Leon High School

Algebra 1A

Lesson Plans for:

4/13 to 4/17 (Week 3) and 4/20 to 4/24 (Week 4)

The following are the plans for the next two weeks of learning. The day by day schedule is there as a guide for you to maximize your learning experience. A quiz covering this material will be taken on Friday 4/24. All work will either be returned to the school or sent to your teacher electronically. If needed, your teacher will send out more information in regards to watching videos on Algebra Nation and Khan Academy. As always, contact your instructor through Remind or email if you have any additional questions.

Week 3

	Notes if you DO have Internet	Notes if you DON'T have internet	Problem Set to Complete
Day 1 4/13	Algebra Nation Video Section 4, Topic 5 https://web.algebranation.com/video/4429	Go over Day 1: Understanding Systems of Equations	none
Day 2 4/14	Notes for Day 2 Handout	Notes for Day 2 Handout	Day 2 Solving by Graphing
Day 3 4/15	Watch the video "Solving Systems of Equations by Substitution" on Khan Academy. https://www.khanacademy.org/math/algebra/x2f8bb11595b61c86:systems-of-equations/x2f8bb11595b61c86:solving-systems-of-equations-with-substitution/v/practice-using-substitution-for-systems	Notes for Day 3 and 4 Handout	Day 3 Solving Systems by Substitution
Day 4 4/16	Notes for Day 3 and 4 Handout	Notes for Day 3 and 4 Handout	Day 4 Practice Solving Systems by Substitution.
Day 5 4/17	Algebra Nation Video Section 4, Topic 7 https://web.algebranation.com/video/4431	Notes: Day 5 Understanding Equivalent Equations in Algebra	none

Week 4

	Notes if you DO have Internet	Notes if you DON'T have internet	Problem Set to Complete
Day 6 4/20	Watch the video "Solving Systems of Equations by Elimination" on Khan Academy. https://www.khanacademy.org/math/algebra-home/alg-system-of-equations/alg-equivalent-systems-of-equations/v/solving-systems-of-equations-by-elimination	Notes for Days 6 and 7	Day 6 Solving Systems by Elimination
Day 7 4/21	Notes for Days 6 and 7	Notes for Days 6 and 7	Day 7 Practice Solving Systems by Elimination
Day 8 4/22	Review all Notes	Review all Notes	Day 8 Solving Systems Quiz Review #1
Day 9 4/23	Review all Notes	Review all Notes	Day 9 Solving Systems Quiz Review #2 with Answers
Day 10 4/24	Review all Notes	Review all Notes	Solving Systems Quiz

Day 1: Understanding Systems of Equations

Before you jump into learning how to solve for those unknowns, it's important to know exactly what these solutions mean.

What is a System of Equations?

A **System of Equations** is exactly what it says it is. It's a system, meaning 2 or more, equations. When you first encounter system of equations problems you'll be solving problems involving 2 linear equations. That means your equations will involve at most an x-variable, y-variable, and constant value.

Eventually (perhaps in algebra 2, precalculus, or linear algebra) you'll encounter more complicated systems. These may involve higher-order functions like quadratics, more than two equations in the system, or equations involving x, y, and z variables (these equations represent planes in 3D space).

But no matter how complicated your system gets, your solution always represents the same concept: **intersection**. For example, the solution to a system of two linear equations, the most common type of system, is the intersection point between the two lines.

Potential Solutions

As you may already realize, not all lines will intersect in exactly one point. Parallel lines by definition will never intersect, therefore they have **no solution**. You also may encounter equations that look different, but when reduced end up being the same equation. In this case, you'll have **infinitely many solutions.**

The Graphing Method

The easiest and most visual way to find the intersection of a system is by graphing the equations on the same coordinate plane.

The Substitution Method

Of course, graphing is not the most efficient way to solve a system of equations. That's why we have a couple more methods in our algebra arsenal.

The first is the **Substitution Method**. In this method, you isolate a variable in one of your equations and plug that relationship into the other equation. This will provide you with an equation with only one variable, meaning that you can solve for the variable. Once you know the value of one variable, you can easily find the value of the other variable by back-solving.

The Elimination Method

If the Substitution Method isn't your cup of tea, you have one last method at your disposal: the **Elimination Method**.

In this method, you'll strategically eliminate a variable by adding the two equations together. In order to do this, you'll often have to multiply one or both equations by a value in order to eliminate a variable. Once you have added the equations and eliminated one variable, you'll be left with an equation that has only one type of variable in it. Which is handy because you can then solve for that variable. Once you solve for one variable you can plug in the resulting value into one of the original equations to find the value of the other variable.

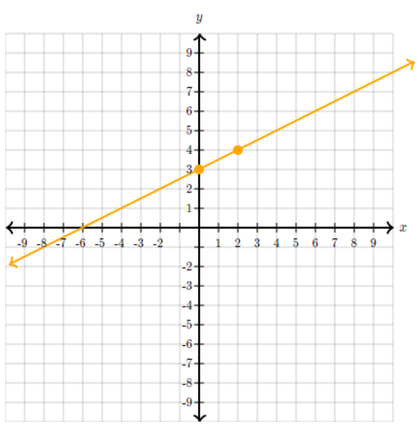
Notes for Days 1 and 2: How to Solve a System by Graphing

We can find the solution to a system of equations by graphing the equations. Let's do this with the following systems of equations:

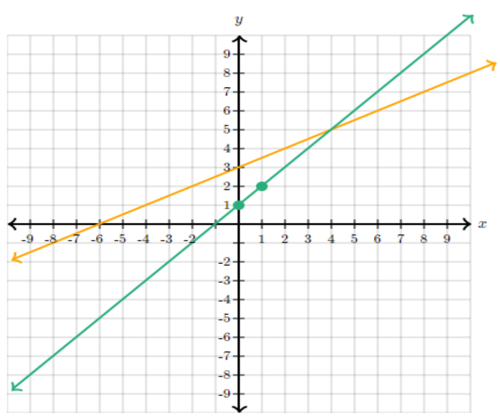
$$y = \frac{1}{2}x + 3$$

$$y = x + 1$$

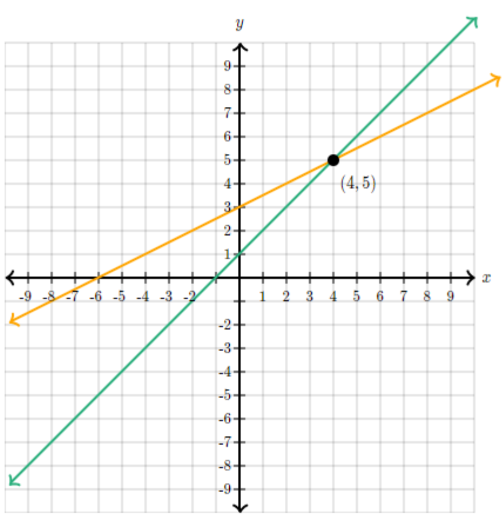
First, let's graph the first equation $y = \frac{1}{2}x + 3$. Notice that the equation is already in y-intercept form so we can graph it by starting at the y-intercept of 3, and then going up 1 and to the right 2 from there.



Next, let's graph the second equation $y = x + 1$ as well.



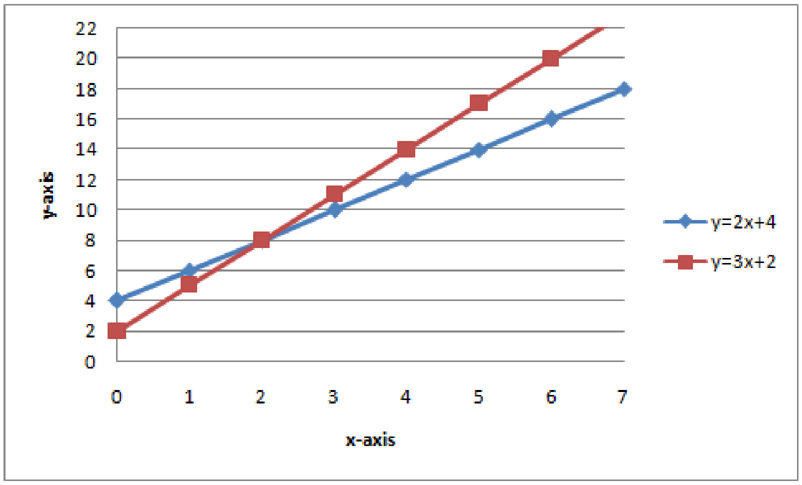
There is exactly one point where the graphs intersect. This is the solution to the system of equations.



Example

Solve the following system of linear equations

$$\begin{cases} y = 2x + 4 \\ y = 3x + 2 \end{cases}$$

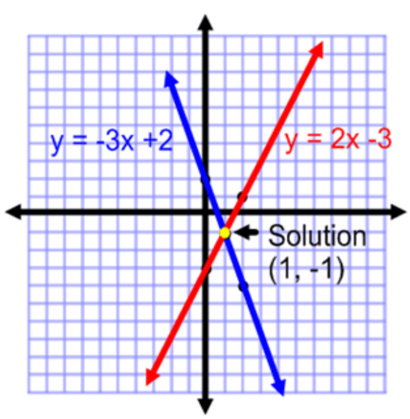


The two lines appear to intersect in (2, 8)

Example

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

Step 1: Graph each equation.



Step 2: Find the point of intersection. This is your solution.

The solution to this system of equations is (1, -1).

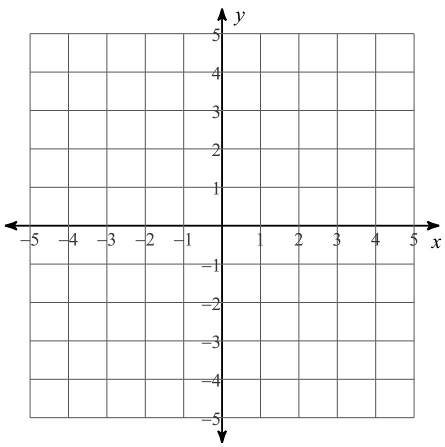
Algebra 1A Name________________________________

DAY 2 Solving Systems by Graphing

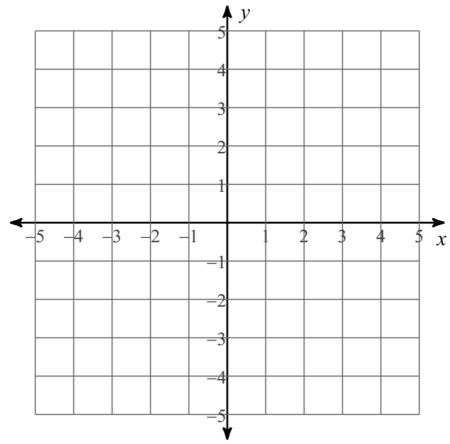
Teacher ______

Solve each system by graphing.***These are already in slope intercept form so no rearranging is necessary.**

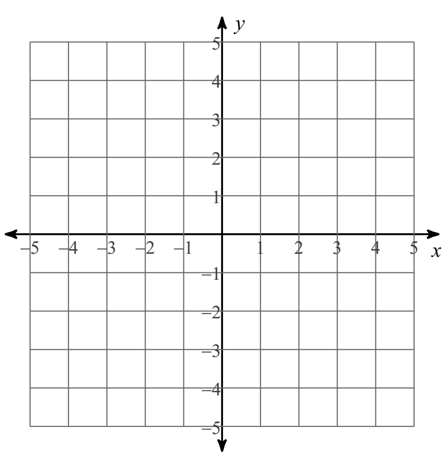
1) $y = x - 4$
$y = -\frac{2}{3}x + 1$



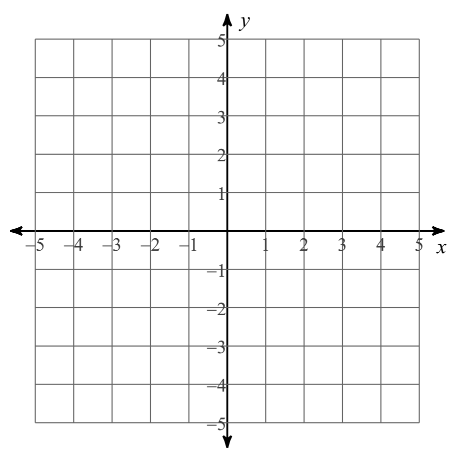
2) $y = -x + 3$
$y = 3x - 1$



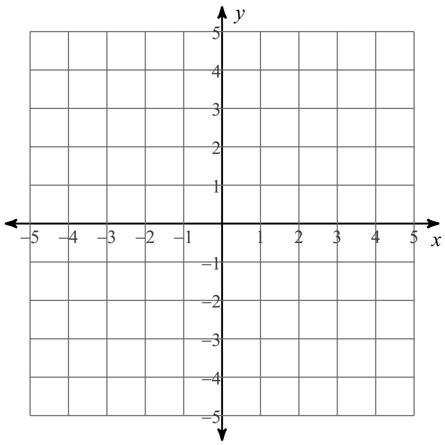
3) $y = \frac{1}{4}x - 3$
$y = -\frac{3}{2}x + 4$



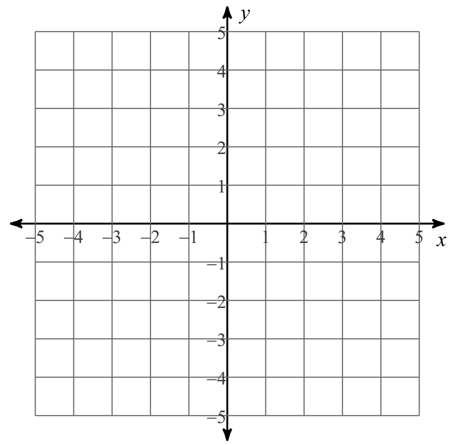
4) $y = -\frac{1}{3}x + 4$
$y = 2x - 3$



5) $y = -x - 3$
$y = -8x + 4$

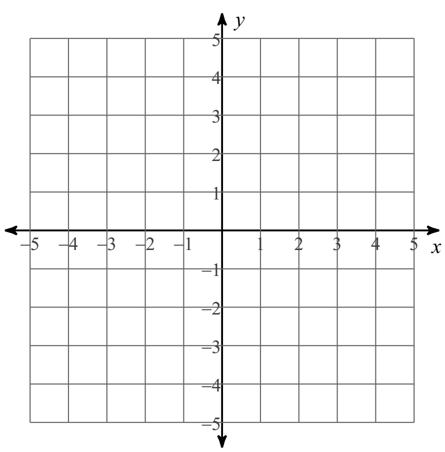


6) $y = -\frac{3}{2}x - 4$
$y = \frac{3}{2}x + 2$

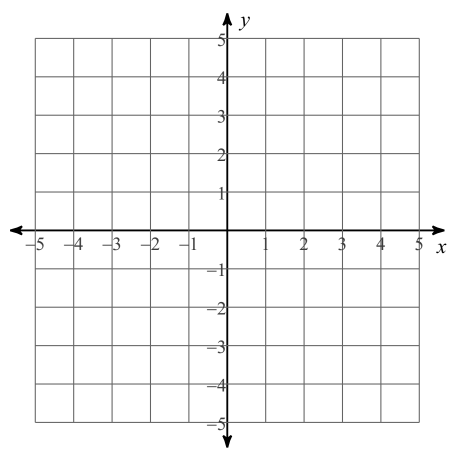


Solve each system by graphing.***These are NOT already in slope intercept form so solving for y is necessary.**

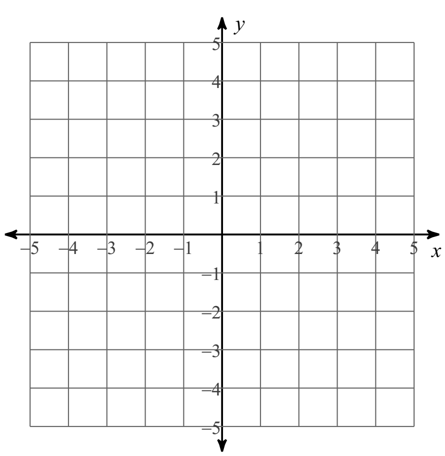
7) $x + 2y = -4$
$2x + y = 4$



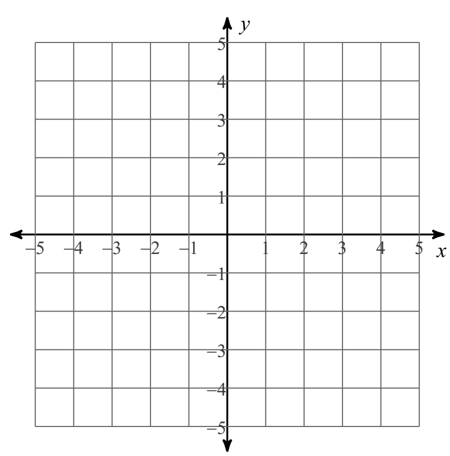
8) $x + y = -3$
$5x - 2y = -8$



9) $x + 4y = 12$
$3x + 2y = -4$



10) $x + y = -2$
$5x + y = 2$



Notes for Days 3 and 4: How to Solve a System by Substitution

Example:

Let's work to solve this system of equations:

$$y = 2x \qquad \text{Equation 1}$$

$$x + y = 24 \qquad \text{Equation 2}$$

The tricky thing is that there are two variables, x and y. If only we could get rid of one of the variables...

Here's an idea! Equation 1 tells us that $2x$ and y are equal. So let's plug in $2x$ for y in Equation 2 to get rid of the y variable in that equation:

$$x + y = 24 \qquad \text{Equation 2}$$

$$x + 2x = 24 \qquad \text{Substitute 2x for y}$$

Brilliant! Now we have an equation with just the x variable that we know how to solve:

$$x + 2x = 24$$

$$3x = 24$$

$$\frac{3x}{3} = \frac{24}{3} \qquad \text{Divide each side by 3}$$

$$x = 8$$

Nice! So we know that x equals 8. But remember that we are looking for an ordered pair. We need a y value as well. Let's use the first equation to find y when x equals 8:

$$y = 2x \qquad \text{Equation 1}$$

$$y = 2(8) \qquad \text{Substitute 8 for x}$$

$$y = 16$$

Therefore the Answer is (8,16)

Example

$$y = 2x + 4$$

$$3x + y = 9$$

We can substitute y in the second equation with the first equation since y = y.

$$3x + y = 9$$

$$3x + (2x + 4) = 9$$

$$5x + 4 = 9$$

$$5x = 5$$

$$x = 1$$

This value of x can then be used to find y by substituting 1 with x e.g. in the first equation

$$y = 2x + 4$$

$$y = 2 \cdot 1 + 4$$

$$y = 6$$

Therefore the Answer is (1,6)

Algebra 1A Name________________________________

DAY 3 Solving Systems by Substitution

Teacher:______

Solve each system by substitution.

1) $y = -6x + 21$
$-4x - 4y = -24$

2) $y = x - 1$
$4x - 2y = -12$

3) $y = -2x + 2$
$-6x - 2y = -8$

4) $7x - 3y = 2$
$y = 3x - 2$

Algebra 1A Name____________________________________

DAY 4 Practice Solving Systems by Substitution

Teacher:______

Solve each system by substitution.

1) $y = -3x + 20$
$-x + 8y = -15$

2) $y = 3x + 7$
$8x - y = -17$

3) $y = -4x - 23$
$-3x - 4y = 1$

4) $4x - 5y = -1$
$y = 3x - 2$

5) $-6x + 6y = 18$
$y = 6x - 12$

6) $-2x - 5y = 5$
$y = 3x - 18$

7) $-2x + 5y = -3$
$y = -8x - 9$

8) $y = 5x - 7$
$-7x + 6y = 4$

Notes Day 5 Understanding Equivalent Equations in Algebra

Linear Equations With One Variable

The simplest examples of equivalent equations don't have any variables. For example, these three equations are equivalent to each other:

- 3 + 2 = 5
- 4 + 1 = 5
- 5 + 0 = 5

Recognizing these equations are equivalent is great, but not particularly useful. Usually, an equivalent equation problem asks you to solve for a variable to see if it is the same (the same **root**) as the one in another equation.

For example, the following equations are equivalent:

- $x = 5$
- $-2x = -10$

In both cases, $x = 5$. How do we know this? How do you solve this for the "$-2x = -10$" equation? The first step is to know the rules of equivalent equations:

- Adding or subtracting the same number or expression to both sides of an equation produces an equivalent equation.
-
- Multiplying or dividing both sides of an equation by the same non-zero number produces an equivalent equation.
-
- Raising both sides of the equation to the same odd power or taking the same odd root will produce an equivalent equation.
-
- If both sides of an equation are non-negative, raising both sides of an equation to the same even power or taking the same even root will give an equivalent equation.

Example

Putting these rules into practice, determine whether these two equations are equivalent:

- $x + 2 = 7$
- $2x + 1 = 11$

To solve this, you need to find "x" for each equation. If "x" is the same for both equations, then they are equivalent. If "x" is different (i.e., the equations have different roots), then the equations are not equivalent. For the first equation:

- $x + 2 = 7$
- $x + 2 - 2 = 7 - 2$ (subtracting both sides by same number)
- $x = 5$

For the second equation:

- $2x + 1 = 11$
- $2x + 1 - 1 = 11 - 1$ (subtracting both sides by the same number)
- $2x = 10$
- $2x/2 = 10/2$ (dividing both sides of the equation by the same number)
- $x = 5$

So, yes, the two equations are equivalent because $x = 5$ in each case.

Practical Equivalent Equations

You can use equivalent equations in daily life. It's particularly helpful when shopping. For example, you like a particular shirt. One company offers the shirt for $6 and has $12 shipping, while another company offers the shirt for $7.50 and has $9 shipping. Which shirt has the best price? How many shirts (maybe you want to get them for friends) would you have to buy for the price to be the same for both companies?

To solve this problem, let "x" be the number of shirts. To start with, set $x =1$ for the purchase of one shirt. For company #1:

- Price $= 6x + 12 = (6)(1) + 12 = 6 + 12 = \$18$

For company #2:

- Price $= 7.5x + 9 = (1)(7.5) + 9 = 7.5 + 9 = \$16.50$

So, if you're buying one shirt, the second company offers a better deal.

To find the point where prices are equal, let "x" remain the number of shirts, but set the two equations equal to each other. Solve for "x" to find how many shirts you'd have to buy:

- $6x + 12 = 7.5x + 9$
- $6x - 7.5x = 9 - 12$ (subtracting the same numbers or expressions from each side)
- $-1.5x = -3$
- $1.5x = 3$ (dividing both sides by the same number, -1)
- $x = 3/1.5$ (dividing both sides by 1.5)
- $x = 2$

If you buy two shirts, the price is the same, no matter where you get it. You can use the same math to determine which company gives you a better deal with larger orders and also to calculate how much you'll save using one company over the other. See, algebra is useful!

Equivalent Equations With Two Variables

If you have two equations and two unknowns (x and y), you can determine whether two sets of linear equations are equivalent.

For example, if you're given the equations:

- $-3x + 12y = 15$
- $7x - 10y = -2$

You can determine whether the following system is equivalent:

- $-x + 4y = 5$
- $7x -10y = -2$

To solve this problem, find "x" and "y" for each system of equations. If the values are the same, then the systems of equations are equivalent.

Start with the first set. To solve two equations with two variables, isolate one variable and plug its solution into the other equation. To isolate the "y" variable:

- $-3x + 12y = 15$
- $-3x = 15 - 12y$
- $x = -(15 - 12y)/3 = -5 + 4y$ (plug in for "x" in the second equation)
- $7x - 10y = -2$
- $7(-5 + 4y) - 10y = -2$
- $-35 + 28y - 10y = -2$
- $18y = 33$

- $y = 33/18 = 11/6$

Now, plug "y" back into either equation to solve for "x":

- $7x - 10y = -2$
- $7x = -2 + 10(11/6)$

Working through this, you'll eventually get $x = 7/3$.

To answer the question, you *could* apply the same principles to the second set of equations to solve for "x" and "y" to find that yes, they are indeed equivalent. It's easy to get bogged down in the algebra, so it's a good idea to check your work using an online equation solver.

However, the clever student will notice the two sets of equations are equivalent *without doing any difficult calculations at all*. The only difference between the first equation in each set is that the first one is three times the second one (equivalent). The second equation is exactly the same.

Notes for Days 6 and 7: How to Solve a System by Elimination

Example 1: Solve the system of equations by elimination

$$\begin{aligned} 3x - y &= 5 \\ x + y &= 3 \end{aligned}$$

Solution:

In this example we will "cancel out" the y term. To do so, we can add the equations together.

$$\left.\begin{aligned} 3x - y &= 5 \\ x + y &= 3 \end{aligned}\right\} \text{Add equations}$$

$$4x = 8$$

Now we can find: $x = 2$

In order to solve for y, take the value for **x** and substitute it back into either one of the original equations.

$$\begin{aligned} x + y &= 3 \\ 2 + y &= 3 \\ y &= 1 \end{aligned}$$

The solution is $(x, y) = (2, 1)$.

Example

$$3y + 2x = 6$$
$$5y - 2x = 10$$

We can eliminate the x-variable by addition of the two equations.

$$3y + 2x = 6$$

$$\underline{+\,5y - 2x = 10}$$

$$= 8y \qquad = 16$$

$$y \qquad = 2$$

The value of y can now be substituted into either of the original equations to find the value of x

$$3y + 2x = 6$$

$$3 \cdot {\color{green}2} + 2x = 6$$

$$6 + 2x = 6$$

$$x = 0$$

The solution of the linear system is (0, 2).

Algebra 1A Name________________________________

DAY 6 Solving Systems By Elimination

Teacher______

Solve each system by elimination.

1) $3x - y = -20$
$-3x - 6y = 6$

2) $-3x + 6y = -15$
$8x - 6y = 30$

3) Kali's school is selling tickets to a fall musical. On the first day of ticket sales the school sold 14 adult tickets and 10 student tickets for a total of $200. The school took in $80 on the second day by selling 2 adult tickets and 10 student tickets. Find the price of an adult ticket and the price of a student ticket.

Algebra 1A Name___________________________________

DAY 7 Practice Solving Systems By Elimination

Teacher______

Solve each system by elimination.

1) $-10x + 6y = -18$
$-5x - 6y = -27$

2) $-6x - 2y = -2$
$5x + 2y = 4$

3) $6x + 3y = 0$
$5x - 3y = 11$

4) $-5x - 9y = -25$
$5x - 7y = 25$

5) $7x - 5y = -20$
$-4x + 5y = -10$

6) $10x - 2y = 30$
$10x + 2y = 10$

7) $-6x - 8y = -28$
$6x + 3y = -12$

8) $7x - 8y = -18$
$-8x + 8y = 16$

9) New York City is a popular field trip destination. This year the senior class at High School A and the senior class at High School B both planned trips there. The senior class at High School A rented and filled 14 vans and 11 buses with 524 students. High School B rented and filled 14 vans and 9 buses with 472 students. Each van and each bus carried the same number of students. How many students can a van carry? How many students can a bus carry?

10) The school that Kathryn goes to is selling tickets to a choral performance. On the first day of ticket sales the school sold 6 adult tickets and 2 child tickets for a total of $58. The school took in $51 on the second day by selling 5 adult tickets and 2 child tickets. What is the price each of one adult ticket and one child ticket?

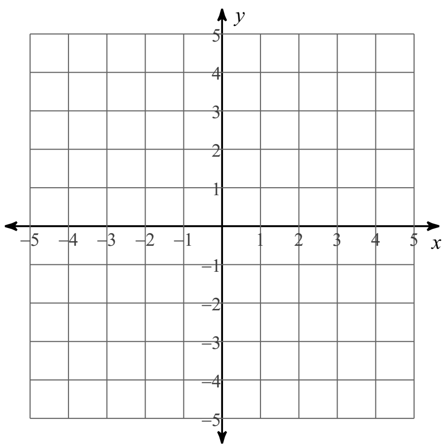
DAY 8 Solving Systems Quiz Review

Teacher______

Solve each system by graphing.

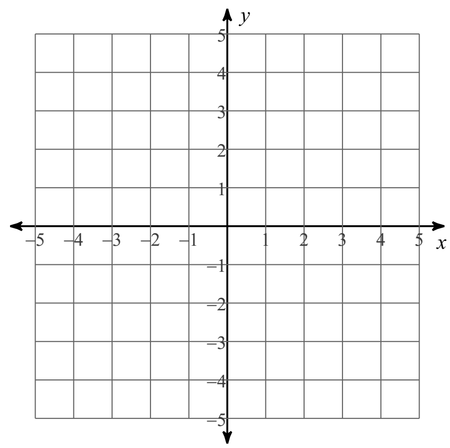
1) $y = -\frac{1}{3}x + 3$

$y = -\frac{7}{3}x - 3$



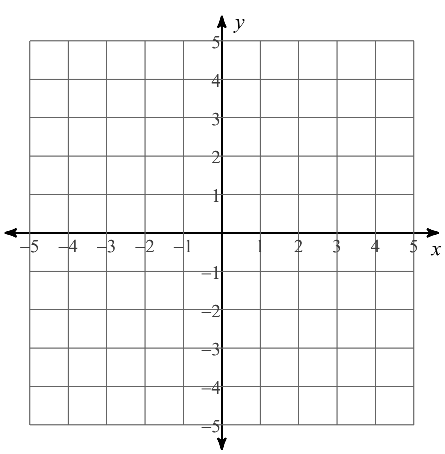
2) $y = \frac{8}{3}x - 4$

$y = \frac{2}{3}x + 2$



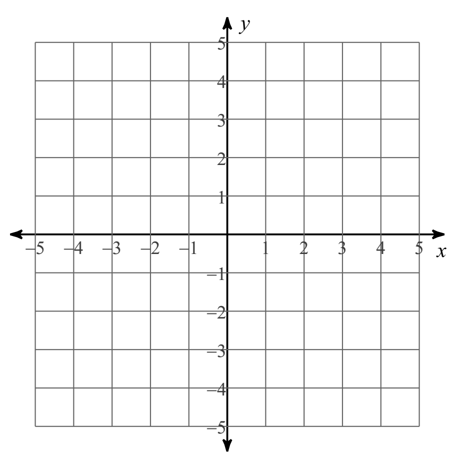
3) $y = \frac{1}{2}x + 1$

$y = 2x - 2$



4) $y = \frac{5}{4}x + 3$

$y = \frac{1}{4}x - 1$



Solve each system by substitution.

5) $7x - 3y = 8$
$y = 6x + 1$

6) $y = 7x - 15$
$2x + 2y = 2$

7) $y = -5x - 12$
$-6x - 3y = 18$

8) $y = 7x + 4$
$-x - 4y = 13$

Solve each system by elimination.

9) $x + 7y = 9$
$x - 7y = -19$

10) $10x - 6y = -8$
$-2x + 6y = -8$

11) $-5x - 3y = -25$
$5x + 2y = 20$

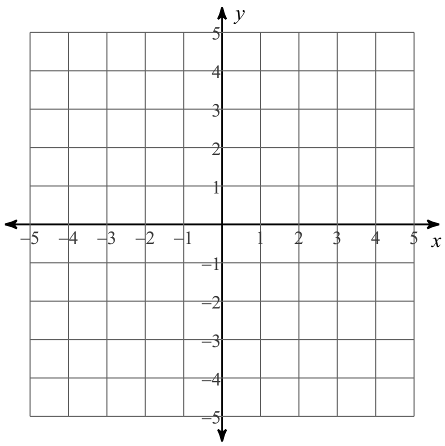
12) $-7x - 6y = -27$
$-3x + 6y = -3$

DAY 9 Solving Systems Quiz Review

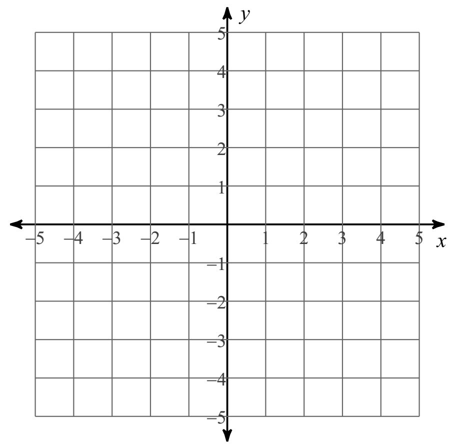
Teacher______

Solve each system by graphing.

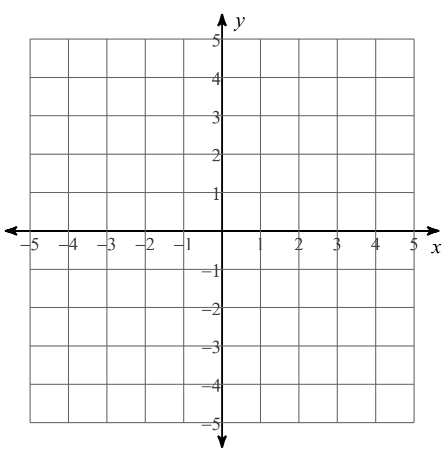
1) $y = 2x - 4$
$y = -5x + 3$



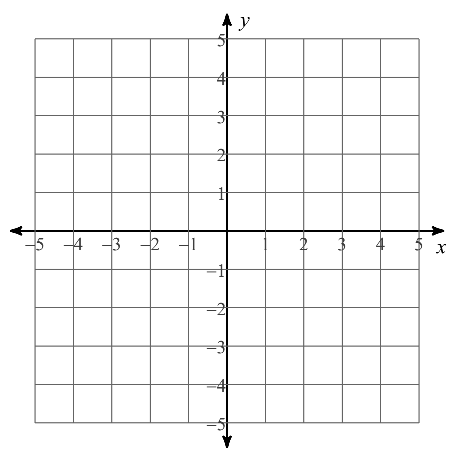
2) $y = 3x - 1$
$y = -x + 3$



3) $y = -\frac{5}{2}x + 2$
$y = -\frac{1}{2}x - 2$



4) $y = -\frac{1}{2}x + 1$
$y = \frac{1}{4}x - 2$



Solve each system by substitution.

5) $-3x - 4y = -19$
$y = -2x + 6$

6) $-7x - 7y = 21$
$y = -7x + 3$

7) $y = 7x + 3$
$8x - 7y = 20$

8) $y = x - 6$
$-8x - 2y = 2$

Solve each system by elimination.

9) $-9x + 3y = -12$
$7x - 3y = 8$

10) $-7x + 2y = 2$
$-2x - 2y = -2$

11) $-6x + 10y = 18$
$6x - 3y = -18$

12) $7x + 7y = 28$
$-5x - 7y = -10$

13) Lisa's school is selling tickets to the annual dance competition. On the first day of ticket sales the school sold 9 senior citizen tickets and 14 child tickets for a total of $331. The school took in $241 on the second day by selling 3 senior citizen tickets and 14 child tickets. What is the price each of one senior citizen ticket and one child ticket?

14) The senior classes at High School A and High School B planned separate trips to the local amusement park. The senior class at High School A rented and filled 10 vans and 10 buses with 580 students. High School B rented and filled 12 vans and 10 buses with 610 students. Each van and each bus carried the same number of students. How many students can a van carry? How many students can a bus carry?

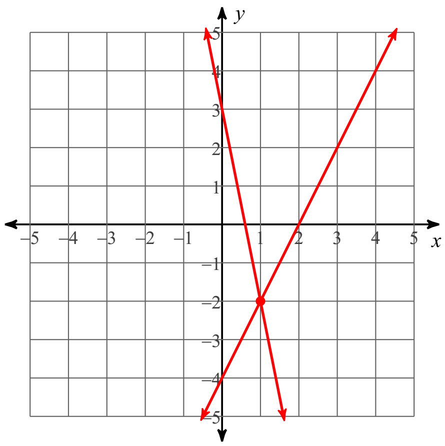
Algebra 1A Name___________________________________ ID: 1

DAY 9 Solving Systems Quiz Review

Teacher______

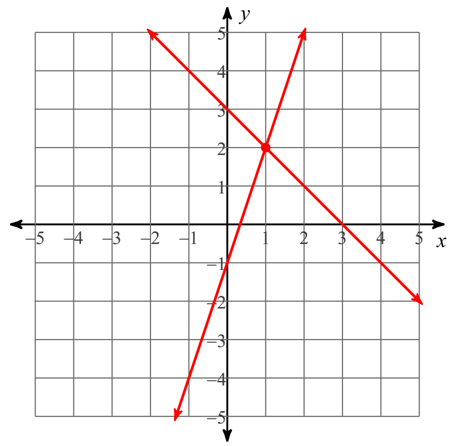
Solve each system by graphing.

1) $y = 2x - 4$
$y = -5x + 3$



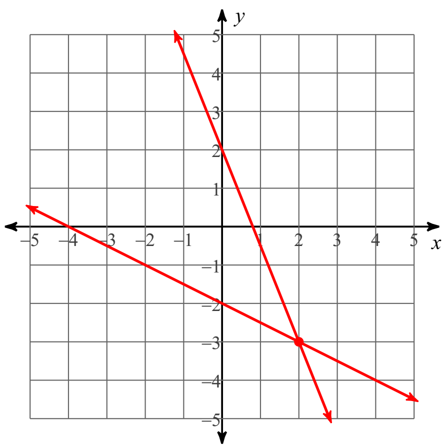
$(1, -2)$

2) $y = 3x - 1$
$y = -x + 3$



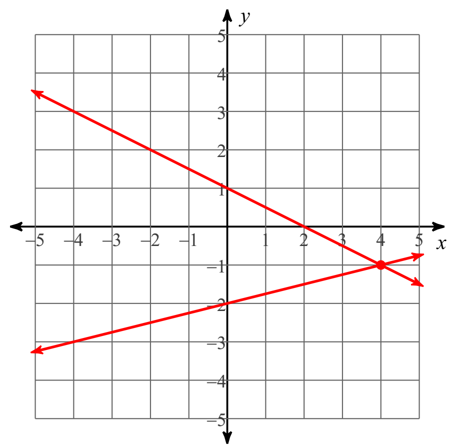
$(1, 2)$

3) $y = -\frac{5}{2}x + 2$
$y = -\frac{1}{2}x - 2$



$(2, -3)$

4) $y = -\frac{1}{2}x + 1$
$y = \frac{1}{4}x - 2$



$(4, -1)$

Solve each system by substitution.

5) $-3x - 4y = -19$
$y = -2x + 6$

$(1, 4)$

6) $-7x - 7y = 21$
$y = -7x + 3$

$(1, -4)$

7) $y = 7x + 3$
$8x - 7y = 20$

$(-1, -4)$

8) $y = x - 6$
$-8x - 2y = 2$

$(1, -5)$

Solve each system by elimination.

9) $-9x + 3y = -12$
$7x - 3y = 8$

$(2, 2)$

10) $-7x + 2y = 2$
$-2x - 2y = -2$

$(0, 1)$

11) $-6x + 10y = 18$
$6x - 3y = -18$

$(-3, 0)$

12) $7x + 7y = 28$
$-5x - 7y = -10$

$(9, -5)$

13) Lisa's school is selling tickets to the annual dance competition. On the first day of ticket sales the school sold 9 senior citizen tickets and 14 child tickets for a total of $331. The school took in $241 on the second day by selling 3 senior citizen tickets and 14 child tickets. What is the price each of one senior citizen ticket and one child ticket?

senior citizen ticket: $15, child ticket: $14

14) The senior classes at High School A and High School B planned separate trips to the local amusement park. The senior class at High School A rented and filled 10 vans and 10 buses with 580 students. High School B rented and filled 12 vans and 10 buses with 610 students. Each van and each bus carried the same number of students. How many students can a van carry? How many students can a bus carry?

Van: 15, Bus: 43

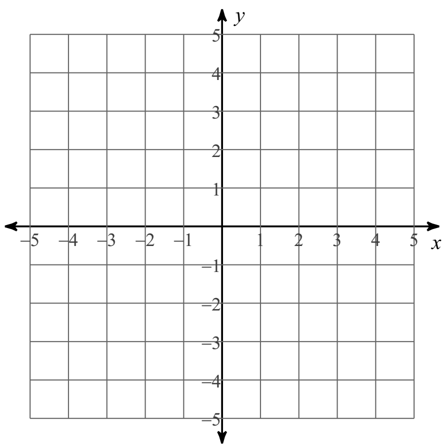
Algebra 1A Name___________________________________ ID: 1

DAY 10 Solving Systems Quiz

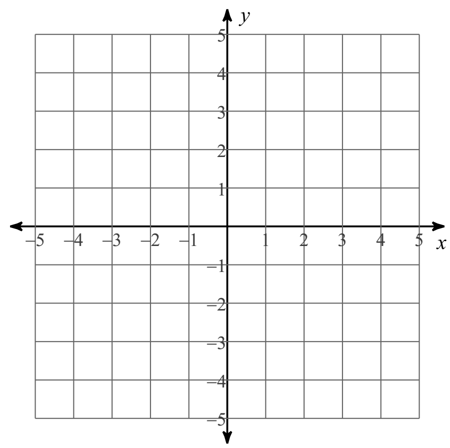
Teacher______

Solve each system by graphing.

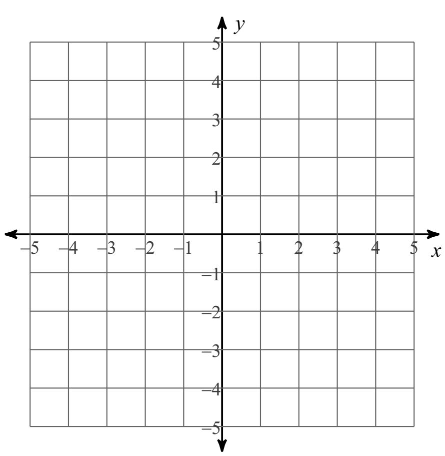
1) $y = 2x - 4$
$y = -5x + 3$



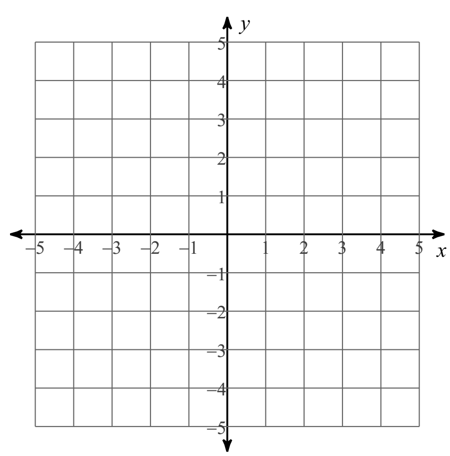
2) $y = 3x - 1$
$y = -x + 3$



3) $y = -\frac{5}{2}x + 2$
$y = -\frac{1}{2}x - 2$



4) $y = -\frac{1}{2}x + 1$
$y = \frac{1}{4}x - 2$



Solve each system by substitution.

5) $-3x - 4y = -19$
$y = -2x + 6$

6) $-7x - 7y = 21$
$y = -7x + 3$

7) $y = 7x + 3$
$8x - 7y = 20$

8) $y = x - 6$
$-8x - 2y = 2$

Solve each system by elimination.

9) $-9x + 3y = -12$
$7x - 3y = 8$

10) $-7x + 2y = 2$
$-2x - 2y = -2$

11) $-6x + 10y = 18$
$6x - 3y = -18$

12) $7x + 7y = 28$
$-5x - 7y = -10$

13) Shanice and Micaela are selling cheesecakes for a school fundraiser. Customers can buy pecan cheesecakes and strawberry cheesecakes. Shanice sold 13 pecan cheesecakes and 7 strawberry cheesecakes for a total of $276. Micaela sold 13 pecan cheesecakes and 8 strawberry cheesecakes for a total of $295. What is the cost each of one pecan cheesecake and one strawberry cheesecake?

14) Lisa and John each improved their yards by planting daylilies and ivy. They bought their supplies from the same store. Lisa spent $138 on 10 daylilies and 12 pots of ivy. John spent $39 on 10 daylilies and 1 pot of ivy. What is the cost of one daylily and the cost of one pot of ivy?