Algebra 2 Name:_____

Substitution and Equal Values: 2 Methods or 1?

The Swear Jar (Part 1)

"Excuse me, Sir, but none of us has any money left to buy lunch."

Your family is getting tired of all your "salty" language, so they decide to start a "swear jar," where you have to pay a little money every time you swear. Each time they hear you swear, you have to put 25 ¢ into the swear jar. You get caught swearing, on average, 5 times a day. Your sister, on the other hand, swears a whopping 11 times a day. You start out with $10.50 and your sister starts with $22.50.

Use multiple strategies to represent and solve the following problems.

1. When will you and your sister have the same amount of money?
2. When will you run out of money? What about your sister?
3. Will the swear jar ever have as much money as you or your sister?

Make a Table: Label your columns	Make a Graph: Label your axes
Use Equations: Define your variables	Answer the questions using the sentence frames provided: 1. My sister and I will both have $_____ after _____ days. 2. I will run out of money after ____ days. My sister will run out after ____ days. 3. The swear jar will have as much money as me on day ____. It will have as much as my sister on day _____.

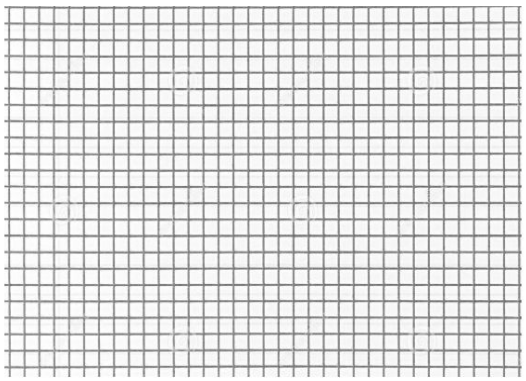
The Swear Jar (Part 2)

You don't think it's fair that only the kids need to follow the "no swearing" rule, when your parents curse all the time! You convince them to also use the swear jar and pay a penalty every time they swear. They haggle with you and argue that they shouldn't have to pay a full quarter for every swear word, "because they are adults and adults know better." You decide that it is "fair enough" to charge them a dime for each swear word. They agree to start using the swear jar on the same day that you do.

After a few days, you open up the swear jar and count how much money there is. Remember that there are only dimes and quarters in the jar. You calculate that there is a total of $17.60 in the jar and that there are four times as many quarters as dimes.

Use multiple strategies to represent and solve the following problems.

4. How many quarters and dimes are in the swear jar?
5. How many days have passed since the swear jar started? (go back to Part 1 for a clue)

Make a Table: Label your columns	Make a Graph: Label your axes 
Use Equations: Define your variables	Answer the questions using the sentence frames provided: 4. The swear jar has _____ quarters and _____ dimes 5. The swear jar started being used _____ days ago.

Reflect

In **The Swear Jar (Part 1),** you should have created the equations: $y = -2.75x + 22.50$ (you), $y = -1.25x + 10.50$ (sister), and $y = 4x$ (swear jar), where x= # of days and y = $

1. Explain why the slopes are negative for you and your sister but positive for the swear jar.

2. Explain why you and your sister have a y-intercept but there is nothing written for the swear jar.

3. Explain how the slopes for you and your sister were calculated based on the numbers in the original problem. (2.75 and 1.25 were NOT in the original problem. How did we get them?)

4. Explain why solving the equation $-2.75x + 22.50 = -1.25x + 10.50$ would tell you the number of days until you and your sister have the same amount of money.

In number 4, many people would say that you "set the equations equal." You can also think of it as a special version of substitution. You are substituting one equation for the letter y in the other.

In **The Swear Jar (Part 2),** you should have created the equations: $y = 4x$, and $.10x + .25y = 17.60$, where x = # of dimes and y = # of quarters

5. Explain why one equation is written in **standard form** and the other equation is written in **slope-intercept form.**

6. Explain why solving the equation $.10x + .25(4x) = 17.60$ would tell you the number of dimes.

7. How is the substitution in number 6 similar to number 4? How are they different?

8. What can you do, if you know the number of dimes, to figure out the number of quarters?

Substitution Notes:
Substitution is a method that allows you to combine multiple equations.
You can plug in one equation into another equation.
Then you solve the new equation.
Plug in your answer to BOTH original equations to find the full solution

There are 2 different flavors of substitution

Equal Values Method: Two slope-intercept equations	**Other Substitution: At least one standard form or other form.**
$y = -3x + 4$ $y = 2x - 16$ **(original system)** $-3x + 4 = 2x - 16$ **(substitute y for y)** $-4 \quad -4$ $-3x = 2x - 20$ **(solve like normal)** $-2x \quad -2x$ $-5x = -20$ $\div -5 \quad \div -5$ $x = 4$ **(substitute x=4 into BOTH EQs)** $y = -3(4) + 4 = -12 + 4 = -8$ $y = 2(4) - 16 = 8 - 16 = -8$ **(Both EQs gave me y=-8, hence I know I'm right)** **Solution (4,-8)**	$3x + 5y = 19$ $y = x - 1$ **(original system)** $3x + 5(x - 1) = 19$ **(substitute y for y)** $3x + 5x - 5 = 19$ $+5 \quad +5$ **(solve like normal)** $8x = 24$ $\div 8 \quad \div 8$ $x = 3$ **(Substitute x=3 into BOTH EQS)** $3(3) + 5y = 19$ $9 + 5y = 19$ $-9 \quad -9$ $5y = 10$ $\div 5 \quad \div 5$ $y = 2$ $y = (3) - 1 = 2$ **(Both EQs gave me y=2, hence I know I'm right.** **Solution (3,2)**

Practice: Solve by substitution. Show your work. Check your answers.

1. $y = -5x + 2$ **and** $y = 2x + 16$

2. $4x + 6y = 62$ **and** $y = x + 2$

Do you think that substitution and equal values are the same method? Or are they two different methods? Explain your reasoning.