

Unit: Symmetry  
Lesson: Fractals

For this activity, students explore fractals and patterns. Discussions center on understanding the concept of infinity by understanding the properties of fractals.

**I. About the lesson**

1. Mathematics content and process learning objectives
  - a. Communicating strategies
  - b. Understanding reasonableness of solutions
  - c. Asking questions
  - d. Making conjectures
2. Related creativity traits
  - a. Making connections
  - b. Questioning norms
  - c. Identifying similarities and differences
  - d. Having aesthetic taste
3. Other disciplinary connections including to everyday life
  - a. Seeing fractals in nature and the environment in which students live.
  - b. Identifying patterns
  - c. Science

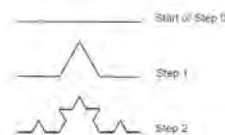
**II. Preparing for the lesson**

1. Materials
  - a. Fractal PowerPoint

**III. Conducting the lesson**

1. Setting up for the exercise.
  - a. Make copies of Koch Curve and Serpinski's Triangle tables
2. Give the following instructions to perform the experiment:
  - a. Drawing a fractal – Koch Curve
    - i. Show students steps 0, 1, and 2 of the Koch Curve.

Drawing a fractal – Koch Curve



- ii. Ask students to draw steps 3 and 4.
  - iii. Recognize patterns within the table based on the Koch Curve.
    - 1. Where is the pattern headed? (Infinity)
- b. Discussion about infinity:
  - i. Can you see infinity?
  - ii. How many points (or numbers) are there between number 1 and 2? (infinite)
- c. Show and discuss Serpinski's Triangle
  - i. Create the point of the new triangle by taking the central point of every segment.
  - ii. Ask students to try steps 3 and 4.
  - iii. Recognize patterns within the table based on Serpinski's Triangle.
- d. Fractal Dimension
  - i.  $s^d = n$ 
    - s = scale factor
    - d = fractal dimension
    - n = number of copies
  - ii.  $d = \log(n) / \log (s)$
- e. Connection to students' experiences:
  - i. Discuss fractals that students have seen in nature
  - ii. Examples: trees, clouds, fossils, hurricanes, the galaxy

#### **IV. Assessment**

The lesson can be assessed by the following means:

- a. You could have students design a fractal or continue one that you have created.

#### **V. Modifications to this lesson**