Algebra I
6-1: Solving Systems by Graphing

Name ______________________
Date ____________ Class Period ______

Learning Target: Today you will be able to SOLVE SYSTEMS BY GRAPHING AND ANALYZE SPECIAL SYSTEMS

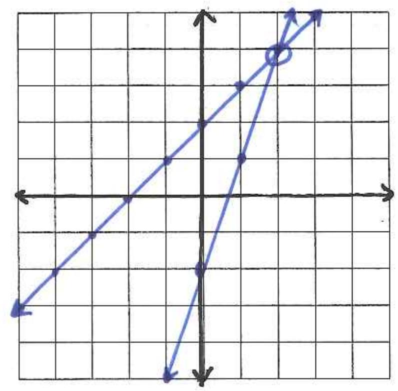
Question/Main Ideas:	Notes:
Definition: System of Linear Equations	Two or more linear equations with the same solution
Definition: Solution of a System of Linear Equations	Any ordered pair that makes all of the equations in a system true.
Example 1: Checking a Solution to a System of Linear Equations	Is the given ordered pair a solution to the given system of linear equations? a. (3, 5) $2x - y = 1$ $x = -3y + 11$ $2(3) - 5 = 1$ $6 - 5 = 1$ $1 = 1$ ✓ $3 = -3(5) + 11$ $3 = -15 + 11$ $3 = -4$ ✗ $\boxed{\text{No}}$ b. (1, -5) $2x + 3y = -13$ $y = x - 6$ $2(1) + 3(-5) = -13$ $2 + -15 = -13$ $-13 = -13$ ✓ $-5 = 1 - 6$ $-5 = -5$ ✓ $\boxed{\text{Yes}}$
Now It's Your Turn	Is the given ordered pair a solution to the given system of linear equations? (-1, 3) $3x + 2y = 3$ $x = 3y - 10$ $3(-1) + 2(3) = 3$ $-3 + 6 = 3$ $3 = 3$ ✓ $-1 = 3(3) - 10$ $-1 = 9 - 10$ $-1 = -1$ ✓ $\boxed{\text{Yes}}$
Steps to Solving a System of Linear Equations by Graphing	Graph 1st Line Graph 2nd Line Solution is where they intersect

Example 2: Solving a System of Equations by Graphing

Use a graph to find the solution to the given system.

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

(2, 4)

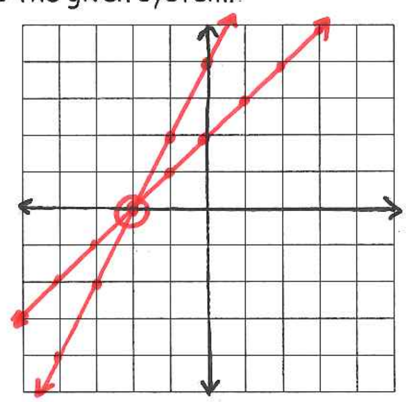


Now It's Your Turn

Use a graph to find the solution to the given system.

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

(-2, 0)

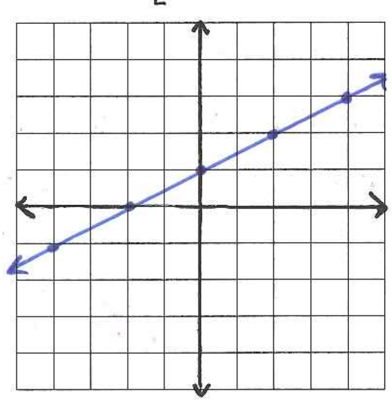


Example 3: Systems with Infinitely Many Solutions or No Solution

Use a graph to find the solution to the given system.

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

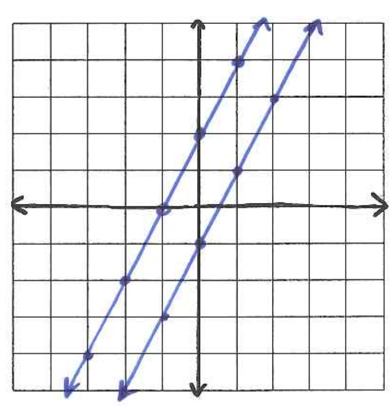
$2y = x + 2$
$y = \frac{1}{2}x + 1$



same line

Infinitely many solutions

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



Parallel Lines

No Solution

Summary: ____

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Algebra I
6-2: Solving Systems Using Substitution

Name ______________________
Date ______________ Class Period _______

Learning Target: Today you will be able to SOLVE SYSTEMS OF EQUATIONS USING SUBSTITUTION

Question/Main Ideas:	Notes:
Example 1: Using Substitution	Solve the system using the Substitution Method. $y = \boxed{3x}$ $4x + 2y = -30$ $4x + 2(3x) = -30$ $4x + 6x = -30$ $\frac{10x}{10} = \frac{-30}{10}$ $x = -3$ $y = 3(-3)$ $y = -9$ $(-3, -9)$
Now It's Your Turn	Solve the system using the Substitution Method. $2x - y = 7$ $x = \boxed{-y - 1}$ $2(-y-1) - y = 7$ $-2y - 2 - y = 7$ $-3y - 2 = 7$ $-3y = 9$ $y = -3$ $x = -(-3) - 1$ $= 3 - 1$ $= 2$ $(2, -3)$
Example 2: Solving for a Variable and Using Substitution	Solve the system using the Substitution Method. $3y + 4x = 14$ $-2x + y = -3 \longrightarrow y = \boxed{2x - 3}$ $3(2x - 3) + 4x = 14$ $6x - 9 + 4x = 14$ $10x - 9 = 14$ $10x = 23$ $x = 2.3$ $y = 2(2.3) - 3$ $= 4.6 - 3$ $= 1.6$ $(2.3, 1.6)$

Now It's Your Turn	Solve the system using the Substitution Method. $6y + 5x = 8$ $x + 3y = -7 \rightarrow x = \boxed{-3y - 7}$ $6y + 5(-3y - 7) = 8$ $6y - 15y - 35 = 8$ $-9y = 43$ $y = -4.8$ $x = -3(-4.8) - 7$ $= 14.4 - 7$ $= 7.4$ $(7.4, -4.8)$
Steps to the Substitution Method	Solve for a variable in one equation Plug that equation into the other equation Solve the equation Plug that value into an original equation Solve for the other variable Write answer as ordered pair Check your answer
Example 3: Systems with Infinitely Many Solutions or No Solution	Solve the system using the Substitution Method. a. $x = \boxed{-2y + 4}$ $3.5x + 7y = 14$ $3.5(-2y + 4) + 7y = 14$ $-7y + 14 + 7y = 14$ $14 = 14$ Infinitely Many Solutions b. $y = \boxed{3x - 11}$ $y - 3x = -13$ $3x - 11 - 3x = -13$ $-11 = -13$ No Solution

Summary: ______________________________

Algebra I
6-3: Solving Systems Using Elimination

Name ______________________________
Date ______________ Class Period _______

Learning Target: Today you will be able to SOLVE SYSTEMS OF EQUATIONS BY ADDING TO ELIMINATE 1 VARIABLE

Question/Main Ideas:	Notes:
Key Idea to Solving by Elimination	Add or subtract the equations in order to "eliminate" one of the variables
Example 1: Solving a System by Adding	Solve the system using the Elimination Method. $2x + 5y = 17$ $+\ 6x - 5y = -9$ $\frac{8x}{8} = \frac{8}{8}$ $x = 1$ $2(1) + 5y = 17$ $2 + 5y = 17$ $5y = 15$ $y = 3$ $(1, 3)$
Now It's Your Turn	Solve the system using the Elimination Method. $5x - \cancel{6y} = -32$ $+\ 3x + \cancel{6y} = 48$ $\frac{8x}{8} = \frac{16}{8}$ $x = 2$ $5(2) - 6y = -32$ $10 - 6y = -32$ $-6y = -42$ $y = 7$ $(2, 7)$
What if the Variables Don't Eliminate Just by Adding?	Multiply one or both equations by a number that will allow a variable to "disappear"
Example 2: Solving a System by Multiplying One Equation	Solve the system using the Elimination Method. $-2x + 15y = -32$ $3(7x - 5y = 17)$ $21x - \cancel{15y} = 51$ $+\ -2x + \cancel{15y} = -32$ $19x = 19$ $x = 1$ $-2(1) + 15y = -32$ $-2 + 15y = -32$ $15y = -30$ $y = -2$ $(1, -2)$

Now It's Your Turn	Solve the system using the Elimination Method. $3(-5x - 2y = 4)$ $3x + 6y = 6$ $+ \; -15x - 6y = 12$ $-12x = 18$ $x = -1.5$ $-5(-1.5) - 2y = 4$ $7.5 - 2y = 4$ $-2y = -3.5$ $y = 1.75$ $(-1.5, 1.75)$
Example 3: Solving a System by Multiplying Both Equations	Solve the system using the Elimination Method. $-4(3x + 2y = 1)$ $3(4x + 3y = -2)$ $\cancel{-12x} - 8y = -4$ $\cancel{12x} + 9y = -6$ $y = -10$ $3x + 2(-10) = 1$ $3x - 20 = 1$ $3x = 21$ $x = 7$ $(7, -10)$
Now It's Your Turn	Solve the system using the Elimination Method. $2(4x + 3y = -19)$ $3(3x - 2y = -10)$ $8x + 6y = -38$ $+ \; 9x - 6y = -30$ $17x = -68$ $x = -4$ $4(-4) + 3y = -19$ $-16 + 3y = -19$ $3y = -3$ $y = -1$ $(-4, -1)$

Summary: ______________________________

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Algebra I
6-4: Applications of Linear Systems

Name ______________________
Date ____________ Class Period _______

Learning Target: Today you will be able to CHOOSE THE BEST METHOD FOR SOLVING A SYSTEM OF LINEAR EQUATIONS

Question/Main Ideas:	Notes:
Concept: Choosing a Method for Solving Linear Systems	Graphing - When you want a visual display of the equations, or when you want to estimate.
	Substitution – When one equation is already solved for one of its variables or when it is easy to do so
	Elimination - When both equations are written in the same form (i.e. standard form)
Concept: Finding a Break-Even Point	Create an income equation and an expense equation. when these two equations equal each other, that is the break even point
Example 1: Finding a Break-Even Point	A fashion designer makes and sells hats. The material for each hat costs \$5.50. The hats sell for \$12.50 each. The designer spends \$1400 on advertising. How many hats must the designer sell to break even? Income: $y = 12.50x$ Expenses: $y = 5.50x + 1400$ $12.50x = 5.50x + 1400$ $-5.50x \quad -5.50x$ $7x = 1400$ $\boxed{x = 200 \text{ hats}}$
Now It's Your Turn	A puzzle expert wrote a new Sudoku puzzle book. His initial costs are \$864. Binding and packaging each book costs \$0.80. The price of the book is \$2. How many copies must be sold to break even? Income: $y = 2x$ Expenses: $y = 0.80x + 864$ $2x = 0.80x + 864$ $1.2x = 864$ $\boxed{x = 720 \text{ books}}$
Concept: Solving a Mixture Problem	Use decimals to represent the percents. One equation will use all 3 percents. The other equation will equal the total

Example 2: Solving a Mixture Problem	A dairy owner produces low-fat milk containing 1% fat and whole milk containing 3.5% fat. How many gallons of each type should be combined to make 100 gal of milk that is 2% fat? $x+y=100 \longrightarrow x=100-y$ $.01x+0.035y=.02(100)$ $.01x+0.035y=2$ $.01(100-y)+.035y=2$ $1-.01y+.035y=2$ $.025y=1$ $y=40$ 40 gal whole, 60 gal low-fat
Now It's Your Turn	One antifreeze solution is 20% alcohol. Another antifreeze solution is 12% alcohol. How many liters of each solution should be combined to make 15 liters of antifreeze solution that is 18% alcohol? $x+y=15 \longrightarrow x=15-y$ $0.2x+0.12y=2.7$ $0.2(15-y)+0.12y=2.7$ $3-0.2y+0.12y=2.7$ $-0.08y=-0.3$ $y=3.75$ 3.75 ℓ of 12%, 11.25 ℓ of 20%
Concept: Solving a Wind or Current Problem	air speed + wind speed = ground speed (with wind) air speed − wind speed = ground speed (against wind) Can be applied to other moving objects (escalator).
Example 3: Solving a Wind or Current Problem	A traveler flies from Charlotte, North Carolina, to Los Angeles, California at a ground speed of 495 mph. At the same time, another flier flies from Los Angeles to Charlotte at a ground speed of 550 mph. The air speed of each plane is the same. What is the air speed? What is the wind speed? $a+w=550$ $+\ a-w=495$ $2a=1045$ $a=522.5$ air speed = 522.5 mph wind speed = 27.5 mph
Now It's Your Turn	You row upstream at a speed of 2 mph. You travel the same distance downstream at a speed of 5 mph. What would be your rowing speed in still water? What is the speed of the current? $r+w=5$ $+\ r-w=2$ $2r=7$ $r=3.5$ rowing speed = 3.5 mph speed of current = 1.5 mph

Summary: ____

Algebra I
6-5: Linear Inequalities

Name ____________________
Date ______________ Class Period ________

Learning Target: Today you will be able to GRAPH LINEAR INEQUALITIES IN TWO VARIABLES

Question/Main Ideas:	Notes:
Definition: Linear Inequality	An inequality with two variables. Ex. $y > x - 3$
Definition: Solution of an Inequality	An ordered pair that makes the inequality true.
Example 1: Identifying Solutions of a Linear Inequality	Is the given ordered pair a solution of $y > x - 3$? a. (1, 2) $2 > 1 - 3$ $2 > -2$ ✓ $\boxed{\text{Yes}}$ b. (-3, -7) $-7 > -3 - 3$ $-7 > -6$ ✗ $\boxed{\text{No}}$
Now It's Your Turn	a. Is (3, 6) a solution of $y \leq \frac{2}{3}x + 4$? $6 \leq \frac{2}{3}(3) + 4$ $6 \leq 2 + 4$ $6 \leq 6$ $\boxed{\text{Yes}}$ b. Suppose an ordered pair is not a solution of $y > x + 10$. Must it be a solution of $y < x + 10$? Explain. No, the point could cause the inequalities to be equal.
Steps to Graphing a Linear Inequality	Graph the line as if it was an equation. $\leq \geq$ - solid line $>, <$ dashed line
	Pick a point - not on the line - and plug it into the original inequality.
	Shade above or below the line based on what happened in step 2 - shade true side

Example 2: Graphing an Inequality in Two Variables

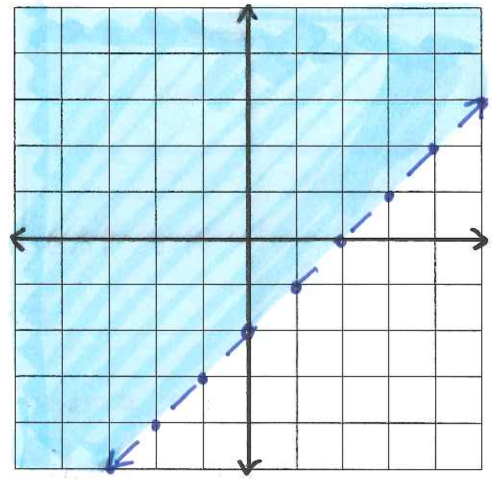
Graph y > x - 2.

Check (0,0)

$0 > 0 - 2$

$0 > -2$

True - shade side with (0,0)



Now It's Your Turn

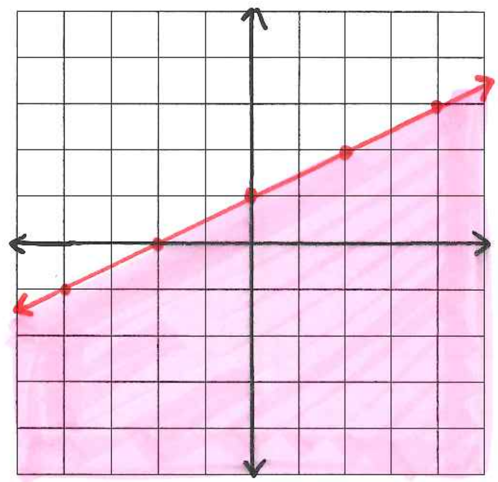
Graph $y \le \frac{1}{2}x + 1$

Check (0,0)

$0 \le \frac{1}{2}(0) + 1$

$0 \le 1$

True - shade side with (0,0)

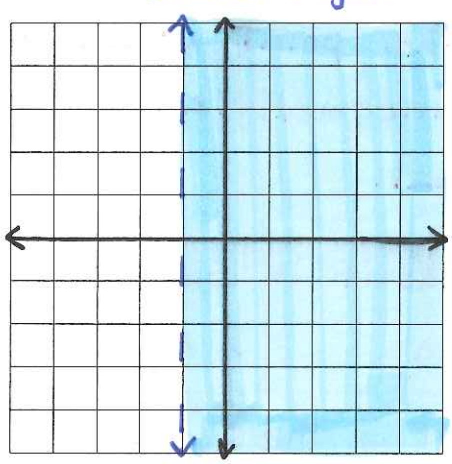


Example 3: Graphing an Inequality in One Variables

Graph the following.

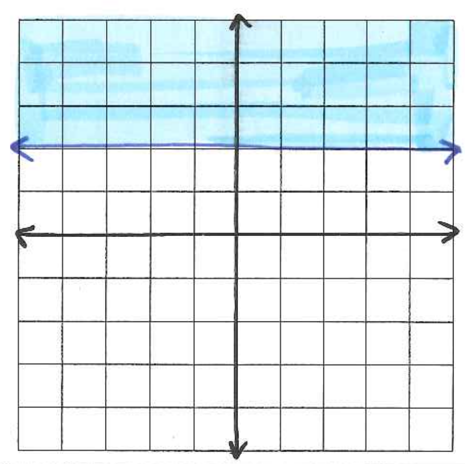
a. x > -1

> means shade right



b. y ≥ 2

≥ means shade above



Summary: ____

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Algebra I
6-6: Systems of Linear Inequalities

Name ______________________
Date ____________ Class Period ______

Learning Target: Today you will be able to SOLVE SYSTEMS OF LINEAR INEQUALITIES BY GRAPHING

Question/Main Ideas:	Notes:
Definition: System of Linear Inequalities	Two or more linear inequalities with the same set of solution points.
Definition: Solution of a System of Linear Inequalities	An ordered pair that is true for ALL inequalities in a system.
Example 1: Identifying Solutions of a System of Linear Inequalities	Determine whether the ordered pair is a solution of the given system. a. (0, 1); $1-x \ge 3y$; $3y-1>2x$ $1-0 \ge 3(1)$ $1 \ge 3$ X $\boxed{\text{No}}$ b. (-2, 3); $2x+3y>2$; $3x+5y>1$ $2(-2)+3(3)>2$ $-4+9>2$ $5>2$ ✓ $3(-2)+5(3)>1$ $-6+15>1$ $9>1$ ✓ $\boxed{\text{Yes}}$
Now It's Your Turn	Determine whether the ordered pair is a solution of the given system. (1, 4); $2x+y>3$; $-3x-y \le 5$ $2(1)+4>3$ $2+4>3$ $6>3$ ✓ $-3(1)-4 \le 5$ $-3-4 \le 5$ $-7 \le 5$ ✓ $\boxed{\text{Yes}}$
Steps to Graphing a System Linear Inequalities	Graph 1ST inequality (shade with one color) Graph 2nd inequality (shade with different color) Solutions are all the points located in the overlapping area.

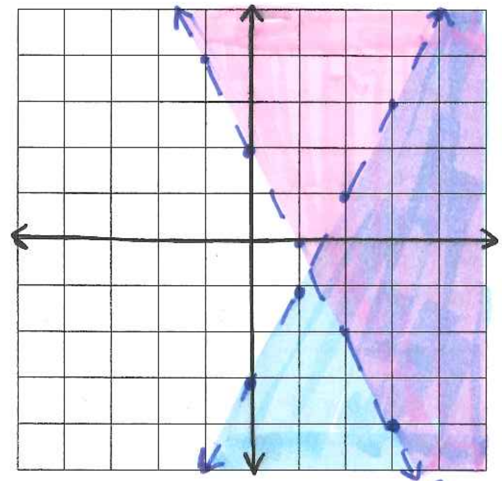
Example 2: Graphing an Inequality in Two Variables

Graph the given system.

$y < 2x - 3$
$2x + y > 2$ $y > -2x + 2$

1st: Check (0,0)
$0 < 2(0) - 3$
$0 < -3$

2nd: Check (0,0)
$2(0) + (0) > 2$
$0 > 2$



Purple area represents all the solutions

Check a Solution: $(4,-1)$

$-1 < 2(4) - 3$ $2(4) - 1 > 2$
$-1 < 5$ $7 > 2$

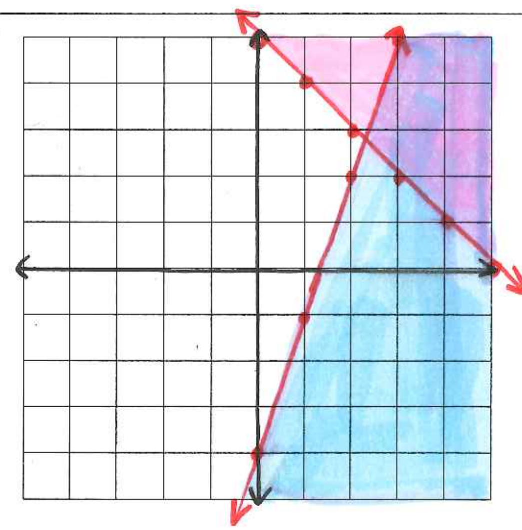
Now It's Your Turn

Graph the given system.

$y \geq -x + 5$
$-3x + y \leq -4$ $y \leq 3x - 4$

1st: Check (0,0)
$0 \geq -0 + 5$
$0 \geq 5$

2nd: Check (0,0)
$-3(0) + (0) \leq -4$
$0 \leq -4$



Check a Solution: $(4,3)$

$3 \geq -4 + 5$ $-3(4) + 3 \leq -4$
$3 \geq 1$ $-9 \leq -4$

Summary: ______________________________

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