Name_____

Fractals: Drawing, Seeing and Counting

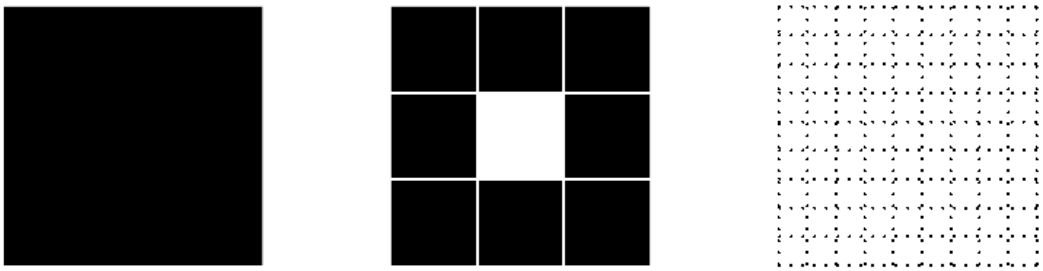
Fractals are geometrical shapes that are dynamic rather than static. Each fractal is the result of an infinite process of iteration (repetition). One way to think of fractals, particularly linear fractals, is to view them as a result of carrying out a process on a shape by applying a "generator" (rule) to an "initiator" (original shape).

The shape (process) shown below is known as the SIERPINSKI GASKET. Notice that the "initiator" (original shape) is a triangle and that the "generator" (rule) is that of removing a central, inverted triangle. In Stage 1 we now have 3 triangles, smaller than the original, remaining. On each of these remaining triangles the process is carried about again. At each stage, even triangle remaining has a central, inverted triangle removed from it.

Stage 0 Initiator | Stage 1 Generator | Stage 2 | Stage 3 | Stage 4

Using this process of carrying out a rule on all smaller copies of the original shape at each stage, draw Stage 2 of the fractal images on the next two pages. USE PENCIL so you can erase if needed. After drawing Stage 2 of each shape, answer the questions listed with the image.

1)



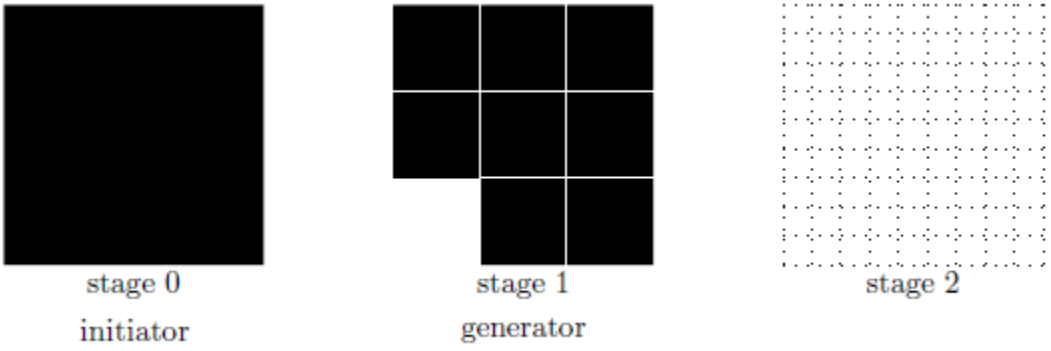
stage 0 initiator | stage 1 generator | stage 2

What size is each remaining square in Stage 1, compared to the size of the original square? _____

What size is each remaining square in Stage 2, compared to the size of the original square? _____

How many squares remain squares in Stage 2 _____

2)

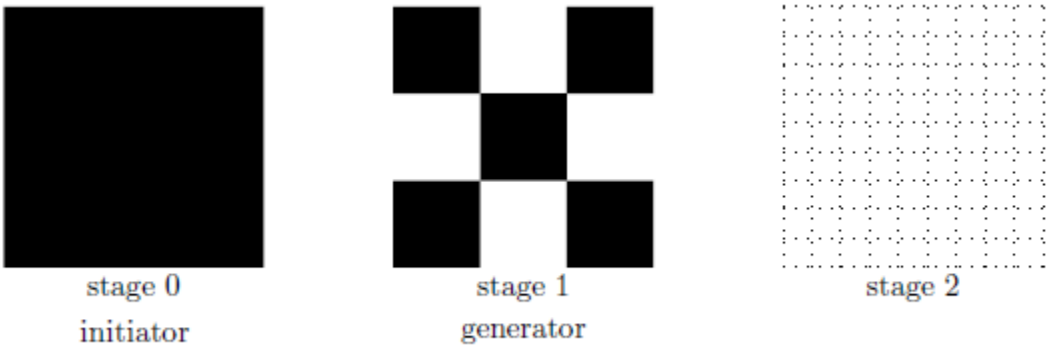


What size is each remaining square in Stage 1, compared to the size of the original square? _____

What size is each remaining square in Stage 2, compared to the size of the original square? _____

How many squares remain squares in Stage 2 _____

3)



What size is each remaining square in Stage 1, compared to the size of the original square? _____

What size is each remaining square in Stage 2, compared to the size of the original square? _____

How many squares remain squares in Stage 2 _____

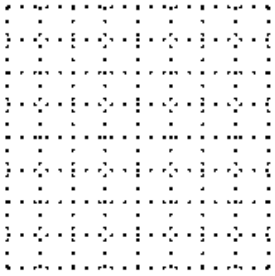
4)

stage 0

initiator

stage 1

generator



stage 2

What size is each remaining square in Stage 1, compared to the size of the original square? _____

What size is each remaining square in Stage 2, compared to the size of the original square? _____

How many squares remain squares in Stage 2 _____

5) Here is the SIERPINSKI GASKET again. It has been drawn for you. Answer the questions below the figure about the size and number of triangles that remain at each stage. Size should always be compared to the size of the original shape, the INITIATOR.

Stage 0
Initiator

Stage 1
Generator

Stage 2

Stage 3

Stage 4

What size is each remaining triangle in Stage 1, compared to the size of the original triangle? _____

What size is each remaining triangle in Stage 2, compared to the size of the original triangle? _____

What size is each remaining triangle in Stage 3, compared to the size of the original triangle? _____

What size is each remaining triangle in Stage 4, compared to the size of the original triangle? _____

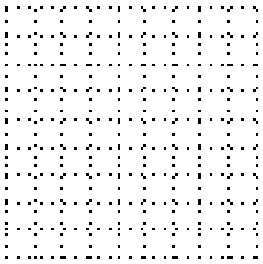
How many solid, filled-in triangles remain in Stage 1 ?_____

How many solid, filled-in triangles remain in Stage 2 ?_____

How many solid, filled-in triangles remain in Stage 3 ?_____

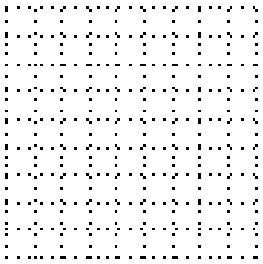
How many solid, filled-in triangles remain in Stage 4? _____

6) Reverse the drawing process. Given Stage 2 for each of the following 3 fractal shapes, draw Stage 1 and Stage 0.



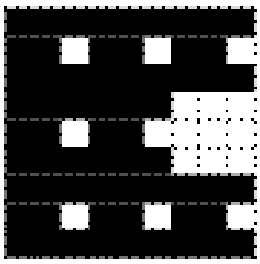
stage 0

initiator

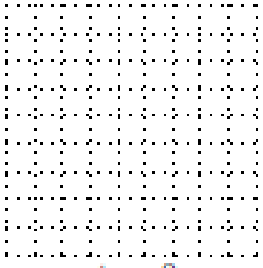


stage 1

generator

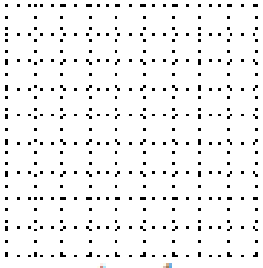


stage 2



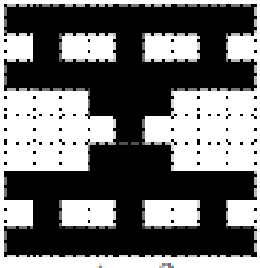
stage 0

initiator

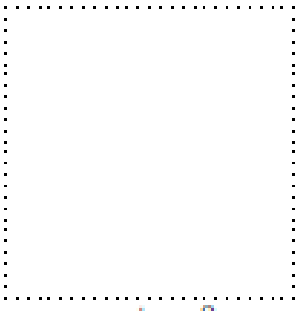


stage 1

generator

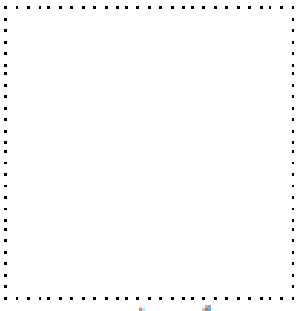


stage 2



stage 0

initiator



stage 1

generator