

What you will learn about:  
Solving Systems of Linear Equations by Graphing

**Solution to System of Equations**

Are the values of the variables that make all the equations true. A solution of a system of two linear equations is represented by an ordered pair  $(x, y)$ .

Consider the system below:

$$3x - y = 7$$

$$x - 2y = 4$$

Is the ordered pair  $(2, -1)$  a solution?

Is the ordered pair  $(3, 2)$  a solution?

Determine whether the ordered pair is a solution to the system

$$\begin{cases} x - y = -1 \\ 2x - y = -5 \end{cases}$$

a)  $(-2, -1)$

b)  $(-4, -3)$

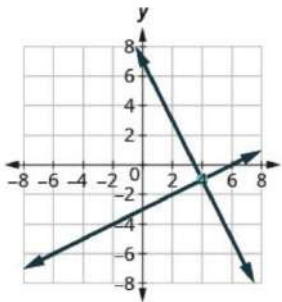
Determine whether the ordered pair is a solution to the system

$$\begin{cases} x - y = -1 \\ 2x - y = -5 \end{cases}$$

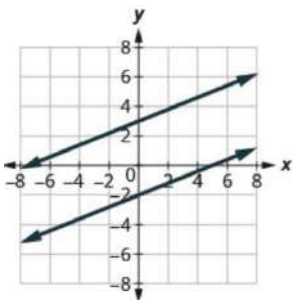
a)  $(2, -2)$

b)  $(-2, 2)$

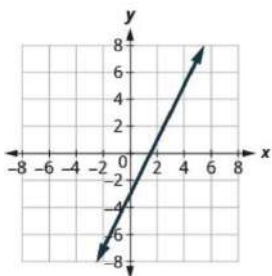
## Solving Systems by Graphing



**The lines intersect.**  
Intersecting lines have one point in common.  
There is one solution to this system.

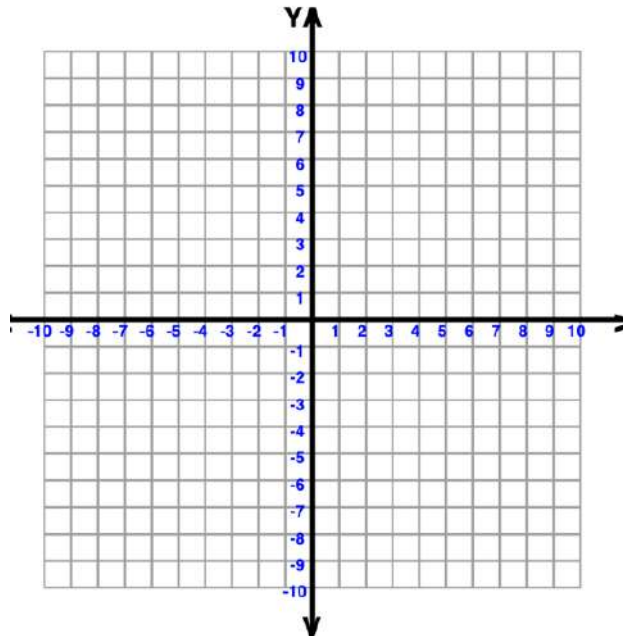


**The lines are parallel.**  
Parallel lines have no points in common.  
There is no solution to this system.

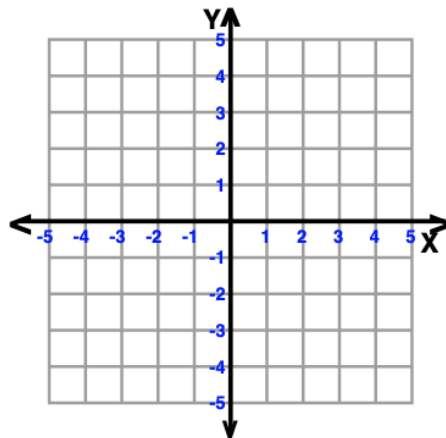


**Both equations give the same line.**  
Because we have just one line, there are infinitely many solutions.

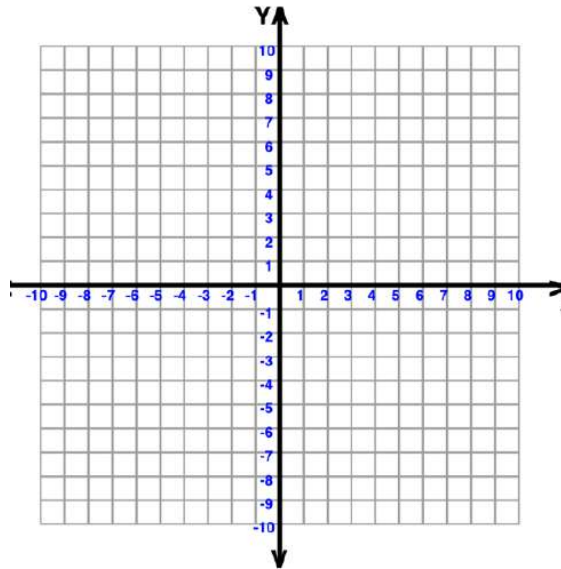
Solve the system by graphing: 
$$\begin{cases} 2x + y = 7 \\ x - 2y = 6 \end{cases}$$



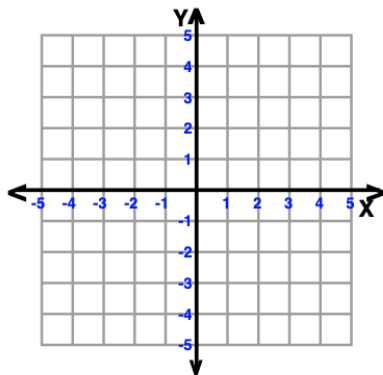
Solve the system by graphing: 
$$\begin{cases} x - 3y = -3 \\ x + y = 5 \end{cases}$$



Solve the system by graphing:  $\begin{cases} -x + y = 1 \\ 3x + 2y = 12 \end{cases}$

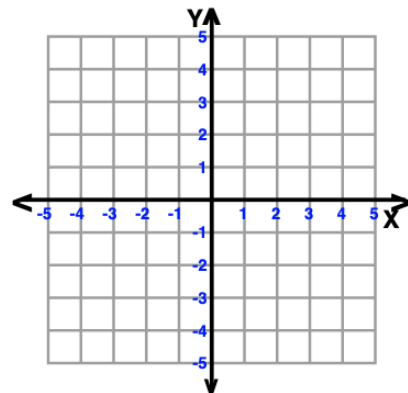


Solve the system by graphing:  $\begin{cases} y = 2x + 1 \\ y = 4x - 1 \end{cases}$

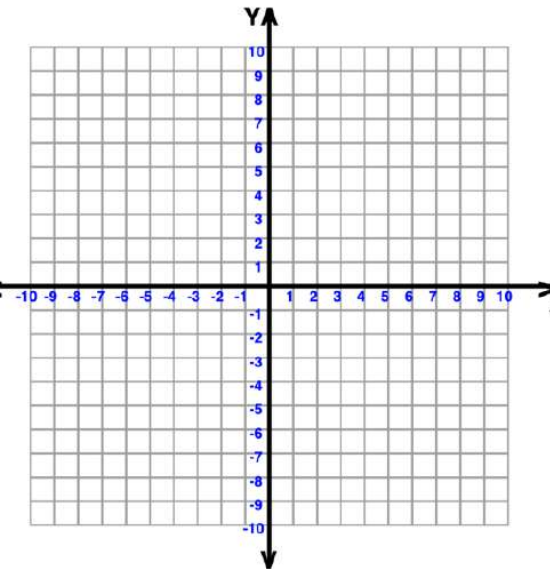


Solve the system by graphing:

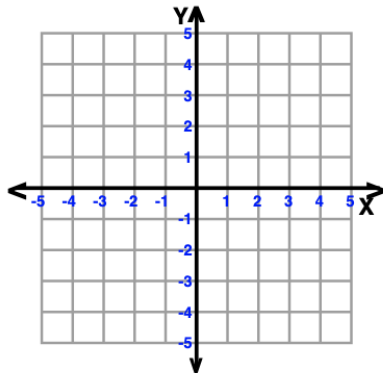
$$\begin{cases} y = 2x + 1 \\ y = 4x - 1 \end{cases}$$



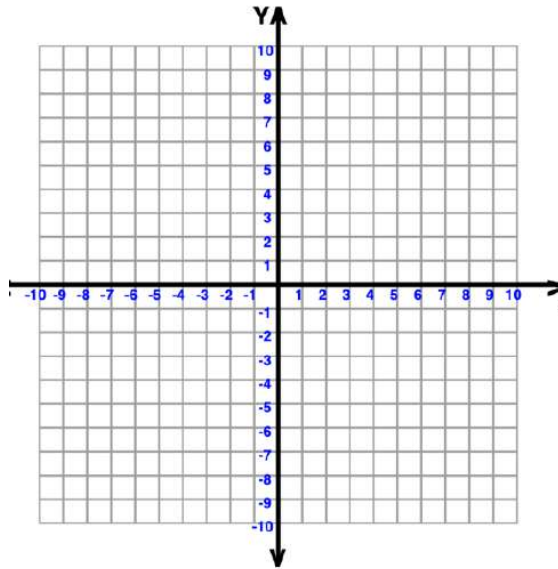
Solve the system by graphing:  $\begin{cases} y = 3x + 3 \\ y = -x + 7 \end{cases}$



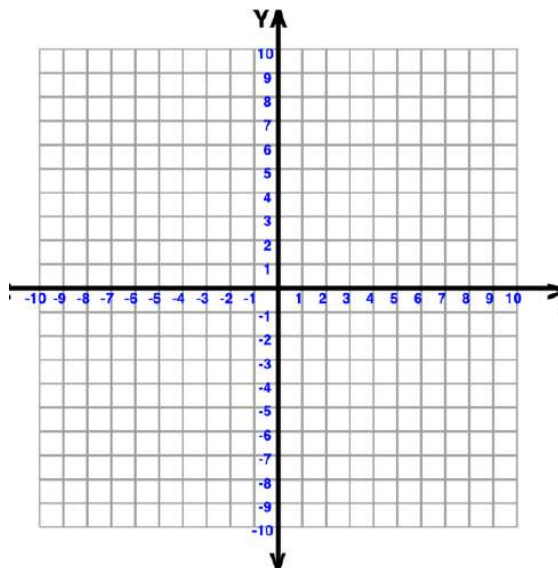
Solve the system by graphing:  $\begin{cases} 3x + y = -1 \\ 2x + y = 0 \end{cases}$



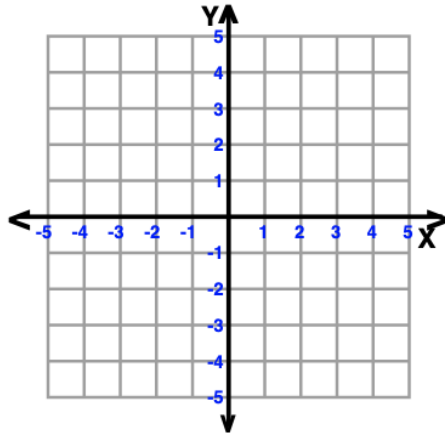
Solve the system by graphing:  $\begin{cases} y = -1 \\ x + 3y = 6 \end{cases}$



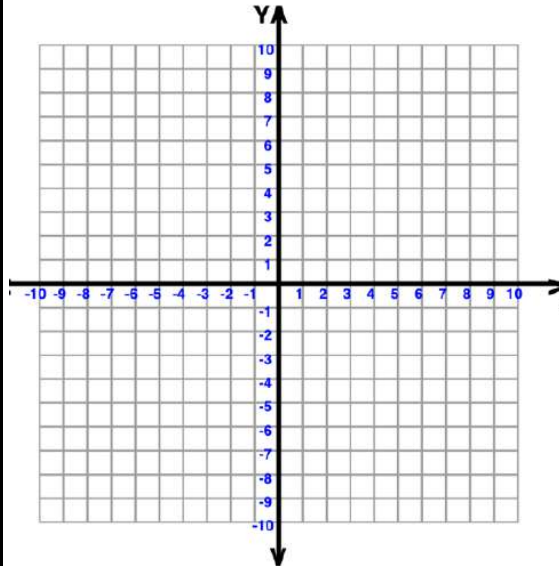
Solve the system by graphing:  $\begin{cases} x = 4 \\ 3x - 2y = 24 \end{cases}$



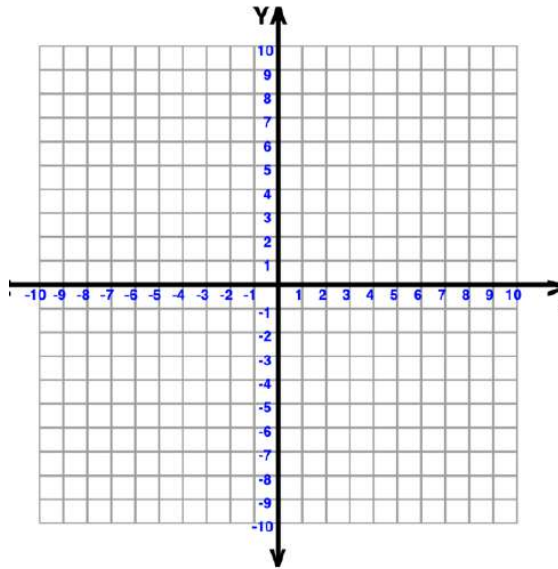
Solve the system by graphing: 
$$\begin{cases} y = \frac{1}{2}x - 3 \\ x - 2y = 4 \end{cases}$$



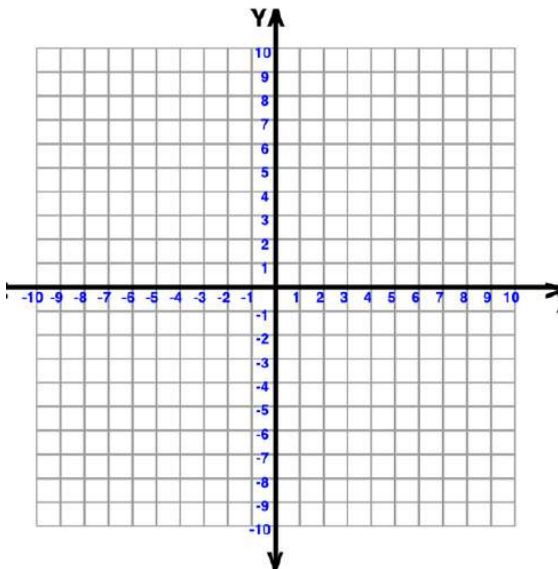
Solve the system by graphing: 
$$\begin{cases} y = -\frac{1}{4}x + 2 \\ x + 4y = 8 \end{cases}$$



Solve the system by graphing:  $\begin{cases} y = 2x - 3 \\ -6x + 3y = -9 \end{cases}$



Solve the system by graphing:  $\begin{cases} y = \frac{1}{2}x - 4 \\ 2x - 4y = 16 \end{cases}$



Coinciding Lines

Determine the number of solutions of a linear system

Graph	Number of Solutions
2 Intersecting Lines	
Parallel Lines	
Same Line	

Number of Solutions of a Linear System of Equations			
Slopes	Intercepts	Types of Lines	# f Solutions
Different			
Same			
Same			

Consistent System

Inconsistent System

Independent

Dependent

Lines	Intersenting	Parallel	Coinside
Number of Solutions			
Consistent/Inconsistent			
Dependent/Independent			



Without graphing, determine the number of solutions and then classify the system of equations.

$$\begin{cases} y = 3x - 1 \\ 6x - 2y = 12 \end{cases}$$

Without graphing, determine the number of solutions and then classify the system of equations.

$$\begin{cases} y = -2x - 4 \\ 4x + 2y = 9 \end{cases}$$

Without graphing, determine the number of solutions and then classify the system of equations.

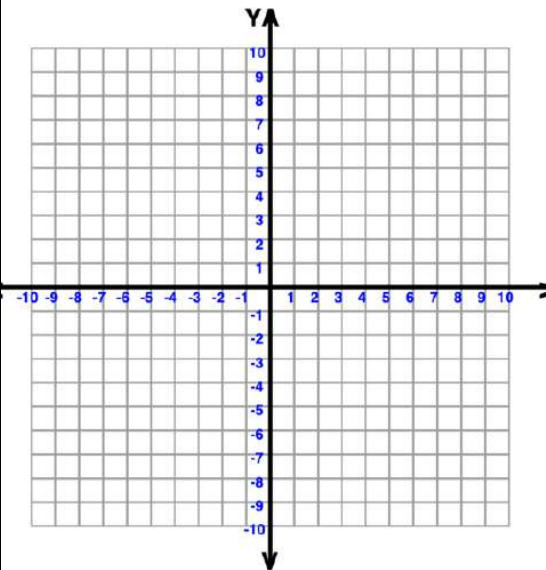
$$\begin{cases} 2x + y = -3 \\ x - 5y = 5 \end{cases}$$

Without graphing, determine the number of solutions and then classify the system of equations.

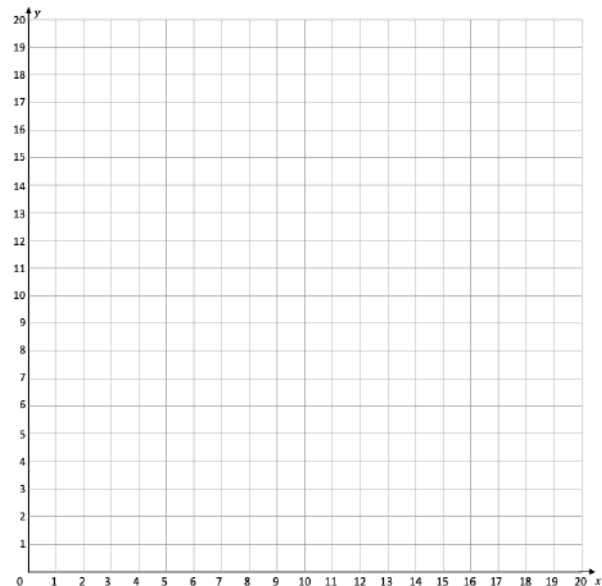
$$\begin{cases} 3x - 2y = 4 \\ y = \frac{3}{2}x - 2 \end{cases}$$

Sondra is making 10 quarts of punch from juice and club soda. The number of quarts of fruit juice is 4 times the number of quarts of club soda. How many quarts of fruit juice and how many quarts of club soda does Sondra need?

Use a graph to find the solution.



Alisha is making an 18 ounce coffee beverage that is made from brewed coffee and milk. The number of ounces of brewed coffee is 5 times greater than the number of ounces of milk. How many ounces of milk does Alisha need?



What you will learn about:  
Solving Systems of Linear Equations by Substitution

Solving System of Equations by  
Substitution

**Solve a system of equations by substitution.**

Step 1. Solve one of the equations for either variable.

Step 2. Substitute the expression from Step 1 into the other equation.

Step 3. Solve the resulting equation.

Step 4. Substitute the solution in Step 3 into one of the original equations to find the other variable.

Step 5. Write the solution as an ordered pair.

Step 6. Check that the ordered pair is a solution to **both** original equations.

Solve the system by Substitution. 
$$\begin{cases} 2x + y = 7 \\ x - 2y = 6 \end{cases}$$

Solve the system by Substitution. 
$$\begin{cases} -7x - 2y = -13 \\ x - 2y = 11 \end{cases}$$

Solve the system by Substitution. 
$$\begin{cases} -5x + y = -3 \\ 3x - 8y = 24 \end{cases}$$

Solve the system by Substitution. 
$$\begin{cases} -3x - 8y = 20 \\ -5x + y = 19 \end{cases}$$

Solve the system by Substitution. 
$$\begin{cases} -2x + 6y = 6 \\ -7x + 8y = -5 \end{cases}$$

Solve the system by Substitution. 
$$\begin{cases} 2x + y = 7 \\ x - 2y = 6 \end{cases}$$

Solve the system by Substitution. 
$$\begin{cases} y = 6x - 11 \\ -2x - y = -7 \end{cases}$$

Solve the system by Substitution. 
$$\begin{cases} y = -3x + 5 \\ 5x - 4y = -3 \end{cases}$$

Solve the system by Substitution. 
$$\begin{cases} y = -2 \\ 4x - 3y = 18 \end{cases}$$

Solve the system by Substitution. 
$$\begin{cases} 2x + y = 7 \\ x - 2y = 6 \end{cases}$$

Solve the system by Substitution. 
$$\begin{cases} y = 2x + 1 \\ y = -3x - 6 \end{cases}$$

Solve the system by Substitution. 
$$\begin{cases} y = -2x + 5 \\ y = \frac{1}{2}x \end{cases}$$

Solve the system by Substitution. 
$$\begin{cases} 4x - 3y = 6 \\ 15y - 20x = -30 \end{cases}$$

Solve the system by Substitution. 
$$\begin{cases} 3x + 2y = 9 \\ y = -\frac{3}{2}x + 1 \end{cases}$$

The sum of two numbers is zero. One number is nine less than the other. Find the numbers.

The perimeter of a rectangle is 88. The length is five more than twice the width. Find the length and width.

The measure of one of the small angles of a right triangle is ten more than three times the measure of the other small angle. Find the measure of both angles.

Heather has been offered two options for her salary as a trainer at the gym. Option A would pay her \$25,000 plus \$15 for each training session. Option B would pay her \$10,000 plus \$40 for each training session. How many training sessions would make the salary options equal?

Kenneth currently sells suits for company A at a salary of \$22,000 plus \$10 commission for each suit sold. Company B offers him a position with a salary of \$28,000 plus a \$4 commission for each suit sold. How many suits would Kenneth need to sell for the options to be equal?

What you will learn about:  
Solving Systems of Linear Equations by Elimination

Solving Systems of equations  
by Elimination

**How to solve a system of equations by elimination.**

Step 1. Write both equations in standard form. If any coefficients are fractions, clear them.

Step 2. Make the coefficients of one variable opposites.

- Decide which variable you will eliminate.
- Multiply one or both equations so that the coefficients of that variable are opposites.

Step 3. Add the equations resulting from Step 2 to eliminate one variable.

Step 4. Solve for the remaining variable.

Step 5. Substitute the solution from Step 4 into one of the original equations. Then solve for the other variable.

Step 6. Write the solution as an ordered pair.

Step 7. Check that the ordered pair is a solution to **both** original equations.

Solve the system by elimination  $\begin{cases} x + y = 10 \\ x - y = 12 \end{cases}$

Solve the system by elimination  $\begin{cases} 3x - 2y = -2 \\ 5x - 6y = 10 \end{cases}$



Solve the system by elimination  $\begin{cases} 4x - 3y = 1 \\ 5x - 9y = -4 \end{cases}$

Solve the system by elimination  $\begin{cases} 4x - 3y = 9 \\ 7x + 2y = -6 \end{cases}$

Solve the system by elimination  $\begin{cases} 3x - 4y = -9 \\ 5x + 3y = 14 \end{cases}$

Solve the system by elimination  $\begin{cases} x + \frac{1}{2}y = 6 \\ \frac{3}{2}x + \frac{2}{3}y = \frac{17}{2} \end{cases}$

Solve the system by elimination  $\begin{cases} \frac{1}{3}x - \frac{1}{2}y = 1 \\ \frac{3}{4}x - y = \frac{5}{2} \end{cases}$

Solve the system by elimination  $\begin{cases} 3x + 4y = 12 \\ y = 3 - \frac{3}{4}x \end{cases}$

Solve the system by elimination  $\begin{cases} -6x + 15y = 10 \\ 2x - 5y = -5 \end{cases}$

Solve the system by elimination  $\begin{cases} 7x - 3y = -2 \\ -14x + 6y = 8 \end{cases}$

The sum of two numbers is 39. Their difference is 9. Find the numbers.

Joe stops at a burger restaurant everyday on his way to work. Monday he had one order of medium fries and two small sodas, which had a total of 620 calories. Tuesday he had two orders of medium fries and one small soda, for a total of 820 calories. How many calories are there in one order of medium fries? How many calories in one small soda?

Malik stops at the grocery store to buy a bag of diapers and 2 cans of formula. He spends a total of \$37. The next week he stops and buys 2 bags of diapers and 5 cans of formula for a total of \$87. How much does a bag of diapers cost? How much is one can of formula?

What you will learn about:  
Solve Application with System of Equations

Translate to a system of equations: The sum of two numbers is negative fourteen. One number is four less than the other. Find the numbers.

Translate to a system of equations: A married couple together earns \$110,000. The wife earns \$16,000 less than twice what her husband earns. What does the husband earn?

Translate to a system of equations: A senior employee makes \$5 less than twice what a new employee makes per hour. Together they make \$43 per hour. How much does each employee make per hour?

Translate to a system of equations and then solve: Devon is 26 years older than his son Cooper. The sum of their ages is 50. Find their ages.

Translate to a system of equations and then solve: When Jenna spent 10 minutes on the elliptical trainer and then did circuit training for 20 minutes, her fitness app says she burned 278 calories. When she spent 20 minutes on the elliptical trainer and 30 minutes circuit training she burned 473 calories. How many calories does she burn for each minute on the elliptical trainer? How many calories does she burn for each minute of circuit training?

Translate to a system of equations and then solve: Mark went to the gym and did 40 minutes of Bikram hot yoga and 10 minutes of jumping jacks. He burned 510 calories. The next time he went to the gym, he did 30 minutes of Bikram hot yoga and 20 minutes of jumping jacks burning 470 calories. How many calories were burned of each minute of yoga? How many calories were burned for each minute of jumping jacks?

Complementary Angles

Supplementary Angles

Translate to a system of equations and then solve: The difference of two complementary angles is 26 degrees. Find the measure of the angles.

Translate to a system of equations and then solve: Two angles are supplementary. The measure of the larger angle is twelve degrees less than five times the measure of the smaller angle. Find the measure of both angles.

Translate to a system of equations and then solve: Randall has 125 feet of fencing to enclose the rectangular part of his backyard adjacent to his house. He will only need to fence three sides, because the fourth side will be the wall of the house. He wants the length of the fenced yard (parallel to the house wall) to be 5 feet more than four times as long as the width. Find the length and width.

Translate to a system of equations and then solve: Joni left St. Louis on the interstate , driving west towards Denver at a speed of 65 miles per hour. Half an hour later, Kelly left St. Louis on the same route as Joni, driving 78 miles per hour. How long will it take Kelly to catch up to Joni?

Translate to a system of equations and then solve: A river cruise ship sailed 60 miles downstream for 4 hours and then took 5 hours sailing upstream to return to the dock. Find the speed of the ship in still water and the speed of the river current.

Translate to a system of equations and then solve: Jason paddled his canoe 24 miles upstream for 4 hours. It took him 3 hours to paddle back. Find the speed of the canoe in still water and the speed of the river current.

Translate to a system of equations and then solve: A private jet can fly 1095 miles in three hours with a tailwind but only 987 miles in three hours into a headwind. Find the speed of the jet in still air and the speed of the wind.

Translate to a system of equations and then solve: A small jet can fly 1,325 miles in 5 hours with a tailwind but only 1,025 miles in 5 hours into a head wind. Find the speed of the jet in still air and the speed of the wind.



What you will learn about:  
Solve Mixture Problems using System of Equations

Translate to a system of equations and then solve: Jamie has seventeen total coins in her purse. She has only quarters and dimes. The change in her purse totals up to \$2.90. How many quarters does she have? How many dimes does she have?

Translate to a system of equations and then solve: The box office at a movie theater sold 147 tickets for the evening show, and receipts totaled \$1,302. How many \$11 adult and how many \$8 child tickets were sold?

Translate to a system of equations and then solve: A science center sold 1,363 tickets on a busy weekend. The receipts totaled \$12,146. How many \$12 adult tickets and how many \$7 child tickets were sold?

Translate to a system of equations and then solve: Steve has a collection of nickels and quarters, with a total value of \$7.30. The number of nickels is six less than three times the number of quarters. How many nickels and how many quarters does he have?

Translate to a system of equations and then solve: Juan has a pocket full of nickels and dimes. The total value of the coins is \$8.10. Juan has a total of 99 coins in his pocket. How many nickels and how many dimes does Juan have?

Translate to a system of equations and then solve: Carson wants to make 20 pounds of trail mix using nuts and chocolate chips. His budget requires that the trail mix costs him \$7.60 per pound. Nuts cost \$9.00 per pound and chocolate chips cost \$2.00 per pound. How many pounds of nuts and how many pounds of chocolate chips should he use.

Translate to a system of equations and then solve: Greta wants to make 5 pounds of a nut mix using peanuts and cashews. Her budget requires the mixture cost her \$6 per pound. Peanuts are \$4 per pound and cashews are \$9 per pound. How many pounds of peanuts and how many pounds of cashews should be used?

Translate to a system of equations and then solve: Salley is a lab assistant at her community college. She needs to make 200 milliliters of a 40% solution of sulfuric acid for a lab experiment. The lab has only 25% and 50% solutions in the storeroom. How much should she mix of the 25% and 50% solutions to make the 40% solution?

Translate to a system of equations and then solve: Marcus needs 150 milliliters of a 30% solution of sulfuric acid for a lab experiment but only has access to a 25% and a 50% solution. How much of the 25% and how much of the 50% solution should he mix to make the 30% solution?

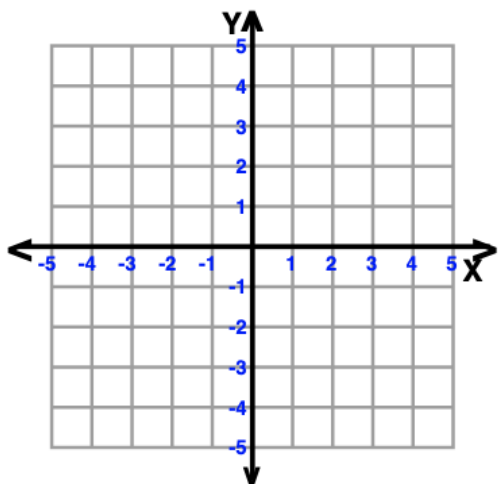
Translate to a system of equations and then solve: Adrian has \$40,000 to invest and hopes to earn 7.1% interest per year. He will put some of the money into a stock fund that earns 8% per year and the rest into bonds that earns 3% per year. How much money should he put into each fund?

Translate to a system of equations and then solve: Leon had \$50,000 to invest and hopes to earn 6.2% interest per year. He will put some of the money into a stock fund that earns 7% per year and the rest into a savings account that earns 2% per year. How much money should he put into each account?

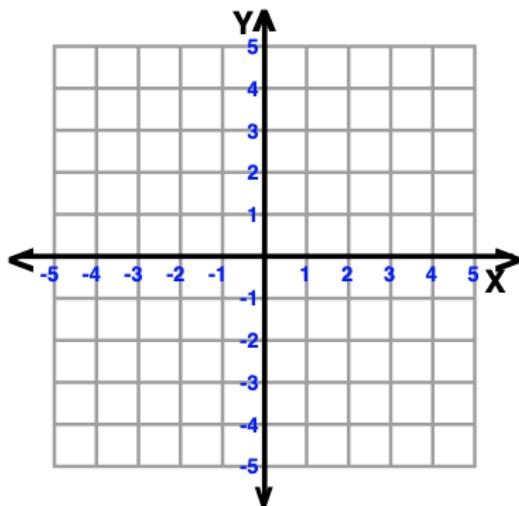
Translate to a system of equations and then solve: Rosie owes \$21,540 on her 2 student loans. The interest rate on her bank loan is 10.5% and the interest rate on the federal loan is 5.9%. The total amount of interest she paid last year was \$1,669.68. What was the principle for each loan?

What you will learn about:  
Solving Systems of Linear Inequalities

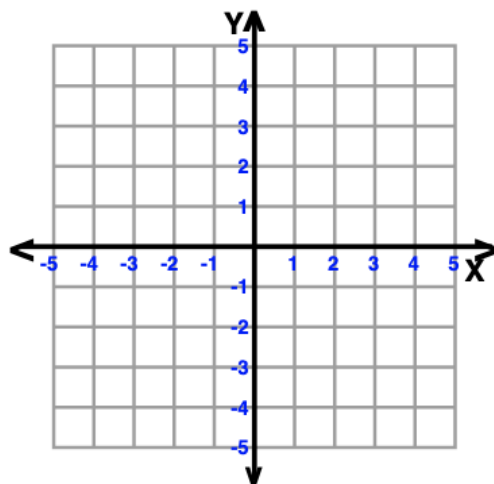
Solve the system by graphing  $\begin{cases} y \geq 2x - 1 \\ y < x + 1 \end{cases}$



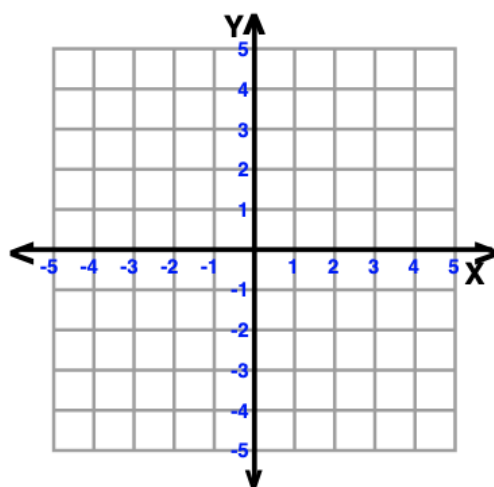
Solve the system by graphing  $\begin{cases} y < -\frac{1}{2}x + 3 \\ y < 3x - 4 \end{cases}$



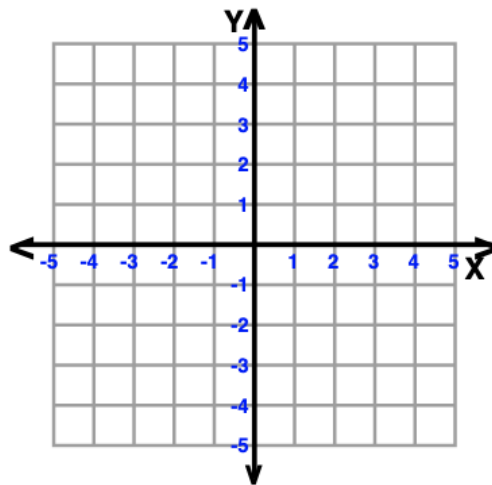
Solve the system by graphing  $\begin{cases} x - y > 3 \\ y < -\frac{1}{5}x + 4 \end{cases}$



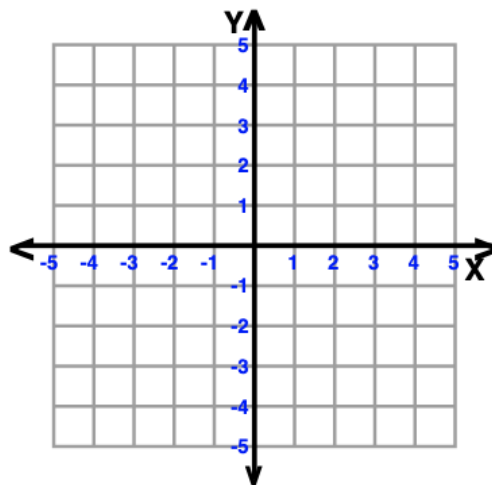
Solve the system by graphing  $\begin{cases} 2x - 3y \leq 6 \\ y > -\frac{1}{4}x + 5 \end{cases}$



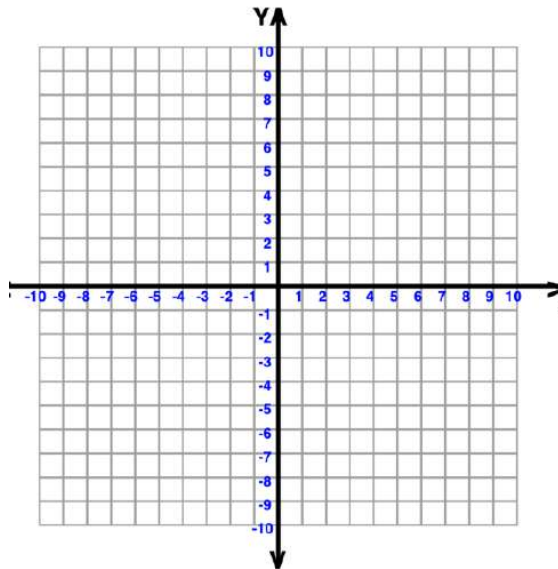
Solve the system by graphing  $\begin{cases} x - 2y < 5 \\ y > -4 \end{cases}$



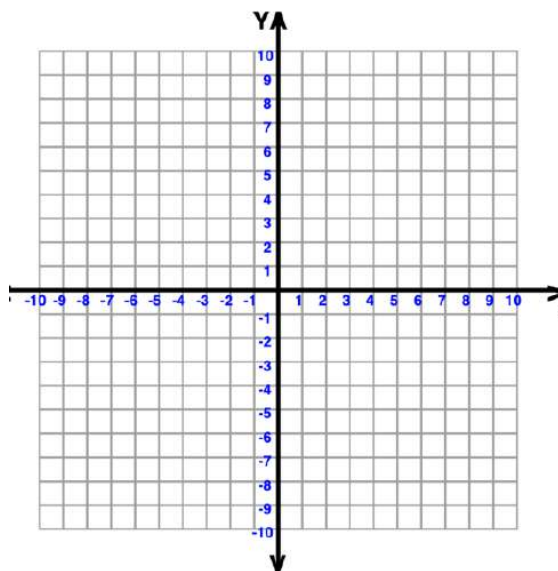
Solve the system by graphing  $\begin{cases} x > -4 \\ x - 2y \leq -4 \end{cases}$



Solve the system by graphing  $\begin{cases} 3x - 2y \leq 12 \\ y \geq \frac{3}{2}x + 1 \end{cases}$

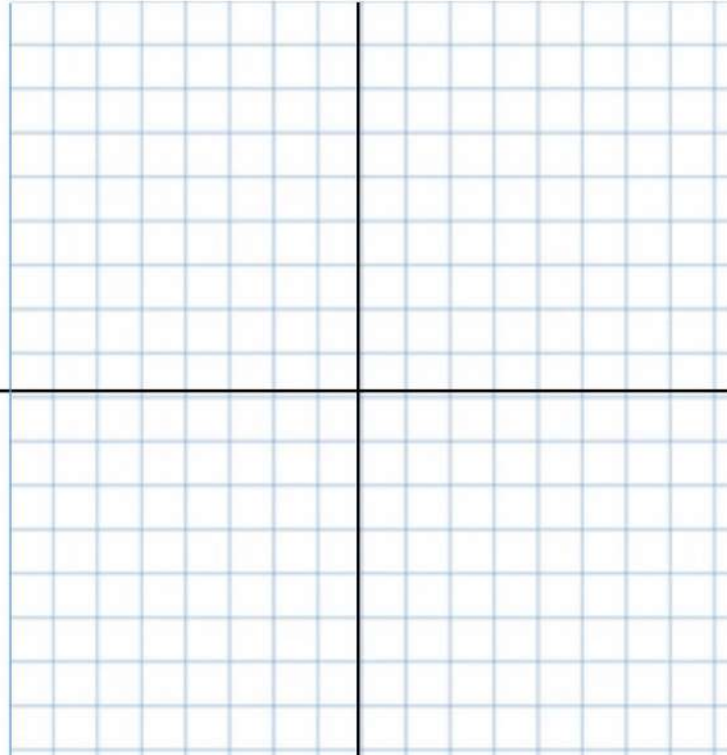


Solve the system by graphing  $\begin{cases} 4x + 3y \geq 12 \\ y < -\frac{4}{3}x + 1 \end{cases}$





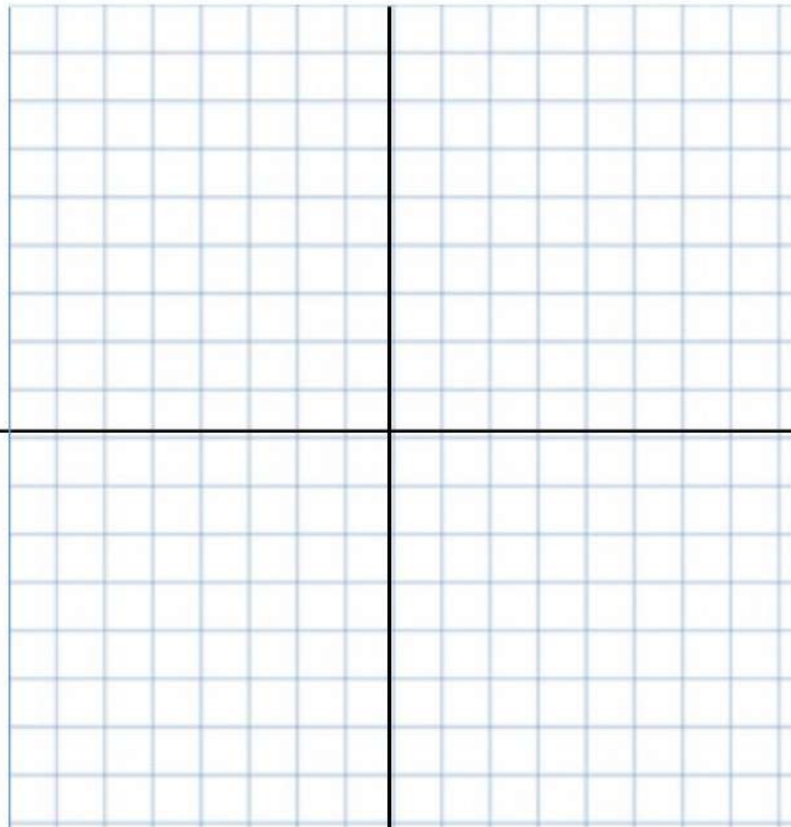
Christy sell here photographs at a booth at a street fair. At the start of the day, she wants to have at least 25 photos to display at her booth. Each small photo she displays cost her \$4 and each large photo costs her \$10. She doesn't want to send more than \$200 on photos to display. Write a system of inequalities to model this situation. Graph the system.



Could she display 15 small and 5 large photos?

Could she display 3 large and 22 small photos?

Omar needs to eat at least 800 calories before going to his team practice. All he wants is hamburgers and cookies and he doesn't want to spend more than \$5. At the hamburger restaurant near his college each hamburger has 240 calories and costs \$1.40. Each cookie has 160 calories and costs \$0.50. Write a system of inequalities to model this situation. Graph the system.



Could he eat 3 hamburgers and 1 cookie?

Could he eat 2 hamburgers and 4 cookies?