

ED 4161 The Teaching of Mathematics in the Intermediate and Secondary School. Instructor: Dr. Margo Kondratieva.

Sample Lesson Plan.

Sept. 14, 2009.

Name: Margo

Date: Sept 14, 2009

Grade level: grade 9

Time allowed: 50 minutes

Number of students: 32

Goal: (KSCO) students will explore, recognize, and represent patterns in multiple ways including algebraic and non-algebraic representations.

Objectives:

- Give students an example of how to deal with patterns recognition, namely, have them to:
 1. observe the pattern,
 2. formulize the observation in a mathematical statement,
 3. prove the statement in multiple ways,
 4. observe connections between different representations.
- Make students familiar with the formula for the sum of odd consecutive numbers starting with 1.

Materials: each team of 4 or 5 students will need 16 cubes or squares of the same size and/or grid paper; Teacher will need cards to form the teams randomly.

Motivation:

Build a triangular tower form the cubes with the foundation layer containing 7 cubes, second layer – 5 cubes, next – 3 cubes, last layer - one cube.

Then ask the students:

If there were a similar construction with the 2007 cubes in the foundation, how many layers it would have? How many cubes are needed to build it?

Lesson Procedure:

1. Deal out one card to each student, randomly. Ask students with the same kind of cards to sit together.

2. Ask each team either to build several models from the cubes or draw on paper few towers, which students believe are relevant to the problem and would help to answer the question.

3. Ask students to make an observation about the total number of cubes in each tower, and how the number of cubes in the foundation of the tower affects the number of layers and total number of cubes in the tower:

Cubes in the foundation	Number of layers	Total number of cubes
3	2	$1+3=4$
5	3	$1+3+5=9$
7	4	$1+3+5+7=16$

4. Ask students to formalize the observations.

Let n be a natural number. Then:

Cubes in the foundation	Number of layers	Total number of cubes
$2n-1$	n	$n*n$

5. Put on the blackboard the statement emerged from the group discussions:

The sum of consecutive odd numbers starting from 1 is a square number: $1+3+5+....+(2n-1)=n*n$ for any natural n .

6. Ask students to explain why they think the statement is true for any n .

Suggest that they may consider either pure algebraic approach or continue use cubes and drawing. They may want to rearrange the cubes from the triangular to square shape towers in order to illustrate the property. Ask them to pay attention on what happens when the next odd number is added to the previous sum.

7. Compare ideas coming from various groups. Summarize on the blackboard geometric and algebraic approaches. Refer to the method of **mathematical induction** for the complete formal proof of the statement.

Closure: We have found a general formula. What does it give for our tower with 2007 cubes in the foundation? (Count in your head!)

Extension: Play a game: one team gives a number (under 100) another team responses with the sum of odds which are less than the number. Then they switch. The winner is the team who makes fewer computational mistakes and spends less time. No calculator is allowed!

Assessment: Ask students to come up with their own problems and games making use of the formula we have derived (along with their solutions and strategies). Assess both creativity and mathematical understanding.