



NCEA Math Lesson Plan

Grade: 5

Subject: Mathematics

Domain:

Operations and Algebraic Thinking

Standard Number(s) and Description:

5.OA.1 Use parentheses, brackets, and braces in expressions, and evaluate expressions with these symbols.

5.OA.2 Write simple expressions that record calculations with numbers....

Vocabulary to be Highlighted:

Parentheses, order of operations, factor, quantity, product, quotient, sum, difference

Mathematical Practices (#):

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
6. Attend to precision.
7. Look for and make use of structure.

Essential Questions:

What are the ways we can make 24? Which have I not tried yet?

What combinations that make 24 are unlikely to work for this card?

Does the suggested way of making 24 make sense for this group of numbers?

How can I communicate the mathematics so that another person will write it accurately?

What are the operations that will produce the size of number I need?

Can I combine the numbers two by two or perhaps hold one and create the other part from the other 3?

How does the power of the operation determine its place in the order of operations?

Materials/Tools (include technology):

A box of the “24” game (either single or double digit or a combination) (alternatively, you can use an online generator such as <http://www.4nums.com>)

Whiteboard

Markers

Calculators or spreadsheet program

Connections to Other Math Domains:

Numbers in Base Ten can be involved in some solutions, and certainly fact fluency plays an important role.

Connections to Other Subject Areas:

Rules of good sportsmanship and competition would apply, a crossover from physical education.

Catholic Identity Component:

Students are practicing clear, logical, precise communication in a slightly stressful situation, which is a skill that could apply to many situations, including evangelization and defense of the faith.

They are also practicing teamwork principles, individually contributing to a larger cause.

Resources (attachments):**Activities/Timeline:**

1. Introduce the “24” game to the whole class. Four numbers are given, and the player must create a mathematical expression using all four numbers, each once, and the four standard operations in order to create the answer of 24.

Ex. 2, 4, 5, 6 Could be made into 24 as follows: $(6*5)-(2+4)$ or $(5*4)+(6-2)$. Multiple solutions may be possible for a given set of numbers, especially the single-dot cards (if you have the actual game).

2. Allow the students to practice the game as a whole group a couple of times. While working through the problems, introduce the order of operations. (Students should understand that mathematics is done left to right, but the power of the operation makes a difference. There is a chain of power. Repeated addition/subtraction gives multiplication/division, which when repeated give exponential calculations. Parentheses are used to override this relationship and group numbers closely together, indicating the calculations inside are more important.) Therefore, parentheses are calculated first, followed by exponents, multiplication & division (left to right) and finally addition & subtraction (again, left to right).

3. Show the students, using a “24” game example, how leaving out parentheses or writing the operations in different orders will elicit different answers from the calculator/ spreadsheet program. Explain to the students that the technology is pre-programmed with the universal rules of order of operations. Discuss how one can communicate verbally that one would like someone to write an expression including parentheses (i.e., “quantity,” “the sum of,” etc.)

4. At this point, the students could do more practice of the “24” game in small groups, or could go directly to the final step. The final step would be to split the class into groups of 4 or 5. Each group sits in a line behind a “front person” who stands at the whiteboard. The only person who can write is the person at the whiteboard. Reveal a “24” number set/card, and each line needs to communicate to their front person the expression that will make 24. The first group to get a correct expression, with correct notation, gets a point. The front person sits in the back of their line and the next student is now the writer. Reveal another “24” number set/card, and continue in this manner as long as desired. There could be a point total to be reached, or the game can be played until time is up.

The “24” game or its surrogate makes a great math station for students to practice when they have extra or choice time.

Formative Assessment (what to look for, how/when to look):

Look for students who write expressions consisting only of numbers without parentheses, or put parentheses in the wrong spots. Give formative feedback by alerting them to what their expression actually equals, and in what order calculations would be performed according to their notation.

Look for students using more primitive verbal language (put parentheses there) and encourage

them to use mathematical language (quantity, sum/difference/product/quotient).

Summative Assessment:

Give a “24” number set that has multiple solutions and ask students to generate at least two, with correct notation.

Give a “24” number set with an incorrectly notated, but almost correct expression. Ask students to correct it.

Give students one of the “Answer It!” tests from the Internet and ask them to find the answer. Alternatively, ask the students to create four multiple choice answers, including clever distractors based upon what they think would be common mistakes. They should explain which choice is correct, and why they chose the alternative answers.