Algebra/Geometry Institute Summer 2005

<center>**Figuring Out Equations with Figurines**</center>

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School: Friars Point Elementary

Grade Level: 6th

Teaching Objectives (s)

The students will be able to solve simple, algebraic equations involving addition, subtraction, and one variable. Ex: $3+y = 10$ Ex: $Y-10 = 40$

Instructional Activities:

The lesson is started by explaining to the students about equations utilizing the dry erase board, a scale, and figurines. After presenting the topic to the students verbally, the teacher will write an equation on the board. Ex: $2+4=6$. Then, the teacher will ask the students, "What makes the example written on the board an equation?" After the teacher has received several responses, the teacher will explain to the students that the $=$ sign indicates that the problem is an equation. Then, the teacher will explain to the students that the mere fact that the problem is an equation means that whatever is on the left of the equal sign should have the same value as whatever is on the right. Thereafter, the teacher will write an inequality on the dry erase board. Ex: $2 < 4$. The teacher will ask the students whether the problem presented is an equation. After the students have had an opportunity to respond, the teacher will explain that $2 < 4$ is not an equation because the two sides are not separated by

an equal sign and the value of the sides are not the same. The teacher will place emphasis on the two sides having to be equal.

To further explain the concept of equality in an equation, the teacher will retrieve a scale balance that he/she will place at the front of the class along with several miniature figurines. The teacher will ask the students questions about balance and what must be done to make the scale apparatus balance? After discussing the concept of balance and making sure the students understand what must be done to achieve balance, the teacher will take two figurines that are identical and place one on the left and one on the right of the scale. The teacher will then ask the students if what is on the left of the scale is the same as what is on the right of the scale and if the two sides are equal? The students will then be asked if they can write an equation to represent what they see presented on the scale. The teacher will then proceed to write the equation one figurine = one figurine. The teacher will explain that just like there had to be the same value on the left as it was on the right of the balance, the value presented on the left of the equal sign must be the same as the value presented on the right of the equal sign for the equation to be balanced and for the mathematical statement to be true.

Then, the teacher will explain to the students that they will play a balancing game similar to what was just exhibited to them. The class will be divided so that all groups have at least two people and no more than four. Each group will be given figurines that match the instructor's figurines. Ex: Mickey Mouse, Donald Duck, Army men, Cinderella, etc. The teacher will place one or more figurines on one side of the balance. The teacher will pose questions such as what will make the scale balanced. The spokesperson for the group will raise his or her hand, come to the front of the class, and use the group's figurines to balance the scale. Thereafter, the students will be asked to justify why they placed the figurines on

the balance in the manner that they did. Next, a student will be asked to write what is illustrated on the balancing apparatus in the form of an equation. This game will continue until all of the groups have had an opportunity to physically balance the scale using his/her groups figurines, and the students understand the relationship of balance, equality, and equations.

After completing the balance game, the teacher will ask a series of questions like: When there is one figurine on one pan, what must be done to balance the scale? After the students give the responses, the question will be illustrated in the form of an equation with an unknown, one figurine + _____ = two figurines.   The teacher will tell the students that, in math, the unknown or the quantity that will make the equation balanced or true is represented using a letter called a variable, so the equation could be written as one figurine + Y = two figurines. The teacher will then place a construction paper letter Y and one figurine in the left pan and two figurines in the right pan. The students will be told that an equation is in balance when the unknown quantity makes the statement true. The teacher will further explain that to solve for the Y, which represents the unknown quantity, one must get the Y in the pan by itself. Additionally, the students will be told that whatever they do to one side of the equation, when trying to find out the unknown quantity (Y), they must also do to the other side. The teacher will illustrate solving the equation by removing one figurine from the left pan and removing one figurine out of the right pan. This will result in Y in the left pan and one figurine in the right pan. The teacher will, say, "we have solved the equation." The teacher will write the solution Y= one figurine on the dry erase board. The teacher will ask the students, "Now, class, what is the value of the Y?" After the students have responded, the teacher will then put the original equation back on the board one figurine + Y = two

figurines. The teacher will model this equation using the figurines, placing one figurine in the left pan along with the letter Y and two figurines in the right pan. The scale will not be balanced, and the question will be asked, "If I remove this Y from the left pan, what could I put in place of it to balance out the scale or make both sides of the equation equal?" The students will say, "One figurine." The teacher will remove the Y and place one figurine in the pan, and the scale will balance revealing that the two sides are equal. Then the teacher will say,"Our equation is true, one figurine + Y, which is equal to one figurine, does equal to two figurines." Other equations such as: $3 - N = 2$, $5 + 6 = Y$, and $4 + B = 6$ will be demonstrated utilizing the dry erase board, the scale, and the construction paper letters.

Last, groups will be given a balancing apparatus, some figurines, and a letter that has been cut out from construction paper. Equations will be presented on the board and the students will be told to use the figurines for the number value and to use the letter for the unknown. Utilizing the steps to balance the scale, the groups will complete a work sheet of equations. See Appendix A. After the worksheet is completed, the members of various groups will be randomly selected to come to the front of the room and illustrate the solution to an equation using the balance apparatus and the manipulatives.

Materials and Resources

Dry erase board, Construction paper letters, Dry Erase Markers, Worksheets, Balance Apparatus, and Figurines

Gunnar Carlsson, Ph.D. *Mcgraw Hill Mathematics*. Mcgraw Hill School Companies, Inc. 2002. New York, NewYork

Navigating Through Algebra 3-5 National Council of Teachers of Mathematics, 2005.

Bright, George W. *Navigating through Measurement for grades 6-8*. National Council of

       Teachers of Mathematics, 2002.

Assessment   Teacher Observation and the grading of the group worksheet

Appendix A

Name: _____

Date: _____ **Class:** _____**Topic:** <u>Solving linear equations</u>

As a group, solve the following equations and explain the steps to solving each equation.

Answers only will not be accepted!!!

1. ____ + 8 = 10   3. _____ = 10 - 6   5. 6 - ____ = 10

2. _____ - 2 = 5   4. _____ + 4 = 10   6. 5 + 3 = 8

7. 2 + ___ = 14   8. 12- ____ = 8   9. 10 + _____ = 12

11. _____ -1 = 5   12. ____ + 4 =7   13. 5 + ____ = 6