

EISENHOWER PROFESSIONAL DEVELOPMENT PROGRAM

Mathematics Within: Algebraic Patterns

Lesson Plan

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Broad Topic: Algebra

Subtopic: Tile Patterns that Grow

Aim:

Students will understand how a pattern built with square tiles grows and describe the change from stage to stage. This lesson is intended to plant some ideas for the algebra topic of recursion.

Specific Objective(s):

- o Build tile designs that change in a regular way
- o Recognize designs that grow according to number patterns
- o Predict later stages of a tile design sequence
- o Recognize and create math equations related to the growth of tile designs.

Materials/Supplies:

- o Square tiles or cubes for creating pattern sequences
- o cm grid paper

Lesson:

- o This lesson was designed for a 60-minute class period. It could easily be stopped at 30 minutes and carried over to the next period. There are many possible extensions that could follow in later class periods.
- o Through group discussion, generate a student definition of the word “pattern.” Record these responses on chart paper, and post for the class to use as a reference throughout the lesson.
- o Students will complete number sequences such as 3, 2, 3, 2, ... and 2, 5, 8, 11...(See page 3)
Introduce vocabulary: sequence, term, re-occurring, repeating, growing.
- o Distribute square tiles or cubes. Invite students to complete the 3rd and 4th stage of a tile sequence that begins like this:



After a brief period of exploration, draw the students to one table for a rich discussion of the different sequences that were created. Note the change in total number of tiles from stage to stage in each different sequence. Invite students to verbalize how they “see” growth in a pattern created by a fellow student. Check with the pattern designer for clarification. With the group, verbalize the rule used to develop the extended stages of the pattern. Predict how the 5th, 10th, or 20th stage of the pattern might look. Guide students towards the use of a table to record growth of a tile pattern, and illustrate how the pattern could be extended. Repeat this process for several other student created sequences. (See page 4)

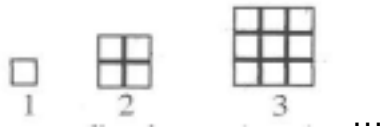
(Possible ending point for 30-minute lesson.)

- o Present students with the following tile sequence:



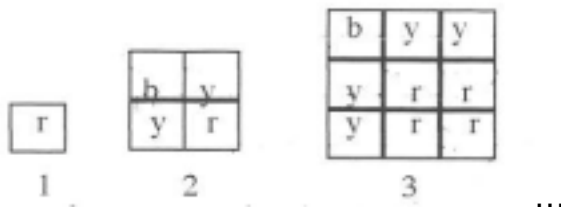
Students will create and extend the sequence with tiles/blocks, diagram the sequence on cm graph paper, and record the growth pattern in a table. This will lead to a large group discussion of a rule that explains the growth of the pattern.

- o Discuss with students how they might express the “rule” mathematically. Create word and/or symbol equations.
- o Using the tiles/cubes, explore the pattern of square numbers.



Students predict the continuation of the sequence with a discussion of square numbers.

- o Alter the building of the above sequence, using color to look at the idea of a recursive* sequence, rather than a “squaring” sequence.



Discuss the pattern noting that the “square” of the previous term becomes the lower right corner of the next term, and that the “y” on each leg increases by one. What would the 4th and 5th term of this sequence look like? This is a different way of looking at the growth than simply talking about squaring the term number.

- o Looking at the change in perimeter of this pattern could provide yet another exploration.
- o Closure: Chart the big ideas discovered through the lesson and compare with the original chart with definitions of pattern. Encourage students to generate ideas for further exploration.(See page 5)

*A recursion is a specific type of algorithm in which a process is repeated using the previous answer(s).

Text or Website references:

Follow up to Unit 11-Rates, 4th grade [Everyday Learning](#)

Follow up to Investigation 1, 5th grade [Investigations in Number, Data, and Space](#)

References in Planning:

IMPACT MATHEMATICS-Course 1, Chapter 1

[Opening Eyes to Mathematics--Volume 3, Lesson 1](#)

Website connections:

<http://www.mcs.surrey.ac.uk/Personal/R.Knott/Fibonacci/fibpuzzles.html>

Fill in the blanks.

Puzzle A: 3, 2, 3, 2, —, —, —, ...

Puzzle B: \square , \triangle , \square , \triangle , —, —, —, ...

Puzzle C: 2, 5, 8, 11, —, —, —, ...

Puzzle D: 16, 8, 4, 2, —, —, —, ...

