7th Grade Advanced Math

Book 1: Linear Equations

Block 4: Systems of Equations

Guided Practice

(notes)

Name: _____

Period: _____

You may use your guided notes on the test!

Lesson 1 – Parallel, Intersecting or Same Line

Warm-Up

Convert each equation to slope-intercept form.

$-5x + 2y = 12$ $y = 3(x + 4) - 5$ $x + 3y = 3$

Vocabulary

System of Linear Equations = _____

_____

Solution to a System of Linear Equations _____

_____

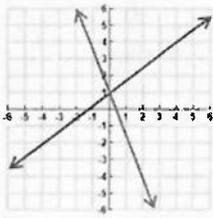**Parallel** _____

Good to Know!

✓ The solution to the system of linear equations is found at the _____ of _____ of the two lines.

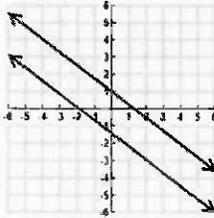✓ Systems of linear equations can have _____ solution, _____ solutions or _____ many solutions.
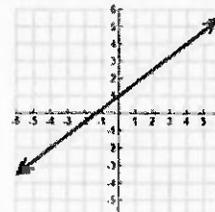
One Solution	No Solution	Infinitely Many Solutions
Intersecting Lines	**Parallel Lines**	**Same Line**

Determining Types of Systems

Intersecting Lines _____

_____

Parallel Lines _____

_____

Same Line _____

_____

Lesson 4.1 ~ Explore!   **Types of Systems**

Step 1: For each system, convert all equations into slope-intercept form.
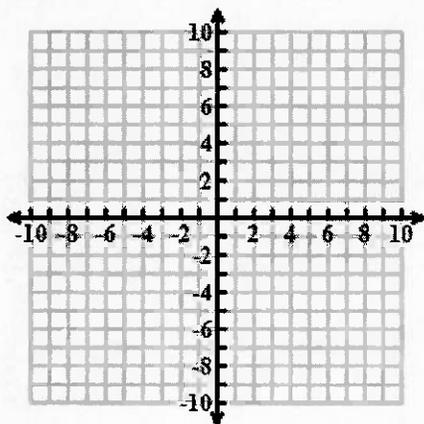
System #1
$y = \frac{1}{2}x - 2$
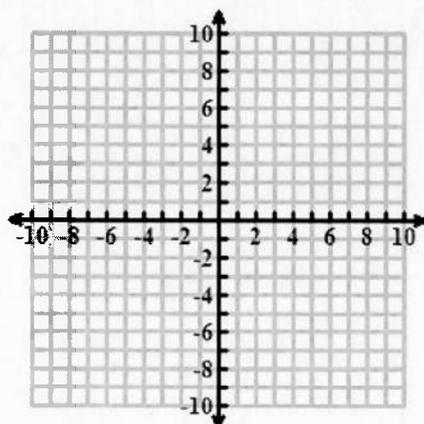$6x + 2y = 10$

System #2
$y = -3 + 4x$
$y = 4(x + 1) - 7$

System #3
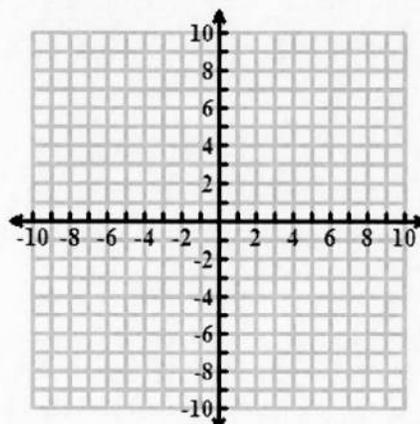$y = -\frac{2}{3}x - 1$
$2x + 3y = 6$

Step 2: Use the three coordinate planes below. Graph the two lines in System #1 on the first coordinate plane, graph System #2 on the second coordinate plane and System #3 on the third coordinate plane.

How are the lines related?   How are the lines related?   How are the lines related?

Step 6: Is there a way to tell, just by looking at the equations in slope-intercept form, when the lines will be intersecting, parallel or the same line?

Step 7: Without graphing, how do you think the equations in System #4 are related? Explain your reasoning.

System #4
$y = 5x - 1$
$y = 5x + 4$

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

$$4x - 5y = 30, \quad y = \frac{4}{5}x - 3 \qquad\qquad -x + 2y = -6, \quad y = \frac{1}{2}(x + 2) - 4$$

$$y = 2x + 1, \quad y = -2x + 1 \qquad\qquad y = \frac{1}{2}x + 3, \quad -2x + y = 6$$

Lesson 2 – Solving Systems by Graphing

Warm-Up

Is (4, 1) on the line $y = 2x - 5$?   Is (0, −5) on the line $4x + 2y = 10$?   Is (−2, 7) on the line $y = 3(x + 5) - 2$?

Sue graphed the following system. She listed her solution to the system below. Decide whether her ordered pair is a solution to the system of equations.

$$-2x + 4y = 20 \qquad \text{Sue's Answer: } (-4, 3)$$
$$3x + y = -9$$

$$y = \frac{1}{3}x + 3 \qquad \text{Sue's Answer: } (-9, 0)$$
$$x + y = 9$$

Solving Systems of Linear Equations by Graphing

1. Convert both linear equations in the system to _____.

2. Graph both equations on the same _____. Be sure to clearly mark three points on each line.

3. Determine the point of _____.

4. Verify that the ordered pair is the solution by substituting the x- and y-values into each equation in the system.

Solve the system of equations by graphing.

$$y = \frac{1}{2}x - 3 \qquad \text{and} \qquad 3x + 2y = 2$$
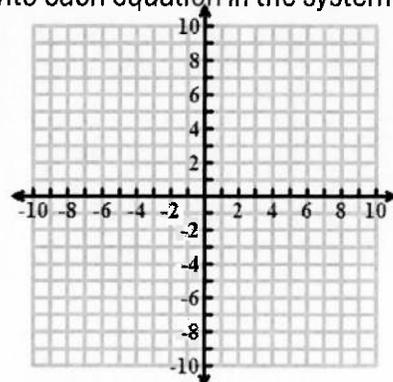
Lesson 3 – Solving Systems Using Tables

Warm-Up

Complete the input-output table for each question.

1. $y = 7x - 3$

x	y
0	
1	
2	
3	

2. $y = -10 - 2x$

x	y
0	
1	
2	
3	

Lesson 4.3 ~ Explore!   Larry's Landscaping

Larry's Landscaping offers two payment options for his employees. Option #1 offers $925 per month in salary plus $25 for every job completed. Option #2 offers $1,000 every month plus $10 for every job completed.

Step 1: Write an equation to represent the monthly salary, *y*, that could be earned for *x* jobs completed if an employee chooses Option #1.

Step 2: Write an equation to represent the monthly salary, *y*, that could be earned for *x* jobs completed if an employee chooses Option #2.

Option #1		Option #2	
Jobs Completed, x	Monthly Salary, y	Jobs Completed, x	Monthly Salary, y
0		0	
1		1	
2		2	
3		3	
4		4	
5		5	
6		6	
7		7	
8		8	
9		9	
10		10	

Step 3: Fill in the tables to the right by calculating the monthly salary for an employee under each plan for 0 through 10 jobs.

Step 4: The solution to this system of equations occurs when an employee earns the same amount of money for the same number of jobs. Use your table to determine when this happens.

Step 5: Verify your answer by substituting the *x*- and *y*-values of your solution into the original equations in the system to see if the ordered pair makes each equation true.

Step 6: If an employee thinks he can complete 50 jobs in one month, which payment option should he choose?

Solving Systems of Linear Equations Using Tables

1. Convert both linear equations in the system to _____.

2. Create an _____ for each equation. Use the same _____ values for each table.

3. Locate the point in each table where the _____ pair of input and output values occurs. This is the solution to the system of equations.

4. Verify that the ordered pair is the solution by _____ the x- and y-values into both equations in the system.

Solve the system of equations using input-output tables.

Convert both equations to slope-intercept form.

$y = -3x + 13$ $2x + y = 9$

Equation in Slope-Intercept Form	
x	y
0	
1	
2	
3	
4	
5	

Equation in Slope-Intercept Form	
x	y
0	
1	
2	
3	
4	
5	

Solve the system of equations using input-output tables.

Convert both equations to slope-intercept form.

$y = 11 - 3x$ $y = 3x - 1$

Equation in Slope-Intercept Form	
x	y
0	
1	
2	
3	
4	
5	

Equation in Slope-Intercept Form	
x	y
0	
1	
2	
3	
4	
5	

Lesson 4 – Solving Systems by Substitution

Warm-Up - Solve each equation for x.

$3x + 4x - 7 = 21$ $10 + 2x - 4x = 12$ $2(3x + 4) - x = -7$

Vocabulary

Substitution Method = _____

Integers (vocabulary review) = _____

Solving a system of linear equations by graphing or input-output table is convenient when the ordered pair solution contains only _____. This will not occur with every system of equations. The Substitution Method will be a better method for solving some systems of equations.

Solving Systems of Linear Equations by Substitution

1. Solve one of the linear equations for a variable (_____), if necessary.

2. Replace the variable in the _____ equation with the expression that you solved for in Step 1. Solve for the variable in your _____ equation.

3. Substitute your solution into the equation from _____ to find the value of the other variable. State your full answer as an ordered pair (_____).

4. Verify that the ordered pair is the solution by _____ the x- and y-values into both equations in the system or by graphing the system to confirm that the point of intersection matches your solution.

Use the substitution method to solve the system of linear equations.

$y = -2x + 5$ $4x + 3y = 9$ ✔ $y = -2x + 5$ $4x + 3y = 9$

$-5x + 2y = 18$ $y = 2x + 8$ ✔ $-5x + 2y = 18$ $y = 2x + 8$

Lesson 4.4 ~ Explore!   **A Trip on I-70**

Zach lives in Salina, Kansas. Gina lives 45 miles east in Junction City, Kansas. Gina and Zach both leave their houses at the same time, heading east on I-70. Zach drives 65 miles per hour and Gina drives 55 miles per hour. Zach wants to determine how long it will take before he catches up with Gina using the substitution method.

Step 1: Identify which equation below corresponds to Zach and which equation corresponds to Gina.

$y = 55x + 45$ _____ $y = 65x$ _____

The y-variable represents the distance from Zach's house. Describe what the x-variable represents in this situation.

_____

Step 2: Solve this system of equations using the substitution method.

$y = 55x + 45$ $y = 65x$ ✔ $y = 55x + 45$ $y = 65x$

Step 3: How many hours will it take before Zach catches Gina? _____

How far will Zach have driven at this point? _____

Step 4: Explain how you know your answer is correct.

_____

Lesson 5 – Solving Systems by Elimination

Warm-Up - Solve each equation for *y* given the *x*-value.
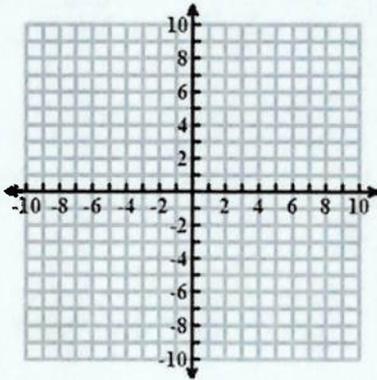
$5x + 4y = 22$ when $x = 2$ $\qquad\qquad$ $x - 8y = -3$ when $x = 5$ $\qquad\qquad$ $-2x + 9y = -30$ when $x = -3$

Let's review the three methods we have already learned to find the solution to a system of equations...

So far we have learned how to find the solution to a system of equations by graphing, making a t-chart, and substitution. Use the space below to solve the system of equations using these three methods.

$3x - 2y = 1$ $\qquad$ $2x + 2y = 4$ $\qquad\qquad\qquad$ $3x - 2y = 1$ $\qquad$ $2x + 2y = 4$

x	y

x	y

Vocabulary

Elimination Method = _____

_____

Good to Know! When both equations in a system are in standard form ($Ax + By = C$) the easiest method to use to solve the system will be the Elimination Method.

Solving Systems of Linear Equations by Elimination

1. Arrange the equations so the common variables are _____ in columns and the constants are alone on one side of the equals sign.

2. Multiply one or both equations so that one of the variables (*x* or *y*) have _____ that are opposites.

3. Add the columns together. One variable should _____ by adding to zero. Solve for the remaining variable.

4. Substitute your solution into either of the _____ and solve for the other variable.

5. Verify that the ordered pair is the solution by substituting the _____ into both equations in the system or by graphing the system to confirm that the point of intersection matches your solution.

Use the elimination method to solve the system of linear equations.

$3x - 2y = 1$

$2x + 2y = 4$

✓

$3x - 2y = 1$

$2x + 2y = 4$

$-4x + 3y = 22$

$4x + 7y = 38$

✓

$-4x + 3y = 22$

$4x + 7y = 38$

$-2x + 3y = -4$

$5x + 6y = 37$

✓

$-2x + 3y = -4$

$5x + 6y = 37$

Challenge Problem: Can you use elimination to solve for three variables?

$-3x - y + z = 0$
$-2x + 2y - 3z = -9$
$2x + 3y - z = 18$

$-3x - y + z = 0$
$-2x + 2y - 3z = -9$

$-2x + 2y - 3z = -9$
$2x + 3y - z = 18$

Solving Linear Inequalities with One Variable

Warm-Up

1. $\dfrac{h}{2} + 5 = 7$

2. $8y + 1 = -15$

3. $0.5x - 4 = 10$

Vocabulary

Inequality = _____

_____

Good to Know!

Inequalities have multiple answers that can make the statement true. In Nathan's example, he might have $20 or $100, all that is known for certain is that he has more than $10 in his wallet. There are an infinite number of possibilities that make the statement $n > \$10.00$ true.

Inequality Symbols	
>	"greater than"
<	"less than"
≥	"greater than or equal to"
≤	"less than or equal to"

Write an inequality for each statement.

a. Carla's weight (w) is greater than 100 pounds.

b. Vicky has at most $500 in her savings account. Let m represent the amount of money in Vicky's account.

c. Quinton's age is greater than 40 years old. Let a represent Quinton's age.

a. Sharon earns at least 8 dollars (d) per baby-sitting job.
b. Kenny does less than 10 hours (h) of homework per week.
c. Rayanna is more than 48 inches (i) tall.

Solutions to an inequality can be graphed on a number line.
For < or >, use an **OPEN** circle to graph the inequality:

$x > -1$
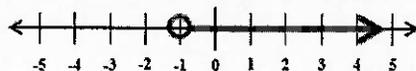
$x < -1$
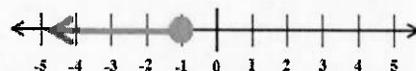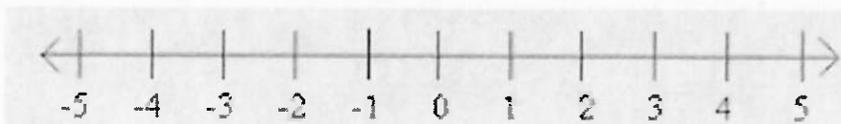
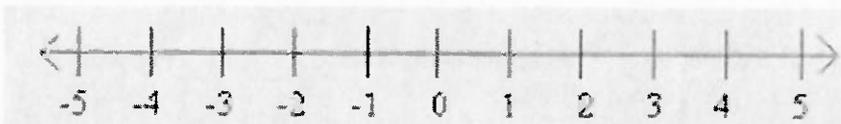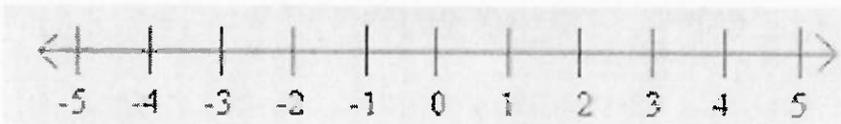For ≤ or ≥, use a **CLOSED** circle to graph the inequality:

$x \geq -1$

$x \leq -1$

$\dfrac{x}{4} + 2 \geq 3$

$4x + 5 > 21$

$6x + 3 < 2x - 5$

$-4x + 7 \leq 19$