

A. Lesson Context

BIG PICTURE of this UNIT:	<ul style="list-style-type: none"> • What is meant by the term FUNCTIONS and how do we work with them? • mastery with working with basics & applications of linear functions • mastery with working with basics & applications of linear systems • understanding basics of function concepts and apply them to lines & linear systems 		
CONTEXT of this LESSON:	<p>Where we've been</p> <p>In Lesson 8, you practiced with writing equations to various word problems & practiced HOW to solve the systems</p>	<p>Where we are</p> <p>We will analyze systems graphically & analytically to classify a systems in terms of the number of solutions</p>	<p>Where we are heading</p> <p>How do we apply the concept of "functions" to linear relations.</p>

(A) Lesson Objectives:

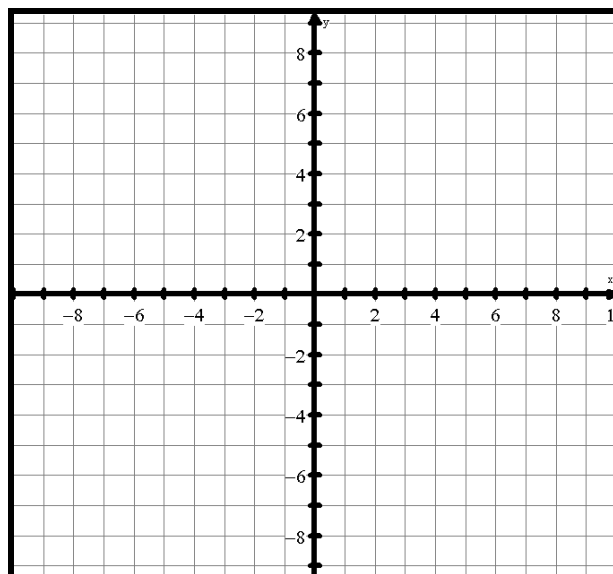
- a. Investigate the numbers of solutions that linear systems can have
- b. Use multiple representations in solving linear systems

(B) Investigation #1 – Number of Solutions

1. On the same grid, use DESMOS to graph the lines $y = -\frac{1}{2}x + 3$ and $x + 2y = -10$.
2. How are the graphs related?
3. How are the equations related?

Algebraic Verification (Use the substitution method)

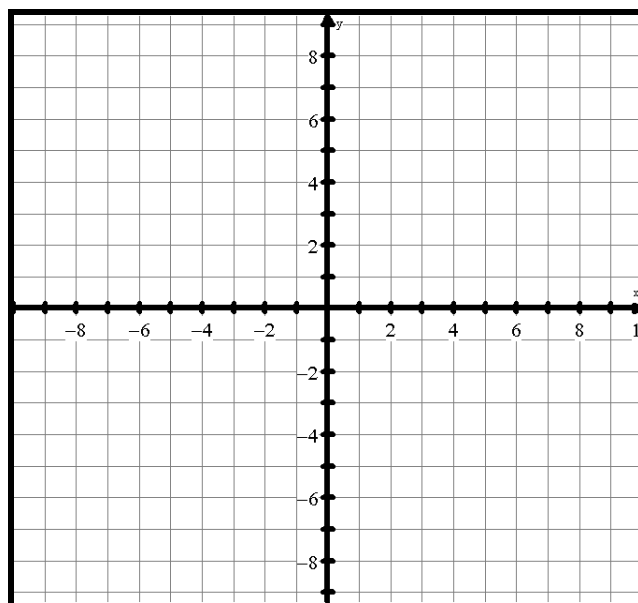
Graphic Verification using DESMOS (sketch)



1. On the same grid, use DESMOS to graph the lines $-x + 3y = 9$ and $2x - 6y = 18$.
2. How are the graphs related?
3. How are the equations related?

Algebraic Verification (using Elimination method)

Graphic Verification (Sketch from DESMOS)



(C) Investigation #2 – Number of Solutions

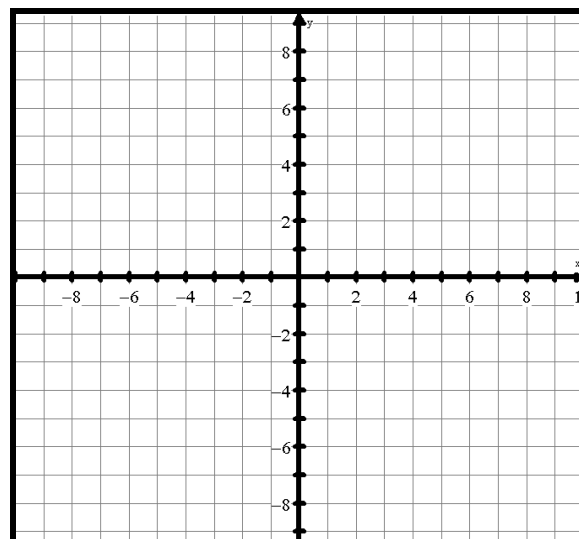
1. On the same grid, use DESMOS to graph the lines $x + 2y = 8$ and $2x + 4y = 16$. Sketch the resultant graph on the grid included. Graphic Verification – Sketch from DESMOS

2. How are the graphs related?

3. How are the equations related?

4. On the same graph, use DESMOS to graph $-8x - 16y = -64$

5. How are the graphs & the three equations related?



6. PREDICT the appearance of the graph of $kx + 2ky = 8k$, where k is any real number. Explain your prediction.

7. Use the ELIMINATION METHOD to solve the linear system
$$\begin{aligned} x + 2y &= 8 \\ 2x + 4y &= 16 \end{aligned}$$
. Explain the “problem” that comes up with the algebraic solution.

8. Use the SUBSTITUTION METHOD to solve the linear system
$$\begin{aligned} x + 2y &= 8 \\ 2x + 4y &= 16 \end{aligned}$$
. Explain the “problem” that comes up with the algebraic solution.

(D) CHALLENGE PROBLEM (AP/HL):

You are given the linear system defined by
$$\begin{aligned} 2x + By &= 9 \\ -3x + 4y &= C \end{aligned}$$
. For what value(s) of B and C will this system have:

- Infinite solutions
- No solutions
- One unique value

(E) Word Problems

CALC INACTIVE. Mr. S. has \$18,000 savings in 2 accounts. My total interest earned for the year was \$930. One account earns me 6% annual interest and the other account earns me 3% annual interest. How much do I have in each account? Provide an ALGEBRAIC SOLUTION. Verify your solution ALGEBRAICALLY.

CALC INACTIVE. Mr. S travelled 1930 miles by car and plane. He drove to the airport at an average speed of 60 mph and the plane averaged 350 mph. The total trip took 8 hours. How long did it take to get to the airport? Provide an ALGEBRAIC SOLUTION. Verify your solution ALGEBRAICALLY.

(F) For Further Practice:

- [Nelson 10, Chap 1.8](#), p92, Q13,14,16,17,18,22,25
- [Nelson 10 Chap 1.9](#), p102, Q5,14,15,16,17,18,23,24

(G) Extra Help →

- WORKED EXAMPLES showing solutions to different types of word problems at <http://www.themathpage.com/alg/word-problems3.htm>
- More worked and very well explained examples at <http://www.algebra-class.com/solving-systems-of-equations.html>
- Video Help #1 → http://www.artofproblemsolving.com/Videos/external.php?video_id=258
- Video Help #2 → http://www.artofproblemsolving.com/Videos/external.php?video_id=259

(H) For Further Practice (AP/HL group)

You have worked with the equation $|-2x + 5| = x + 4$ in a previous lesson. We will now incorporate function concepts into this question. We will let $f(x) = |2x + 8|$ and $g(x) = -x + 2$. Graph both functions using DESMOS and sketch a copy of the graph into your work.

- Using your graphic representation, explain what the equation $f(x) = g(x)$ means in this context. Provide an algebraic solution to the equation.
- Using your graphic representation, explain what the equation $f(x) > g(x)$ means in this context. Provide an algebraic solution to the equation.
- Explain what the equation $f(x) - g(x) = 0$ means in this context. Write an equation for $y = f(x) - g(x)$ and find the zeroes of this equation.
- Solve the following equations involving absolute value ALGEBRAICALLY.

(i) $|-x + 8| < \frac{1}{2}x + 10 = 0$

(ii) $|-3x - 1| - x - 5 = 0$

(iii) $x + 7 - |2x + 5| < 0$

(iv) $4 - |2x| = 6 + x$