Symmetry
Patterns

For this activity, students explore familiar and unfamiliar patterns. Discussions center on the patterns students experience in their everyday lives as well as other mathematical patterns i.e. Pascal's Triangle.

I. About the lesson

1. Mathematics content and process learning objectives
    a. Making conjectures
    b. Asking questions
    c. Identifying patterns
    d. Communicating strategies

2. Related creativity traits
    a. Making connections
    b. Being inquisitive
    c. Identifying similarities and differences
    d. Having flexibility
    e. Having aesthetic taste
    f. Being unorthodox
    g. Being motivated
    h. Convince others of the value of ideas

3. Other disciplinary connections including to everyday life
    a. When can recognizing patterns be useful in everyday life?
    b. How do patterns impact learning science and mathematics?
    c. What are examples of patterns you see and use daily?

II. Preparing for the lesson

1. Materials
    a. Patterns Worksheet
    b. Patterns PowerPoint
    c. Pascal's Triangle Worksheet
    d. Cubes and/or number chips
2. Preparation
    a. Review PowerPoint presentation

III. Conducting the lesson

1. Setting up for the exercise.
    a. Students will work individually for the beginning portion of this exercise but will later be split into groups.

2. Give the following instructions to perform the experiment:
    a. Identifying patterns. Lead a discussion about the patterns students see in their daily life. (Symmetries, number patterns etc.)
    b. Explore and guide students in defining triangular numbers.
        i) Have students build the first five triangular numbers using cubes/number chips.
        ii) Complete the worksheet
        iii) Have students complete a 30 second instructional video on the coolest pattern that their group found.
    c. Show students Pascal's triangle and ask them to identify and discuss patterns.
3. Whole group discussion of the patterns visible in clock and modular arithmetic
    a. Have students think about (analog) clocks that count in different ways. (For example, what if a clock only counted up to 4 hours or 6 hours, etc.)
    b. Have students practice with modular arithmetic
4. For homework, students color a blank Pascal's triangle as described on the worksheet. Once they return to class, the instructor can combine those assigned the same modular number to make kaleidoscopes.

IV. Assessment

The lesson can be assessed by the following means:
    a. Students look up and explain their understanding of the relationship between Pascal's triangle and flipping coins.
    b. Students look up the relationship between Pascal's triangle and walking blocks (block-walking)
    c. Students demonstrate understanding of patterns and modular and clock arithmetic

V. Modifications to this lesson