

Pyramid Equality

Summary

Students will learn about the concept of equality by balancing equations and using a pyramid.

Main Core Tie

Mathematics Grade 6

[Strand: EXPRESSIONS AND EQUATIONS \(6.EE\) Standard 6.EE.3](#)

Materials

- [Tomb Treasures](#) (pdf)
 - [Pyramid Equality](#) (pdf)
 - [Pyramid Equality \(Key\)](#) (pdf)
 - [Treasure and Pyramid Cut-Outs](#) (pdf)
- Treasure and Pyramid Cut-Outs (magnets)
Math journals
Pencils

Background for Teachers

The key to solving algebraic equations is to understand equality. Many students think of an equal sign as a symbol to solve something. For example, $6 + 13 = ?$. Similarly, $6 \times 13 + 15 = ?$. Students think of equality as calculating a set of numbers to get an answer. This can lead to misconceptions.

Equality is a statement that indicates two quantities are equal. It can be thought of as a balance. To solve an equation means to maintain the equality between the two sides of the equal sign.

To help students develop an understanding of equality, they should have already learned how to substitute values from tables into an equation to calculate the missing variable (Standard II, Objective 1). In this activity, students will use a pictorial situation to develop a symbolic method for solving a linear equation, or an equation with a constant rate of change that will produce a straight line on a graph.

This lesson draws on knowledge of burial rituals in Ancient Egypt. This lesson will probably come after a study of Ancient Egypt and will therefore be a review, but it will not hinder the students' learning if this lesson is done beforehand.

Instructional Procedures

Invitation to Learn

Write the following starter problem on the board:

The equation $35 = 20 + 15$ states that the quantities 35 and $20 + 15$ are equal. What do you have to do to keep both sides equal if you:

- subtract 15 from the left hand side of the equation?
- add 10 to the right hand side of the original equation?
- divide the left-hand side of the original equation by 5?
- multiply the right-hand side of the original equation by 4?

Try your methods on another example of equality. With your math partner, summarize what you know about maintaining equality between two quantities.

Discuss strategies as a class. Students should understand that anything done on one side of an equation must be done on the other to maintain equality.

Instructional Procedures

Create a transparency of *Tomb Treasures* or make enough copies to share with your students.

Read the scenario as the students follow along. Make sure students understand the treasures and pyramids problem.

Have students work alone or in pairs to figure out the answer, 2 treasures in each pyramid.

When all students are finished, summarize as a class. Use the *Treasure and Pyramid Cut-Outs* magnets to help.

Pass out the worksheet entitled *Pyramid Equality* to each student. Have students work in partners or groups of three to determine the number of treasures in each pyramid. They need to make sure that all work is explained, whether in words or pictures. They must also respond to the two questions at the bottom of the page.

Pass out the pre-cut *Treasure & Pyramid Cut-outs* for the students to use to figure out each problem, or ask the students to cut out the set for use. As they work, walk around the room and ask the following questions to guide their thinking: What does equality mean? How can we maintain equality? How do you know your answer is correct?

When all students are finished, summarize as a class. Have different pairs or groups of three discuss their work for a problem. They should use the *Treasure and Pyramid Cut-outs* magnets on the board to illustrate their thinking. Always check to ensure that the students are always maintaining equality!

Have students write down common strategies in their math journals. Ask them to circle the strategy they like best.

Use the *Tomb Treasures* problem to help students to make the transition from pyramids to variables. Ask, If we let x represent the number of treasures in a pyramid and 1 represent one treasure, how can we rewrite the equality-using x 's and numbers?

Have students share their ideas to rewrite the problem as an equation, $8 = 2x + 4$. Then, in pairs or small groups, have students rewrite each set of treasures and pyramids on the *Pyramid Equality* sheet as equations.

Instruct the students to create their own pyramid equalities by using their *Treasure and Pyramid Cut-Outs*, drawing their equations, and then writing out the equations. Their pyramids must not contain decimals of treasures, so insist that students find whole number answers and check their work. They should create 3-5 equalities, which may be shared with a partner.

Students are now ready to learn how to solve algebraic equations.

Strategies for Diverse Learners

Children with special needs may benefit from working with a partner during step 9 of the instructional procedures.

Advanced students may research the mummification and burial rituals of Ancient Egypt and prepare some additional information to share with the class.

Extensions

Family Connections

Challenge the students to balance their family's weight to within ten pounds. Who will you put on each side of the imaginary equality sign? Students can be creative with household items or even pets to make up for any additional needed weight.

Assessment Plan

- Pyramid Equality

At the conclusion of the lesson, students should create 3-5 equalities of their own using the *Treasure and Pyramid Cut-outs*.

Informal class discussion and math journals

Bibliography

Falkner, K.P., Levi, L., & Carpenter, T.P. (1999, December). Children's understanding of equality: a foundation for algebra. *Teaching Children Mathematics*, 6, 232-236.

Equality is a crucial idea for developing algebraic reasoning in young children. Children need to understand that equality expresses the idea that two mathematical expressions hold the same value. This article explores misconceptions of the equal sign and relates the experiences of a teacher's classroom lessons on equality.

Freiman, V., & Lee, L. (2004). Tracking primary students' understanding of the equality sign. *Proceedings of the 28th Conference of the International Group for the Psychology of Mathematics Education*, 2, 415-422.

The NCTM standards consider equality as a concept that must be taught and understood starting in the younger grades. This article highlights a research study in Quebec that proves misconceptions of the equal sign may be prevented with early introduction of equality.

Authors

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