

3-1 Solving Systems Using Tables and Graphs

Standards

A2.A.REI.C.4 (formerly A.REI.C.6) Write and solve a system of linear equations in context.

A2.A.REI.D.6 (formerly A.REI.11) Explain why the x -coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are solutions of the equation $f(x) = g(x)$, find the appropriate solutions using technology.

Key Concepts

_____ - a set of two or more equations that use the same variables

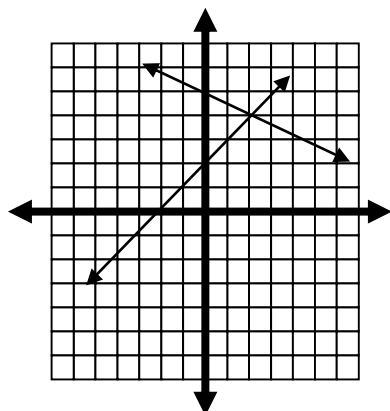
_____ - when the graph of each equation of a system is a line

_____ - a set of values for the variables that makes all the equations true, this may also be called a point of intersection

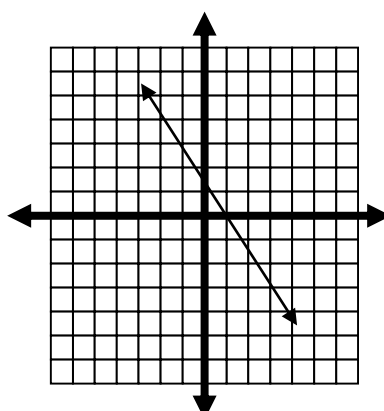
_____ - a system that has a unique solution. (Intersecting lines, different slopes)

_____ - a system that does not have a unique solution (Coinciding lines, same m and same b)

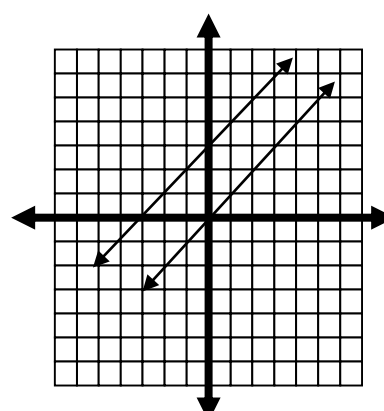
_____ - a system with no solution (Parallel lines, same m but different b)



One solution
Consistent/Independent



Infinitely many solutions
Consistent/Dependent



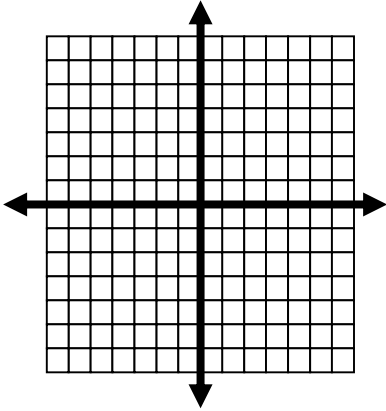
No solution
Inconsistent

Examples

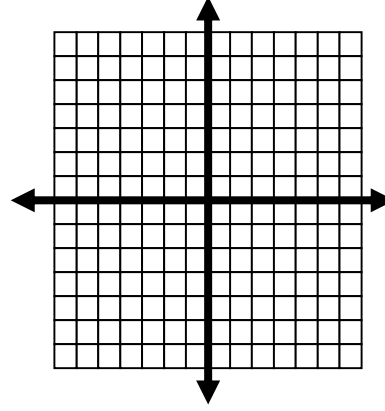
- (I do) Determine whether the point $(3, 2)$ is a solution of the system $\begin{cases} 2x + 3y = 12 \\ 2x - y = 1 \end{cases}$
- Classify the system without graphing.
 - (I do) $\begin{cases} y = 3x + 2 \\ -6x + 2y = 4 \end{cases}$
 - (We do) $\begin{cases} 4y - 2x = 6 \\ 8y = 4x - 12 \end{cases}$

3. Solve the system by graphing.

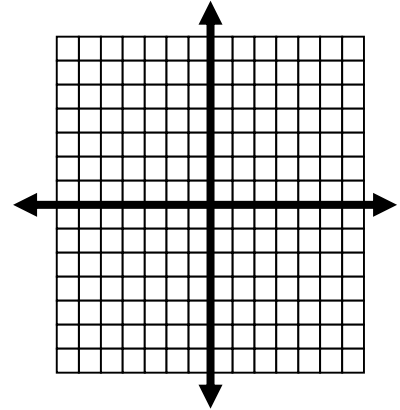
a. (They do) $\begin{cases} y = x \\ y = 2x + 2 \end{cases}$



b. (You do) $\begin{cases} -3x + 2y = 8 \\ x + 4y = -12 \end{cases}$



4. (They do) You bought a total of 6 pens and pencils for \$4. If each pen costs \$1 and each pencil costs \$.50, how many pens and pencils did you buy? Write and solve a system of equations.



You do: Practice 3-1: Complete your assignment on a GRAPH paper. Show your work!

Solve each system by graphing.

1. $\begin{cases} y = x - 2 \\ y = -2x + 7 \end{cases}$

2. $\begin{cases} 2x + 4y = 12 \\ x + y = 2 \end{cases}$

Write and solve a system of equations.

- A store sells small notebooks for \$8 and large notebooks for \$10. If you buy 6 notebooks and spend \$56, how many of each notebook did you buy?
- A shop has one-pound bags of peanuts for \$2 and three-pound bags of peanuts for \$5.50. If you buy 5 bags and spend \$17, how many of each size bag did you buy?

3-2 Solving Systems Algebraically Part 1: Substitution

Standards

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A2.A.REI.D.6 (formerly A.REI.11) Explain why the x -coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are solutions of the equation $f(x) = g(x)$, find the appropriate solutions using technology.

Key Concepts

_____ – means to plug in or replace a variable with an expression.

Steps for Solving Systems using Substitution:

- 1.
- 2.
- 3.
- 4.

Examples

1. (I do) Solve the system by substitution.
$$\begin{cases} y = x \\ y = -x + 2 \end{cases}$$

2. (We do) Solve the system by substitution.
$$\begin{cases} x + 3y = 5 \\ -2x + 4y = 0 \end{cases}$$

3. (They do) Solve the system by substitution.
$$\begin{cases} r + s = -12 \\ 4r - 6s = 12 \end{cases}$$

3-2 Solving Systems Algebraically Part 2: Elimination

Standards

A2.A.REI.C.4 (formerly A.REI.C.6) Write and solve a system of linear equations in context.

A2.A.REI.D.6 (formerly A.REI.11) Explain why the x -coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are solutions of the equation $f(x) = g(x)$, find the appropriate solutions using technology.

Key Concepts

_____ - using the Addition Property of Equality, or using additive inverses to cancel a variable.

Steps for Solving Systems using Elimination:

- 1.
- 2.
- 3.
- 4.
- 5.

1. (I do) Solve the system by elimination.
$$\begin{cases} 3x + y = -9 \\ -3x - 2y = 12 \end{cases}$$

2. (We do) Solve the system by elimination.
$$\begin{cases} 3x + 5y = 13 \\ y = -2x + 4 \end{cases}$$

3. (They do) Solve the system by elimination.
$$\begin{cases} 2x + 4y = -4 \\ 3x + 5y = -3 \end{cases}$$

Systems without unique solutions.

4. (We do) $\begin{cases} -3x + y = -5 \\ 3x - y = 5 \end{cases}$

5. (They do) $\begin{cases} 4x - 6y = 6 \\ -4x + 6y = 10 \end{cases}$

You do: Practice 3-2: Complete your assignment on a separate sheet of paper. Show work!

Solve by substitution

1. $\begin{cases} 4x + 2y = 7 \\ y = 5x \end{cases}$

2. $\begin{cases} x + 12y = 68 \\ x = 8y - 12 \end{cases}$

3. $\begin{cases} -2x + y = -1 \\ 3x - y = -1 \end{cases}$

4. A student has some \$1 bills and \$5 bills in his wallet. He has a total of 15 bills that are worth \$47. How many of each type of bill does he have? Write and solve a system of equations using substitution.
5. A student took 60 minutes to answer a combination of 20 multiple choice and extended response questions. She took 2 minutes to answer each multiple choice question and 6 minutes to answer each extended response question. How many of each type of question was on the test? Write and solve a system of equations using substitution.

Solve by elimination

6. $\begin{cases} x + y = 12 \\ x - y = 2 \end{cases}$

7. $\begin{cases} 4r + 2s = 4 \\ 6r + 2s = 8 \end{cases}$

8. $\begin{cases} 3x + 2y = 6 \\ 3x + 3 = y \end{cases}$

9. $\begin{cases} 5a - 2b = -19 \\ 2a + 3b = 0 \end{cases}$

10. $\begin{cases} -6 = 3x - 6y \\ 4x = 4 + 5y \end{cases}$

11. $\begin{cases} 7x + 2y = -8 \\ 4x = 8y \end{cases}$

3-3 Solving Systems of Inequalities

Standards

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A2.A.REI.D.6 (formerly A.REI.11) Explain why the x -coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are solutions of the equation $f(x) = g(x)$, find the appropriate solutions using technology.

Key Concepts

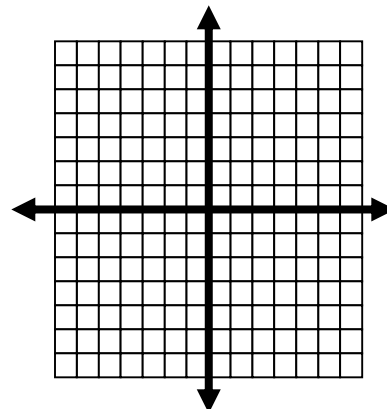
_____ - a set of two or more inequalities that use the same variables.

Steps to Solving Systems of Inequalities by Graphing:

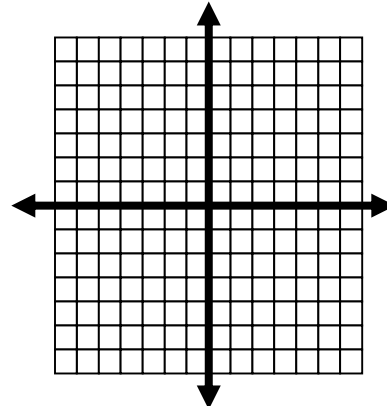
- 1.
- 2.
- 3.

Examples

1. (I do) Solve the system.
$$\begin{cases} y \geq 3 \\ y > 2x + 1 \end{cases}$$



2. (We do) Solve the system.
$$\begin{cases} -3x + y < -1 \\ x - y < 3 \end{cases}$$



You do: Practice 3-3: Complete your assignment on graph paper. Show all work!

1.
$$\begin{cases} y < -2x + 4 \\ y \leq x + 2 \end{cases}$$

2.
$$\begin{cases} -x - y \geq 1 \\ 2x + 3y < 21 \end{cases}$$

3.
$$\begin{cases} -3x + y < 3 \\ x + y > -1 \end{cases}$$

3-6 Solving Systems Using Matrices

Standards

A2.A.REI.C.4 (formerly A.REI.C.6) Write and solve a system of linear equations in context.

A2.A.REI.D.6 (formerly A.REI.11) Explain why the x -coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are solutions of the equation $f(x) = g(x)$, find the appropriate solutions using technology.

Key Concepts

_____ - a rectangular array of numbers

_____ - each number in a matrix

Examples

1. (I do) Consider the matrix $A = \begin{bmatrix} 4 & 9 & 17 & 1 \\ 0 & 5 & 8 & 6 \\ 3 & 2 & 10 & 0 \end{bmatrix}$.

- How many rows does matrix A have?
- How many columns does matrix A have?
- How many elements does matrix A have?
- What is the dimension of matrix A?
- Identify elements a_{23} and a_{14} .

2. Write the system as a matrix.

a. (We do) $\begin{cases} -4x - 2y = 7 \\ 3x + y = -5 \end{cases}$

b. (They do) $\begin{cases} x - 3y + z = 6 \\ x + 3z = 12 \\ y = -5x + 1 \end{cases}$

3. Solve the system using a matrix.

a. (I do) $\begin{cases} 3x + 4y = 12 \\ 2x + y = 10 \end{cases}$

b. (We do) $\begin{cases} 2x - y + z = 4 \\ x + 3y - z = 11 \\ 4x + y - z = 14 \end{cases}$

c. (They do) $\begin{cases} 2x + 3y - 2z = -1 \\ x + 5y = 9 \\ 4z - 5x = 4 \end{cases}$

You do: Practice 3-6: Complete your assignment on a separate sheet of paper. Show work!

$$A = \begin{bmatrix} 4 & -2 & 2 \\ 1 & 4 & 1 \\ 0 & 5 & -7 \end{bmatrix}$$

1. Identify a_{21}

2. Identify a_{13}

3. **Error Analysis** Your classmate says that in matrix A, a_{23} is 5. What mistake did your classmate make? What is the correct answer?

4. Write a matrix to represent the system of equations.

a. $\begin{cases} -4x + y = -3 \\ 2x + y = 0 \end{cases}$

b. $\begin{cases} 3x + 2y - 2z = 9 \\ 5x + y - 3z = -7 \\ x + 4y + 3z = 5 \end{cases}$

5. Write a system of equations to represent each matrix.

a. $\begin{bmatrix} 1 & 6 & | & 7 \\ 2 & 4 & | & -2 \end{bmatrix}$

b. $\begin{bmatrix} -1 & 5 & -4 & | & 0 \\ 3 & 4 & 1 & | & -1 \\ -3 & 6 & -7 & | & 2 \end{bmatrix}$

6. Solve the system of equations using a matrix.

a. $\begin{cases} x - 2y = -10 \\ -2x - 3y = -1 \end{cases}$

b. $\begin{cases} -3x - y = -1 \\ 4x + y = 3 \end{cases}$

c. $\begin{cases} 2x + y + z = 8 \\ x + 2y - z = -5 \\ z = 2x - y \end{cases}$