

ACTIVITY 11

Backwards Math

Materials:

- paper
- calculators
- activity master
- butcher paper

Overview: This activity provides an excellent format for practicing operations. Students will not only work intently for long periods of time, they will want to learn even more advanced operations such as exponents, roots, and factorials. Classes and groups of students will be challenged to work together to explore and complete this task.

Vocabulary: operation, square root, factorial, greatest integer

PROCEDURE

Skills:

- Performing operations
- Working with order of operations
- Problem solving

1 Tell the students that today's math will be backwards. You will give them all the answers. (This will usually make them pretty happy.) However, tell them that they must come up with the correct problem to the answer. In addition, the only numbers they can use are four 4's.

2 For example, they can make a problem that produces the answer one in either of these ways:

$$\frac{4}{4} \times \frac{4}{4} = 1 \qquad \frac{44}{44} = 1$$

3 Challenge students to find other ways to make a problem equal to one.

4 Next have them try to get the numbers two through ten. This will give you an opportunity to introduce the order of operations:

- a. Do work inside **parentheses**.
- b. Solve **exponents**.
- c. **Multiply** and **divide** from left to right in the problem.
- d. **Add** and **subtract** from left to right.

For example, in this problem, solving correctly will result in an answer of 32:

$$\frac{4^4}{(4+4)} = \frac{4^4}{8} = \frac{256}{8} = 32$$

An acronym for the order of operations is P.E.M.D.A.S.: "**P**lease **E**xcuse **M**y **D**ear **A**unt **S**ally."

Good Tip!



If you teach more than one class, they can compete against one another. Assign fours to one class, fives to another, sixes to the next and so on.

- 5 Have the students number a piece of paper one through one hundred (or whatever range you desire). Allow students to make up problems and write them on the paper by the correct answers. Share these with the whole class to get them started. You may wish to have students work in teams of three or four.
- 6 For more advanced classes, you can introduce exponents, roots, factorials, and the greatest integer function. Some examples of these are given below.

Exponents $4^4 = 4 \times 4 \times 4 \times 4 = 256$

Square roots $\sqrt{4} = 2$

Factorial $4! = 4 \times 3 \times 2 \times 1 = 24$

Greatest integer function $[4 \times 4.44] = [17.76] = 17$

(The greatest integer function, $[x]$, is the largest integer \leq to x .)



Journal Prompts:



If you erased the four 4's in a problem and substituted four 5's, would any of them have the same answer? Why or why not?
 Would four 9's be easier or more difficult to use? Why?
 How many problems can you write that will have a solution of 1?

Homework:



You can ask students to finish the chart from one to one hundred. This will take more than one day. Even advanced students will have difficulty finding all 100 answers in a week. You might prefer to ask them to do ten problems per night.

Taking a Closer Look:



This assignment can be repeated using four fives, four sixes, and so on. Some numbers will provide greater difficulty. For example, while 44 is usable in some problems, 88 rarely is since it is too large a number. However, $[8^{\cdot 8}] \approx [5.2780316] = 5$.

Assessment:



Students can volunteer solutions to various answers. Write them on the board and have the class verify them. Those that work can stay on the list or chart. You may wish to include multiple solutions to some answers.

Good Tip!



For easy assessment, have students work in teams. One partner verifies the solution of another student. If they believe it's correct, they record it on the chart and they are given a point. If another team proves them wrong, that team gets two points and the incorrect solution is erased.

Backwards Math

Name _____

Here are the answers to one hundred math problems. Use four 4's to create problems that will give these answers. Remember to use the correct order of operations to solve your problems: Parentheses, Exponents, Multiply or Divide, Add or Subtract.

1 = _____

26 = _____

2 = _____

27 = _____

3 = _____

28 = _____

4 = _____

29 = _____

5 = _____

30 = _____

6 = _____

31 = _____

7 = _____

32 = _____

8 = _____

33 = _____

9 = _____

34 = _____

10 = _____

35 = _____

11 = _____

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Backwards Math

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100 = _____