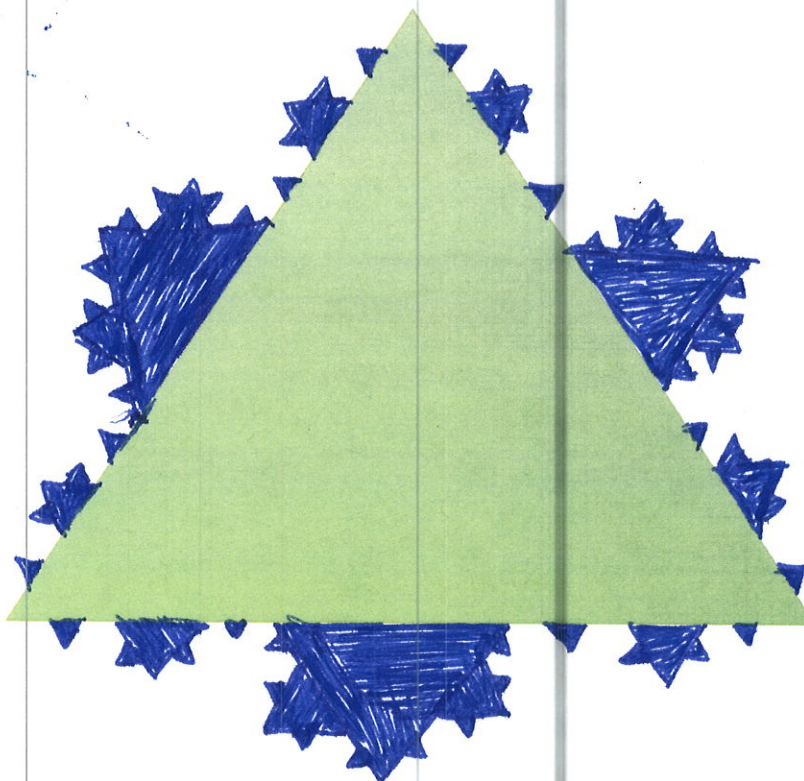
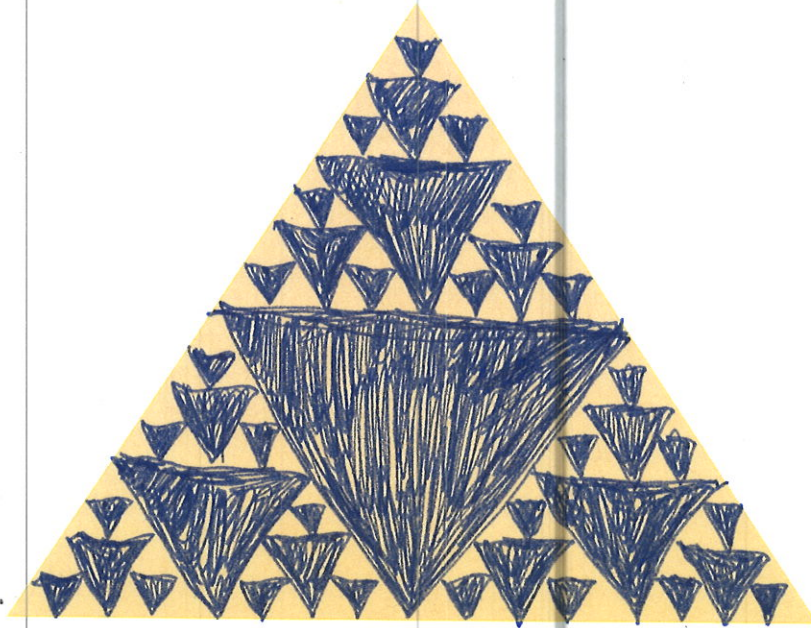


Instructions: Answer the following questions on separate numbered page(s) and attach work to this page. Indicate for each problem on this sheet which page the answer to the question can be found, and indicate the answers clearly in your work (you can circle the answer, for instance).

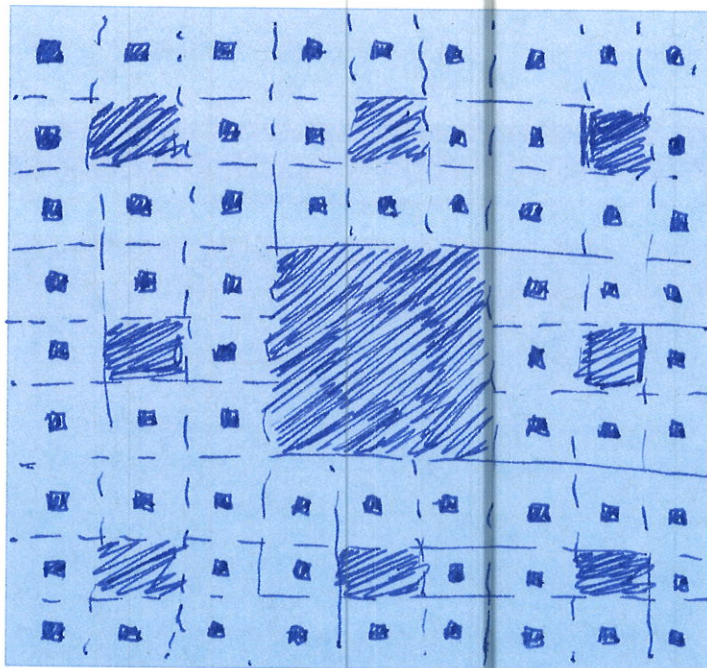
1. Use the image of the equilateral triangle below to construct the first three stages of the Koch Snowflake.



2. Define the term **self-similarity**, in your own words.
3. Construct your own fractal similar to the Koch snowflake. Begin with a shape (say, a pentagon) and clearly state your replacement rule. Then follow that rule for four steps. Attach your drawing. For the area and perimeter, which is finite and which is infinite, if we carried on the steps indefinitely?
4. Construct Sierpinski's Gasket for 4 steps using the triangle below.



5. Construct Sierpinski's Carpet using the square below.



6. Play the Chaos Game at <http://www.shodor.org/interactivate/activities/TheChaosGame/> and print the results (or attach a screenshot in Canvas). Experiment with different vertices and different probabilities. What do you notice?
7. What happens to the area in a Sierpinski gasket/carpet? What happens to the length of the boundary?

MAT 100 Homework #2 Key

①

2. Self-similarity is when you zoom in and see the same repeating pattern at any scale.

7. The boundary goes to ∞ , but the area decreases and is finite.

8. The Cantor Set is a 1D version of the Sierpinski Gasket. Start w/ a line segment & remove the middle third. Repeat.

9. Nature has randomness so applying a random twist makes a shape constructed by a rule both unique and more natural looking.

12. a. $s = 3/4$

$s_1 = 1.3125, s_2 = 2.472... s_3 = 6.86..., s_4 = 47.86...$

not in Mandelbrot set

b. $s = i/2$

$s_1 = -.25 + .5i, s_2 = -.1875 + .25i, s_3 = -.0273... + .406i,$

$s_4 = -.16429... + .477...i, s_5 = -.201... + .343...i,$

after many steps it keeps getting closer to $-.1360... + .393...i$ in Mandelbrot set

c. $s = 3 - i$

$s_1 = 11 - 7i, s_2 = 75 - 155i, s_3 = -18397 - 23251i ...$

keeps getting bigger so not in Mandelbrot set

13. $(-1/8, 3/4)$

$(-.671875, .5625)$

$(.010..., -.005859)$

$(-.1249, .74988)$

$(-.6717, .5626)$

$(.00965, -.00585)$

$(-.12494, .749887)$

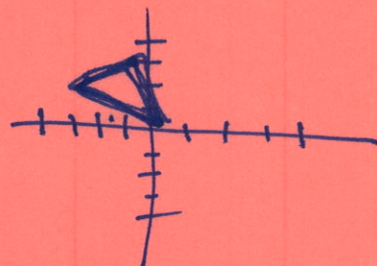
$(-.67172, .5626)$

$(.00967, .00584)$

$(-.1249, .74988)$

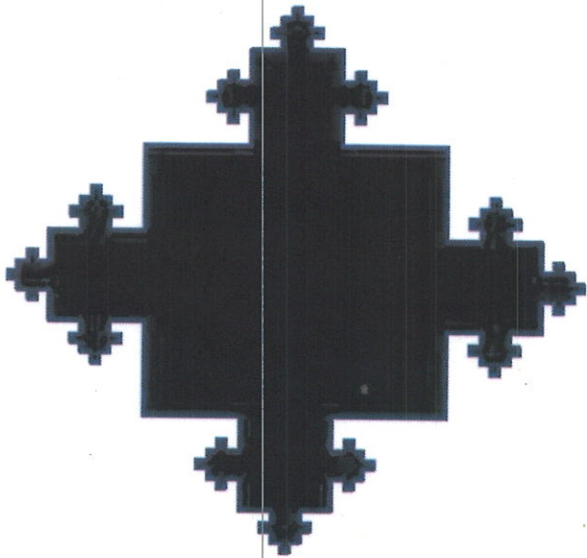
$(-.67172, .5626)$

$(.00966999, -.0058)$

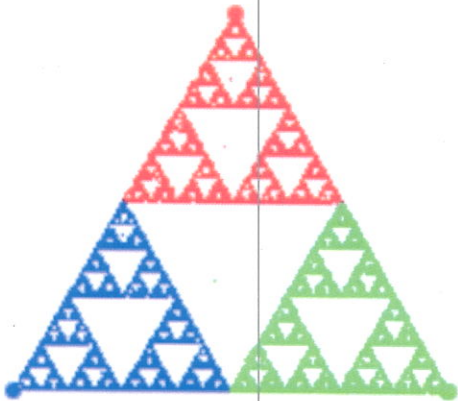


Homework #2 key

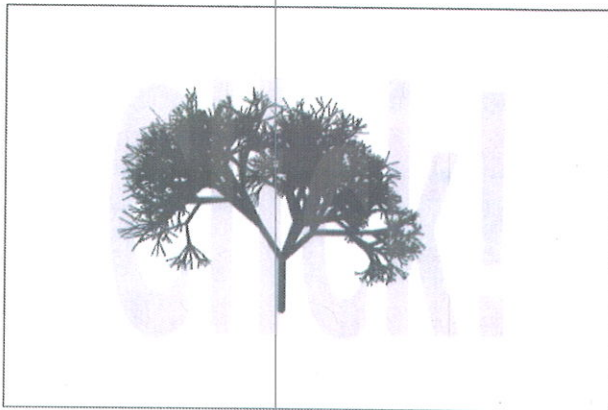
3. Answers will vary



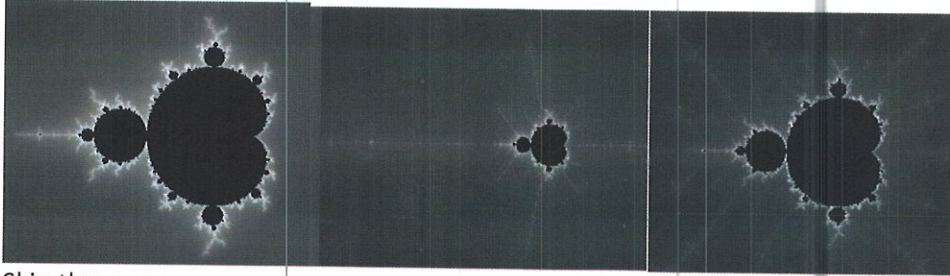
6.



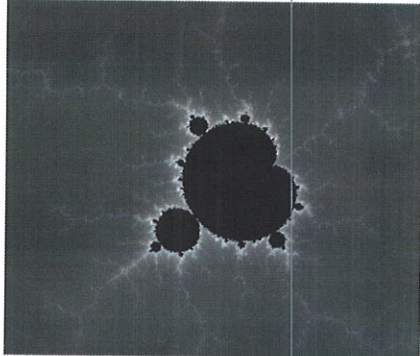
10.



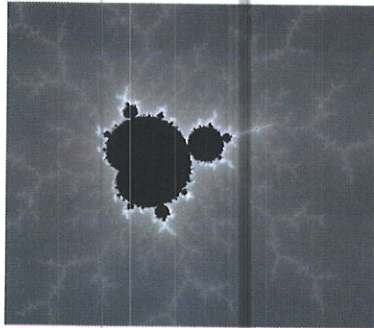
11.



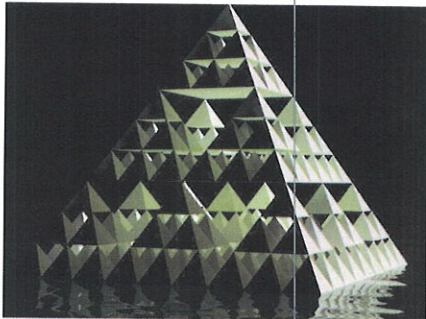
Skip three zoom



skip 2 zooms



14.



this is the 3D equivalent of Sierpinski triangle