## How Many Solutions?

Determine whether a system of three linear equations has zero, one or infinitely many solutions.

See page 140 for details.

## Pros and Cons

Create a visual display showing the positive and negative aspects of each method for solving systems of equations.

See page 174 for details.

## Polygons

Develop systems of equations that make different polygons when graphed.

See page 153 for details.

## “How To” Guide

Produce a brochure about solving systems of linear equations using at least two different ways.

See page 174 for details.

## Fraction Coefficients

Solve systems of equations with fraction coefficients.

See page 166 for details.

## Math Dictionary

Make a dictionary for all the vocabulary terms in this textbook. Create diagrams when possible.

See page 149 for details.

## Letter to Fifth Graders

Write a letter to a fifth grade class explaining why learning math is important. Support your reasons with research.

See page 153 for details.

## Different Systems

Find the solutions to systems of equations involving a quadratic and a linear function.

See page 149 for details.

## Solution Given

Create systems of equations that have given solutions.

See page 157 for details.
16. Write a system of two linear equations in which the lines will intersect. Graph the two lines on the same coordinate plane. Use words, graphs and/or numbers to justify your answer.

17. Write a system of two linear equations in which the lines are parallel. Graph the two lines on the same coordinate plane. Use words, graphs and/or numbers to justify your answer.

18. Describe how you can tell if two lines intersect by looking at the linear equations in slope-intercept form.

19. On her Block 4 Test, Victoria was asked to give an example of two lines that are parallel but not the same line. She answered with the equations: \( y = 4x + 5 \) and \( y = 3x + 5 \). Did she get the question right? If not, what mistake did she make?

**REVIEW**

State whether each equation is true or false for the values of the variables given. Show all work necessary to justify your answer.

20. \( 5x + 2y = 10 \) where \( x = 0 \) and \( y = 5 \)

21. \(-3x + y = 7\) where \( x = -1 \) and \( y = -4 \)

22. \( y = \frac{4}{3}x - 2 \) where \( x = 9 \) and \( y = 34 \)

23. \( y = 1 + 2(x - 5) \) where \( x = 7 \) and \( y = 5 \)

Simplify each expression.

24. \( 4 + 6x - 1 + 2x \)

25. \( 3(x - 2) + 2(x + 7) \)

26. \( 5x + x + 7x - 10x \)

27. \( 6(x - 1) - 2(x + 1) \)

28. \( 7x + 3y - x + 4y - 2x \)

29. \( 3(2x + 4y) + 5(x - 2y) \)

**Tic-Tac-Toe ~ How Many Solutions?**

In this block, all the systems of linear equations only include two equations; however, systems of equations can include more than two equations. A solution to a system of linear equations is the point where all the lines intersect. Each of the systems below has either zero, one or infinitely many solutions. Use input-output tables or graphing to determine the number of solutions. If the system does have one solution, give the point of intersection.

<table>
<thead>
<tr>
<th>System #1</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y = 3x + 3 )</td>
</tr>
<tr>
<td>( y = 3x - 4 )</td>
</tr>
<tr>
<td>( y = 3x - 7 )</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>System #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y = 2(x - 3) + 5 )</td>
</tr>
<tr>
<td>( 4x - 2y = 2 )</td>
</tr>
<tr>
<td>( y = 2x - 1 )</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>System #3</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y = \frac{1}{2}x - 3 )</td>
</tr>
<tr>
<td>( y = x - 5 )</td>
</tr>
<tr>
<td>( y = \frac{-3}{4}x + 2 )</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>System #4</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y = \frac{1}{2}x )</td>
</tr>
<tr>
<td>( -x + 2y = 6 )</td>
</tr>
<tr>
<td>( y = \frac{1}{2}(x + 4) - 1 )</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>System #5</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y + x = 6 )</td>
</tr>
<tr>
<td>( 2x + y = 8 )</td>
</tr>
<tr>
<td>( -x + y = 2 )</td>
</tr>
</tbody>
</table>
Lesson 4.3 ~ Solving Systems using Tables

**REVIEW**

Solve each equation. Show all work necessary to justify your answer.

14. \[8x - 10 = -2x + 60\]
15. \[\frac{2}{3}x + 7 = \frac{4}{3}x + 6\]
16. \[4x + 2 = 5x + 7\]
17. \[-2x = 6x + 40\]
18. \[x + 3 = \frac{1}{2}x + 1\]
19. \[3.2x - 12 = 4.7x - 9\]

**Tic-Tac-Toe ~ Different Systems**

Systems of equations can include equations that are not linear. In this activity, you will be finding the solutions to systems of equations containing a linear equation and a quadratic equation. Each system will have 2 solutions. You may use graphing or input-output tables to find the solutions.

For example: \[y = x + 3\]
\[y = x^2 - 3\]

<table>
<thead>
<tr>
<th>(x)</th>
<th>(y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-3</td>
<td>0</td>
</tr>
<tr>
<td>-2</td>
<td>1</td>
</tr>
<tr>
<td>-1</td>
<td>2</td>
</tr>
<tr>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>

SOLUTIONS: (-2, 1) and (3, 6)

Find the two solutions to each system of equations. Show all work.

1. \[y = x^2\]
   \[y = 2x + 3\]

2. \[y = -x^2 + 1\]
   \[y = x - 5\]

3. \[y = 3x + 1\]
   \[y = x^2 + 1\]

**Tic-Tac-Toe ~ Math Dictionary**

Create a “Linear Equations” Dictionary. Locate all of the vocabulary words from the first four Blocks in this textbook. Alphabetize the list of words and design a dictionary. The dictionary should include each word, spelled correctly, along with the definition. If appropriate, a diagram or illustration can be included.
23. Tad and Timothy went to the paint store together. Tad bought 6 cans of paint and 1 paint brush for $67. Timothy bought 4 cans of the same paint and 3 of the same type of paint brushes. Timothy’s total cost was $54.
   a. Write a linear equation that represents Tad’s purchase and another to represent Timothy’s purchase. Let \( x \) represent the cost of a can of paint and \( y \) represent the cost of a paint brush.
   b. Solve the system of linear equations using the substitution method.
   c. What was the cost for a can of paint? The cost of a paint brush?

**REVIEW**

Determine if the two lines in each system of equations are intersecting, parallel or the same line. State how many solutions there will be for each system.

24. \( y = \frac{4}{3}x + 3 \)
    \( y = \frac{4}{3}x - 3 \)

25. \( y = \frac{1}{2}x + 5 \)
    \( y = -\frac{1}{2}x + 5 \)

26. \( y = 2(x + 1) \)
    \( y = 2x + 1 \)

27. \( 4x + 2y = 30 \)
    \( y = \frac{4}{3}x - 5 \)

28. \( -x + 6y = 6 \)
    \( y = \frac{1}{6}x + 1 \)

29. \( y = 6(x + 1) - 4 \)
    \( 6x - y = 2 \)

**Tic-Tac-Toe ~ Letter to Fifth Graders**

Write a letter to a class of fifth grade students explaining why it is important to learn math. Support your reasons with research. Give some examples of real-world situations in which they will encounter math. Include any advice you believe would help them be successful in mathematics through the middle school years. Turn in one copy of the letter to your teacher and give another copy of the letter to a fifth grade teacher in your district.

**Tic-Tac-Toe ~ Polygons**

Polygons are enclosed figures whose sides are made up of line segments. Create a polygon (triangle, quadrilateral, pentagon, hexagon, etc.) by graphing linear equations that enclose the polygon. Write the equations for each line. List the vertices (or points of intersection). Color in the polygon. Repeat the process on another sheet of graph paper, creating a different polygon.
Lesson 4.5 ~ Solving Systems using Elimination

Solve each system of equations using the elimination method. Show all work necessary to justify your answer.

8. \[x + y = 11\]  
   \[x - y = -3\]

9. \[3x + 2y = 0\]  
   \[-3x + y = 9\]

10. \[5x + 2y = -5\]  
    \[-x + 3y = 1\]

11. \[6x - 2y = 36\]  
    \[3x - 2y = 21\]

12. \[3x + y = -11\]  
    \[4x - 3y = 7\]

13. \[5x + 2y = -1\]  
    \[x - 2y = 1\]

14. \[7x - 4y = 26\]  
    \[5x + 4y = 46\]

15. \[12x + 3y = 12\]  
    \[8x - 2y = 4\]

16. \[3x + 4y = -25\]  
    \[2x - 3y = 6\]

17. Two children’s blocks are chosen. Three times the value of one block plus the value of the second block is 29. The value of the first block plus twice the value of the second block is 18.
   a. Write two equations using the information given about the two chosen blocks to create a system of linear equations.
   b. Solve the system of equations using the elimination method. What is the value of each chosen block?

18. Irina sells two types of candy bars for a fundraiser. One type costs $1 and the other costs $2. At the end of the fundraiser, she has sold 44 candy bars for a total of $68. She wants to determine the number of each type of candy bar she has sold. Let \(x\) represent the number of $1 candy bars she has sold and \(y\) represent the number of $2 candy bars she has sold.
   a. Explain why the equations \(x + y = 44\) and \(x + 2y = 68\) represent this situation.
   b. Solve the system of equations using the elimination method.
   c. How many $1 candy bars did she sell? How many $2 candy bars did she sell?

**REVIEW**

Solve each system of linear equations using the graphing method.

19. \[y = \frac{4}{3}x - 2\]  
    \[y = -\frac{2}{3}x + 4\]

20. \[y = x - 1\]  
    \[y = -3x - 5\]

21. \[y = -\frac{1}{2}x + 2\]  
    \[y = \frac{1}{2}x - 2\]

Solve each system of linear equations using the substitution method.

22. \[4x + 3y = 31\]  
    \[x = 2y + 5\]

23. \[x = 15 + 12y\]  
    \[2x + 3y = 3\]

24. \[2x + 5y = -1\]  
    \[x + y = 4\]

**Tic-Tac-Toe ~ Solution Given**

Below are solutions to systems of two linear equations. Create a system of linear equations that has each solution. You may not use any horizontal or vertical lines. Prove that your system of equations has the solution by solving the system using graphing, tables, substitution or elimination.

1. \((3, 2)\)
2. \((0, 5)\)
3. \((-1, 4)\)
4. \((2, -6)\)
5. \((-3, -3)\)
6. \((8, 0)\)
10. Two types of stereos were on sale at a local car stereo dealer. The J-Series model sold for $118. The K-Series model sold for $92. During the sale, 32 stereos were sold. The receipts for these stereos totaled $3,230. How many of each type of stereo did the local dealer sell during this sale?

11. Nancy and Pedro both drove to Nashville. Nancy started 72 miles closer to Nashville than Pedro did. Her average speed was 50 miles per hour. Pedro left at the same time Nancy left. He averaged 62 miles per hour. How long will it take before Pedro catches up with Nancy?

REVIEW

Graph each linear inequality.

12. \( y > 2x - 5 \)
13. \( y \leq \frac{3}{4}x + 1 \)
14. \( y \geq -3x + 4 \)

15. \( y < -\frac{6}{5}x + 7 \)
16. \( y \geq -3 \)
17. \( y < -2 + \frac{3}{2}x \)

18. Write the inequality for the graph below.

19. Write the inequality for the graph below.

Tic-Tac-Toe ~ Fraction Coefficients

Each system of linear equations below has at least one fraction coefficient.

Solve each system of linear equations using either substitution or elimination. Show all work necessary to justify each answer.

1. \( y = \frac{1}{2}x + 4 \)
   \[2x + 4y = 40\]

2. \( \frac{1}{2}x + 2y = 3 \)
   \[x + 3y = 3\]

3. \( x = 4y - 2 \)
   \[\frac{1}{2}x + 5y = 6\]

4. \( \frac{1}{3}x + \frac{2}{3}y = 0 \)
   \[2x + \frac{1}{3}y = -11\]
29. Two beach house rentals have different pricing systems. House A charges a flat fee for cleaning of $90 plus $120 per night. House B does not have a cleaning fee but charges $142.50 per night.
   a. How many nights would you need to stay so that both houses charged the same amount?
   b. How much would it cost to rent one of the houses after this many nights?

30. Julie has a total of 23 granola bars and candy bars. The granola bars have 90 calories each. The candy bars each have 240 calories. Together her treats have a total of 2,970 calories. How many of each type of treat does she have? Show all work necessary to justify your answer.

31. Jacob and Jordan each decided to buy movie tickets and popcorn with their monthly allowance. Jacob bought 5 movie tickets and 3 popcorons for $63. Jordan bought 9 movie tickets and 2 popcorons for $93.
   a. What is the cost for a single movie ticket?
   b. What is the cost for a single popcorn?
   c. Kylie was at the same theater and bought 4 movie tickets and 3 popcorons for her family. How much did she spend? Show all work necessary to justify your answer.

32. Solve the system of equations using two different methods.
   \[2x + 3y = 2\]
   \[x − 3y = 10\]