**Hopkins**

**Algebra 2**

**Systems of Equations**

**Graphing DESMOS activity**

1. Using Google, define what a system of equations is. (Just type into Google “what is a system of equations”)

2. What does it mean to “solve a system of equations”? Again use Google.

3. Today, we are graphing 2 lines on the same graph. There are 3 ways that you can graph 2 lines on the same graph.

 The first graph is called **inconsistent**  because the lines are parallel and they will NEVER touch.

 The second graph is called **consistent and independent** because the lines touch only ONE time.

 The third graph is called **consistent and dependent** because the 2 lines overlap each other (look closely, there are 2 arrows)

4. As you may recall, DESMOS is an online graphing program that allows you to graph equations and see points of intersection clearly in multiple colors formats. Today, we are going to use this program to help us solve systems of equation word problems. Go to ezmath123.weebly.com. Go to the Algebra 2 tab, scroll down to DAY 16. How long will this unit take us?

5. Go to DESMOS under the Algebra 2 tab, Day 16. Let us start off easy by graphing something that does not have any real life application. Type this in exactly as you see it:

Graph: 13x + 8y = 11 -5x + 20y = 7

Find the point of intersection: REMEMBER IT IS A POINT SO THERE IS AN X AND Y COORDINATE

6. That first system was given to you in STANDARD FORM. Now let’s try to do it in SLOPE-INTERCEPT FORM. (This is the form we are much more used to working with)

 Clear out the old equations and, in a new grid, graph these two lines:

 $y=\frac{25}{41}x-14$ and $y=\frac{-61}{7}x+54$.

Now on this one, you will have to zoom out to find the point of intersection. Write the point of intersection here:

Is this graph consistent or inconsistent? (look at number 3 above)

7. Now graph a couple of systems, write the point of intersection and tell if the graph is consistent or inconsistent.

 **A.** $y=\frac{88}{95}x+7.1$ Point of Intersection:

 y = -15.6x + 48 Consistent or Inconsistent:

 **B.** 6.5x + 7.3y = 234.50 Point of Intersection:

 5.4x + 8.8y = 219.75 Consistent or Inconsistent:

 **C.** $y=2-\frac{4}{18}x$ Point of Intersection:

 2x + 9y = 18 Consistent or Inconsistent:

8. Now for the real reason we are here in this lab today. Systems of equations occur in real life all the time. Often times, when you start comparing two entities, you can use a system of equations, particularly with money. Let’s say you go to the mall and buy 4 shirts and 3 pairs of pants for $85.50. Your mother returns the next day and goes to the same store and buys 3 shirts and 5 pairs of jeans for $115. How much did one pair of jeans costs? How bout one shirt? This apparent word problem can be changed into a system of equations very easily, and thus solved through DESMOS.

 Let **j** stand for the cost of one pair of jeans and let **s** stand for the cost of a shirt.

 When you went the equation is: 4**s** + 3**j** = 85.50

 What’s the equation for when your mama went?

 Use DESMOS to solve that system and and give the cost of a pair of jeans and a shirt. When you use DESMOS, type in x’s and y’s for the “s” and “j”.

9. Those equations above came at you in STANDARD FORM. Let’s see if you can recognize when an equation is coming at you in SLOPE INTERCEPT FORM. Here’s the situation:

 Right now, since it’s October, there are lots of festivals/fairs going on. Suppose the fair in Owings Mills goes like such: 26 dollars to get in but each ride is only 50 cents. The fair in White Marsh goes like this: 15 dollars to get in but each ride is 1 dollar. How many rides is it going to take in order for you to spend the same amount at each fair?

 This system can be described as this: Let C = the cost of the fair and r = the amount of rides.

 Owings Mills: C = 26 + .5r

 White Marsh: \_\_\_\_\_\_\_\_\_\_\_\_\_

 Type this system into DESMOS and find the point of intersection.

10. Now you’re ready to roll. Just know, the problems are going to get tougher than what I just did. Use that noggin’ and figure it out. Solve each word problem:

A. You purchase 8 gallons of paint and 3 brushes for $152.50. The next day, you purchase 6 gallons of paint and 2 brushes for $113.00? How much does each gallon of paint and each brush cost? Make sure you write the system and the answer to get full credit.

B. The math club and the science club had fundraisers to buy supplies for the school store. The math club spent 135 dollars buying 6 cases of juice and 1 case of bottled water. The science club spent 110 dollars buying 4 cases of juice and 2 cases of bottled water. How much did a case of juice cost? How much did a case of bottled water cost?

C. At the Apple Pan, 4 burgers and 3 fries cost $19.75. 5 burgers and 5 fries cost $36.25. How much does one burger cost? How much does one fry cost? Using this information, how much would it cost for 4 fries and 4 burgers?

D. One time, Shaquille O’Neal scored 40 against the Washington Wizards. His 40 points were scored on all free throws and two point baskets. He made a total of 25 shots. How many free throws did he make? How many 2 point baskets did he make?

E. For dinner, Kamal had a Big Mac and 2 small fries containing 1000 calories. Booker had 3 Big Macs and 2 small fries for 2080 calories. How many calories are in each item?

F. At William’s preschool, they have a total of 25 bicycles and tricycles. Among them all, there are a total of 57 wheels. How many of each are there?

G. Jherie’s wallet is full of $5 and $10 bills. She has 25 bills totaling $230. How many of each denomination is there (how many five dollar bills are there and how many ten dollar bills are there)

H. Adam and his family plan to rent a midsize car for a one day trip. In the Standard Rental Plan, they can rent a car for $52 per day plus 23 cents per mile. In the Deluxe Plan, they can rent a car for $80 per day with unlimited mileage (0 cents per mile). Find the break even point for each plan. That is, how many miles will it take for you to spend the same amount for each plan?