variables

23. \(-24x + 8y \geq -48\)

**SOLUTION:**
Solve for \(y\) in terms of \(x\).

\[
-24x + 8y \geq -48 \\
-24x + 24x + 8y \geq -48 + 24x \\
8y \geq 24x - 48 \\
\frac{8y}{8} \geq \frac{24x - 48}{8} \\
y \geq 3x - 6
\]

Because the inequality involves \(\geq\), graph the boundary using a solid line. Choose \((0, 0)\) as a test point.

\[y \geq 3x - 6\]
\[0 \geq 3(0) - 6\]
\[0 \geq -6\]

Since 0 is greater than or equal to -6, shade the half-plane that contains \((0, 0)\).
5-6 Graphing Inequalities in Two Variables

Use a graph to solve each inequality.

24. \(10x - 8 < 22\)

**SOLUTION:**
Graph the boundary, which is the related function. Replace the inequality sign with an equal sign, and solve for \(x\).

\[
\begin{align*}
10x - 8 &< 22 \\
10x - 8 & = 22 \\
10x - 8 + 8 & = 22 + 8 \\
10x & = 30 \\
\frac{10x}{10} & = \frac{30}{10} \\
x & = 3
\end{align*}
\]

Because the inequality involves <, graph \(x = 3\) using a dashed line.
Choose \((0, 0)\) as a test point in the original inequality.

\[
\begin{align*}
10x - 8 &< 22 \\
10(0) - 8 &< 22 \\
0 - 8 &< 22 \\
-8 &< 22
\end{align*}
\]

Since \(-8\) is less than 22, shade the half–plane that contains the point \((0, 0)\).
Notice that the \(x\)–intercept of the graph is at 3. Since the half–plane to the left of the \(x\)–intercept is shaded, the solution is \(x < 3\).
25. $20x - 5 > 35$

**SOLUTION:**

Graph the boundary, which is the related function. Replace the inequality sign with an equal sign, and solve for $x$.

\[
20x - 5 > 35 \\
20x - 5 = 35 \\
20x = 40 \\
\frac{20x}{20} = \frac{40}{20} \\
x = 2
\]

Because the inequality involves $>$, graph $x = 2$ using a dashed line. Choose $(0, 0)$ as a test point in the original equation.

\[
20x - 5 > 35 \\
20(0) - 5 \overset{?}{>} 35 \\
0 - 5 \overset{?}{>} 35 \\
-5 \not\overset{>}{=} 35
\]

Since $-5$ is not greater than $35$, shade the half–plane that does not contain the point $(0, 0)$. Notice that the $x$–intercept of the graph is at $2$. Since the half–plane to the right of the $x$–intercept is shaded, the solution is $x > 2$. 

![Graph of inequality](image)
26. $4y - 77 \geq 23$

**SOLUTION:**
Graph the boundary, which is the related function. Replace the inequality sign with an equal sign, and solve for $y$.

\[
\begin{align*}
4y - 77 & \geq 23 \\
4y - 77 & = 23 \\
4y & = 100 \\
y & = \frac{100}{4} \\
y & = 25
\end{align*}
\]

Because the inequality involves $\geq$, graph $y = 25$ using a solid line. Choose $(0, 0)$ as a test point in the original equation.

\[
\begin{align*}
4y - 77 & \geq 23 \\
4(0) - 77 & \overset{?}{\geq} 23 \\
0 - 77 & \overset{?}{\geq} 23 \\
-77 & \not\geq 23
\end{align*}
\]

Since $-77$ is not greater than or equal 23, shade the half–plane that does not contain the point $(0, 0)$. Notice that the $y$–intercept of the graph is at 25. Since the half–plane above the $y$–intercept is shaded, the solution is $y \geq 25$. 

![Graph of the inequality $4y - 77 \geq 23$](image)
27. $5y + 8 \leq 33$

**SOLUTION:**
Graph the boundary, which is the related function. Replace the inequality sign with an equal sign and solve for $y$.

\[
\begin{align*}
5y + 8 & \leq 33 \\
5y + 8 & = 33 \\
5y + 8 - 8 & = 33 - 8 \\
5y & = 25 \\
\frac{5y}{5} & = \frac{25}{5} \\
y & = 5
\end{align*}
\]

Because the inequality involves $\leq$, graph $y = 5$ using a solid line.

Choose $(0, 0)$ as a test point in the original equation.

\[
\begin{align*}
5y + 8 & \leq 33 \\
5(0) + 8 & \leq 33 \\
0 + 8 & \leq 33 \\
8 & \leq 33
\end{align*}
\]

Since $8$ is less than or equal to $33$, shade the half–plane that contains the point $(0, 0)$.

Notice that the $y$–intercept of the graph is at 5. Since the half–plane under the $y$–intercept is shaded, the solution is $y \leq 5$. 

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5-6 Graphing Inequalities in Two Variables

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5-6 Graphing Inequalities in Two Variables

28. \(35x + 25 < 6\)

**SOLUTION:**
Graph the boundary, which is the related function. Replace the inequality sign with an equal sign and solve for \(x\).

\[
35x + 25 < 6 \\
35x + 25 = 6 \\
35x + 25 - 25 = 6 - 25 \\
35x = -19 \\
\frac{35x}{35} = \frac{-19}{35} \\
x = -\frac{19}{35}
\]

Because the inequality involves <, graph \(x = -\frac{19}{35}\) using a dashed line.

Choose \((0, 0)\) as a test point in the original inequality.

\[
35x + 25 < 6 \\
35(0) + 25 < 6 \\
0 + 25 < 6 \\
25 < 6
\]

Since 25 is not less than 6, shade the half-plane that does not contain the point \((0, 0)\).

Notice that the \(x\)-intercept of the graph is at \(-\frac{19}{35}\). Since the half-plane to the left of the \(x\)-intercept is shaded, the solution is \(x < -\frac{19}{35}\).
29. $14x - 12 > -31$

**SOLUTION:**
Graph the boundary, which is the related function. Replace the inequality sign with an equal sign and solve for $x$.

\[
14x - 12 > -31 \\
14x - 12 = -31 \\
14x - 12 + 12 = -31 + 12 \\
14x = -19 \\
\frac{14x}{14} = \frac{-19}{14} \\
x = \frac{-19}{14}
\]

Because the inequality involves $>$, graph $x = \frac{-19}{14}$ using a dashed line.

Choose $(0, 0)$ as a test point in the original equation.

\[
14x - 12 > -31 \\
14(0) - 12 > -31 \\
0 - 12 > -31 \\
-12 > -31
\]

Since $-12$ is greater than $-31$, shade the half-plane that contains the point $(0, 0)$.

Notice that the $x$–intercept of the graph is at $\frac{-19}{14}$. Since the half-plane to the right of the $x$–intercept is shaded, the solution is $x > \frac{-19}{14}$. 

---

**Case 1:**

The arboretum will close after 30 days.

b. Shade the half-plane that contains $(0, 0)$.

c.

Because $(1, 1)$, $(2, 5)$, and $(6, 0)$ are in the shaded half-plane, the inequality is true.

---

The shop would have to sell 1 skim board and 4 longboard surf boards to make a profit of $500 to $1200.

---

If the rectangular prism has a volume of 10,080 cm$^3$, the length $l$ and height $h$ are both 24 cm. Since $h = 24$ cm, the volume is $V = lwh = l(24)(10) = 240l$. Since the volume is 10,080 cm$^3$, $240l = 10,080$, and $l = 42$ cm.
5-6 Graphing Inequalities in Two Variables

30. DECORATING  Sybrina is decorating her bedroom. She has $300 to spend on paint and bed linens. A gallon of paint costs $14, while a set of bed linens costs $60.

a. Write an inequality for this situation.
b. How many gallons of paint and bed linen sets can Sybrina buy and stay within her budget?

SOLUTION:
a. Let \( x \) represent the number of gallons of paint and \( y \) represent the number of sets of bed linens. \( 14x + 60y \leq 300 \)

b. To graph the inequality, solve for \( x \) first.

\[
14x + 60y \leq 300 \\
14x - 14x + 60y \leq 300 - 14x \\
\frac{60}{60}y \leq \frac{300 - 14x}{60} \\
y \leq \frac{300 - 14x}{60}
\]

Graph. Then use the test point \((0, 0)\) to determine the shading. The point \((0, 0)\) results in \(0 \leq 5\) which is true. Shade the side that includes the origin.

One possible solution would be to buy 5 gallons of paint. Calculate how many bed linen sets must be purchased when 5 gallons of paint are bought.

\[
y \leq \frac{300 - 14x}{60} \\
y \leq \frac{300 - 14(5)}{60} \\
y \leq \frac{230}{60} \\
y \leq 3.83
\]

Thus when 5 gallons of paint are purchased, 3 bed linen sets can be purchased.
5-6 Graphing Inequalities in Two Variables

Use a graph to solve each inequality.

31. \(3x + 2 < 0\)

**SOLUTION:**
First, graph the boundary, which is the related equation. Replace the inequality sign with an equals sign and solve for \(x\).

\[
\begin{align*}
3x + 2 &< 0 \\
3x + 2 &= 0 \\
3x &= -2 \\
x &= -\frac{2}{3}
\end{align*}
\]

Because the inequality involves \(<\), graph \(x = -\frac{2}{3}\) with a dashed line.

Choose \((0, 0)\) as a test point in the original inequality.

\[
\begin{align*}
3x + 2 &< 0 \\
3(0) + 2 &< 0 \\
0 + 2 &< 0 \\
2 &< 0
\end{align*}
\]

Since 2 is not less than 0, shade the half-plane that does not contain the point \((0, 0)\).

![Graph of the inequality](image)

Notice that the \(x\)-intercept of the graph is at \(-\frac{2}{3}\). Since the half-plane to the left of the \(x\)-intercept is shaded, the solution is \(x < -\frac{2}{3}\).
5-6 Graphing Inequalities in Two Variables

32. $4x - 1 > 3$

**SOLUTION:**
First, graph the boundary, which is the related equation. Replace the inequality sign with an equals sign and solve for $x$.

$$4x - 1 = 3$$
$$4x = 4$$
$$x = 1$$

Because the inequality involves $>$, graph $x = 1$ with a dashed line.

Choose $(0, 0)$ as a test point in the original inequality.

$$4x - 1 > 3$$
$$4(0) - 1 > 3$$
$$0 - 1 > 3$$
$$-1 > 3$$

Since $-1$ is not greater than $3$, shade the half-plane that does not contain the point $(0, 0)$.

Notice that the $x$–intercept of the graph is at $1$. Since the half-plane to the right of the $x$–intercept is shaded, the solution is $x > 1$. 


5-6 Graphing Inequalities in Two Variables

33. $-6x - 8 \geq -4$

**SOLUTION:**
Graph the boundary, which is the related function. Replace the inequality sign with an equal sign and solve for $x$.

\[
\begin{align*}
-6x - 8 & \geq -4 \\
-6x - 8 & = -4 \\
-6x & = 4 \\
\frac{-6x}{-6} & = \frac{4}{-6} \\
x & = -\frac{2}{3}
\end{align*}
\]

Because the inequality involves $\geq$, graph $x = -\frac{2}{3}$ using a solid line.

Choose $(0, 0)$ as a test point in the original inequality.

\[
\begin{align*}
-6x - 8 & \geq -4 \\
-6(0) - 8 & \geq -4 \\
0 - 8 & \geq -4 \\
-8 & \geq -4
\end{align*}
\]

Since $-8$ is not greater than or equal to $-4$, shade the half-plane that does not contain the point $(0, 0)$.

Notice that the $x$-intercept of the graph is at $-\frac{2}{3}$. Since the half-plane to the left of the $x$-intercept is shaded, the solution is $x \leq -\frac{2}{3}$. 
34. \(-5x + 1 < 3\)

**SOLUTION:**

Graph the boundary, which is the related function. Replace the inequality sign with an equal sign and solve for \(x\).

\[-5x + 1 < 3\]
\[-5x + 1 = 3\]
\[-5x + 1 - 1 = 3 - 1\]
\[-5x = 2\]
\[\frac{-5x}{-5} = \frac{2}{-5}\]
\[x = -\frac{2}{5}\]

Because the inequality involves \(<\), graph \(x = -\frac{2}{5}\) using a dashed line.

Choose \((0, 0)\) as a test point in the original inequality.

\[-5(0) + 1 < 3\]
\[0 + 1 < 3\]
\[1 < 3\]

Since 1 is less than 3, shade the half-plane that contains the point \((0, 0)\).

Notice that the \(x\)-intercept of the graph is at \(-\frac{2}{5}\). Since the half-plane to the right of the \(x\)-intercept is shaded, the solution is \(x > -\frac{2}{5}\).
5-6 Graphing Inequalities in Two Variables

35. \(-7x + 13 < 10\)

**SOLUTION:**
Graph the boundary, which is the related function. Replace the inequality sign with an equal sign and solve for \(x\).

\[-7x + 13 < 10\]
\[-7x + 13 = 10\]
\[-7x + 13 - 13 = 10 - 13\]
\[-7x = -3\]
\[\frac{-7x}{-7} = \frac{-3}{-7}\]
\[x = \frac{3}{7}\]
Because the inequality involves <, graph \(x = \frac{3}{7}\) using a dashed line.

Choose (0, 0) as a test point in the original inequality.

\[-7x + 13 < 10\]
\[-7(0) + 13 < 10\]
\[0 + 13 < 10\]
\[13 < 10\]

Since 13 is not less than 10, shade the half–plane that does not contain the point (0, 0).

Notice that the \(x\)–intercept of the graph is at \(\frac{3}{7}\). Since the half–plane to the right of the \(x\)–intercept is shaded, the solution is \(x > \frac{3}{7}\). 
36. \(-4x - 4 \leq -6\)

**SOLUTION:**
Graph the boundary, which is the related function. Replace the inequality sign with an equal sign and solve for \(x\).

\[
\begin{align*}
-4x - 4 & \leq -6 \\
-4x - 4 & = -6 \\
-4x - 4 + 4 & = -6 + 4 \\
-4x & = -2 \\
\frac{-4x}{-4} & = \frac{-2}{-4} \\
x & = \frac{1}{2}
\end{align*}
\]

Because the inequality involves \(\leq\), graph \(x = \frac{1}{2}\) using a solid line.

Choose \((0, 0)\) as a test point in the original inequality.

\[
\begin{align*}
-4x - 4 & \leq -6 \\
-4(0) - 4 & \leq -6 \\
0 - 4 & \leq -6 \\
-4 & \leq -6
\end{align*}
\]

Since \(-4\) is not less than or equal to \(-6\), shade the half-plane that does not contain the point \((0, 0)\).

Notice that the \(x\)-intercept of the graph is at \(\frac{1}{2}\). Since the half-plane to the left of the \(x\)-intercept is shaded, the solution is \(x \leq \frac{1}{2}\).
37. **Soccer** The girls’ soccer team wants to raise $2000 to buy new goals. How many of each item must they sell to buy the goals?

\[
\text{Support Girls Soccer}
\]

<table>
<thead>
<tr>
<th>Hot Dogs</th>
<th>$1.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodas</td>
<td>$1.25</td>
</tr>
</tbody>
</table>

**SOLUTION:**

a. Write an inequality that represents this situation.

b. Graph this inequality.

c. Make a table of values that shows at least five possible solutions.

d. Plot the solutions from part c.

\[
x + 1.25y \geq 2000
\]

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>1600</td>
</tr>
<tr>
<td>200</td>
<td>1500</td>
</tr>
<tr>
<td>300</td>
<td>1400</td>
</tr>
<tr>
<td>400</td>
<td>1300</td>
</tr>
<tr>
<td>1000</td>
<td>1000</td>
</tr>
</tbody>
</table>

d. Sample points should be in the shaded region of the graph in part b.
Graphing Inequalities in Two Variables

Graph each inequality. Determine which of the ordered pairs are part of the solution set for each inequality.

38. \( y \geq 6; \) \{\(0, 4\), \((-2, 7)\), \((4, 8)\), \((-4, -8)\), \((1, 6)\)\}

**SOLUTION:**

\( y \geq 6 \)

Because the inequality involves \( \geq \), graph the boundary using a solid line. Choose \((0, 0)\) as a test point.

\( 0 \not\geq 6 \)

Since 0 is not greater than or equal to 6, shade the half-plane that does not contain \((0, 0)\).

To determine which of the ordered pairs are part of the solution set, plot them on the graph.

Because \((-2, 7)\), \((4, 8)\) and \((1, 6)\) are in the shaded half-plane or on the boundary line, they are part of the solution set.
5-6 Graphing Inequalities in Two Variables

39. \( x < -4; \) \( \{(2, 1), (-3, 0), (0, -3), (-5, -5), (-4, 2)\} \)

**SOLUTION:**

\( y < -4 \)

Because the inequality involves \(<\), graph the boundary using a dashed line. Choose \((0, 0)\) as a test point.

\(0 < -4\)

Since \(0\) is not less than \(-4\), shade the half-plane that does not contain \((0, 0)\).

![Graph of the inequality](image)

To determine which of the ordered pairs are part of the solution set, plot them on the graph.

![Graph with points plotted](image)

Because \((-5, -5)\) is in the shaded half-plane, it is part of the solution set.

40. \(2x - 3y \leq 1; \) \( \{(2, 3), (3, 1), (0, 0), (0, -1), (5, 3)\} \)

**SOLUTION:**

Solve for \(y\) in terms of \(x\).

\[
\begin{align*}
2x - 3y & \leq 1 \\
2x - 2x - 3y & \leq 1 - 2x \\
-3y & \leq -2x + 1 \\
\frac{-3y}{-3} & \geq \frac{-2x + 1}{-3} \\
y & \geq \frac{-2}{3}x - \frac{1}{3}
\end{align*}
\]
5-6 Graphing Inequalities in Two Variables

Because the inequality involves \( \leq \), graph the boundary using a solid line. Choose \((0, 0)\) as a test point.

\[
y \geq \frac{2}{3}x - \frac{1}{3}
\]

\[
0 \geq \frac{2}{3}(0) - \frac{1}{3}
\]

\[
0 \geq -\frac{1}{3}
\]

Since 0 is greater than or equal to \(-\frac{1}{3}\), shade the half–plane that contains \((0, 0)\).

To determine which of the ordered pairs are part of the solution set, plot them on the graph.

Because \((2, 3)\), \((0, 0)\), and \((5, 3)\) are in the shaded half–plane or on the boundary line, they are part of the solution set.

41. \(5x + 7y \geq 10; \{(-2, -2), (1, -1), (1, 1), (2, 5), (6, 0)\}\)

**SOLUTION:**
Solve for \(y\) in terms of \(x\).
5-6 Graphing Inequalities in Two Variables

\[5x + 7y \geq 10\]

\[5x - 5x + 7y \geq 10 - 5x\]

\[7y \geq -5x + 10\]

\[\frac{7y}{7} \geq \frac{-5x + 10}{7}\]

\[y \geq \frac{-5}{7}x + \frac{10}{7}\]

Because the inequality involves \(\geq\), graph the boundary using a solid line. Choose \((0, 0)\) as a test point.

\[y \geq \frac{-5}{7}x + \frac{10}{7}\]

\[0 \geq \frac{-5}{7}(0) + \frac{10}{7}\]

\[0 \geq \frac{10}{7}\]

Since 0 is not greater than or equal to \(\frac{10}{7}\), shade the half-plane that does not contain \((0, 0)\).

To determine which of the ordered pairs are part of the solution set, plot them on the graph.

Because \((1, 1)\), \((2, 5)\), and \((6, 0)\) are in the shaded half-plane or on the boundary line, they are part of the solution set.
5-6 Graphing Inequalities in Two Variables

42. \(-3x + 5y < 10\); \{(3, -1), (1, 1), (0, 8), (-2, 0), (0, 2)\}

**SOLUTION:**
Solve for \(y\) in terms of \(x\).

\[
-3x + 5y < 10 \\
-3x + 3x + 5y < 10 + 3x \\
5y < 3x + 10 \\
\frac{5y}{5} < \frac{3x + 10}{5} \\
y < \frac{3}{5}x + 2
\]

Because the inequality involves <, graph the boundary using a dashed line. Choose \((0, 0)\) as a test point.

\[
-3(0) + 5(0) < 10 \\
0 < 10
\]

Since 0 is less than 10, shade the half–plane that contains \((0, 0)\).

To determine which of the ordered pairs are part of the solution set, plot them on the graph.

Because \((3, -1), (1, 1),\) and \((2, 0)\) are in the shaded half–plane, they are part of the solution set.
5-6 Graphing Inequalities in Two Variables

43. $2x - 2y \geq 4$; 
   \{(0, 0), (0, 7), (7, 5), (5, 3), (2, -5)\}

   **SOLUTION:**

   Solve for $y$ in terms of $x$.

   \[
   \begin{align*}
   2x - 2y & \geq 4 \\
   2x - 2x - 2y & \geq 4 - 2x \\
   -2y & \geq -2x + 4 \\
   \frac{-2y}{-2} & \leq \frac{-2x + 4}{-2} \\
   y & \leq x - 2
   \end{align*}
   \]

   Because the inequality involves $\geq$, graph the boundary using a solid line. Choose $(0, 0)$ as a test point.

   \[
   2(0) - 2(0) \geq 4 \\
   0 \geq 4
   \]

   Since 0 is not greater than or equal to 4, shade the half-plane that does not contain $(0, 0)$.

   To determine which of the ordered pairs are part of the solution set, plot them on the graph.

   Because $(7, 5)$, $(5, 3)$, and $(2, -5)$ are in the shaded half-plane or on the boundary line, they are part of the solution set.
5-6 Graphing Inequalities in Two Variables

44. **RECYCLING** Mr. Jones would like to spend no more than $37.50 per week on recycling. A curbside recycling service will remove up to 50 pounds of plastic bottles and paper products per week. They charge $0.25 per pound of plastic and $0.75 per pound of paper products.
   a. Write an inequality that describes the number of pounds of each product that can be included in the curbside service.
   b. Write an inequality that describes Mr. Jones’ weekly cost for the service if he stays within his budget.
   c. Graph an inequality for the weekly costs for the service.

**SOLUTION:**
   a. Let \( x \) represent the pounds of plastic and \( y \) represent the pounds of paper products. They will remove \textit{up to 50} pounds, so use \( \leq \).
   \[ x + y \leq 50 \]
   b. The sum of the costs for paper and plastic products must be less than or equal to $37.50 per week.
   \[ 0.25x + 0.75y \leq 37.50 \]
   c. 

![Graph of inequalities](image-url)
45. **MULTIPLE REPRESENTATIONS** Use inequalities A and B to investigate graphing compound inequalities on a coordinate plane.

A. \( 7(y + 6) \leq 21x + 14 \)
B. \(-3y \leq 3x - 12 \)

a. **NUMERICAL** Solve each inequality for \( y \).

b. **GRAPHICAL** Graph both inequalities on one graph. Shade the half-plane that makes A true in red. Shade the half-plane that makes B true in blue.

c. **VERBAL** What does the overlapping region represent?

**SOLUTION:**

a. For equation A:
\[
\frac{7(y + 6)}{7} \leq \frac{21x + 14}{7} \\
y + 6 \leq 3x + 2 \\
y + 6 - 6 \leq 3x + 2 - 6 \\
y \leq 3x - 4
\]

For equation B:
\[
\frac{-3y}{-3} \geq \frac{3x - 12}{-3} \\
y \geq -x + 4
\]

b. 

![Graph of inequalities](image)

c. The overlapping region represents the solutions that make both A and B true.

46. **ERROR ANALYSIS** Reiko and Kristin are solving \( 4y \leq \frac{8}{3}x \) by graphing. Is either of them correct? Explain your reasoning.

**SOLUTION:**

Kristin used a test point located on the line and shaded the incorrect half-plane. Reiko is correct.
5-6 Graphing Inequalities in Two Variables

47. **CHALLENGE** Write a linear inequality for which (−1, 2), (1, 1), and (3, −4) are solutions but (0, 1) is not.

**SOLUTION:**
We want to find a linear inequality for which three points are solutions and one point is *not* a solution. The best way to find this is to plot the points on the coordinate plane and visualize the line that would be satisfactory.

Plot all of the points and label (1,1) with an X to separate it from the others.

From the graph, it looks like the three points that are included in the solution almost form a straight line. It looks like a good line to use would be the one that includes (−1, 2) and (0, 1). It also looks like point X would be above this line and the other point would be below it. Therefore, the linear inequality should be close to this line and the shading should be *below* it.

Using points (−1, 2) and (0, 1), you can determine the equation for the line to be \( y = -x + 1 \). The points on the line are a part of the solution and we are shading below the line, so the inequality is \( y \leq -x + 1 \).

48. **REASONING** Explain why a point on the boundary should not be used as a test point.

**SOLUTION:**
The test point is used to determine which half–plane is the solution set for the inequality. A test point on the boundary does not show which half–plane contains the points that make the inequality true.

49. **OPEN ENDED** Write a two-variable inequality with a restricted domain and range to represent a real-world situation. Give the domain and range, and explain why they are restricted.

**SOLUTION:**
Sample answer: The inequality \( y > 10x + 45 \) represents the cost of a monthly smartphone data plan with a flat rate of $45 for the first 2 GB of data used, plus $10 per each additional GB of data used. Both the domain and range are nonnegative real numbers because the GB used, and the total cost cannot be negative.
5-6 Graphing Inequalities in Two Variables

50. WRITING IN MATH  Summarize the steps to graph an inequality in two variables.

SOLUTION:
Sample answer: First solve the inequality for y. Then change the inequality sign to an equal sign and graph the boundary. If < or > is used, the boundary is not included in the graph and the line is dashed. Otherwise, the boundary is included and the line is solid. Then choose a test point not on the boundary. Substitute the coordinates of the test point into the original inequality. If the result makes the inequality true, then shade the half-plane that includes the test point. If the result makes the inequality false, shade the half-plane that does not include the test point. Lastly, check your solution by choosing a test point that is in the half-plane that is not shaded. This second test point should make the inequality false if the solution is correct.

51. What is the domain of this function?

\[ A \{ x \mid 0 \leq x \leq 3 \} \]
\[ B \{ x \mid 0 \leq x \leq 9 \} \]
\[ C \{ y \mid 0 \leq y \leq 9 \} \]
\[ D \{ y \mid 0 \leq y \leq 3 \} \]

SOLUTION:
The domain of a function is the \( x \)--values, which means that you can delete choices C and D. This graph shows values from 0 to 9, so the correct choice is B.

52. EXTENDED RESPONSE  An arboretum will close for the winter when all of the trees have lost their leaves. The table shows the number of trees each day that still have leaves.

<table>
<thead>
<tr>
<th>Day</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trees with Leaves</td>
<td>325</td>
<td>260</td>
<td>195</td>
<td>130</td>
</tr>
</tbody>
</table>

a. Write an equation that represents the number of trees with leaves \( y \) after \( d \) days.
b. Find the \( y \)-intercept. What does it mean in the context of this problem?
c. After how many days will the arboretum close? Explain how you got your answer.

SOLUTION:
a. Choose two points \((5, 325)\) and \((20, 130)\). Find the slope of the line containing the given points.
5-6 Graphing Inequalities in Two Variables

\[ m = \frac{y_2 - y_1}{x_2 - x_1} \]
\[ = \frac{130 - 325}{20 - 5} \]
\[ = \frac{-195}{15} \]
\[ = -13 \]

Use the slope and either of the two points to find the \( y \)-intercept.

\[
\begin{align*}
y &= mx + b \\
130 &= -13(20) + b \\
130 &= -260 + b \\
130 + 260 &= -260 + 260 + b \\
390 &= b
\end{align*}
\]

Write the equation in slope–intercept form.

\[ y = mx + b \]
\[ y = -13d + 390 \]

b. The \( y \)-intercept is 390. This represents the number of trees in the arboretum before any have lost their leaves.

c. To determine when the arboretum will close, let \( y = 0 \).

\[
\begin{align*}
y &= -13d + 390 \\
0 &= -13d + 390 \\
0 - 390 &= -13d + 390 - 390 \\
-390 &= -13d \\
\frac{-390}{-13} &= \frac{-13d}{-13} \\
30 &= d
\end{align*}
\]

The arboretum will close after 30 days.

53. Which inequality best represents the statement below?

A jar contains 832 gumballs. Ebony’s guess was within 46 pieces.

F \( |g - 832| \leq 46 \)

G \( |g + 832| \leq 46 \)

H \( |g - 832| \geq 46 \)

J \( |g + 832| \geq 46 \)

**SOLUTION:**

The guess was within 46, means less than or equal to 46, which eliminates choices H and J. For \( |g + 832| \leq 46 \), \( g + 832 \leq 46 \) is one solution, which makes \( g \leq -786 \). The number of gumballs cannot be negative, so G is eliminated.

The correct choice is F.
5-6 Graphing Inequalities in Two Variables

54. GEOMETRY If the rectangular prism has a volume of 10,080 cm$^3$, what is the value of $x$?

A 12
B 14
C 16
D 18

SOLUTION:
Volume of a rectangular prism is equal to length times width times height.

$$V = lwh$$
$$10,080 = (40)(14)x$$
$$10,080 = 560x$$
$$\frac{10,080}{560} = \frac{560x}{560}$$
$$x = 18$$

So, the correct choice is D.

Solve each open sentence.

55. $|y - 2| > 4$

SOLUTION:
Case 1:
$$y - 2 > 4$$
$$y - 2 + 2 > 4 + 2$$
$$y > 6$$

Case 2:
$$y - 2 < -4$$
$$y - 2 + 2 < -4 + 2$$
$$y < -2$$

So the solution set is $\{y \mid y > 6 \text{ or } y < -2\}$. 
5-6 Graphing Inequalities in Two Variables

56. \(|t - 6| \leq 5\)

**SOLUTION:**
Case 1:
\[ t - 6 \leq 5 \]
\[ t - 6 + 6 \leq 5 + 6 \]
\[ t \leq 11 \]

Case 2:
\[ t - 6 \geq -5 \]
\[ t - 6 + 6 \geq -5 + 6 \]
\[ t \geq 1 \]

So the solution set is \( \{t | 1 \leq t \leq 11\} \).

57. \(|3 + d| < -4\)

**SOLUTION:**
This problem has an absolute value equal to a negative number. That means that the distance between 3 and \(d\) is equal to \(-4\), but distances cannot be negative, so there is no solution.
So the solution set is an empty set, \( \emptyset \).

**Solve each compound inequality.**

58. \(4c - 4 < 8c - 16 < 6c - 6\)

**SOLUTION:**
\[ 4c - 4 < 8c - 16 \]
\[ 4c - 4c - 4 < 8c - 4c - 16 \]
\[ -4 < 4c - 16 \]
\[ -4 + 16 < 4c - 16 + 16 \]
\[ 12 < 4c \]
\[ \frac{12}{4} < \frac{4c}{4} \]
\[ 3 < c \]

and
\[ 8c - 16 < 6c - 6 \]
\[ 8c - 6c - 16 < 6c - 6c - 6 \]
\[ 2c - 16 < -6 \]
\[ 2c - 16 + 16 < -6 + 16 \]
\[ 2c < 10 \]
\[ \frac{2c}{2} < \frac{10}{2} \]
\[ c < 5 \]

So, the solution set is \( \{c | 3 < c < 5\} \).
5-6 Graphing Inequalities in Two Variables

59. \[ 5 < \frac{1}{2} p + 3 < 8 \]

**SOLUTION:**

\[
\begin{align*}
5 < \frac{1}{2} p + 3 & \quad \text{and} \quad \frac{1}{2} p + 3 < 8 \\
5 - 3 < \frac{1}{2} p + 3 - 3 & \quad \frac{1}{2} p + 3 - 3 < 8 - 3 \\
2 < \frac{1}{2} p & \quad \frac{1}{2} p < 5 \\
2(2) < 2 \left( \frac{1}{2} p \right) & \quad 2 \left( \frac{1}{2} p \right) < 2(5) \\
4 < p & \quad p < 10
\end{align*}
\]

So, the solution set is \( \{ p \mid 4 < p < 10 \} \).

60. \[ 0.5n \geq -7 \text{ or } 2.5n + 2 \leq 9 \]

**SOLUTION:**

\[
\begin{align*}
0.5n \geq -7 \quad \text{or} \quad 2.5n + 2 & \leq 9 \\
0.5 \quad \frac{-7}{0.5} & \quad 2.5n + 2 - 2 \leq 9 - 2 \\
0.5 & \quad 2.5n \leq 7 \\
\frac{-14}{0.5} & \quad \frac{2.5n}{2.5} \leq \frac{7}{2.5} \\
& \quad n \leq 2.8
\end{align*}
\]

Notice the two inequalities overlap so that every point is a solution. So, the solution set is \( \{ n \mid n \text{ is any real number} \} \).
5-6 Graphing Inequalities in Two Variables

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

61. (1, −3) and (2, 5)

SOLUTION:
Find the slope of the line containing the given points.

\[ m = \frac{y_2 - y_1}{x_2 - x_1} \]
\[ = \frac{5 - (-3)}{2 - 1} \]
\[ = \frac{8}{1} \]
\[ = 8 \]

Use the slope and either of the two points to find the y–intercept.

\[ y = mx + b \]
\[ 5 = 8(2) + b \]
\[ 5 = 16 + b \]
\[ 5 - 16 = 16 - 16 + b \]
\[ -11 = b \]

Write the equation in slope–intercept form.

\[ y = mx + b \]
\[ y = 8x - 11 \]
62. \((-2, -4)\) and \((-7, 3)\)

**SOLUTION:**
Find the slope of the line containing the given points.

\[
m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3 - (-4)}{-7 - (-2)} = \frac{7}{-5} = -\frac{7}{5}
\]

Use the slope and either of the two points to find the \(y\)-intercept.

\[
y = mx + b
\]
\[
3 = -\frac{7}{5}(-7) + b \\
3 = \frac{49}{5} + b \\
3 - \frac{49}{5} = \frac{49}{5} - \frac{49}{5} + b \\
-\frac{34}{5} = b
\]

Write the equation in slope–intercept form.

\[
y = mx + b
\]
\[
y = -\frac{7}{5}x - \frac{34}{5}
\]
63. \((-6, -8)\) and \((-8, -5)\)

**SOLUTION:**

Find the slope of the line containing the given points.

\[
m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-5 - (-8)}{-8 - (-6)} = \frac{3}{-2} = -\frac{3}{2}
\]

Use the slope and either of the two points to find the \(y\)–intercept.

\[
y = mx + b
\]

\[
-5 = -\frac{3}{2}(-8) + b
\]

\[
-5 = 12 + b
\]

\[
-5 - 12 = 12 - 12 + b
\]

\[
-17 = b
\]

Write the equation in slope–intercept form.

\[
y = mx + b
\]

\[
y = -\frac{3}{2}x - 17
\]
64. **FITNESS**  The table shows the maximum heart rate to maintain during aerobic activities. Write an equation in function notation for the relation. Determine what would be the maximum heart rate to maintain in aerobic training for an 80-year-old.

![Table of Pulse Rates](image)

**SOLUTION:**
Choose two points: (20, 175) and (70, 130). Find the slope of the line containing the given points.

\[
m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{130 - 175}{70 - 20} = \frac{-45}{50} = -0.90
\]

Use the slope and either of the two points to find the y–intercept.

\[
\begin{align*}
y &= mx + b \\
130 &= -0.90(70) + b \\
130 &= -63 + b \\
130 + 63 &= -63 + 63 + b \\
193 &= b
\end{align*}
\]

Write the equation in function notation.

\[
f(x) = mx + b \\
f(x) = -0.9x + 193
\]

To determine what the maximum heart rate is for an 80 year–old, substitute 80 in for \(x\).

\[
\begin{align*}
f(x) &= -0.9x + 193 \\
&= -0.9(80) + 193 \\
&= -72 + 193 \\
&= 121
\end{align*}
\]

The maximum heart rate for an 80-year-old is 121 beats/min.
5-6 Graphing Inequalities in Two Variables

65. **WORK** The formula \( s = \frac{w-10r}{m} \) is used to find keyboarding speeds. In the formula, \( s \) represents the speed in words per minute, \( w \) the number of words typed, \( r \) the number of errors, and \( m \) the number of minutes typed. Solve for \( r \).

**SOLUTION:**

\[
s = \frac{w-10r}{m}
\]

\[
m(s) = m \left( \frac{w-10r}{m} \right)
\]

\[
sm = w - 10r
\]

\[
sm - w = w - w - 10r
\]

\[
sm - w = -10r
\]

\[
\frac{sm-w}{-10} = \frac{-10r}{-10}
\]

\[
\frac{w-sm}{10} = r
\]