

Name: KEY Date: \_\_\_\_\_ Period: \_\_\_\_\_

Advanced Algebra II Honors: Section 1.4 Review Systems ~~and Linear Programming~~

1. Solve the system by linear combinations:

$$\begin{array}{r} 5x - 8y = 47 \rightarrow \\ 2x + 7y = -22 \end{array} \rightarrow \begin{array}{r} -10x + 16y = -94 \\ 10x + 35y = -110 \\ \hline 51y = -204 \\ y = -4 \end{array}$$

$$\begin{array}{l} 2x + 7(-4) = -22 \\ 2x - 28 = -22 \\ 2x = 6 \\ x = 3 \end{array}$$

$$(3, -4)$$

2. Solve the system with substitution or linear combinations:

$$\begin{array}{l} 2(4x - 3y) = 5 \quad (2) \rightarrow 8x - 6y = 10 \\ 3(7x + 2y) = (-1) \quad (3) \rightarrow 21x + 6y = -3 \\ \hline 29x = 7 \\ x = \frac{7}{29} \end{array}$$

$$4\left(\frac{7}{29}\right) - 3y = 5$$

$$\frac{28}{29} - 3y = 5$$

$$-3y = 4\frac{1}{29}$$

$$y = \frac{107}{29} \left(-\frac{1}{3}\right) \rightarrow y = -\frac{39}{29}$$

$$\left(\frac{7}{29}, -\frac{39}{29}\right)$$

3. Solve the system with linear combinations:

$$\begin{array}{l} 2x + y + 2z = 11 \\ 3x + 2y + 2z = 8 \\ x + 4y + 3z = 0 \end{array}$$

$$\begin{array}{l} x = 2 \\ y = -5 \\ z = 6 \end{array}$$

$$(2, -5, 6)$$

4. Solve the system with rref:  
USE YOUR GRAPHING CALCULATOR!

$$\begin{aligned} 3x - 2y + 5z &= -1 \\ 4x + 3y - 2z &= -13 \\ 2x + 5y - 4z &= -9 \end{aligned}$$

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

5. Solve the system with rref:  
USE YOUR GRAPHING CALCULATOR!

$$\begin{aligned} 3a + 2c &= 11 & 3a + 0b + 2c &= 11 \\ b - 7c &= 4 & 0a + 1b - 7c &= 4 \\ a - 6b &= 1 & 1a - 6b + 0c &= 1 \end{aligned}$$

$$\begin{aligned} a &= 4 \\ b &= 0.5 \\ c &= -0.5 \end{aligned}$$

6. Elaine Eous had decided to buy a car from the local Bee Plus Car Company. After shopping for several days she chose to test drive a "racy red" 1962 Rambler and a "mellow melon" 1976 Mustang. The price of the Rambler is \$1250, and the cost of the Mustang is \$2960. She liked both cars, but she began to think about the cost of owning an "older"; so she decided to ask her mechanic about problems she might face with the maintenance of the auto she chose. Mel Mechanic told her that the Rambler would average \$150 per month in expenses, but that the Mustang would operate on \$60 per month in expenses.

- a. Find the equations of the functions  $R(t)$  and  $M(t)$  if

$t$  = time in months

$R(t)$  = total cost of the Rambler in  $t$  months =  $150t + 1250$

$M(t)$  = total cost of Mustang in  $t$  months =  $60t + 2960$

- b. Find  $R(25)$  and  $M(25)$ . Explain the meaning of these two pieces of data.

$$\begin{aligned} R(25) &= 150(25) + 1250 & M(25) &= 60(25) + 2960 \\ &= 5000 & &= 4460 \end{aligned}$$

After owning the car for 25 months, Elaine would have paid out \$5000 for the Rambler and \$4460 for the Mustang.

- c. Find the breakeven point. Explain its meaning.

$$\begin{aligned} 150t + 1250 &= 60t + 2960 \\ 90t &= 1710 \\ t &= 19 \end{aligned}$$

The breakeven point is 19 months.

This means at 19 months, the cost of owning either car would be the same. Before 19 months, it is cheaper to own the Rambler. After 19 months, it is cheaper to own the Mustang.

7. Graph the solution set of the system: (use graph paper)

$$\begin{aligned} y &\geq 3x + 2 \\ 2x - 3y &> -15 & \rightarrow & 2x = -15 & -3y = -15 \\ y + 2 &\geq \frac{-2}{5}(x + 3) & & x = -7.5 & y = 5 \\ y &> -1 \end{aligned}$$

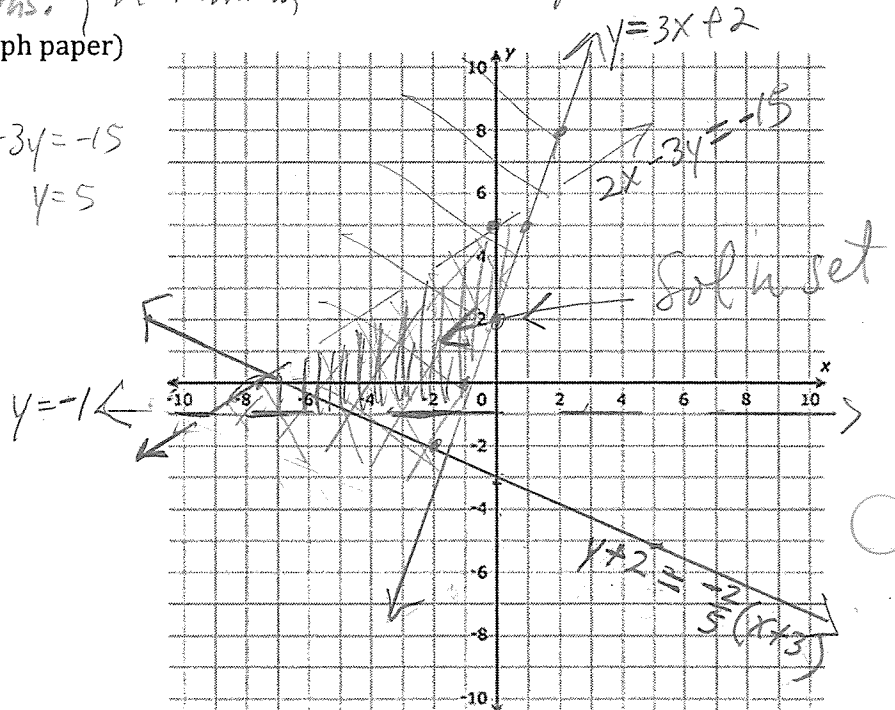
$$y = -\frac{2}{5}x - \frac{6}{5} - \frac{10}{5}$$

$$y = -\frac{2}{5}x - \frac{16}{5}$$

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

$$(0,0)$$

$$2 \geq -\frac{2}{5}(3)$$



8. Solve with a system of equations using linear combinations.

When he runs against the wind, Ricky can run 16 km in 2 hours. With the wind, he can run  $\frac{5}{4}$  of this distance in 2 hours. Find Rick's running rate and rate of the wind. Assume that both are constant.

let  $W$  = rate of the wind  
 $r$  = rate of running

$$\begin{aligned} r - W &= 8 \\ r + W &= \frac{5}{4}(16) \div 2 \end{aligned}$$

$$\rightarrow r + W = 10$$

$$r - W = 8$$

$$r + W = 10$$

$$2r = 18$$

$$r = 9 \text{ Km/hr.}$$

$$W = 1 \text{ Km/hr.}$$

Runs at 9 Km/hr.  
 Winds at 1 Km/hr.

9. Solve with a system of equations using linear combinations.

The owner of a men's clothing store bought 6 shirts and 8 hats for \$70. A week later, at the same prices, he bought 9 shirts and 6 hats for \$66. Find the price of a shirt and the price of a hat.

let  $H$  = cost of a hat  
 $R$  = cost of a shirt

$$\begin{aligned} 6R + 8H &= 70 \\ 9R + 6H &= 66 \end{aligned} \rightarrow \begin{aligned} 36R + 48H &= 420 \\ -36R - 24H &= -264 \end{aligned}$$

$$24H = 156$$

$$H = 6.5$$

$$6R + 52 = 70$$

$$6R = 18$$

$$R = 3$$

A shirt costs \$3  
 A hat costs \$6.50.

10. Solve with a system of equations.

A motorboat can travel 60 miles downstream in 3 hours. It requires 5 hours to make the return trip against the current. Find the rate of the boat in still water and the rate of the current.

let  $B$  = rate of boat  
 $C$  = rate of current

$$B + C = \frac{60}{3}$$

$$B - C = \frac{60}{5}$$

$$2B = 32$$

$$B = 16 \text{ mph}$$

$$C = 4 \text{ mph}$$

Boat at 16 mph  
 Current at 4 mph

11. Solve with a system of equations using ref. USE YOUR GRAPHING CALCULATOR!

Mr. and Mrs. Smith put \$6000 into three different investments paying 9.5%, 8.5% and 6.25% respectively. The total simple annual interest at the end of 2 years was \$970. The average of the amounts invested at 9.5% and 8.5% was equal to the amount invested at 6.25%. How much was invested at each rate?

let  $x$  = amt invested at 9.5%  
 $y$  = " " " 8.5%  
 $z$  = " " " 6.25%

$$\begin{aligned} x &= 2000 \\ y &= 2000 \\ z &= 2000 \end{aligned}$$

$$x + y + z = 6000$$

$$.095(2)x + .085(2)y + .0625(2)z = 970 \rightarrow 0.19x + 0.17y + .125z = 970$$

$$\frac{x+y}{2} = z \rightarrow x+y-2z=0$$

12. Solve with a system of equations using linear combinations. (3 equations, 3 unknowns)

A builder hired carpenters at \$16 per hour, apprentices at \$9 per hour, and student helpers at \$5 per hour. Twice as many carpenters as apprentices are hired. If the builder hires 11 people and pays them total salaries of \$133 per hour, how many of each did he hire?

let  $c$  = # of carpenters  
 $a$  = # of apprentices  
 $h$  = # of student helpers

Check

$$6(16) + 9(3) + 5(2) \stackrel{?}{=} 133$$

$$133 = 133$$

$$\begin{cases} c = 2a \\ c + a + h = 11 \\ 16c + 9a + 5h = 133 \end{cases}$$

$$\begin{aligned} &\rightarrow 3a + h = 11 \\ &\rightarrow 41a + 5h = 133 \\ &\quad -15a - 5h = -55 \\ &\hline &26a = 78 \\ &\quad a = 3 \end{aligned}$$

3 apprentices  
 6 carpenters  
 2 st. helpers

$$\begin{aligned} c &= 6 \\ h &= 2 \end{aligned}$$

Your choice of solution! BE CAREFUL!!!

13. Two consecutive even integers are such that their sum is more than 98 decreased by twice the larger. Find the smallest possible values for the integers.

let  $x = 1^{st}$  cons. even integer  
 $x+2 = 2^{nd}$  " " "

$$24 \text{ \& } 26$$

$$\begin{aligned} x + x + 2 &> 98 - 2(x + 2) \\ 2x + 2 &> 98 - 2x - 4 \\ 4x &> 92 &\rightarrow x > 23 \end{aligned}$$

check:  $24 + 26 = 50$   
 $98 - 2(26) = 46$   
 $50 > 46 \checkmark$

14. Mr. Blake is 20 years younger than Mr. Sawyer and Mr. Reid is one-third as old as Mr. Sawyer. The sum of Mr. Blake's age and Mr. Sawyer's age is at least 70 years more than Mr. Reid's age. Find Mr. Sawyer's minimum age.

let  $B$  = Blake's age  
 $S$  = Sawyer's age  
 $R$  = Reid's age

$$\begin{aligned} 3R - 20 + 3R &> R + 70 \\ 6R &> R + 70 \\ 5R &> 70 \\ R &> 14 \\ R &> 18 &\text{ Reid } 19 \\ S &> 54 &\text{ Sawyer } 57 \\ B &= 34 &\text{ Blake } 37 \end{aligned}$$

$$\begin{aligned} B + 20 = S &\rightarrow B + 20 = 3R \rightarrow B = 3R - 20 \\ R = \frac{1}{3}S &\rightarrow 3R = S \\ B + S > R + 70 &\rightarrow B + 3R > R + 70 \end{aligned}$$