Sierpinski Gasket in 3-D

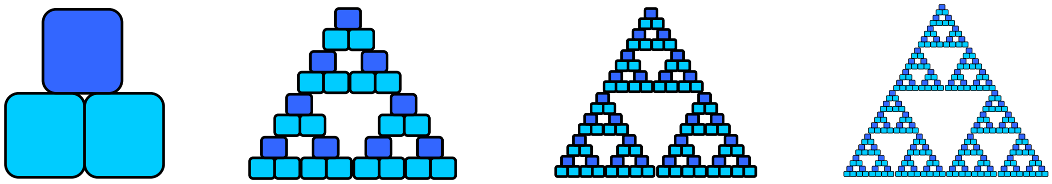
A Beaded Fractal Showpiece

Topics: Math, Fractals, Patterns

Materials List
- ✓ Pony beads
- ✓ Hot glue (preferred) or tacky glue

This activity can be used to teach:
Common Core Math Standards:

- Patterns (Grade 4, Operations and Algebraic Thinking, 5; Grade 5, Operations and Algebraic Thinking, 3)
- Exponents (Grade 6, Expressions and Equations, 1)
- Sequences (High School, Interpreting Functions, 3)
- Properties of functions (High School, Interpreting Functions, 9)
- Problem Solving and Reasoning (Math Practices Grades 4-12)

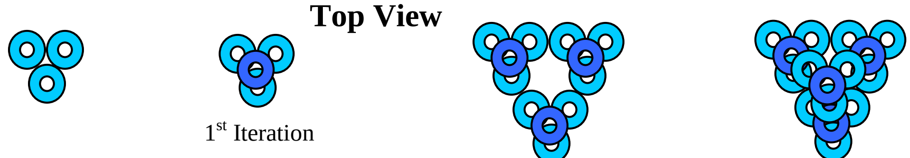


In this activity, students work together to build the 3-dimensional analog to the popular fractal "Sierpinski Gasket". This 3-D shape is called a Tetrix (also known as a Sierpinski Sponge or a Sierpinski Tetrahedron). The more students that work on the large fractal, the more impressive it will be!

To Do and Notice

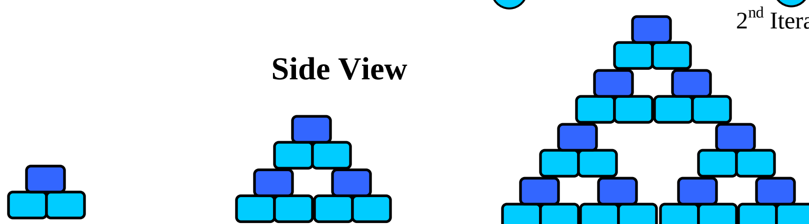
1. To form the 1^{st} iteration: Glue together 3 beads to form as triangle, then glue 1 bead on top of the 3-bead triangle (centered) (as illustrated below). [NOTE: students should use caution when using hot glue! If using tacky glue, students need to allow glue to dry before proceeding to the next step.]
2. 4 1^{st} iteration pieces are required to form the 2^{nd} iteration: Glue together 3 1^{st} iteration pieces to form a triangle, then glue an additional 1^{st} iteration piece on top of the created triangle (as illustrated below).
3. Continue building using 4 of the previous iteration to create the next. Students can build a 2^{nd} (or perhaps $3^{rd)}$ iteration piece in a class period; then groups of students can work together to form 3^{rd}, 4^{th}, or 5^{th} iterations.

Top View



1^{st} Iteration 2^{nd} Iteration

Side View



1^{st} Iteration 2^{nd} Iteration 3^{rd} Iteration

The Math Behind the Activity

Fractals are a relatively new branch of mathematics popularized by Mandelbrot in the early 1980's. Defined by repeating patterns that are self-similar on every scale, fractals are found in nature (branching trees, watershed drainage patterns, ferns, broccoli) and they also can be mathematical. This activity illustrates fractals and exponential growth. The number of beads required for each iteration increases exponentially: Beads required for iteration $N_n = 4^n$. Therefore, the number of beads required for 3^{rd} iteration = $4^3 = 64$.

Web Resources (Visit www.raft.net/raft-idea?isid=382 for more resources!)
For more information on the Tetrix and its 2-d counterpart (Sierpinski's Sieve), go to: http://mathworld.wolfram.com/SierpinskiSieve.html and http://mathworld.wolfram.com/Tetrix.html.

raft resource area for teaching www.raft.net

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