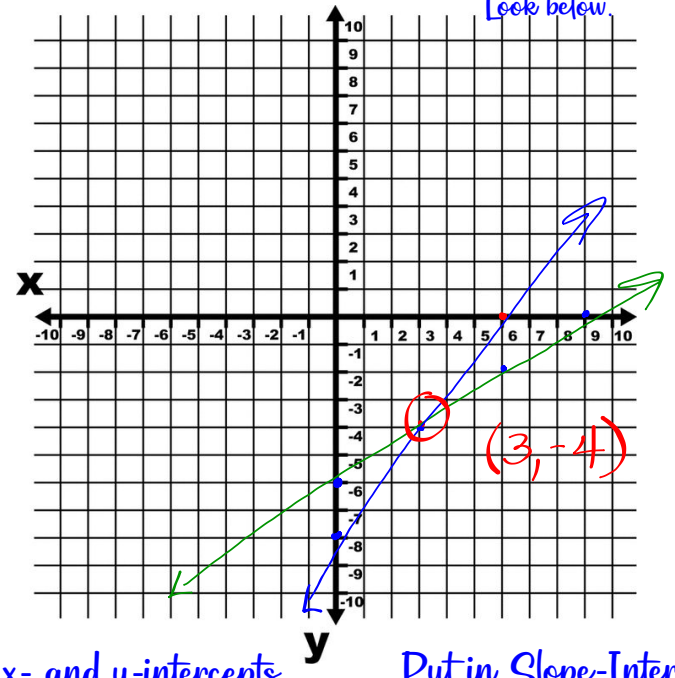
Warm Up

2/29

Graph the following system of equations, is there a common solution?

- $y = \frac{2}{3}x - 6$ Easy to graph this because it is in Slope-Intercept form.
- $4x - 3y = 24$ How to graph this? Look below.



Find x- and y-intercepts

$4(0) - 3y = 24$

$\frac{-3y}{-3} = \frac{24}{-3}$

$y = -8$

$(0, -8)$

$4x - 3(0) = 24$

$\frac{4x}{4} = \frac{24}{4}$

$x = 6$

$(6, 0)$

Put in Slope-Intercept form

Find y-int and use slope to get another point.

$4x - 3y = 24$

$-4x \quad -4x$

$\frac{-3y}{-3} = \frac{-4x}{-3} + \frac{24}{-3}$

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

Homework Questions?

For each problem:

- Define your variables (Let x = , and Let y =)
- Write your equations (are there some totals involving both variables?)
- Use Desmos to solve your system of equations
- What does your solution mean in the context of the problem?

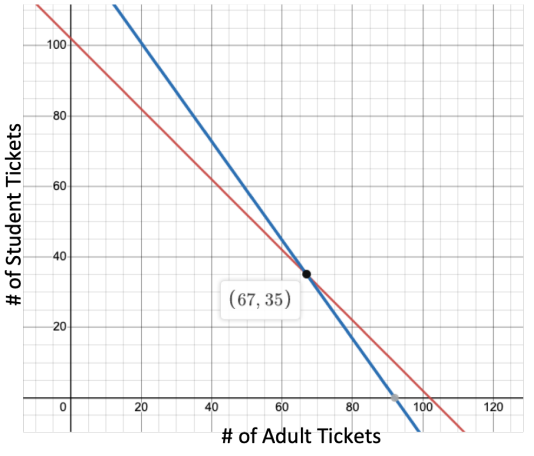
1. A theater production charges $21 for adult tickets and $15 for student tickets. If the production sold 102 tickets for its opening night and made $1,932 in ticket sales, how many of each type of ticket were sold?

Let x = # of adult tickets
Let y = # of student tickets

x + y = 102
21x + 15y = 1932

Common Solution: (67, 35)

They sold **67** adult tickets and **35** student tickets.



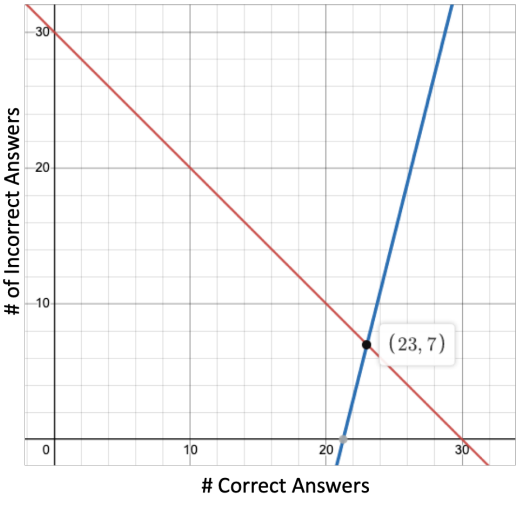
2. The player of a trivia game receives 100 points for each correct answer and loses 25 points for each incorrect answer. Leona answered a total of 30 questions and scored a total of 2125 points. How many questions did she answer correctly?

Let x = # of correct answers
Let y = # of incorrect answers

x + y = 30
100x - 25y = 2125

Common Solution: (23, 7)

They answered **23** questions correctly and **7** questions incorrectly.



3. At a restaurant the cost for a breakfast taco and a small glass of milk is $2.10. The cost for 2 tacos and 3 small glasses of milk is $5.15. How much does a breakfast taco cost? How much does a small glass of milk cost?

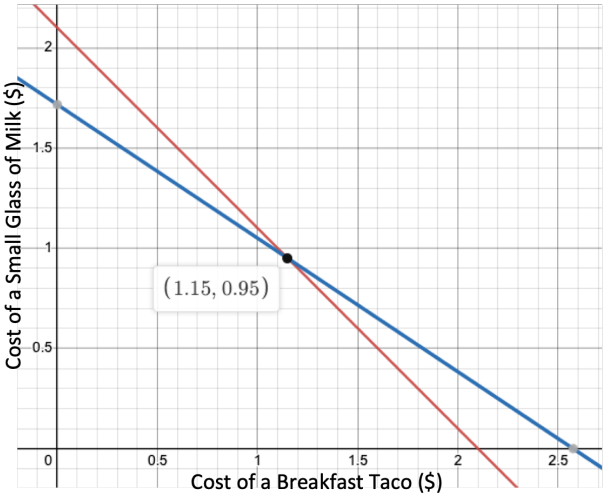
Look for totals!

Let x = cost of a breakfast taco
Let y = cost of a small glass of milk

x + y = 2.10
2x + 3y = 5.15

Common Solution: (1.15, 0.95)

The breakfast taco costs **$1.15** and the small glass of milk costs **$0.95**.



4. The Frosty Ice Cream Shop sells sundaes for $2 and banana splits for $3. On a hot summer day, the shop sold 8 more sundaes than banana splits and made $156. How many banana splits did they sell?

Let x = # of sundaes sold
Let y = # of banana splits sold

x = y + 8
2x + 3y = 156

x = y + 8
−y −y
x − y = 8

Common Solution: (36, 28)

They sold **28** Banana Splits.

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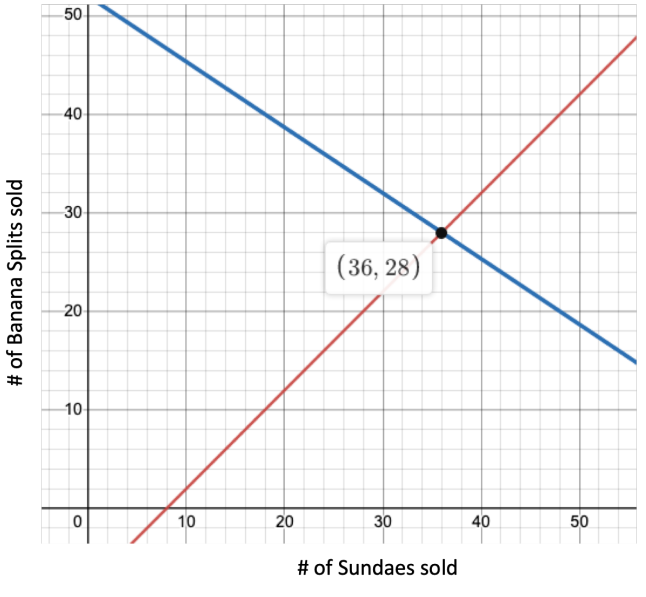


Investigation 2

Solving Linear Systems Symbolically

using Algebra

Your work in Investigation 1 revealed key facts about solving linear equations.

- The solutions of equations in the form $Ax + By = C$ are ordered pairs of numbers.
- The graph of the solutions for an equation $Ax + By = C$ is a straight line.
- The solution of a system of two linear equations is the coordinates of the point where the lines intersect.

Finding an exact solution is not always easy to do from a graph of the pair of linear equations. In this Investigation, you will develop symbolic methods for solving systems of linear equations.

2.1 Shirts and Caps Again

Solving Systems With $y = mx + b$

Recall the T-shirt and cap sale from Investigation 1.

Totals

Let x = # of shirts

Let y = # of caps

- What two equations represent the relationship between the number of shirts sold and the number of caps sold?
- How can you find the number of shirts and the number of caps sold? Explain your reasoning.

$$\begin{cases} x + y = 18 \\ 5x + 10y = 125 \end{cases}$$

Looking for (x, y) that is the same for both eq's.

Nyla and Jimfa have different ways to solve this system of equations.

Let's check them out ...

The 2 methods

Nyla

Write a system of two linear equations.

$$\begin{cases} y + x = 18 \\ 10y + 5x = 125 \end{cases}$$

Write equivalent equations.

$$y = -x + 18$$

$$y = -0.5x + 12.5$$

Graph the two equations.
The solution of the system is the point where the graphs of the equations meet.

Jimfa

Write a system of two linear equations.

$$\begin{cases} y + x = 18 \\ 10y + 5x = 125 \end{cases}$$

Write equivalent equations.

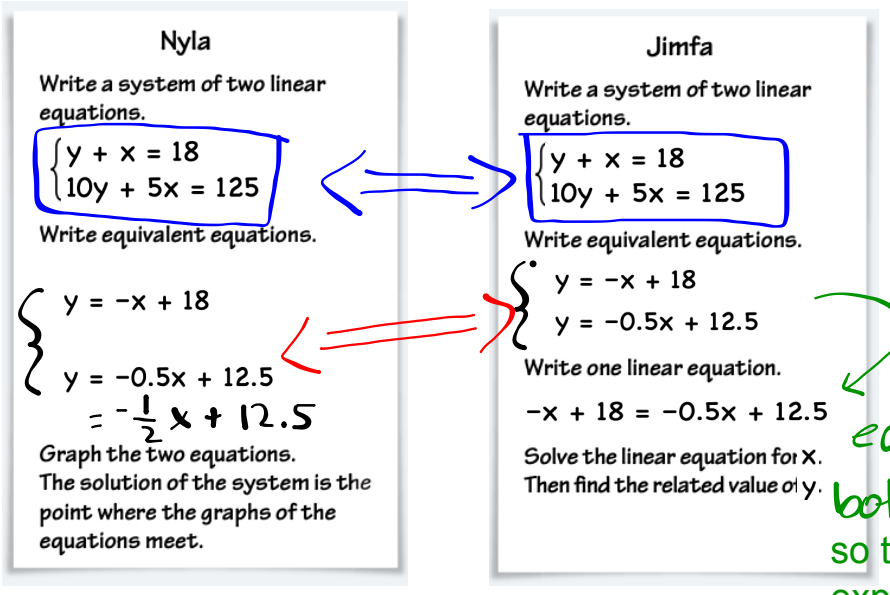
$$y = -x + 18$$

$$y = -0.5x + 12.5$$

Write one linear equation.

$$-x + 18 = -0.5x + 12.5$$

Solve the linear equation for x.
Then find the related value of y.



They both started the same way:

1. Write a system of equations:

$$y + x = 18$$
$$10y + 5x = 125$$

2. Create equivalent equations
(isolate either x or y in both equations)

Now solve using each method!

Let's try B1 together?

B Use symbolic methods to find values of x and y that satisfy each system. Check your solution by substituting the values into the equations and showing that the resulting statements are true.

1. $\begin{cases} y = 1.5x - 0.4 \\ y = 0.3x + 5 \end{cases}$

(4.5, 6.35)

$1.5x - 0.4 = 0.3x + 5$

$-0.3x \qquad -0.3x$

$1.2x - 0.4 = 5$

$+0.4 \quad +0.4$

$\frac{1.2x}{1.2} = \frac{5.4}{1.2}$

$x = 4.5$

$y = 0.3x + 5$

$y = 0.3(4.5) + 5$

$y = 1.35 + 5$

$y = 6.35$

Problem 2.1 B

B Use ~~symbolic methods~~ Algebra to find values of x and y that satisfy each system. Check your solution by substituting the values into the equations and showing that the resulting statements are true.

1. $\begin{cases} y = 1.5x - 0.4 \\ y = 0.3x + 5 \end{cases}$ **2.** $\begin{cases} x + y = 3 \\ x - y = -5 \end{cases}$ **3.** $\begin{cases} 3x - y = 30 \\ x + y = 14 \end{cases}$

4. $\begin{cases} x + 6y = 15 \\ -x + 4y = 5 \end{cases}$ **5.** $\begin{cases} x - y = -5 \\ -2x + 2y = 10 \end{cases}$ **6.** $\begin{cases} x - y = -5 \\ -2x + 2y = 8 \end{cases}$

Remember to solve all equations for one variable first.

Do we make this x= or y= ?

It is easier to rewrite each equation, to solve for x (no fractions) than to solve for y.

Problem 2.1 B

B Use ~~symbolic methods~~ Algebra to find values of x and y that satisfy each system. Check your solution by substituting the values into the equations and showing that the resulting statements are true.

1. $\begin{cases} y = 1.5x - 0.4 \\ y = 0.3x + 5 \end{cases}$

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

3. $\begin{cases} 3x - y = 30 \\ x + y = 14 \end{cases}$

4. $\begin{cases} x + 6y = 15 \\ -x + 4y = 5 \end{cases}$ $x = 15 - 6y$ $x = 4y - 5$

5. $\begin{cases} x - y = -5 \\ -2x + 2y = 10 \end{cases}$ $-y = -5 - x$ $y = 5 + x$

6. $\begin{cases} x - y = -5 \\ -2x + 2y = 8 \end{cases}$

Get x alone

Remember to solve all equations for one variable first.

$x + y = 3$

$x - y = -5$

We want both to be $y =$

$x + y = 3$

$-x \quad -x$

$y = 3 - x$

$x - y = -5$

$-x \quad -x$

$-1(-y = -x - 5)$

$y = x + 5$

$3 - x = x + 5$

Now you can solve for x

Homework

Finish classwork.