

Math 5 - Act. 12: Algebraic Equations

Summary

This activity introduces students to basic algebraic equations using counters, cups, and drawings.

Materials

- A two-pan balance scale with weights
- 3-ounce cups
- Plain piece of paper
- Beans or counters (25 for each pair of students)

Additional Resources

Hands-On Math by Frances M. Thompson

Safari Park by Stuart J. Murphy (MathStart Series)

Background for Teachers

To get a feel for what students know about algebra, have students write their response to this question in their math journals: "What do you think it means to think algebraically?" Have students share their responses either orally or by turning in their responses for you to review. This will inform you what students know about algebra at this point in their schooling. Students may not realize what they know or that they have actually been thinking algebraically for several years. This lesson can help your students see the connection between arithmetic and algebra.

Intended Learning Outcomes

2. Become mathematical problem solvers.

Instructional Procedures

Invitation to Learn

Show the students the balance scale. Show them how both sides need to have the same amount of weight on them to balance. Demonstrate how adding or removing objects from one or both pans affects the balance. Explain that mathematical equations must be equal on both sides to balance.

Activity A

Instructional Procedures

Give each pair of students one piece of paper, one cup, and 25 counters. Have the students fold their paper in half, open it up and draw a line down the middle. Explain that this paper will act as a balance scale and each side of the paper has to remain the same to be balanced.

Have the students hide four counters under their cup on the left half of their paper. Ask how many counters would need to be on the right side to make their paper scale balance? (4)

Now have them empty the cup and put it on the left side of the paper with 3 counters next to it. Put 8 counters on the right side of the paper. Tell the students that we will pretend that the correct number of counters are under the cup to make the paper scale balance. To be able to find out how many counters are under the cup, you could remove the same amount of counters from each side (thereby keeping it balanced) until all the beans you can see on the left are gone (what remains under the cup will equal what remains on the right side).

Students should remove three counters from the left and in turn remove three from the right. What remains shows what is "hiding" under the cup (5). To verify this, have students put 8 counters on each side. Cover up 5 of them with the cup and then do the same procedure as

before. When they lift the cup, they will see 5 counters on each side.

Write the equation for this problem: $x + 3 = 8$.

Write the equation for what happened:

$$\begin{array}{r} x + 3 = \\ \underline{ + 3} \\ 8 \\ \underline{- 3} \\ = 5 \end{array}$$

Now give the students other equations to solve (you may have to model a few more first). Here are some sample problems:

$$x + 5 = 12$$

$$x + 8 = 20$$

$$24 = 14 + x$$

$$15 = x + 3$$

Have students share their results and write number sentences on the board to record the steps they used.

Activity B

To move from the concrete to pictorial practice, you will now have students draw the counters, balance scale, and cup to solve equations.

In their math journals, have students draw a similar type diagram:

Remind students that the "cup/unknown/variable" has to be all alone on one side to reveal what is beneath (it's value). Ask them to get rid of or cross out the circles on the left and a corresponding amount on the right. Then have them write the equation they just completed, including the value of x :

$$\begin{array}{r} x = 5 = \\ \underline{ = 5} \\ 9 \\ \underline{- 5} \\ = 4 \end{array}$$

You may do several more problems like this before moving on.

Now give students basic one-step equations to solve and have them do it without counters, cups, or drawing. Emphasize that you are doing "inverse operations" so that when problems look like this: $x - 3 = 10$, the students will know to add. It isn't recommended that you try to do this with the counters or the drawing though, just with the equations. This can lead into solving equations with larger numbers too such as: $112 + x = 245$, or $x - 3,000 = 5,000$.

Extensions

Possible Extensions/Adaptations

Some students may need to continue to use the counters and cups throughout the entire activity. Make them available for that purpose. Also, a literature book that gives students practice with equations and finding unknowns is *Safari Park* by Stuart J. Murphy.

Homework & Family Connections

Send home a cup with beans and the paper used in class with each student. Have them show their parents the activity they did in class and explain how to solve for missing addends.

Assessment Plan

Give students several problems to solve equations with variables. Many textbooks have lessons and practice problems like this or you could create your own.

Authors

[Utah LessonPlans](#)