Title: The Equation Invasion

Description: Solving Multi-Step Linear Equations with a Single Variable.

Subject/Educational Level: Algebra 1/grades 8-10

Introduction: Students will learn how to solve multi-step linear equations with a single variable through the emergence method. Students will be expected to continuously evaluate their methods and consider if they are nearing a correct answer. Students will then need to re-evaluate their answer to decide if it is in fact correct.

Group Size: Whole class small group and individual

Benchmark/Standards:

MA.912.A.3.1: Solve linear equations in one variable that include simplifying algebraic  expressions.

MA.912.A.3.2: Identify and apply the distributive, associative, and commutative properties of  real numbers and the properties of equality.

MA.912.A.3.5: Symbolically represent and solve multi-step and real-world applications that involve linear equations.

Learning Objectives:

SWBAT:

-Correctly translate mathematical sentences into number and variable equations on the second question in the W.S. each time.

-Provide 3 examples of real world applications of linear equations on their WS

-Justify and verify each step once they have worked through each question.

Guiding Question:

When can we use the method of solving multiple step equations with a single variable in the real-world?

Materials: (one per student)

-Student W.S.

- Graphing calculators

Procedure:

1. Review how to solve single-step equations and ask students how they think multi-step may be similar and/or different. By viewing: http://www.thefutureschannel.com/algebra/40\_years\_from\_now.php

2. As a class go through the first equation on the worksheet. Have students fill in their own answer for each line before sharing as a class.

3. Lead a class discussion about if and when these types of problems could be relevant in the real world.

4. Then distribute the graphing calculators and have the students work on the second question on their own.

5. Share results to the second question and have a student share their graphing calculator graph and table with the rest of the class.

6. Students will then create their own real-world problem that requires a multiple-step equation with a single variable.

7. The students will then exchange papers and solve each others’ problem. Ask students if their answer seems reasonable? If it doesn’t, what should they do?

Assessment: Students are to create their own real-world problem which requires a multiple step equation with a single variable. Students will then exchange papers and will have to solve their classmates’ papers explaining and checking each step.

Answer Key/Rubric: Provided in parentheses on W.S.

**Class Worksheet**

**Question 1:**

Write out all steps and explain each line when solving for x.

4(3x - 12) = 6x – 3 + x

What is our first step? (To draw a line down the center of the equation)

What is our second step? (To put a 1 in front of the x)

What is our third step? (To distribute)

What are we left with? (12x - 48 = 6x – 3 + 1x)

What is our fourth step? (To check to see if we can combine like terms on each side of the equals sign.)

What are we left with? (12x - 48 = 7x – 3 or 12x - 48 = -3 +7x)

What is our fifth step? (To move the variable over so that they are all together)

Does it matter which variable we choose to move? (Not really)

How do we decide which variable to move? (We want to move one that will keep us from having to deal with negatives.)

So what are we going to move? (The 7x)

What are we left with? (5x - 48 = -3 )

What do we do next? (Move the constants so that they are together)

How do we do that? (Move the constants to the opposite side of the variables)

What are we left with? (5x = 45 )

And now what does this equation remind us of? ( A single-step equation)

What operation do we use to solve for x? Why? (Division because it is the opposite of multiplication.)

X= ? (9)

**Question 2:**

You have $23.56 to spend on apples for the apple bobbing contest at the fall festival. The flat rate for shipping is $4.00 and the apples cost $1.99 a pound. How many apples can you buy?

Show your work and explain why you did what you did in each step.

Does your answer make sense?

How could you check your answer?

Could you afford 10 apples? Explain.

Using a graphing calculator and looking at the graph of the equation, how do you know the maximum number of apples you can afford?

Looking at the table of the equation, what is the total price for 3 apples? 8 apples? How much would it cost to purchase 100 apples?

**Question 3:**

List three real-world examples where creating and solving a linear equation would be helpful.

1.

2.

3.