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Understanding Multiplication

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Introduction

In its document, *Principles and Standards for School Mathematics*, The National Council of Teachers of Mathematics (NCTM, 2000) states that students need to “understand meanings of operations and how they relate to one another” (p. 78). The *Alabama Course of Study: Mathematics* (Alabama State Department of Education, 1997) maintains that students must be able to “express multiplication as repeated addition using physical materials and using symbolic representation” (p. 23). The following activities are designed to help students understand the meaning of multiplication through the use of a variety of manipulatives.

Using Graph Paper (making arrays)

Materials: Large sheet of graph paper with one inch squares and color tiles (Have the students sit around the graph paper on the floor.)

Procedure:

- (1) Make a rectangle (2×3) with the tiles on a section on the graph paper. Ask how many tiles are shown? How did you get the answer? Are there any other ways to get the

answer (count each tile, count by 2's: $2 + 2 + 2 = 6$, count by 3's: $3 + 3 = 6$)? Do several other examples, asking how to get the answer by adding equal numbers.

- (2) Have the students make several more rectangles and discuss their answers by adding. Write the addition problems on the board (but leave some space under each one).
- (3) Ask the students what they noticed about all the problems (equal rows, equal columns, sets of the same number, etc.).
- (4) Show the problem 5×4 on the graph paper and write the addition problem on the board: $4 + 4 + 4 + 4 + 4 = 20$. Ask the students if they know another way to write the problem that does not involve addition (5×4). Write $5 \times 4 = 20$ under the addition problem. Indicate that this is called multiplication and that it really is repeated addition. 5×4 means five rows of four. Show that 4×5 results in the same answer.
- (5) Use the other addition problems on the board to help the students convert them to multiplication problems. Write the multiplication problem under each addition problem.
- (6) Put several multiplication problems on the board and ask the students to illustrate them with the tiles and the graph paper.

Using Counters (making equal sets)

Materials: circular counters

Procedure:

- (1) Give each pair of students 30-50 circular counters.
- (2) Ask them to make a set of 4 counters; then make another set of 4 counters; then make another set of 4 counters. Ask them how many counters they have altogether (12). Ask them how they got the answer (counted, added, etc.).
- (3) Show the problem on the board as an addition problem leaving a space under the problem.
- (4) Do several more examples, making equal sets and writing the problem on the board as an addition problem.
- (5) Ask the students what they noticed about all the problems (equal groups).
- (6) Show the students another way to write the addition problem ($4+4+4 = 12$) by writing the multiplication problem under it ($3 \times 4 = 12$). 3×4 means 3 groups of 4.

- (7) Have the students make 4 groups of 3 counters and find the answer. Show this problem on the board as addition and multiplication, indicating that the same answer results for both problems.
- (8) Use the other addition problems on the board to help the students convert them to multiplication problems. Write the multiplication problem under each addition problem.
- (9) Put several multiplication problems on the board and ask the students to illustrate them with the circular counters.

Using Coins (skip counting)

Materials: play money (nickels and dimes)

Procedure:

- (1) Have students put 3 nickels in a row in front of them. Have them count the money aloud ($5¢$, $10¢$, $15¢$).
- (2) Write the problem on the board as an addition problem ($5¢ + 5¢ + 5¢ = 15¢$). Then write as a multiplication problem ($3 \times 5¢ = 15¢$).
- (3) Continue with other problems involving nickels.
- (4) Repeat the activity for dimes.

Using Related Facts (fact families)

Procedure:

- (1) Give students a multiplication problem such as $3 \times 4 = 12$. Ask them what other multiplication problem can be done with the same 3 numbers ($4 \times 3 = 12$).
- (2) Ask the students if they know any division problems that can be done with the same 3 numbers ($12 \div 4 = 3$; $12 \div 3 = 4$).
- (3) Repeat with other examples.
- (4) Give the students 3 related numbers (fact families for multiplication and division) and ask them to write the 2 multiplication and the 2 division problems for those related numbers (e.g. 3, 6, 18).

References

- (1) Alabama State Department of Education (1997). *Alabama Course of Study: Mathematics*, Montgomery, AL.
- (2) National Council of Teachers of Mathematics (2000). *Principles and Standards for School Mathematics*, Reston, VA.