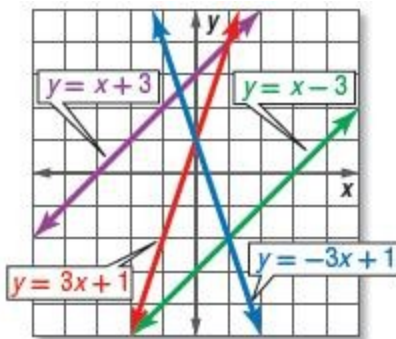


6-1 Graphing Systems of Equations

Use the graph shown to determine whether each system is *consistent* or *inconsistent* and if it is *independent* or *dependent*.



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

SOLUTION:

The two equations intersect at exactly one point, so they are consistent and independent.

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

SOLUTION:

The two equations intersect at exactly one point, so they are consistent and independent.

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

SOLUTION:

These two equations do not intersect, so they are inconsistent.

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

SOLUTION:

Rearrange the first equation into slope–intercept form to determine which line it is.

$$\begin{aligned}x - y &= -3 \\x - x - y &= -3 - x \\-y &= -x - 3 \\-\frac{y}{-1} &= \frac{-x - 3}{-1} \\y &= x + 3\end{aligned}$$

The two equations are the same and so intersect in an infinite amount of points. Therefore, they are consistent and dependent.

6-1 Graphing Systems of Equations

$$5. \begin{aligned} x - y &= -3 \\ y &= -3x + 1 \end{aligned}$$

SOLUTION:

Rearrange the first equation into slope–intercept form to determine which line it is.

$$\begin{aligned} x - y &= -3 \\ x - x - y &= -3 - x \\ -y &= -x - 3 \\ \frac{-y}{-1} &= \frac{-x - 3}{-1} \\ y &= x + 3 \end{aligned}$$

The two equations intersect at exactly one point, so they are consistent and independent.

$$6. \begin{aligned} y &= -3x + 1 \\ y &= x - 3 \end{aligned}$$

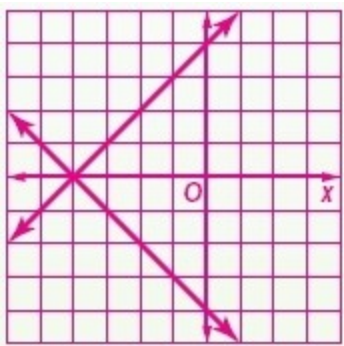
SOLUTION:

The two equations intersect at exactly one point, so they are consistent and independent.

Graph each system and determine the number of solutions that it has. If it has one solution, name it.

$$7. \begin{aligned} y &= x + 4 \\ y &= -x - 4 \end{aligned}$$

SOLUTION:

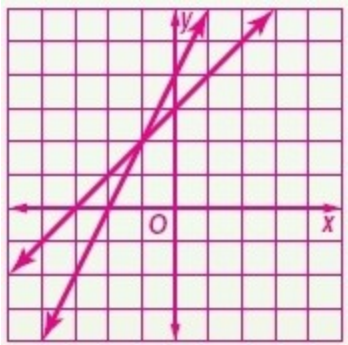


The graphs intersect at one point, so there is one solution. The lines intersect at $(-4, 0)$.

6-1 Graphing Systems of Equations

8. $y = x + 3$
 $y = 2x + 4$

SOLUTION:



The graphs intersect at one point, so there is one solution. The lines intersect at $(-1, 2)$.

9. **CCSS MODELING** Alberto and Ashanti are reading a graphic novel.



- Write an equation to represent the pages each boy has read.
- Graph each equation.
- How long will it be before Alberto has read more pages than Ashanti? Check and interpret your solution.

SOLUTION:

a. Let y represent the number of pages read and let x represent the number of days. Alberto: $y = 20x + 35$; Ashanti: $y = 10x + 85$

b.

6-1 Graphing Systems of Equations



c. The solution is (5, 135). To check this answer, enter it into both equations.

$$y = 20x + 35$$

$$135 \stackrel{?}{=} 20(5) + 35$$

$$135 \stackrel{?}{=} 100 + 35$$

$$135 = 135$$

So, it is a solution for the first equation. Now check the second equation.

$$y = 10x + 85$$

$$135 \stackrel{?}{=} 10(5) + 85$$

$$135 \stackrel{?}{=} 50 + 85$$

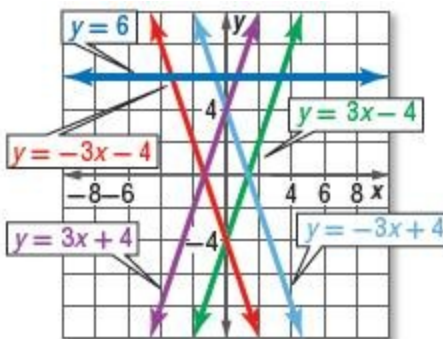
$$135 = 135$$

So it is a solution for the second equation.

Alberto will have read more pages than Ashanti after 5 days.

6-1 Graphing Systems of Equations

Use the graph shown to determine whether each system is *consistent* or *inconsistent* and if it is *independent* or *dependent*.



10. $y = 6$
 $y = 3x + 4$

SOLUTION:

The two equations intersect at exactly one point, so they are consistent and independent.

11. $y = 3x + 4$
 $y = -3x + 4$

SOLUTION:

The two equations intersect at exactly one point, so they are consistent and independent.

12. $y = -3x + 4$
 $y = -3x - 4$

SOLUTION:

These two equations do not intersect, so they are inconsistent.

13. $y = -3x - 4$
 $y = 3x - 4$

SOLUTION:

The two equations intersect at exactly one point, so they are consistent and independent.

14. $3x - y = -4$
 $y = 3x + 4$

SOLUTION:

Rearrange the first equation into slope–intercept form to determine which line it is.

$$\begin{aligned}3x - y &= -4 \\3x - 3x - y &= -4 - 3x \\-y &= -3x - 4 \\\frac{-y}{-1} &= \frac{-3x - 4}{-1} \\y &= 3x + 4\end{aligned}$$

The two equations are identical, so they are consistent and dependent.

6-1 Graphing Systems of Equations

15. $3x - y = 4$
 $3x + y = 4$

SOLUTION:

Rearrange the two equations into slope–intercept form to determine which lines they are.

$$\begin{aligned}3x - y &= -4 \\3x - y - 3x &= -4 - 3x \\-y &= -3x - 4 \\ \frac{-y}{-1} &= \frac{-3x - 4}{-1} \\y &= 3x + 4\end{aligned}$$

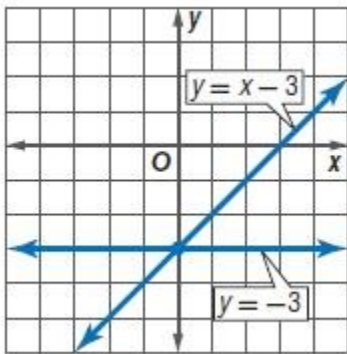
$$\begin{aligned}3x + y &= 4 \\3x - 3x + y &= 4 - 3x \\y &= -3x + 4\end{aligned}$$

The two equations intersect at exactly one point, so they are consistent and independent.

Graph each system and determine the number of solutions that it has. If it has one solution, name it.

16. $y = -3$
 $y = x - 3$

SOLUTION:

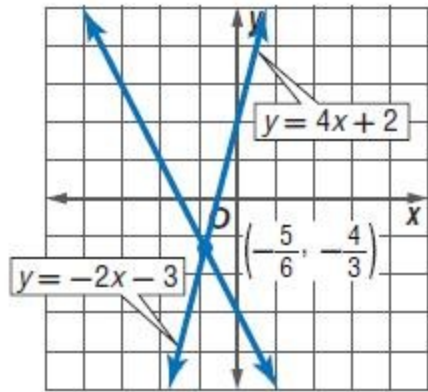


The graphs intersect at one point, so there is one solution. The lines intersect at $(0, -3)$.

6-1 Graphing Systems of Equations

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

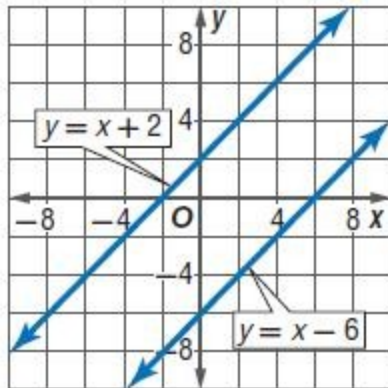
SOLUTION:



The graphs intersect at one point, so there is one solution. The lines intersect at $(-\frac{5}{6}, -\frac{4}{3})$.

18. $y = x - 6$
 $y = x + 2$

SOLUTION:



These two lines are parallel, so they do not intersect. Therefore, there is no solution.

6-1 Graphing Systems of Equations

$$19. \begin{aligned} x + y &= 4 \\ 3x + 3y &= 12 \end{aligned}$$

SOLUTION:

Rearrange the two equations into slope-intercept form.

$$3x + 3y = 12 \quad \text{Original equation}$$

$$3x - 3x + 3y = 12 - 3x \quad \text{Subtract.}$$

$$3y = -3x + 12 \quad \text{Simplify.}$$

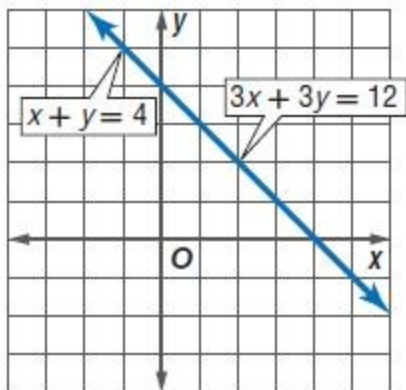
$$\frac{3y}{3} = \frac{-3x + 12}{3} \quad \text{Divide.}$$

$$y = -x + 4 \quad \text{Simplify.}$$

$$x + y = 4 \quad \text{Original equation}$$

$$x - x + y = 4 - x \quad \text{Subtract.}$$

$$y = -x + 4 \quad \text{Simplify.}$$



The two lines are the same line. Therefore, there are infinitely many solutions.

6-1 Graphing Systems of Equations

$$20. \begin{aligned} x - y &= -2 \\ -x + y &= 2 \end{aligned}$$

SOLUTION:

Rearrange the two equations into slope-intercept form.

$$x - y = -2 \quad \text{Original equation}$$

$$x - x - y = -2 - x \quad \text{Subtract.}$$

$$-y = -2 - x \quad \text{Simplify.}$$

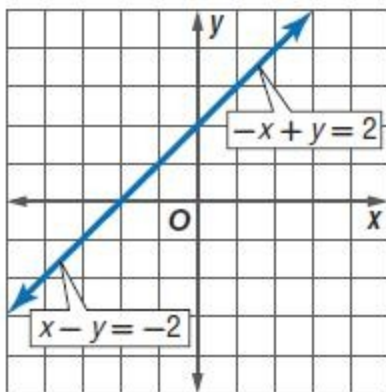
$$\frac{-y}{-1} = \frac{-x-2}{-1} \quad \text{Divide each} \\ \text{side by } -1.$$

$$y = x + 2 \quad \text{Simplify.}$$

$$-x + y = 2 \quad \text{Original equation}$$

$$-x + x + y = 2 + x \quad \text{Add.}$$

$$y = x + 2 \quad \text{Simplify.}$$



The two lines are the same line. Therefore, there are infinitely many solutions.

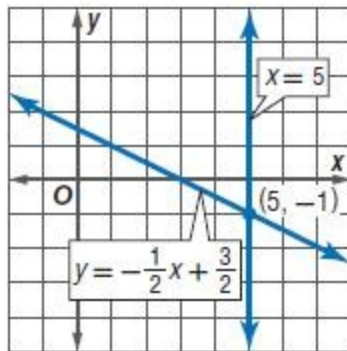
6-1 Graphing Systems of Equations

$$21. \begin{aligned} x + 2y &= 3 \\ x &= 5 \end{aligned}$$

SOLUTION:

Rearrange the first equation into slope-intercept form.

$$\begin{aligned} x + 2y &= 3 && \text{Original equation} \\ x - x + 2y &= 3 - x && \text{Subtract } x \text{ from each side.} \\ 2y &= -x + 3 && \text{Simplify.} \\ \frac{2y}{2} &= \frac{-x+3}{2} && \text{Divide each side by 2.} \\ y &= -\frac{1}{2}x + \frac{3}{2} && \text{Simplify.} \end{aligned}$$



The graphs intersect at one point, so there is one solution. The lines intersect at $(5, -1)$.

6-1 Graphing Systems of Equations

$$22. \begin{aligned} 2x + 3y &= 12 \\ 2x - y &= 4 \end{aligned}$$

SOLUTION:

Rearrange the two equations into slope-intercept form.

$$2x + 3y = 12 \quad \text{Original equation}$$

$$2x - 2x + 3y = 12 - 2x \quad \text{Subtract } 2x \text{ from each side.}$$

$$3y = -2x + 12 \quad \text{Simplify.}$$

$$\frac{3y}{3} = \frac{-2x+12}{3} \quad \text{Divide each side by 3.}$$

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

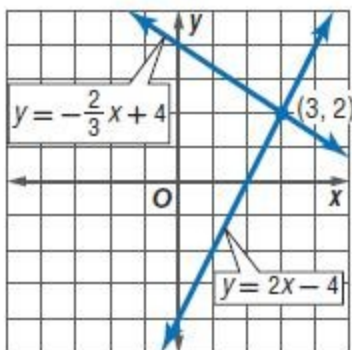
$$2x - y = 4 \quad \text{Original equation}$$

$$2x - 2x - y = 4 - 2x \quad \text{Subtract } 2x \text{ from each side.}$$

$$-y = -2x + 4 \quad \text{Simplify.}$$

$$\frac{-y}{-1} = \frac{-2x+4}{-1} \quad \text{Divide each side by } -1.$$

$$y = 2x - 4 \quad \text{Simplify.}$$



The graphs intersect at one point, so there is one solution. The lines intersect at $(3, 2)$.

6-1 Graphing Systems of Equations

$$23. \begin{aligned} 2x + y &= -4 \\ y + 2x &= 3 \end{aligned}$$

SOLUTION:

Rearrange the two equations into slope-intercept form.

$$2x + y = -4 \quad \text{Original equation}$$

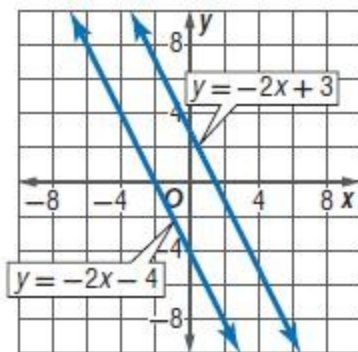
$$2x - 2x + y = -4 - 2x \quad \text{Subtract } 2x \text{ from each side.}$$

$$y = -2x - 4 \quad \text{Simplify.}$$

$$y + 2x = 3 \quad \text{Original equation}$$

$$y + 2x - 2x = 3 - 2x \quad \text{Subtract } 2x \text{ from each side.}$$

$$y = -2x + 3 \quad \text{Simplify.}$$



These two lines are parallel, so they do not intersect. Therefore, there is no solution.

6-1 Graphing Systems of Equations

$$24. \begin{aligned} 2x + 2y &= 6 \\ 5y + 5x &= 15 \end{aligned}$$

SOLUTION:

Rearrange the two equations into slope-intercept form.

$$2x + 2y = 6 \quad \text{Original equation}$$

$$2x - 2x + 2y = 6 - 2x \quad \text{Subtract } 2x \text{ from each side.}$$

$$2y = -2x + 6 \quad \text{Simplify.}$$

$$\frac{2y}{2} = \frac{-2x+6}{2} \quad \text{Divide each side by 2.}$$

$$y = -x + 3 \quad \text{Simplify.}$$

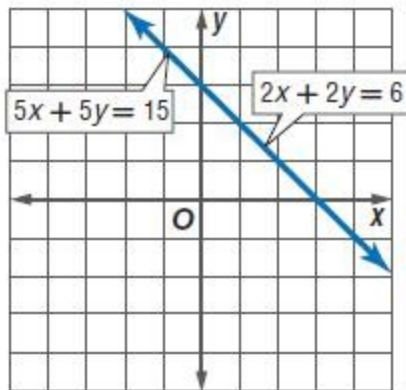
$$5x + 5y = 15 \quad \text{Original equation}$$

$$5x - 5x + 5y = 15 - 5x \quad \text{Subtract } 5x \text{ from each side.}$$

$$5y = -5x + 15 \quad \text{Simplify.}$$

$$\frac{5y}{5} = \frac{-5x+15}{5} \quad \text{Divide each side by 5.}$$

$$y = -x + 3 \quad \text{Simplify.}$$



The two lines are the same line. Therefore, there are infinitely many solutions.

6-1 Graphing Systems of Equations

25. **SCHOOL DANCE** Akira and Jen are competing to see who can sell the most tickets for the Winter Dance. On Monday, Akira sold 22 and then sold 30 per day after that. Jen sold 53 one Monday and then sold 20 per day after that.

- Write equations for the number of tickets each person has sold.
- Graph each equation.
- Solve the system of equations. Check and interpret your solution.

SOLUTION:

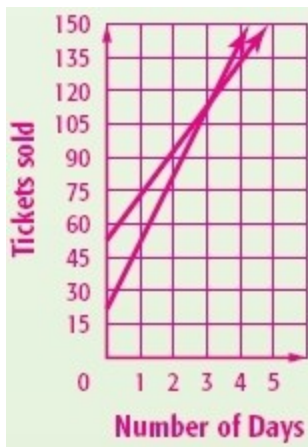
a. Let x represent the number of days and let y represent the number of tickets sold.

Number of tickets sold by each equals tickets sold per day times the number of days plus the number of tickets sold initially

Akira: $y = 30x + 22$;

Jen: $y = 20x + 53$

b. Graph $y = 30x + 22$ and $y = 20x + 53$. Choose appropriate scales for the horizontal and vertical axes.



c. The graphs appear to intersect at (3.1, 115) Use substitution to check this.

$$y = 30x + 22 \quad \text{Original equation} \quad y = 20x + 53$$

$$115 \stackrel{?}{=} 30(3.1) + 22 \quad \text{Substitution} \quad 115 \stackrel{?}{=} 20(3.1) + 53$$

$$115 \stackrel{?}{=} 93 + 22 \quad \text{Multiply} \quad 115 \stackrel{?}{=} 62 + 53$$

$$115 = 115 \checkmark \quad \text{Simplify} \quad 115 = 115 \checkmark$$

Since the answer works in both equations, (3.1, 115) is the solution to the system of equations.

For less than 3 days Jen will have sold more tickets. After about 3 days Jen and Akira will have sold the same number of tickets. For 4 days or more, Akira will have sold more tickets.

6-1 Graphing Systems of Equations

26. **CCSS MODELING** If x is the number of years since 2000 and y is the percent of people using travel services, the following equations represent the percent of people using travel agents and the percent of the people using the Internet to plan travel.

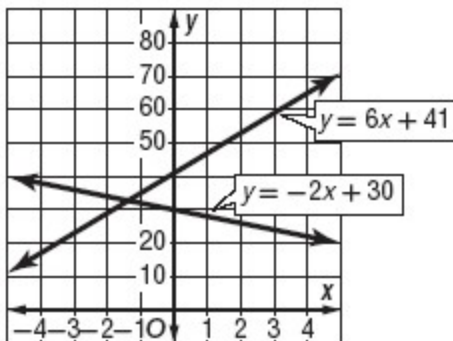
Travel agents: $y = -2x + 30$

Internet: $y = 6x + 41$

- a. Graph the system of equations.
- b. Estimate the year travel agents and the Internet were used equally.

SOLUTION:

a.

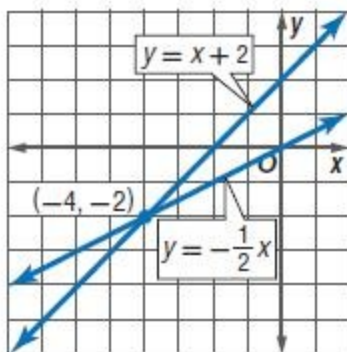


- b. The intersection occurs close to $x = -1$. So, this means that the year is $2000 - 1$, or 1999.

Graph each system and determine the number of solutions that it has. If it has one solution, name it.

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

SOLUTION:

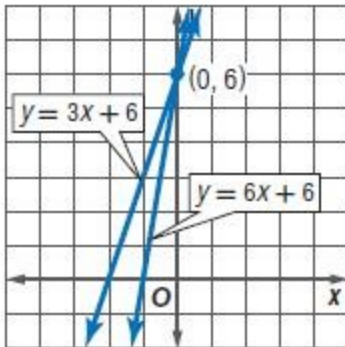


The graphs intersect at one point, so there is one solution. The lines intersect at $(-4, -2)$.

6-1 Graphing Systems of Equations

28. $y = 6x + 6$
 $y = 3x + 6$

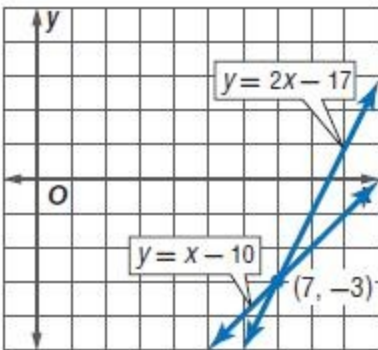
SOLUTION:



The graphs intersect at one point, so there is one solution. The lines intersect at $(0, 6)$.

29. $y = 2x - 17$
 $y = x - 10$

SOLUTION:



The graphs intersect at one point, so there is one solution. The lines intersect at $(7, -3)$.

6-1 Graphing Systems of Equations

30. $8x - 4y = 16$
 $-5x - 5y = 5$

SOLUTION:

Rearrange the two equations into slope-intercept form.

$$8x - 4y = 16 \quad \text{Original equation}$$

$$8x - 8x - 4y = 16 - 8x \quad \text{Subtract } 8x \text{ from each side.}$$

$$-4y = -8x + 16 \quad \text{Simplify.}$$

$$\frac{-4y}{-4} = \frac{-8x + 16}{-4} \quad \text{Divide each side by } -4.$$

$$y = 2x - 4 \quad \text{Simplify.}$$

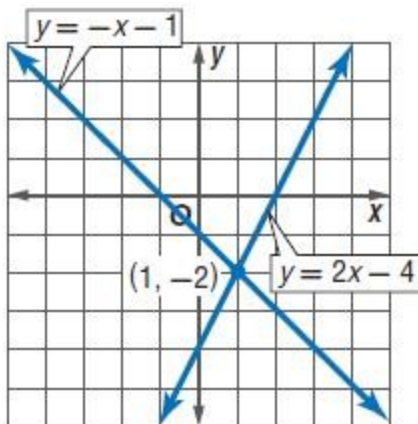
$$-5x - 5y = 5 \quad \text{Original equation}$$

$$-5x + 5x - 5y = 5 + 5x \quad \text{Add } 5x \text{ to each side.}$$

$$-5y = 5x + 5 \quad \text{Simplify.}$$

$$\frac{-5y}{-5} = \frac{5x + 5}{-5} \quad \text{Divide each side by } -5.$$

$$y = -x - 1 \quad \text{Simplify.}$$



The graphs intersect at one point, so there is one solution. The lines intersect at $(1, -2)$.

6-1 Graphing Systems of Equations

31. $3x + 5y = 30$
 $3x + y = 18$

SOLUTION:

Rearrange the two equations into slope-intercept form.

$$3x + 5y = 30 \quad \text{Original equation}$$

$$3x - 3x + 5y = 30 - 3x \quad \text{Subtract } 3x \text{ from each side.}$$

$$5y = -3x + 30 \quad \text{Simplify.}$$

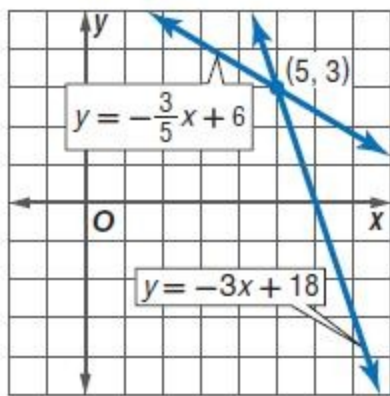
$$\frac{5y}{5} = \frac{-3x + 30}{5} \quad \text{Divide each side by 5.}$$

$$y = -\frac{3}{5}x + 6 \quad \text{Simplify.}$$

$$3x + y = 18 \quad \text{Original equation}$$

$$3x - 3x + y = 18 - 3x \quad \text{Subtract } 3x \text{ from each side.}$$

$$y = -3x + 18 \quad \text{Simplify.}$$



The graphs intersect at one point, so there is one solution. The lines intersect at $(5, 3)$.

6-1 Graphing Systems of Equations

$$32. \begin{aligned} -3x + 4y &= 24 \\ 4x - y &= 7 \end{aligned}$$

SOLUTION:

Rearrange the two equations into slope-intercept form.

$$-3x + 4y = 24 \quad \text{Original equation}$$

$$-3x + 3x + 4y = 24 + 3x \quad \text{Add } 3x \text{ to each side.}$$

$$4y = 3x + 24 \quad \text{Simplify.}$$

$$\frac{4y}{4} = \frac{3x+24}{4} \quad \text{Divide each side by 4.}$$

$$y = \frac{3}{4}x + 6 \quad \text{Simplify.}$$

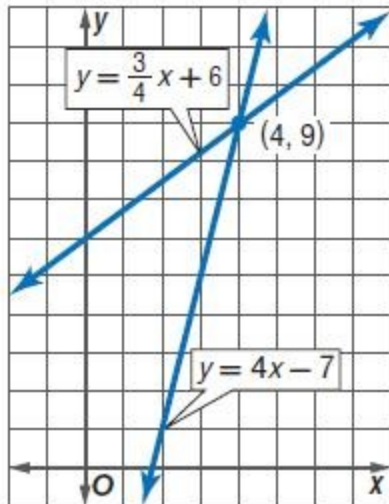
$$4x - y = 7 \quad \text{Original equation}$$

$$4x - 4x - y = 7 - 4x \quad \text{Subtract } 4x \text{ from each side.}$$

$$-y = -4x + 7 \quad \text{Simplify.}$$

$$\frac{-y}{-1} = \frac{-4x+7}{-1} \quad \text{Divide each side by } -1.$$

$$y = 4x - 7 \quad \text{Simplify.}$$



The graphs intersect at one point, so there is one solution. The lines intersect at $(4, 9)$.

6-1 Graphing Systems of Equations

$$33. \begin{aligned} 2x - 8y &= 6 \\ x - 4y &= 3 \end{aligned}$$

SOLUTION:

Rearrange the two equations into slope-intercept form.

$$2x - 8y = 6 \quad \text{Original equation}$$

$$2x - 2x - 8y = 6 - 2x \quad \text{Subtract } 2x \text{ from each side.}$$

$$-8y = -2x + 6 \quad \text{Simplify.}$$

$$\frac{-8y}{-8} = \frac{-2x+6}{-8} \quad \text{Divide each side by } -8.$$

$$y = \frac{1}{4}x - \frac{3}{4} \quad \text{Simplify.}$$

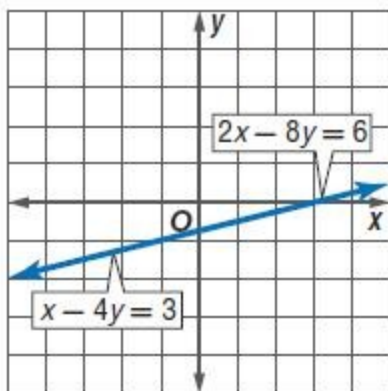
$$x - 4y = 3 \quad \text{Original equation}$$

$$x - x - 4y = 3 - x \quad \text{Simplify.}$$

$$-4y = -x + 3 \quad \text{Subtract } x \text{ from each side.}$$

$$\frac{-4y}{-4} = \frac{-x+3}{-4} \quad \text{Divide each side by } -4.$$

$$y = \frac{1}{4}x - \frac{3}{4} \quad \text{Simplify.}$$



The two lines are the same line. Therefore, there are infinitely many solutions.

6-1 Graphing Systems of Equations

$$34. \begin{aligned} 4x - 6y &= 12 \\ -2x + 3y &= -6 \end{aligned}$$

SOLUTION:

Rearrange the two equations into slope-intercept form.

$$4x - 6y = 12 \quad \text{Original equation}$$

$$4x - 4x - 6y = 12 - 4x \quad \text{Subtract } 4x \text{ from each side.}$$

$$-6y = -4x + 12 \quad \text{Simplify.}$$

$$\frac{-6y}{-6} = \frac{-4x+12}{-6} \quad \text{Divide each side by } -6.$$

$$y = \frac{2}{3}x - 2 \quad \text{Simplify.}$$

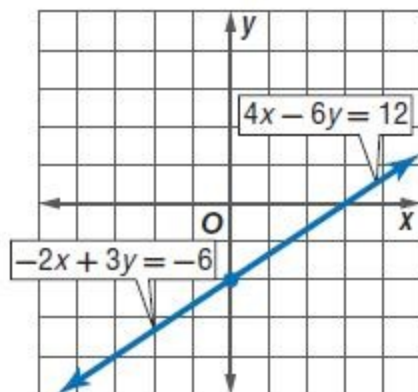
$$-2x + 3y = -6 \quad \text{Original equation}$$

$$-2x + 2x + 3y = -6 + 2x \quad \text{Add } 2x \text{ to each side.}$$

$$3y = 2x - 6 \quad \text{Simplify.}$$

$$\frac{3y}{3} = \frac{2x-6}{3} \quad \text{Divide each side by } 3.$$

$$y = \frac{2}{3}x - 2 \quad \text{Simplify.}$$



The two lines are the same line. Therefore, there are infinitely many solutions.

6-1 Graphing Systems of Equations

$$35. \begin{aligned} 2x + 3y &= 10 \\ 4x + 6y &= 12 \end{aligned}$$

SOLUTION:

Rearrange the two equations into slope-intercept form.

$$2x + 3y = 10 \quad \text{Original equation}$$

$$2x - 2x + 3y = 10 - 2x \quad \text{Subtract } 2x \text{ from each side.}$$

$$3y = -2x + 10 \quad \text{Simplify.}$$

$$\frac{3y}{3} = \frac{-2x+10}{3} \quad \text{Divide each side by 3.}$$

$$y = -\frac{2}{3}x + \frac{10}{3} \quad \text{Simplify.}$$

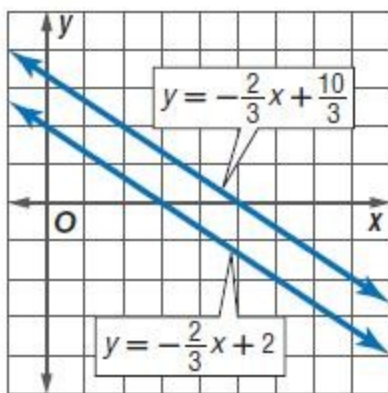
$$4x + 6y = 12 \quad \text{Original equation}$$

$$4x - 4x + 6y = 12 - 4x \quad \text{Subtract } 4x \text{ from each side.}$$

$$6y = -4x + 12 \quad \text{Simplify.}$$

$$\frac{6y}{6} = \frac{-4x+12}{6} \quad \text{Divide each side by 6.}$$

$$y = -\frac{2}{3}x + 2 \quad \text{Simplify.}$$



These two lines are parallel, so they do not intersect. Therefore, there is no solution.

6-1 Graphing Systems of Equations

36. $3x + 2y = 10$
 $2x + 3y = 10$

SOLUTION:

Rearrange the two equations into slope-intercept form.

$$3x + 2y = 10 \quad \text{Original equation}$$

$$3x - 3x + 2y = 10 - 3x \quad \text{Subtract } 3x \text{ from each side.}$$

$$2y = -3x + 10 \quad \text{Simplify.}$$

$$\frac{2y}{2} = \frac{-3x+10}{2} \quad \text{Divide each side by 2.}$$

$$y = -\frac{3}{2}x + 5 \quad \text{Simplify.}$$

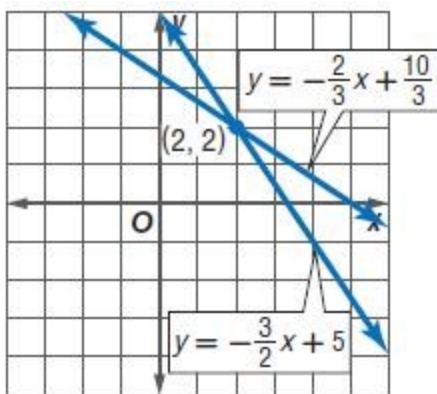
$$2x + 3y = 10 \quad \text{Original equation}$$

$$2x - 2x + 3y = 10 - 2x \quad \text{Subtract } 2x \text{ from each side.}$$

$$3y = -2x + 10 \quad \text{Simplify.}$$

$$\frac{3y}{3} = \frac{-2x+10}{3} \quad \text{Divide each side by 3.}$$

$$y = -\frac{2}{3}x + \frac{10}{3} \quad \text{Simplify.}$$



The graphs intersect at one point, so there is one solution. The lines intersect at $(2, 2)$.

6-1 Graphing Systems of Equations

$$37. 3y - x = -2$$

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

SOLUTION:

Rearrange the two equations into slope-intercept form.

$$3y - x = -2 \quad \text{Original equation}$$

$$3y - x + x = -2 + x \quad \text{Add } x \text{ to each side.}$$

$$3y = x - 2 \quad \text{Simplify.}$$

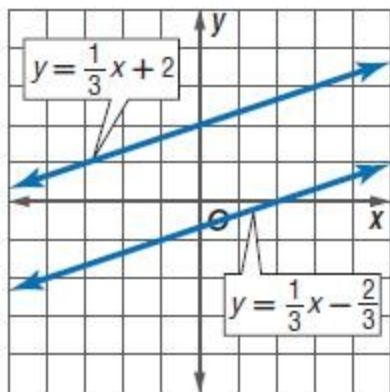
$$\frac{3y}{3} = \frac{x-2}{3} \quad \text{Divide each side by 3.}$$

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

$$y - \frac{1}{3}x = 2 \quad \text{Original equation}$$

$$y - \frac{1}{3}x + \frac{1}{3}x = 2 + \frac{1}{3}x \quad \text{Add } \frac{1}{3}x \text{ to each side.}$$

$$y = \frac{1}{3}x + 2 \quad \text{Simplify.}$$



These two lines are parallel, so they do not intersect. Therefore, there is no solution.

6-1 Graphing Systems of Equations

$$\frac{8}{5}y = \frac{2}{5}x + 1$$

38. $\frac{2}{5}y = \frac{1}{10}x + \frac{1}{4}$

SOLUTION:

Rearrange the two equations into slope-intercept form.

$$\frac{8}{5}y = \frac{2}{5}x + 1 \quad \text{Original equation}$$

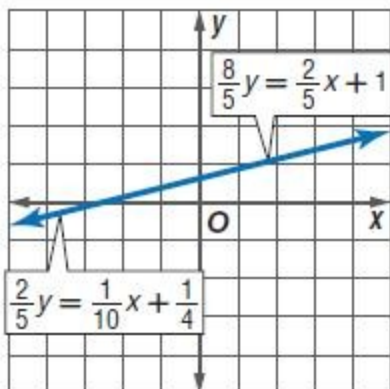
$$\frac{5}{8}\left(\frac{8}{5}y\right) = \frac{5}{8}\left(\frac{2}{5}x + 1\right) \quad \text{Multiply each side by } \frac{5}{8}.$$

$$y = \frac{1}{4}x + \frac{5}{8} \quad \text{Simplify.}$$

$$\frac{2}{5}y = \frac{1}{10}x + \frac{1}{4} \quad \text{Original equation}$$

$$\frac{5}{2}\left(\frac{2}{5}y\right) = \frac{5}{2}\left(\frac{1}{10}x + \frac{1}{4}\right) \quad \text{Multiply each side by } \frac{5}{2}.$$

$$y = \frac{1}{4}x + \frac{5}{8} \quad \text{Simplify.}$$



The two lines are the same line. Therefore, there are infinitely many solutions.

6-1 Graphing Systems of Equations

$$\frac{1}{3}x + \frac{1}{3}y = 1$$

39. $x + y = 1$

SOLUTION:

Rearrange the two equations into slope-intercept form.

$$\frac{1}{3}x + \frac{1}{3}y = 1 \quad \text{Original equation}$$

$$\frac{1}{3}x - \frac{1}{3}x + \frac{1}{3}y = 1 - \frac{1}{3}x \quad \text{Subtract } \frac{1}{3}x \text{ from each side.}$$

$$\frac{1}{3}y = -\frac{1}{3}x + 1 \quad \text{Simplify.}$$

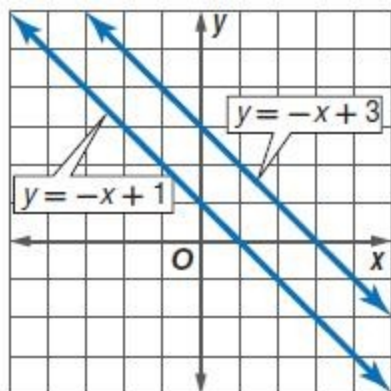
$$3\left(\frac{1}{3}y\right) = 3\left(-\frac{1}{3}x + 1\right) \quad \text{Multiply each side by 3.}$$

$$y = -x + 3 \quad \text{Simplify.}$$

$$x + y = 1 \quad \text{Original equation}$$

$$x - x + y = 1 - x \quad \text{Subtract } x \text{ from each side.}$$

$$y = -x + 1 \quad \text{Simplify.}$$



These two lines are parallel, so they do not intersect. Therefore, there is no solution.

6-1 Graphing Systems of Equations

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

40. $\frac{2}{3}x + \frac{1}{6}y = \frac{1}{2}$

SOLUTION:

Rearrange the two equations into slope-intercept form.

$$\frac{3}{4}x + \frac{1}{2}y = \frac{1}{4} \quad \text{Original equation}$$

$$4\left(\frac{3}{4}x + \frac{1}{2}y\right) = 4\left(\frac{1}{4}\right) \quad \text{Multiply each side by 4.}$$

$$3x + 2y = 1 \quad \text{Simplify.}$$

$$3x - 3x + 2y = 1 - 3x \quad \text{Subtract } 3x \text{ from each side.}$$

$$2y = -3x + 1 \quad \text{Simplify.}$$

$$\frac{2y}{2} = \frac{-3x+1}{2} \quad \text{Divide each side by 2.}$$

$$y = -\frac{3}{2}x + \frac{1}{2} \quad \text{Simplify.}$$

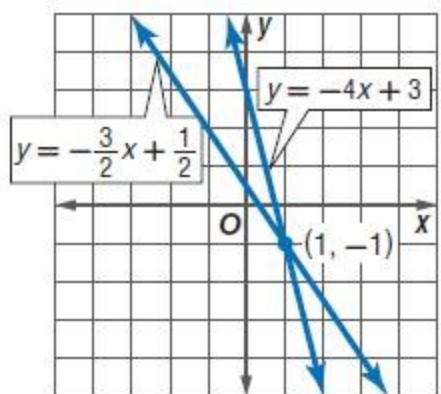
$$\frac{2}{3}x + \frac{1}{6}y = \frac{1}{2} \quad \text{Original equation}$$

$$6\left(\frac{2}{3}x + \frac{1}{6}y\right) = 6\left(\frac{1}{2}\right) \quad \text{Multiply each side by 6.}$$

$$4x + y = 3 \quad \text{Simplify.}$$

$$4x - 4x + y = 3 - 4x \quad \text{Subtract } 4x \text{ from each side.}$$

$$y = -4x + 3 \quad \text{Simplify.}$$



The graphs intersect at one point, so there is one solution. The lines intersect at $(1, -1)$.

6-1 Graphing Systems of Equations

$$\frac{5}{6}x + \frac{2}{3}y = \frac{1}{2}$$

41. $\frac{2}{5}x + \frac{1}{5}y = \frac{3}{5}$

SOLUTION:

Rearrange the two equations into slope-intercept form.

$$\frac{5}{6}x + \frac{2}{3}y = \frac{1}{2} \quad \text{Original equation}$$

$$6\left(\frac{5}{6}x + \frac{2}{3}y\right) = 6\left(\frac{1}{2}\right) \quad \text{Multiply each side by 6.}$$

$$5x + 4y = 3 \quad \text{Simplify.}$$

$$5x - 5x + 4y = 3 - 5x \quad \text{Subtract } 5x \text{ from each side.}$$

$$4y = -5x + 3 \quad \text{Simplify.}$$

$$\frac{4y}{4} = \frac{-5x + 3}{4} \quad \text{Divide each side by 4.}$$

$$y = -\frac{5}{4}x + \frac{3}{4} \quad \text{Simplify.}$$

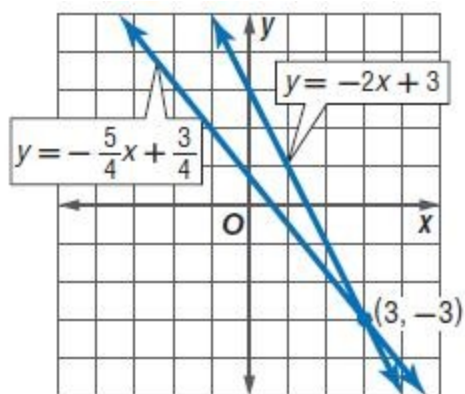
$$\frac{2}{5}x + \frac{1}{5}y = \frac{3}{5} \quad \text{Original equation}$$

$$5\left(\frac{2}{5}x + \frac{1}{5}y\right) = 5\left(\frac{3}{5}\right) \quad \text{Multiply each side by 5.}$$

$$2x + y = 3 \quad \text{Simplify.}$$

$$2x - 2x + y = 3 - 2x \quad \text{Subtract } 2x \text{ from each side.}$$

$$y = -2x + 3 \quad \text{Simplify.}$$



The graphs intersect at one point, so there is one solution. The lines intersect at $(3, -3)$.

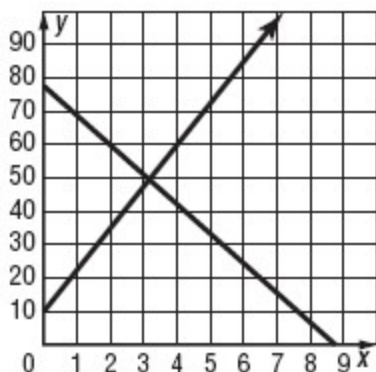
6-1 Graphing Systems of Equations

42. **PHOTOGRAPHY** Suppose x represents the number of cameras sold and y represents the number of years since 2000. Then the number of digital cameras sold each year since 2000, in millions, can be modeled by the equation $y = 12.5x + 10.9$. The number of film cameras sold each year since 2000, in millions, can be modeled by the equation $y = -9.1x + 78.8$.

- Graph each equation.
- In which year did digital camera sales surpass film camera sales?
- In what year will film cameras stop selling altogether?
- What are the domain and range of each of the functions in this situation?

SOLUTION:

a.



- The digital camera passed the film camera at $x = 3$, so it was in 2003.
- The film camera will stop selling at $x \approx 8.7$, or in the year 2008.
- The domain of each of these equations is the set of real numbers greater than or equal to 0. The range of each of these equations is the set of real numbers greater than or equal to 0.

6-1 Graphing Systems of Equations

Graph each system and determine the number of solutions that it has. If it has one solution, name it.

43. $2y = 1.2x - 10$

$4y = 2.4x$

SOLUTION:

Rearrange the two equations into slope-intercept form.

$2y = 1.2x - 10$ Original equation

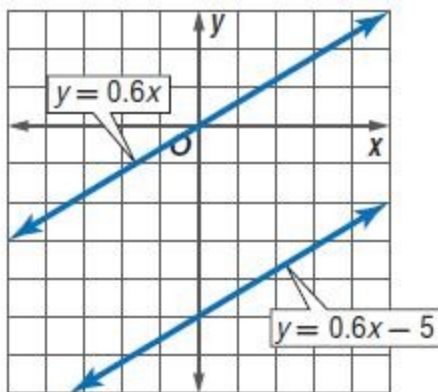
$\frac{2y}{2} = \frac{1.2x - 10}{2}$ Divide each side by 2.

$y = 0.6x - 5$ Simplify.

$4y = 2.4x$ Original equation

$\frac{4y}{4} = \frac{2.4x}{4}$ Divide each side by 4.

$y = 0.6x$ Simplify.



These two lines are parallel, so they do not intersect. Therefore, there is no solution.

6-1 Graphing Systems of Equations

$$x = 6 - \frac{3}{8}y$$

44. $4 = \frac{2}{3}x + \frac{1}{4}y$

SOLUTION:

Rearrange the two equations into slope-intercept form.

$$x = 6 - \frac{3}{8}y \quad \text{Original equation}$$

$$x - 6 = 6 - 6 - \frac{3}{8}y \quad \text{Subtract 6 from each side.}$$

$$x - 6 = -\frac{3}{8}y \quad \text{Simplify.}$$

$$-\frac{8}{3}(x - 6) = -\frac{8}{3}\left(-\frac{3}{8}y\right) \quad \text{Multiply each side by } -\frac{8}{3}.$$

$$-\frac{8}{3}x + 16 = y \quad \text{Simplify.}$$

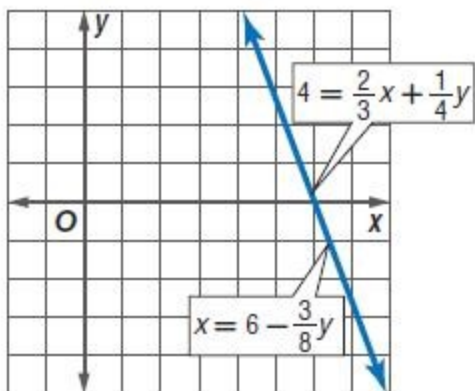
$$4 = \frac{2}{3}x + \frac{1}{4}y \quad \text{Original equation}$$

$$4 - \frac{2}{3}x = \frac{2}{3}x - \frac{2}{3}x + \frac{1}{4}y \quad \text{Subtract } \frac{2}{3}x \text{ from each side.}$$

$$-\frac{2}{3}x + 4 = \frac{1}{4}y \quad \text{Simplify.}$$

$$4\left(-\frac{2}{3}x + 4\right) = 4\left(\frac{1}{4}y\right) \quad \text{Multiply each side by 4.}$$

$$-\frac{8}{3}x + 16 = y \quad \text{Simplify.}$$



The two lines are the same line. Therefore, there are infinitely many solutions.

6-1 Graphing Systems of Equations

45. **WEB SITES** Personal publishing site *Lookatme* had 2.5 million visitors in 2009. Each year after that, the number of visitors rose by 13.1 million. Online auction site *Buyourstuff* had 59 million visitors in 2009, but each year after that the number of visitors fell by 2 million.
- Write an equation for each of the companies.
 - Make a table of values for 5 years for each of the companies.
 - Graph each equation.
 - When will *Lookatme* and *Buyourstuff*'s sites have the same number of visitors?
 - Name the domain and range of these functions in this situation.

SOLUTION:

- a. Let x represent the number of years past 2009 and y represent the number of visitors in the millions.

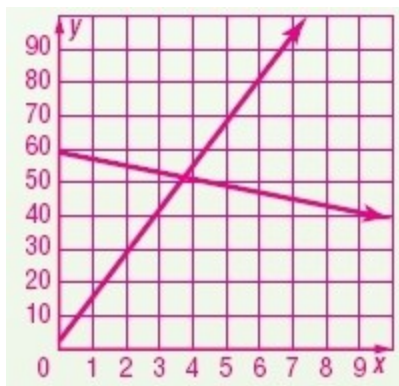
Lookatme: $y = 13.1x + 2.5$;

Buyourstuff: $y = -2x + 59$

b.

Years Since 2009	Lookatme Visitors (mln)	Buyourstuff Visitors (mln)
0	2.5	59
1	15.6	57
2	28.7	55
3	41.8	53
4	54.9	51

c.



- d. The two sites will have the same number of visitors somewhere between $x = 3$ and $x = 4$, meaning that the intersection will occur some time in the 3rd year past 2009, or during 2012.
- e. $D = \{x|x \geq 0\}$; $R = \{y|y \geq 0\}$

6-1 Graphing Systems of Equations

46. **MULTIPLE REPRESENTATIONS** In this problem, you will explore different methods for finding the intersection of the graphs of two linear equations

a. **ALGEBRAIC** Use algebra to solve the equation $\frac{1}{2}x + 3 = -x + 12$.

b. **GRAPHICAL** Use a graph to solve $y = \frac{1}{2}x + 3$ and $y = -x + 12$.

c. **ANALYTICAL** How is the equation in part **a** related to the system in part **b**?

d. **VERBAL** Explain how to use the graph in part **b** to solve the equation in part **a**.

SOLUTION:

a.

$$\frac{1}{2}x + 3 = -x + 12 \quad \text{Original equation}$$

$$\frac{1}{2}x + 3 + x = -x + x + 12 \quad \text{Add } x \text{ to each side.}$$

$$\frac{3}{2}x + 3 = 12 \quad \text{Simplify.}$$

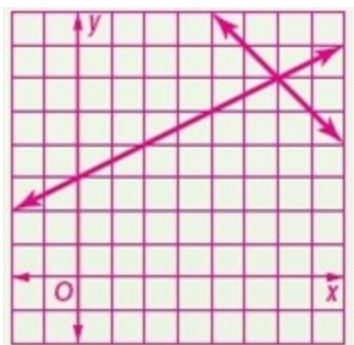
$$\frac{3}{2}x + 3 - 3 = 12 - 3 \quad \text{Subtract 3 from each side.}$$

$$\frac{3}{2}x = 9 \quad \text{Simplify.}$$

$$\frac{2}{3}\left(\frac{3}{2}x\right) = \frac{2}{3}(9) \quad \text{Multiply each side by } \frac{2}{3}.$$

$$x = 6 \quad \text{Simplify.}$$

b.



(6, 6)

c. Both sides of the equation in part **a** are set equal to y in the system of linear equations in part **b**.

d. You can use the graph to find the x -coordinate of the intersection of the two. Then, you can substitute that value into the equation in part **a** and see if it checks.

6-1 Graphing Systems of Equations

47. **ERROR ANALYSIS** Store A is offering a 10% discount on the purchase of all electronics in their store. Store B is offering \$10 off all the electronics in their store. Francisca and Alan are deciding which offer will save them more money. Is either of them correct? Explain your reasoning.

Francisca

You can't determine which store has the better offer unless you know the price of the items you want to buy.

Alan

Store A has the better offer because 10% of the sale price is a greater discount than \$10.

SOLUTION:

If the item is less than \$100, then \$10 off is better. If the item is more than \$100, then the 10% is better. Consider purchasing an item that cost \$175. The cost they will have to pay at Store A is $\$175(1 - 0.10)$ or \$157.50. At Store B, the cost would be \$165. However, if they purchased a item at \$75, at Store A, the cost would be \$67.5 compared to \$65 at Store B. Therefore, Francisca is correct, you must know the price of the item before choosing the store.

48. **CHALLENGE** Use graphing to find the solution of the system of equations $2x + 3y = 5$, $3x + 4y = 6$, and $4x + 5y = 7$.

SOLUTION:

One method would be to rearrange the three equations into slope-intercept form.

$$2x + 3y = 5 \quad \text{Original equation}$$

$$2x - 2x + 3y = 5 - 2x \quad \text{Subtract } 2x \text{ from each side.}$$

$$3y = -2x + 5 \quad \text{Simplify.}$$

$$\frac{3y}{3} = \frac{-2x+5}{3} \quad \text{Divide each side by 3.}$$

$$y = -\frac{2}{3}x + \frac{5}{3} \quad \text{Simplify.}$$

6-1 Graphing Systems of Equations

$$3x + 4y = 6 \quad \text{Original equation}$$

$$3x - 3x + 4y = 6 - 3x \quad \text{Subtract } 3x \text{ from each side.}$$

$$4y = -3x + 6 \quad \text{Simplify.}$$

$$\frac{4y}{4} = \frac{-3x+6}{4} \quad \text{Divide each side by 4.}$$

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

$$4x + 5y = 7 \quad \text{Original equation}$$

$$4x - 4x + 5y = 7 - 4x \quad \text{Subtract } 4x \text{ from each side.}$$

$$5y = -4x + 7 \quad \text{Simplify.}$$

$$\frac{5y}{5} = \frac{-4x+7}{5} \quad \text{Divide each side by 5.}$$

$$y = -\frac{4}{5}x + \frac{7}{5} \quad \text{Simplify.}$$

Notice the fractions in the equations. This will make it a little difficult to graph the lines.

Another option would be to plot the x - and y -intercepts of each graph. Substitute 0 in for x and y to identify the intercepts.

Equation 1:

$$2x + 3y = 5 \quad \text{Original equation}$$

$$2(0) + 3y = 5 \quad x = 0$$

$$3y = 5 \quad \text{Simplify.}$$

$$y = \frac{5}{3} \quad \text{Divide each side by 3.}$$

$$\left(0, \frac{5}{3}\right) \quad y \text{-intercept}$$

$$2x + 3y = 5 \quad \text{Original equation}$$

$$2x + 3(0) = 5 \quad y = 0$$

$$2x = 5 \quad \text{Simplify.}$$

$$x = \frac{5}{2} \quad \text{Divide each side by 2.}$$

$$\left(\frac{5}{2}, 0\right) \quad x \text{-intercept}$$

Equation 2:

6-1 Graphing Systems of Equations

$$3x + 4y = 6 \quad \text{Original equation}$$

$$3(0) + 4y = 6 \quad x = 0.$$

$$4y = 6 \quad \text{Simplify.}$$

$$y = \frac{6}{4} \quad \text{Divide each side by 4.}$$

$$\left(0, \frac{3}{2}\right) \quad y\text{-intercept.}$$

$$3x + 4y = 6 \quad \text{Original equation}$$

$$3x + 4(0) = 6 \quad y = 0.$$

$$3x = 6 \quad \text{Simplify.}$$

$$x = 2 \quad \text{Divide each side by 3.}$$

$$(2, 0) \quad x\text{-intercept.}$$

Equation 3:

$$4x + 5y = 7 \quad \text{Original equation}$$

$$4(0) + 5y = 7 \quad x = 0.$$

$$5y = 7 \quad \text{Simplify.}$$

$$y = \frac{7}{5} \quad \text{Divide each side by 5.}$$

$$\left(0, \frac{7}{5}\right) \quad y\text{-intercept}$$

$$4x + 5y = 7 \quad \text{Original equation}$$

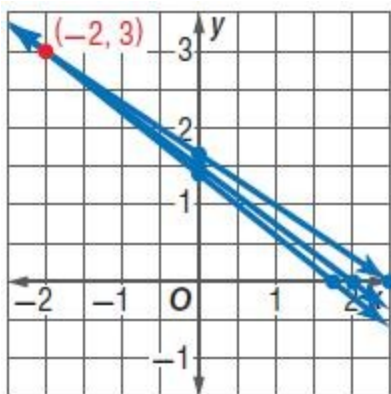
$$4x + 5(0) = 7 \quad y = 0.$$

$$4x = 7 \quad \text{Simplify.}$$

$$x = \frac{7}{4} \quad \text{Divide each side by 4.}$$

$$\left(\frac{7}{4}, 0\right) \quad x\text{-intercept}$$

Plot each set of points. Draw a line through each set. The intersection of these lines is the solution.

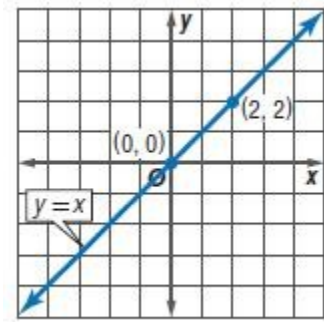


All three lines intersect at $(-2, 3)$

6-1 Graphing Systems of Equations

49. **CCSS ARGUMENTS** Determine whether a system of two linear equations with $(0, 0)$ and $(2, 2)$ as solutions *sometimes*, *always*, or *never* has other solutions. Explain.

SOLUTION:



A system of two linear equations with $(0,0)$ and $(2,2)$ as solutions will always have other solutions. If the equations are linear and have more than one common solution, they must be consistent and dependent, which means that they have an infinite number of solutions in common. Consider the equations of $y = x$ and $2y = 2x$. There are infinite solutions.

50. **WHICH ONE DOESN'T BELONG?** Which one of the following systems of equations doesn't belong with the other three? Explain your reasoning.

$$\begin{aligned} 4x - y &= 5 \\ -2x + y &= -1 \end{aligned}$$

$$\begin{aligned} -x + 4y &= 8 \\ 3x - 6y &= 6 \end{aligned}$$

$$\begin{aligned} 4x + 2y &= 14 \\ 12x + 6y &= 18 \end{aligned}$$

$$\begin{aligned} 3x - 2y &= 1 \\ 2x + 3y &= 18 \end{aligned}$$

SOLUTION:

Rearrange the equations into slope–intercept form.

1 st box	$y = 4x - 5$	$y = 2x - 1$
2 nd box	$y = \frac{1}{4}x + 2$	$y = \frac{1}{2}x - 1$
3 rd box	$y = -2x + 7$	$y = -2x + 3$
4 th box	$y = \frac{3}{2}x - \frac{1}{2}$	$y = -\frac{3}{2}x + 6$

The third box has two equations that are parallel, which means that it is an inconsistent system. The other three systems are independent and consistent.

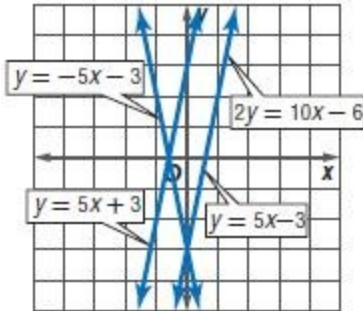
6-1 Graphing Systems of Equations

51. **OPEN ENDED** Write three equations such that they form three systems of equations with $y = 5x - 3$. The three systems should be inconsistent, consistent and independent, and consistent and dependent, respectively.

SOLUTION:

Sample answers: $y = 5x + 3$; $y = -5x - 3$; $2y = 10x - 6$

The first equation is parallel to the original equation, so there is no intersection, which makes the system inconsistent. The second equation has one intersection, which makes the system consistent and independent. The last equation is the same as the original equation, which makes the system consistent and dependent.



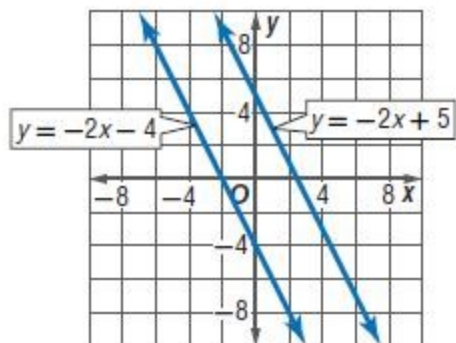
6-1 Graphing Systems of Equations

52. **WRITING IN MATH** Describe the advantages and disadvantages to solving systems of equations by graphing.

SOLUTION:

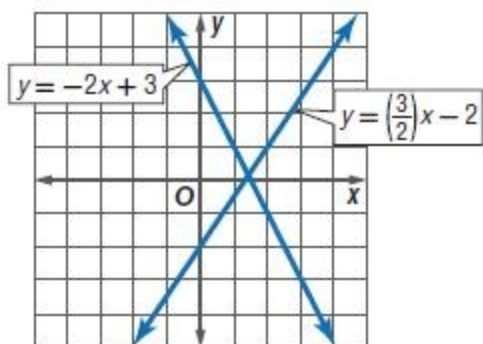
Graphing clearly shows whether a system of equations has one solution, no solution, or infinitely many solutions. However, finding the exact values of x and y from a graph can be difficult.

For example, solve the system $2x + y = 5$ and $6x + 3y = -12$ by graphing. Write each equation in slope-intercept form. $y = -2x + 5$ and $y = -2x - 4$. Graph each line on the same coordinate plane.



It is clear from the graph that the lines are parallel and do not intersect. So, the system has no solutions.

For the system $2x + y = 3$ and $3x - 2y = 4$, the equations in slope-intercept form are $y = -2x + 3$ and $y = \frac{3}{2}x - 2$ and the graphs of these equations yields a pair of intersecting lines.



The graph indicates that the system has one solution but it is not possible to determine from the graph that the solution is $(\frac{10}{7}, \frac{1}{7})$.

6-1 Graphing Systems of Equations

53. **SHORT RESPONSE** Certain bacteria can reproduce every 20 minutes, doubling the population. If there are 450,000 bacteria in a population at 9:00 A.M., how many bacteria will be in the population at 2:00 P.M.?

SOLUTION:

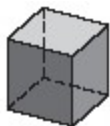
Between 9 A.M. and 2 P.M., there are 5 hours, or 15 twenty-minute sections. That means that the bacteria will double 15 times.

	450,000
1	900,000
2	1,800,000
3	3,600,000
4	7,200,000
5	14,400,000
6	28,800,000
7	57,600,000
8	115,200,000
9	230,400,000
10	460,800,000
11	921,600,000
12	1,843,200,000
13	3,686,400,000
14	7,372,800,000
15	14,745,600,000

Therefore, 14,745,600,000 bacteria will be present at 2:00 P.M.

6-1 Graphing Systems of Equations

54. **GEOMETRY** An 84-centimeter piece of wire is cut into equal segments and then attached at the ends to form the edges of a cube. What is the volume of the cube?



- A 294 cm^3
B 343 cm^3
C 1158 cm^3
D 2744 cm^3

SOLUTION:

There are twelve edges in a cube. So, if you cut an 84-centimeter piece of wire into 12 equal parts, they are each 7 cm long. To calculate the volume of the cube, multiply length times width times height.

$$\begin{aligned} V &= \ell wh \\ &= (7)(7)(7) \\ &= 343 \end{aligned}$$

So, the correct choice is B.

55. What is the solution of the inequality $-9 < 2x + 3 < 15$?

- F $-x \geq 0$
G $x \leq 0$
H $-6 < x < 6$
J $-5 < x < 5$

SOLUTION:

First, express $-9 < 2x + 3 < 15$ using *and*. Then solve each inequality.

$$\begin{array}{rcl} -9 < 2x + 3 & \text{and} & 2x + 3 < 15 \\ -12 < 2x & & 2x < 12 \\ -6 < x & & x < 6 \end{array}$$

The solution is $-6 < x < 6$. So, the correct choice is H.

6-1 Graphing Systems of Equations

56. What is the solution of the system of equations?

$$x + 2y = -1$$

$$2x + 4y = -2$$

A $(-1, -1)$

B $(2, 1)$

C no solution

D infinitely many solutions

SOLUTION:

Solve by graphing. Rewrite each equation in slope-intercept form.

$$x + 2y = -1$$

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

$$2y = -x - 1$$

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

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

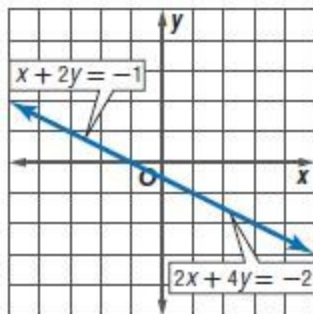
$$2x + 4y = -2$$

$$2x - 2x + 4y = -2x - 2$$

$$4y = -2x - 2$$

$$\frac{4y}{4} = \frac{-2x-2}{4}$$

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



Because both equations are the same in slope-intercept form, they are on the same line. Thus it is a true statement, all numbers will work. Therefore, the correct choice is D.

6-1 Graphing Systems of Equations

Graph each inequality.

57. $3x + 6y > 0$

SOLUTION:

Solve for y in terms of x .

$$3x + 6y > 0$$

$$3x - 3x + 6y > 0 - 3x$$

$$6y > -3x$$

$$\frac{6y}{6} > \frac{-3x}{6}$$

$$y > -\frac{1}{2}x$$

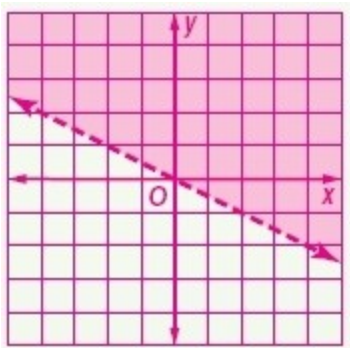
Because the inequality involves $>$, graph the boundary using a dashed line. Choose $(1, 1)$ as a test point.

$$3(1) + 6(1) > 0$$

$$3 + 6 > 0$$

$$9 > 0$$

Since 9 is greater than 0, shade the half-plane that contains $(1, 1)$.



6-1 Graphing Systems of Equations

58. $4x - 2y < 0$

SOLUTION:

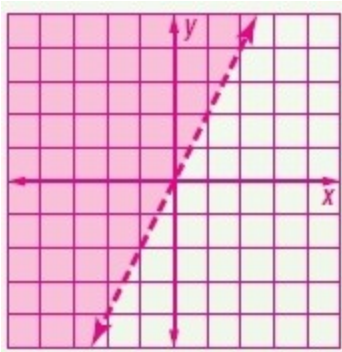
Solve for y in terms of x .

$$\begin{aligned}4x - 2y &< 0 \\4x - 4x - 2y &< -4x \\-2y &< -4x \\ \frac{-2y}{-2} &> \frac{-4x}{-2} \\y &> 2x\end{aligned}$$

Because the inequality involves $>$, graph the boundary using a dashed line. Choose $(1, 1)$ as a test point.

$$\begin{aligned}4(1) - 2(1) &< 0 \\4 - 2 &< 0 \\2 &< 0\end{aligned}$$

Since 2 is not less than 0, shade the half-plane that does not contain $(1, 1)$.



6-1 Graphing Systems of Equations

59. $3y - x \leq 9$

SOLUTION:

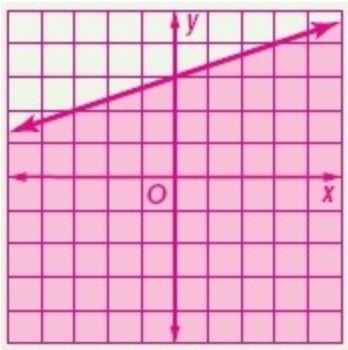
Solve for y in terms of x .

$$\begin{aligned}3y - x &\leq 9 \\3y - x + x &\leq 9 + x \\3y &\leq x + 9 \\ \frac{3y}{3} &\leq \frac{x + 9}{3} \\ y &\leq \frac{1}{3}x + 3\end{aligned}$$

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

$$\begin{aligned}3(0) - (0) &\stackrel{?}{\leq} 9 \\ 0 &\leq 9\end{aligned}$$

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



6-1 Graphing Systems of Equations

60. $4y - 3x \geq 12$

SOLUTION:

Solve for y in terms of x .

$$4y - 3x \geq 12$$

$$4y - 3x + 3x \geq 12 + 3x$$

$$4y \geq 3x + 12$$

$$\frac{4y}{4} \geq \frac{3x + 12}{4}$$

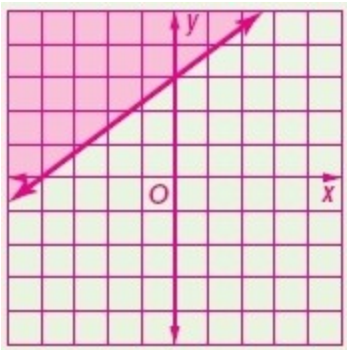
$$y \geq \frac{3}{4}x + 3$$

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

$$4(0) - 3(0) \stackrel{?}{\geq} 12$$

$$0 \geq 12$$

Since 0 is not greater than or equal to 12, shade the half-plane that does not contain $(0, 0)$.



6-1 Graphing Systems of Equations

61. $y < -4x - 8$

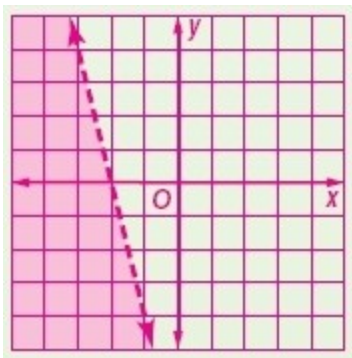
SOLUTION:

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

$$0 < -4(0) - 8$$

$$0 < -8$$

Since 0 is not less than -8 , shade the half-plane that does not contain $(0, 0)$.



62. $3x - 1 > y$

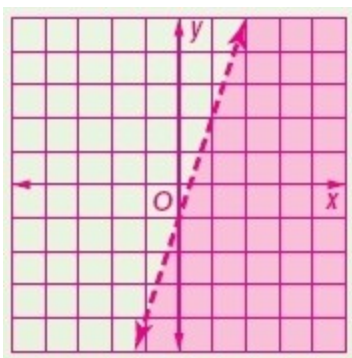
SOLUTION:

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

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

$$-1 > 0$$

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



63. **LIBRARY** To get a grant from the city's historical society, the number of history books must be within 25 of 1500. What is the range of the number of history books that must be in the library?

SOLUTION:

The least number of books is $1500 - 25 = 1475$, while the greatest number of books is $1500 + 25 = 1525$. Therefore, the range is 1475 to 1525 books.

6-1 Graphing Systems of Equations

64. **SCHOOL** Camilla's scores on three math tests are shown in the table. The fourth and final test of the grading period is tomorrow. She needs an average of at least 92 to receive an A for the grading period.

Test	Score
1	91
2	95
3	88

- If m represents her score on the fourth math test, write an inequality to represent this situation.
- If Camilla wants an A in math, what must she score on the test?
- Is your solution reasonable? Explain.

SOLUTION:

a.
$$\frac{91+95+88+m}{4} \geq 92$$

b.

$$\frac{91+95+88+m}{4} \geq 92$$

$$\frac{274+m}{4} \geq 92$$

$$4\left(\frac{274+m}{4}\right) \geq 4(92)$$

$$274+m \geq 368$$

$$274 - 274 + m \geq 368 - 274$$

$$m \geq 94$$

Therefore, Camilla needs a 94 or higher.

- Yes, the score is attainable and Camilla has scored higher than that before.

6-1 Graphing Systems of Equations

Write the slope–intercept form of an equation for the line that passes through the given point and is perpendicular to the graph of the equation.

65. $(-3, 1), y = \frac{1}{3}x + 2$

SOLUTION:

The slope of the line with equation $y = \frac{1}{3}x + 2$ is $\frac{1}{3}$. The slope of the perpendicular line is the opposite reciprocal of $\frac{1}{3}$, or -3 .

$$y = mx + b$$

$$1 = -3(-3) + b$$

$$1 = 9 + b$$

$$-8 = b$$

Write the equation in slope-intercept form.

$$y = mx + b$$

$$y = -3x - 8$$

66. $(6, -2), y = \frac{3}{5}x - 4$

SOLUTION:

The slope of the line with equation $y = \frac{3}{5}x - 4$ is $\frac{3}{5}$. The slope of the perpendicular line is the opposite reciprocal of $\frac{3}{5}$, or $-\frac{5}{3}$.

$$y = mx + b$$

$$-2 = -\frac{5}{3}(6) + b$$

$$-2 = -10 + b$$

$$8 = b$$

Write the equation in slope-intercept form.

$$y = mx + b$$

$$y = -\frac{5}{3}x + 8$$

6-1 Graphing Systems of Equations

67. $(2, -2)$, $2x + y = 5$

SOLUTION:

Rearrange the equation into slope–intercept form.

$$2x + y = 5$$

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

$$y = -2x + 5$$

The slope of the line with equation $y = -2x + 5$ is -2 . The slope of the perpendicular line is the opposite reciprocal of -2 , or $\frac{1}{2}$.

$$y = mx + b$$

$$-2 = \frac{1}{2}(2) + b$$

$$-2 = 1 + b$$

$$-3 = b$$

Write the equation in slope-intercept form.

$$y = mx + b$$

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

68. $(-3, -3)$, $-3x + y = 6$

SOLUTION:

Rearrange the equation into slope–intercept form.

$$-3x + y = 6$$

$$-3x + 3x + y = 6 + 3x$$

$$y = 3x + 6$$

The slope of the line with equation $y = 3x + 6$ is 3 . The slope of the perpendicular line is the opposite reciprocal of 3 , or $-\frac{1}{3}$.

$$y = mx + b$$

$$-3 = -\frac{1}{3}(-3) + b$$

$$-3 = 1 + b$$

$$-4 = b$$

Write the equation in slope-intercept form.

$$y = mx + b$$

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

6-1 Graphing Systems of Equations

Find the solution of each equation using the given replacement set.

69. $f - 14 = 8$; {12, 15, 19, 22}

SOLUTION:

f	$f - 14 = 8$	True or False?
12	$12 - 14 = 8$	False
15	$15 - 14 = 8$	False
19	$19 - 14 = 8$	False
22	$22 - 14 = 8$	True

The solution is {22}.

70. $15(n + 6) = 165$; {3, 4, 5, 6, 7}

SOLUTION:

n	$15(n + 6) = 165$	True or False?
3	$15(3 + 6) = 165$	False
4	$15(4 + 6) = 165$	False
5	$15(5 + 6) = 165$	True
6	$15(6 + 6) = 165$	False
7	$15(7 + 6) = 165$	False

The solution is {5}.

71. $23 = \frac{d}{4}$; {91, 92, 93, 94, 95}

SOLUTION:

d	$23 = \frac{d}{4}$	True or False?
91	$23 = \frac{91}{4}$	False
92	$23 = \frac{92}{4}$	True
93	$23 = \frac{93}{4}$	False
94	$23 = \frac{94}{4}$	False
95	$23 = \frac{95}{4}$	False

The solution is {92}.

6-1 Graphing Systems of Equations

72. $36 = \frac{t-9}{2}$; {78, 79, 80, 81}

SOLUTION:

t	$36 = \frac{t-9}{2}$	True or False?
78	$36 = \frac{78-9}{2}$	False
79	$36 = \frac{79-9}{2}$	False
80	$36 = \frac{80-9}{2}$	False
81	$36 = \frac{81-9}{2}$	True

The solution is {81}.

Evaluate each expression if $a = 2$, $b = -3$, and $c = 11$.

73. $a + 6b$

SOLUTION:

$$\begin{aligned} a + 6b &= 2 + 6(-3) \\ &= 2 - 18 \\ &= -16 \end{aligned}$$

74. $7 - ab$

SOLUTION:

$$\begin{aligned} 7 - ab &= 7 - 2(-3) \\ &= 7 - (-6) \\ &= 7 + 6 \\ &= 13 \end{aligned}$$

75. $(2c + 3a) \div 4$

SOLUTION:

$$\begin{aligned} (2c + 3a) \div 4 &= [2(11) + 3(2)] \div 4 \\ &= [22 + 6] \div 4 \\ &= 28 \div 4 \\ &= 7 \end{aligned}$$

6-1 Graphing Systems of Equations

76. $b^2 + (a^3 - 8)5$

SOLUTION:

$$\begin{aligned} b^2 + (a^3 - 8)5 &= (-3)^2 + (2^3 - 8)5 \\ &= 9 + (8 - 8)5 \\ &= 9 + (0)5 \\ &= 9 + 0 \\ &= 9 \end{aligned}$$