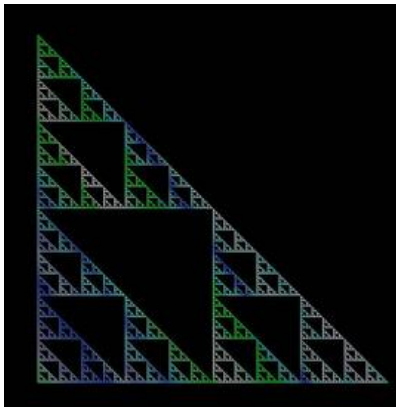# Cut It Out

Level E

A *fractal* is a geometric figure that has self-similarity, that is created using a recursive process, and that is infinite in structure.

There are two categories of fractals—geometric and random.

A *geometric* fractal is an endlessly generating pattern of self-similarity. The pattern continually replicates itself in smaller versions. Thus, when a small portion of a geometric fractal is magnified, it looks exactly like the original version.

A *random* fractal also contains self-similar images of itself, only in a disorderly, non-predictable pattern.

Beautiful computer-generated images such as the Mandelbrot Set are examples of these fractals.

Geometric Fractal: Sierpinski Triangle
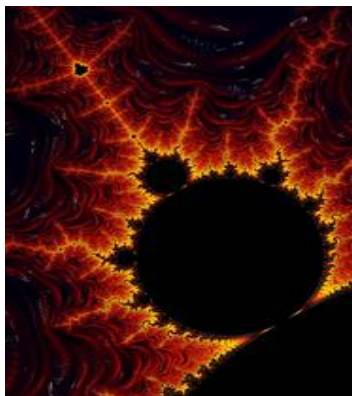
Random Fractal: Mandelbrot Set

Design a poster/object that contains a fractal.

- The fractal could be a self-similar collage, a series of pictures inside a picture, a self-similar geometric design, or another self-similar unique creation. It must be an original drawing or design.
- Your poster may contain photographs, pictures from periodicals, enlargements and reductions from copiers, and/or computer-generated designs.
- The fractal may be created using a random (chaos) technique or a self-similar drawing.
- You may produce a 3-dimensional model of a fractal.
- Your design must contain at least four iterations of a process that produces some self-similar shapes.

Write a report that describes the fractal and the process that you used to create the design.

- Be sure to describe the relationship between similar objects in your design.
- Identify the self-similar shapes or pictures that you used in the fractal.
- Demonstrate a procedure for finding the size (length, area, volume, angular distance, etc.) of the self-similar objects at any given level of the fractal.