



Fractal Cutout Card



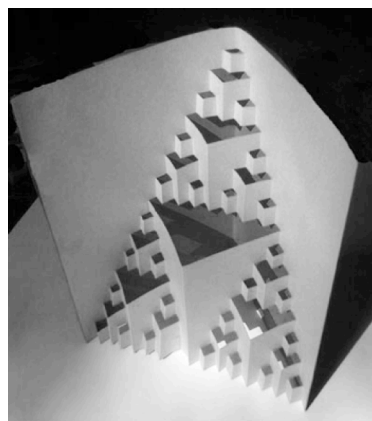
Overview

Students will make a 3-dimensional fractal cutout card 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.

Appropriate for: grades K – 12, college and adults

Objectives

- To gain skills in measuring, cutting and precision
- To gain experience in understanding that repeating a simple processes over and over can create a complex object
- To draw and identify lines and angles and classify shapes by properties of their lines and angles
- To experience ratio and portion in action
- To create and understand complex patterns in math
- To express creativity in connection with math
- To model with math and classify shapes by properties of their lines and angles
- To look for and make use of structure



Materials

- 8.5" x 11" white paper
- 8.5" x 11" card stock in contrasting color
- Scissors
- Glue stick
- Rulers in centimeters (cm)
- Cutout Card worksheet



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Common Core Standards for Mathematics

Code	Standard	Grade	Code	Standard	Grade
CC	Counting and Cardinality	K	NF	Number and Operations – Fractions	4
NBT	Number and Operations in Base Ten	K, 1	NS	Number System	6
OA	Operations and Algebraic Thinking	K – 5	RP	Ratios and Proportional Relationships	6, 7
MD	Measurement and Data	K – 5	SP	Statistics and Probability	6 – 8
G	Geometry	K – 8			

Common Core Standards for English Language Arts

Code	Standard	Grades K – 5	Grades 6 – 8	Grades 9 – 12
RL	Reading: Literature	1, 4, 7, 10	1, 4, 7, 10	1, 4, 10
RI	Reading: Informational Text	1, 3, 4, 7, 10	1, 3, 4, 7, 10	1, 3, 4, 10
FS	Foundational Skills	1, 2, 3 for grades K – 1; 3 and 4 for grades 2 – 5	None available	None available
W	Writing	2, 3, 8; 4 for grades 3 – 5	2, 3, 4	2, 3, 4, 9
SL	Speaking and Listening	1, 2, 3, 4, 5, 6	1, 2, 3, 4, 5, 6	1, 2, 3, 4, 5, 6
L	Language	1, 4, 6; 3 for grades 2 – 5	1, 3, 4, 6	1, 3, 4, 6
RST	Science and Technical Subjects	None available	1, 3, 4, 6, 7, 10	2, 3, 4, 6, 7, 10

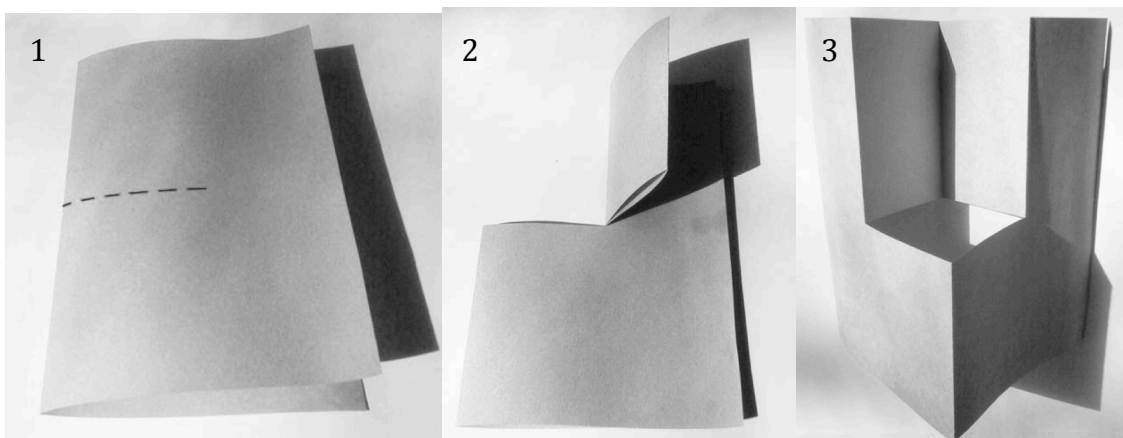


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Instructions

There are three elements to making the fractal cutout. They are repeated over and over using a smaller scale. These three elements are 1) cutting, 2) folding and 3) inverting.



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

- 1) Cut through the folded edge along the dotted line above. The cut should start half way up and down the fold and go half way to the right along the folded paper.
- 2) Now fold over one half and crease, as shown above.
- 3) Open up the folded-over creased flap, and fold it inside itself. Inverting is a little tricky, but critical.

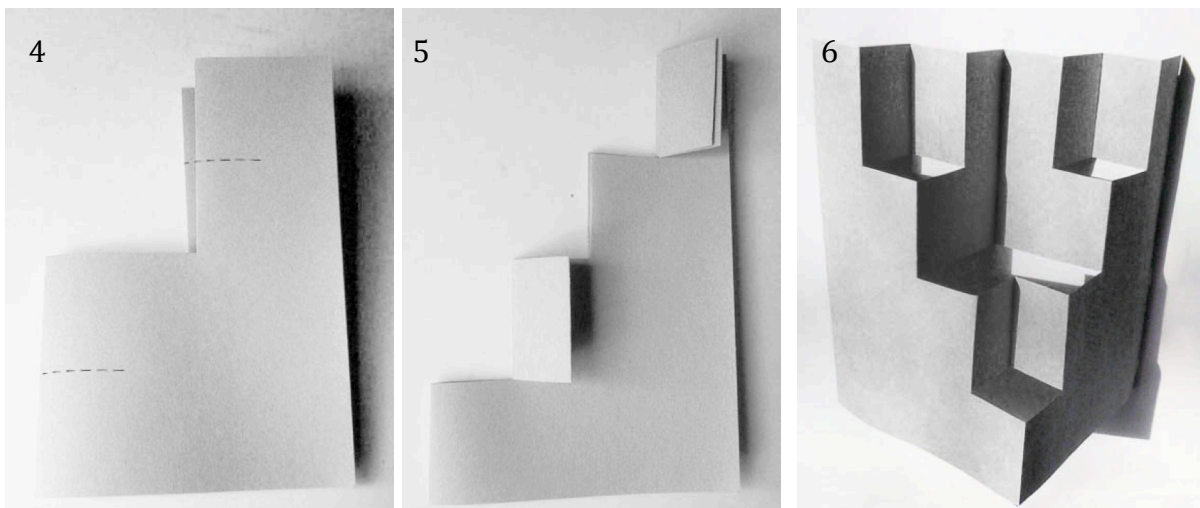
You have now completed the basic step to create the fractal cutout, and now all you have to do is keep repeating this process over and over.

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

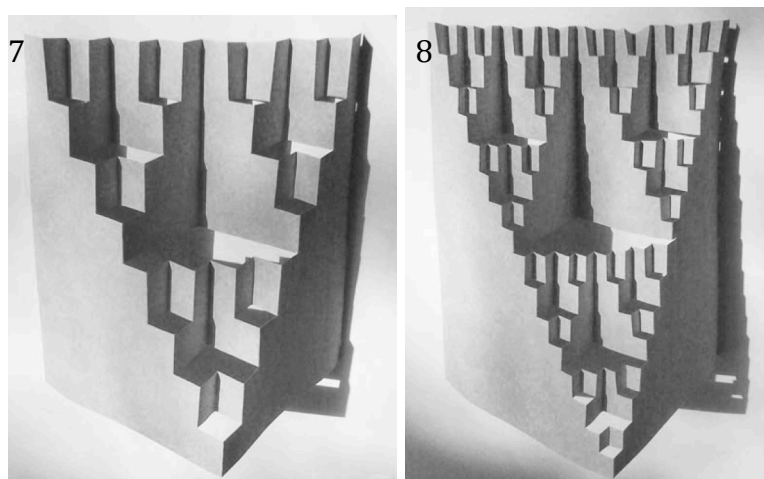
- 4) Next, make two cuts half way through each of the folded edges, at the dotted lines. The cuts will be half as long, and again the cuts should be half way up and down each edge and go only half way through the piece. **Be careful not to cut too far!**



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- 5) Once you've made the two cuts, fold over and crease the flaps. How can you tell which ones to fold over? You want to end up with something looking like a staircase.
- 6) Next, you unfold the flaps, and invert them. When you open up the paper, it should look like 6.
- 7) Repeat the same cutting, folding and inverting, but this time you need to make four cuts instead of two. Fold and flip the flaps inside themselves like below.



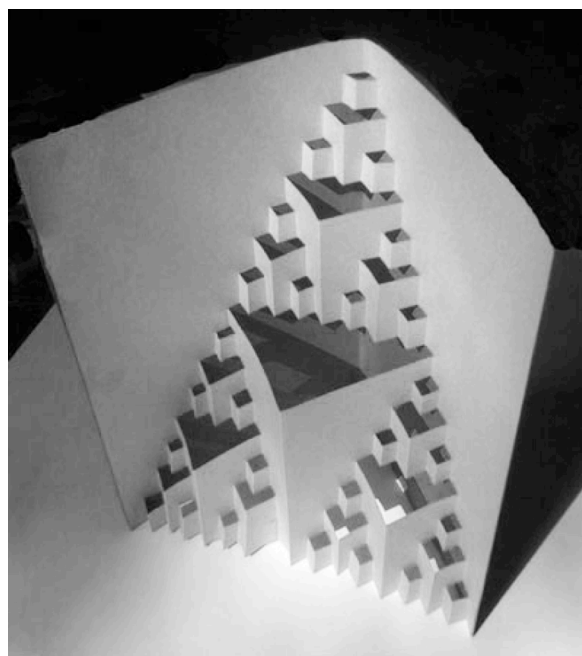
- 8) Repeat this again, making eight cuts total to have your final product.



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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.



Try different cutting patterns, such as the ones below.

