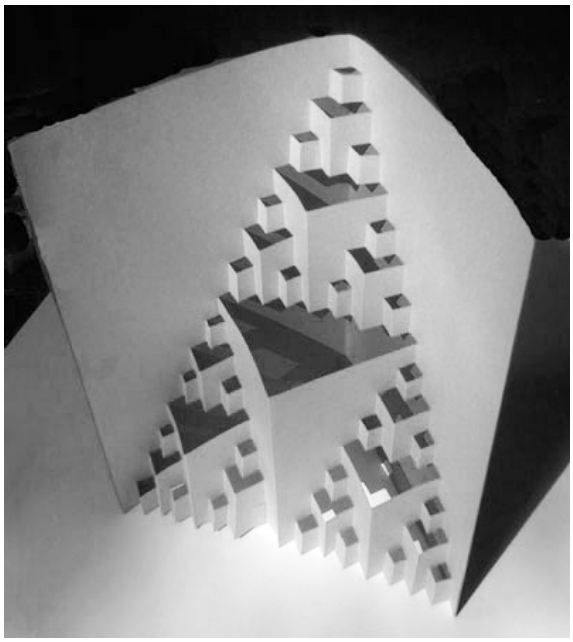
Fractal Cutout

Teacher's Intro

OVERVIEW

Students will make a 3D fractal cutout, by repeating a simple process of cutting and folding. They can turn their cutout into a fractal popup greeting card, decorate it artistically, and share the lessons of fractals with others. Although it is formed by a very different process, the resulting fractal shares much in common with the Sierpinski triangle fractal.



MATERIALS

Regular 8.5"x11" paper, any color
Card stock, or construction paper, also 8.5"x11", in a contrasting color.

Scissors

Glue Stick

NM Math Standards:

(K,1,2).A.1.3 Recognize, reproduce, describe, extend, and create repeating patterns.
2.M.2.3 Estimate measurements and develop precision in measuring objects
2.G.4.4 Relate geometric ideas to numbers
3.G.4.1 Visualize, build, and draw geometric objects.
4.G.1.1 Identify, compare, and analyze attributes of two- and three-dimensional shapes and develop vocabulary to describe the attributes:
- a. build, draw, create, and describe geometric objects
- c. identify and compare congruent and similar figures

5.A.1.3 Identify, describe, and continue patterns presented in a variety of formats

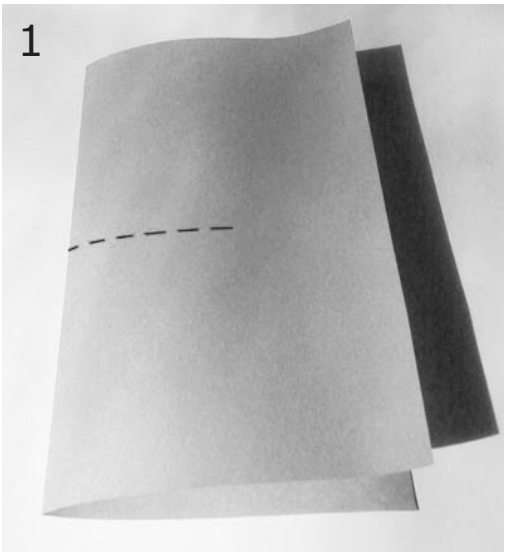
NM Art Standards:

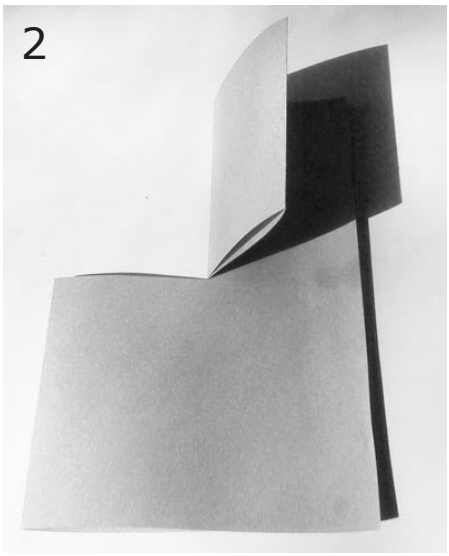
Content Standard 1: Learn and develop the essential skills and technical demands unique to dance, music, theatre/drama, and visual arts
K-4 Benchmark: Participate in the process of making art to understand the elements of art: line, shape, form, color, and texture
1. Identify and/or make art using different materials (such as watercolor, tempera, clay, etc.)
2. Identify the elements of design (line, color, shape, texture, pattern, space, value) as found in the environment and in art

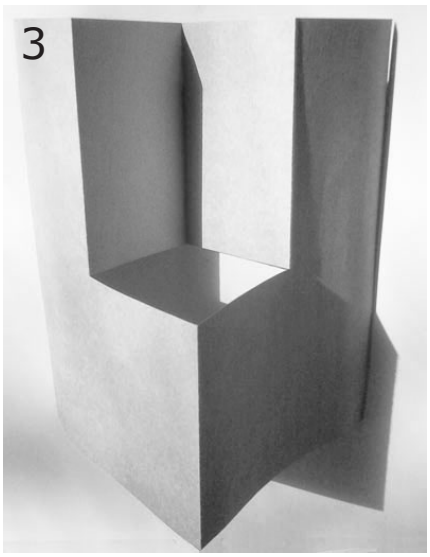
Content Standard 2: Use dance, music, theatre/drama, and visual arts to express ideas
K-4 Benchmark: Complete, discuss and display one's own original works of art
5-8 Benchmark: Apply elements of art and principles of design to communicate ideas

Fractal Cutout

There are only 3 elements to making the fractal cutout, and they are repeated again and again at smaller scales.
These three elements are Cutting (1), Folding (2) and Inverting (3).







Take one piece of paper and fold it in half, so it looks like a book.

Cut through the folded edge along the dotted line above (1). The cut should start half way up and down the fold and go half way to the right along the folded paper. Now fold over one half and crease, as shown (2).

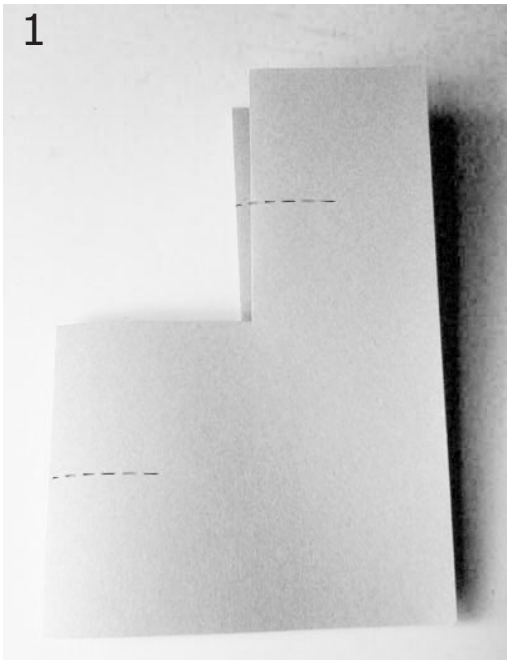
The next step, Inverting, is a little tricky, but critical. Open up the folded-over creased flap, and fold it inside itself (3).

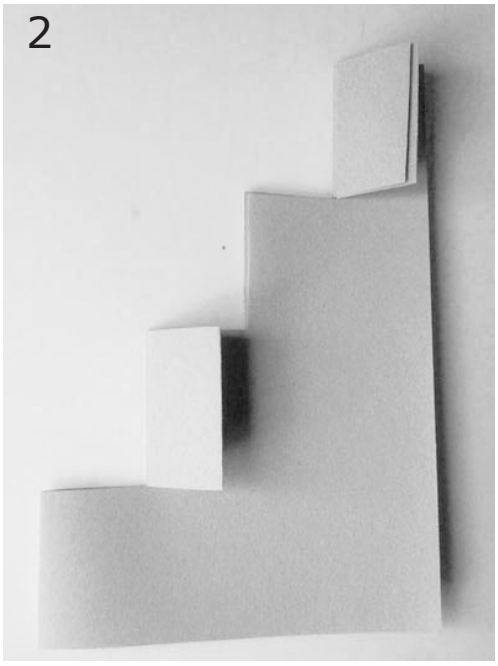
You have now completed the basic step to create the fractal cutout, and all you have to do now is keep repeating this process again and again.

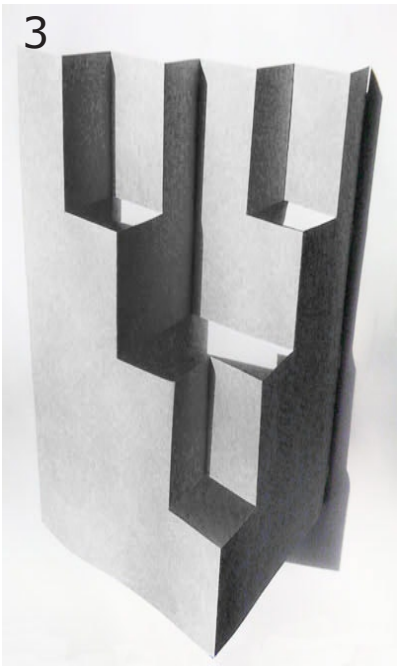
Note: You do not need to be exact, but estimate the half-way points as closely as you can. Older students will generally be more accurate, and the resulting fractals they make will end up more uniform.

Fractal Cutout

Next make two cuts, half way through each of the folded edges, at the dotted lines (1). The cuts will be half as long, and again the cuts should be half way up and down each edge and go only half way through the piece. Be careful not to cut too far!





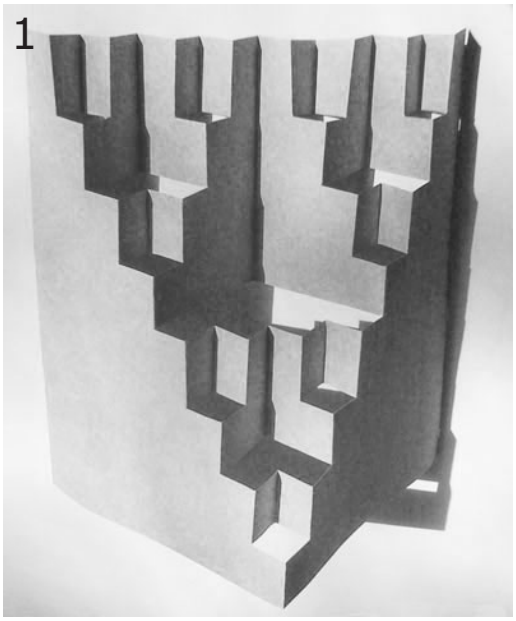


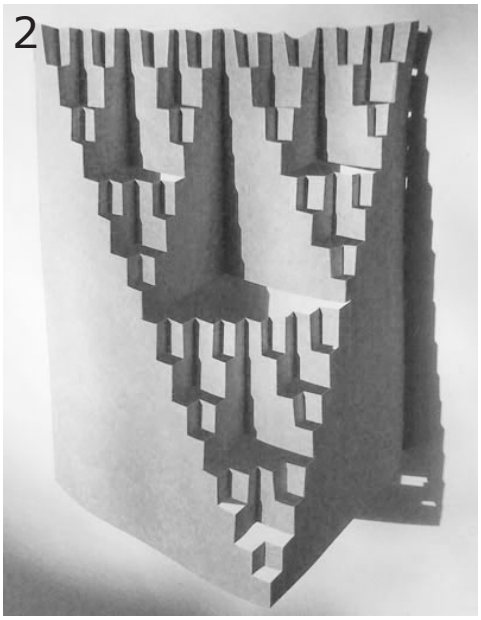
Once you've made the two cuts, fold over the and crease the flaps. How can you tell which ones to fold over? You want to end up with something looking like a staircase (2).

Next, you unfold the flaps, and invert them. When you open up the paper, it should look like (3).

Fractal Cutout

Repeat the same cutting, folding and inverting, but this time you need to make four cuts instead of two. After folding and flipping the flaps inside themselves, you'll end up with (1). Repeat this again, if you have time, making 8 cuts, and end up with (2).





Choose a piece of heavier paper in a different color, and fold it in half. Place the fractal cutout inside it, like the pages of a book. Open it gently, and apply glue to the solid areas of the fractal cutout, and then glue it in place inside the folded outer paper.