**Chapter 11: Solving Systems of Linear Equations**

**Lesson 1: Solving Linear Equations by Graphing**

-Essential Question: How can you find the solution of a system of linear equations by graphing?

 **-**A **system of linear equations**, also called a linear system, consists of two or more linear equations that have the same variables. A **solution of a system of linear equations** with two variables is any ordered pair that satisfies all of the equations in the system.

 -A **consistent system** is a system with at least one solution. Consistent systems can be either independent or dependent. An independent system has exactly one solution. The graph of an independent system consists of two lines that intersect at exactly one point. A **dependent system** has infinitely many solutions. The graph of a dependent system consists of two coincident lines, or the same line. A system that has no solution is an **inconsistent system.**

**Example 1:** Solve the system of linear equations by graphing. Check your answer.

 $2x+y=6$

 $-x+y=3$

Step 1: Find the x and y intercepts for each equation and graph them.

Step 2: Find the point of intersection and check to see if it proves each equation.

**Example 2:** Solve the system of linear equations by graphing. Check your answer.

 $y=2x-2$

 $3y+6x=18$

Step 1: Find the x and y intercepts for each equation and graph them.

Step 2: Find the point of intersection and check to see if it proves each equation.

You will also find Systems of Linear Equations which result in Parallel Lines. When parallel lines are in your graph, it means there are no solutions.

You will also find Systems of Linear Equations which result with one specific line. When one specific line is present in your graph, it means there are infinitely many solutions.

**Example 3:** Solve the system of linear equations by graphing. Check your answer.

 $y=2x-2$

 $-2x+y=4$

Step 1: Find the x and y intercepts for each equation and graph them.

**Example 4:** Solve the system of linear equations by graphing. Check your answer.

 $y=3x-3$

 $-3x+y=-3$

Step 1: Find the x and y intercepts for each equation and graph them.

**Interpreting Graphs of Linear Systems to solve problems.**

**Example 1:**

Rock and Bowl charges $2.75 per game plus $3 for shoe rental. Super Bowling charges $2.25 per game and $3.50 for shoe rental. For how many games will the cost to bowl be approximately the same at both places? What is that cost?

Step 1: Create your system of linear equations

Step 2: Find the x and y intercepts for each equation and graph them.

**Example 2:**

Video club A charges $10 for membership and $4 per movie rental. Video club B charges $15 for membership and $3 per movie rental. For how many movie rentals will the cost be the same at both video clubs? What is that cost? Write a system and solve by graphing

Step 1: Create your system of linear equations

Step 2: Find the x and y intercepts for each equation and graph them.

 **Chapter 11: Solving Systems of Linear Equations**

**Lesson 11.2: Solving Linear Systems by substitution**

Essential Question: How can you solve a linear system by using the substitution method?

**Example 1:**

 y = 2 x + y = 6

**Step 1: Solve one of the equations for a specific variable.**

Since, y = 2 is already one of our equations we can just substitute 2 in for y in the second equation.

**Step 2: Substitution**

**Step 3: Substitute your x value into the equation to find the corresponding y- value.**

Since, we already know y = 2 your corresponding x-value is your answer for step 2.

**Example 2:**

y = 4x

 5x + 2y = 39

**Step 1: Solve one of the equations for a specific variable.**

Since, y = 4x is already one of our equations we can just substitute 4x in for y in the second equation.

**Step 2: Substitution**

**Step 3: Substitute your x value into the equation to find the corresponding y- value.**

**Example 3:** 3x + y = **-**3

 **-**2x + y = 7

**Step 1: Solve one of the equations for a specific variable.**

**Step 2: Substitution**

**Step 3: Substitute your x value into the equation to find the corresponding y- value.**

**Chapter 11: Solving Systems of Linear Equations**

**Lesson 11.2: Solving Linear Systems by substitution**

**Example 1:**

 X + y = 4

 -x – y = 6

**Example 2:**

 x – 3y = 6

 4x -12y = 24

**Example 4:**

Fitness center A has a $60 enrollment fee and costs $35 per month. Fitness center B has no enrollment fee and costs $45 per month. Let t represent the total cost in dollars and m represent the number of months. The system of equations:

t = 60 + 35m t = 45m

can be used to represent this situation. In how many months will both fitness centers cost the same? What will the cost be?

**Chapter 11: Solving Systems of Linear Equations**

**Lesson 3: Solving Linear Systems by adding or subtracting**

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| **Steps in the Elimination Method**  |
| 1). Add or subtract the equations to eliminate one variable, and then solve for the other variable. 2). Substitute the value into either original equation to find the value of the eliminate variable.3). Write the solution as an ordered pair.  |

Example 1:

 2x – 4y = -10

 3x + 4y = 5

Example 2:

 4x – 2y = 12

 X + 2y = 8

Example 3:

 2x + 6y = 6

 2x – y = -8

Example 4:

 x + y = -2

 x + y = 4

Example 5:

Perfect Patios is building a rectangular deck for a customer. According to the customer’s specifications, the perimeter should be 40 meters and the difference between twice the length and twice the width should be 4 meters. The system of equations

 2(l) + 2(w) = 40

 2(l) – 2(w) = 4

can be used to represent this situation, where ℓ is the length and w is the width. What will be the length and width of the deck?

**Chapter 11: Solving Systems of Linear Equations**

**Lesson 4: Solving Linear Systems by Multiplying First**

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| Steps for Solving Systems by Multiplying First  |
| 1. Decide which variable to eliminate. 2. Multiply one or both equations by a constant so that adding or subtracting the equations will eliminate the variable. 3. Solve the system using the elimination method. |

Example 1:

 2x – y = 1

 4x + 4y = 8

Example 2:

 -3x + 4y = 12

 2x + y = -8

Example 3:

 3x + 8y = 7

 2x – 2y = -10

Example 4:

 -3x + 2y = 4

 4x – 13y = 5