LESSON OVERVIEW
SOLVING LINEAR EQUATIONS WITH A TEETER TOTTER
CHUCK TRADER, SAINT MARYS MIDDLE SCHOOL

Goal of the Lesson: Students will obtain hands on understanding through application activities in order to solve linear equations in one variable and interpret, determine, and create various equations that have one solution, no solutions, or infinite many solutions.

Essential Question: How can I apply and benefit from a practical real life use of solving linear equations in one variable and visually, physically, and algebraically understand and relate to the outcomes?

Standards Addressed

> **MCC8.EE.7:** Solve linear equations in one variable.
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> **MCC8.EE.7a:** Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation in simpler forms, until an equivalent equation of the form x=a, a=a or a= b results.
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> **MCC8.F.1:** Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.
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> **MCC8.F.4:** Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two $(x,)$ values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.
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> **MCC9-12G.GPE.6:** Find the point on a directed line segment between two given points that partitions the segment in a given ratio.

Introduction/Warm Up (10 minutes)
Students work in pairs to:

- View the Learn Zillion Video #1008 – "Predict how many solutions a linear equation has" – available here: http://learnzillion.com/lessons/1008-predict-how-many-solutions-a-linear-equation-has.

- Complete the **Learn Zillion Activity Sheet.**

As students are working, circle around the room, prompting discussion among pairs and probing with open-ended questions.

Guided Practice (10 minutes)

Students complete the **Solutions of Equations Practice Problems**. As a whole class, students review and discuss their answers.

A guided practice video is available for students needing further review or remediation. The links can be found on the bottom of the Solutions of Equations Practice Problems Sheet.

Activity

Students work together to create and solve various equations with one solution by calculating the amount of force or the distance from the fulcrum required to balance the teeter totter.

- Provide each group with a copy of the **Teeter Task Activity and Data Sheet**.

- Split students into groups of four, and assign each student a role. *(See the Teeter Totter Task Activity Sheet for descriptions of each role).*

- As a class, discuss how students can use algebra to determine how two students with different weights can equalize or balance the teeter totter. As an example, ask students to solve and tell if the following equations have one solution, no solutions, or many solutions: $x=100(5)$, $500=100(x)$, $100(x)=150(x)$.

- Following the directions on the Task Activity Sheet, students will:
  - Construct small teeter totters
  - Attempt to balance the teeter totter with at least three different weight and distance combinations
  - Record their attempts on their data sheet

- Explain to students that in order to balance the teeter totter, the force ("weight") times distance on one side must equal the force ("weight") times distance on the other side. By knowing one side of the equation and one variable, students can solve the equation to balance the teeter totter. Provide and work through example problems for the class, such as the one below.
  Be sure to let students know they must convert feet and inches to a standard format.

  - John weighs 90 pounds more than Robert. If John sits 20 inches from the fulcrum, and Robert sits 50 inches from the fulcrum and the teeter totter balances, how much do both John and Robert weigh?

- Take students outside and allow them to apply the concepts of force and distance using moving dollies, wheelbarrows and shovels.

Closing Activity/Assessment

Students will complete the **Teeter Totter Activity Summary Report Questions.**
*A **Summary Report Rubric** is available to help score these questions*

Additional Notes:

Prior to starting this lesson, you will need to create fulcrums for the teeter-totters. To create a fulcrum for an 8 foot 2" x 4" teeter totter:

1. Cut an 8" piece of each of the following:
   - 4" x 4"
   - 2" x 4"
   - 1" x 1"
   - ½" or ¾" half round molding

2. Glue these pieces together in the order above. The half molding on top will eventually hold the center of the 8 foot 2" x 4".

3. To help keep the half molding in the center, cut a small slot in the bottom of the 2" x 4".

* If you need to balance an unbalanced 2" x 4", trim the end of the 2" x 4", or drive a larger nail into the end of the wood that needs more weight.