R.E.A.L. Math 1010 Supplemental Activity   Name: _____
S3 Systems of 2 equations with 2 variables.

Watch the product review video about Oru Kayaks https://www.youtube.com/watch?v=4CGclIZBlRA
or the promotional video on this page https://www.orukayak.com

The business owners of Oru Kayaks appeared on the TV show Shark Tank seeking an investment of $500,000 dollars for a 12% equity stake. During the episode, the following information was shared.
   ✓ The company sold 473 kayaks during their first 2 months of business through a Kickstarter campaign.
   ✓ The kayaks have been selling for $1100
   ✓ The kayaks cost $505 to build
   ✓ At the point being on the show, 9 months after the Kickstarter campaign, they have sold 1228 kayaks.

1. Assuming the sales had a linear growth rate, write a function that represents the number of kayaks sold as a function of the number of months since the company started.

2. Use the function to estimate the number of kayaks sold during the 12 months following the Shark Tank episode. Does this projection seem reasonable? Why or why not?

Using a non-linear model an analyst calculated a more reasonable projection that the company should sell 3153 kayaks in the next year. On the Shark Tank episode, the business owners projected sales for their second year of business to be at 4 million dollars. They got their investment of $500,000 from a Shark Tank investor. Since that time, the price of the original kayak was raised to $1600 and they developed another model for beginner paddlers that sells for $1200.

We want to find out how many of each model needs to be sold to reach projected sales of 4 million dollars. Whenever we want to find two unknown values (variables) we need 2 equations about those values.

3. Let x = the number of units sold for $1200 and y = the number of units sold for $1600. Write two equations with x and y,
a) one representing the total units sold based on the analyst's projection

b) one representing how many of each priced kayak should be sold to meet the projected amount of sales.
Before we solve this system of equations for x and y, we need to review a few skills.

4. To solve a system of equations we want to find the values of the ordered pair (x,y) that are a solution for both equations. For example, the ordered pair (6, 10) is a solution for the first equation below, but not for the second equation. Therefore, (6, 10) is not a solution of the system.

$$\begin{cases} y = x + 4 \\ x + 3y = 8 \end{cases}$$

To find the solution to a system of equations, solve for one variable at a time by creating one equation with one variable and solve for that variable. There are two ways to algebraically solve systems of two equations in two variables -- substitution and elimination. Both methods use equivalence as a tool.

a) Solve the above system using the substitution method. Then draw a graph that represents the system and it's solution.

5. Solve this system of equations using elimination. Then draw a graph that represents the system and its solution.

$$\begin{cases} 2x - 3y = 12 \\ x + 3y = 9 \end{cases}$$

7. Use either substitution or elimination to solve the Oru Kayak system of equations. How many of each model of kayak sold would produce the projected outcomes.

8. A small pottery company specializes in a large vase that sells on Etsy for $100. The total cost in dollars, $C(x)$, of producing x vases is modeled by $C(x) = 25x + 500$.
a) What is the practical meaning of the slope and intercept of the cost function?

b) Write a revenue function that represents the amount of money collected in dollars, R, from the sale of x vases.

c) A company will break even when its revenue exactly equals its cost. Determine the break-even point on the vases graphically and algebraically.