Alignments to Content Standards:

* CCSS.MATH.CONTENT.HSA.SSE.A.1

Interpret expressions that represent a quantity in terms of its context.

* CCSS.MATH.CONTENT.HSA.REI.C.6

Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

Kyle and Kylon play a popular video game that allows you to buy gold coins and elixir to use for various things within the game. Kyle tells Kylon that the game is promoting a deal that states “you will receive a fifty percent discount off of your entire purchase if you buy the secret amount of coins and secret amount of elixir!” Kylon, wanting to get the special discount, asks how much Kyle had to spend on the game. Kyle tells Kylon that his total cost was $9 including a $2 service fee and that he bought a total of 500 coins and elixir. Kylon, being the mathematician that he is, came up with the following equations to figure out what the mystery amount is. Kylon says that he will use x to represent the number of gold coins and y to represent the amount of elixir and came up with the following equations:

x + y = 500

0.02x + 0.01y + 2 = 9

Assuming Kylon used his new equations and knowledge of the game, answer the following questions:

1. What is the cost of one gold coin?
2. What is the cost of one elixir?
3. What does the 2 represent?
4. What does the equations x + y = 500 represent?
5. How much elixir did he buy?
6. How many gold coins did Kyle buy?

This problem assumes that the students have worked with two variable equations before. Instead of asking the students to solve for x and y, this problem has the students show their understanding of the equations by identifying different parts of the equations and their meanings. Students must then determine the amount of gold and elixir that Kyle bought to show they are capable of solving equations.

1. The cost of one gold coin is 2 cents. We know that Kylon is using the x variable to represent the number of gold coins and the equation produces the cost of Kyle’s purchase, 9. Therefore, the number 0.02 is the cost of each coin because it is being multiplied by the x variable.
2. The cost of one elixir is 1 cent. We know that Kylon is using the y variable to represent the amount of elixir and the equation produces the total cost of Kyle’s purchase, 9. Therefore, the number 0.01 is the cost of one elixir because it is being multiplied by the y variable.
3. 2 represents the cost of the service charge. We know this because it is mentioned in the story problem and is the initial value of the function.
4. It appears that the equation x + y = 500 is the equations used to determine how many gold coins were purchased and how much elixir was purchased. We know this since x was identified as the variable for gold coins, y was identified as the variable for elixir, and 500 was the total amount of items purchased.
5. Kyle bought 300 elixir. By solving the first equation, we see x = 500 – y. Substituting x into the second equation, we see that   
   Therefore, Kyle bought 300 elixir.
6. Kyle bought 200 gold coins. Using the answer of y = 300 from the previous question, we substitute that into the equation x + y = 500 and see that   
   Therefore, Kyle bought 200 gold coins