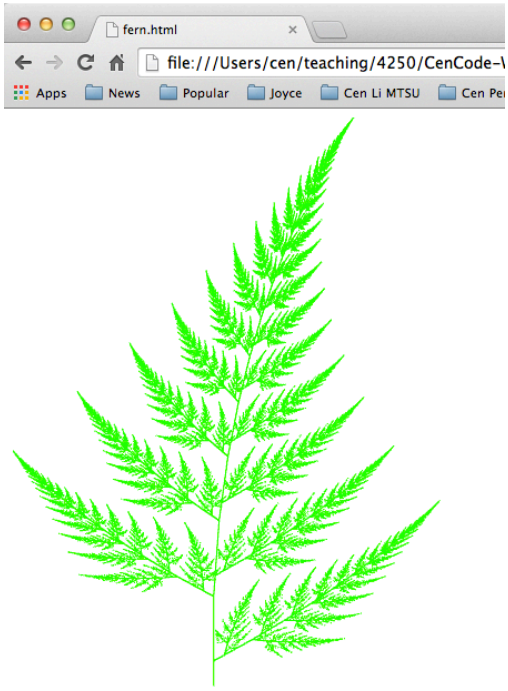
Project 1 Due: midnight, Tuesday, September 20th

The Sierpinski Gasket is a shape that has been generated by an Iterated Function System. There are many such shapes that can be generated. We have seen one such shape already -- the Sierpinski gasket.

One of the very common and attractive forms generated by Iterated Function Systems (IFS) is the fern leaf shown on the left. The following will describe how to generate this form and allow you to experiment with other IFS generators.



Iterated function systems are described by repeatedly computing terms in two series, one series describes the x coordinate and the other series the y coordinate. The equations describe translation, scaling, rotation, and shearing of points in a plane with the restriction that the transformations are "affine".

The general form of the series is as follows:

$$x_{n+1} = a * x_n + b * y_n + e$$
$$y_{n+1} = c * x_n + d * y_n + f$$

A point is drawn at each pair (x_i, y_i) for i greater than some number, typically 10 to 100.

The magic is in finding the values of (a, b, c, d, e, f) that give the desired form. In many application it is necessary to have a number of sets of (a, b, c, d, e, f). As the series is being generated a particular set is chosen at random for each term. Such IFS systems are often known as Random Iterated Function Systems

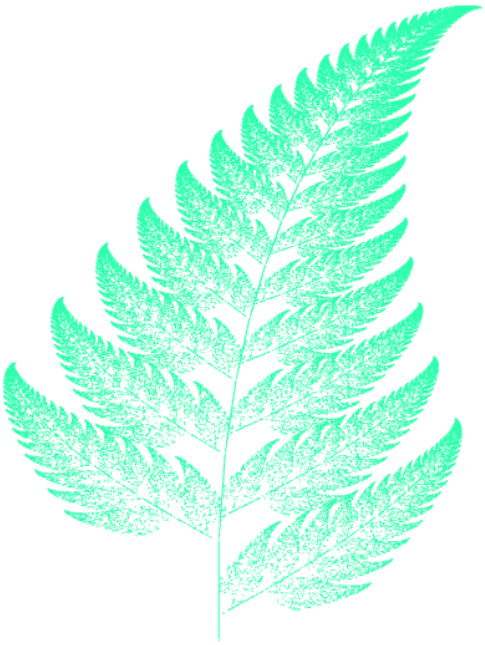
The fern can be constructed using the table of values shown below:

-	Set1	Set2	Set3	Set4
a	0.0	0.2	-0.15	0.75
b	0.0	-0.26	0.28	0.04
c	0.0	0.23	0.26	-0.04
d	0.16	0.22	0.24	0.85
e	0.0	0.0	0.0	0.0
f	0.0	1.6	0.44	1.6
probability	0.1	0.08	0.08	0.74

It turns out that if the different sets of (a, b, c, d, e, f) are chosen with appropriate probabilities then the fern will "emerge" much faster and evenly than if the sets are chosen with equal chance. The last row in the table gives the optimal probabilities.
The fern above resulted from 100 thousand (10^5) iterations, that is, 100 thousand points are drawn.

A slightly different set of codes gives the result shown below:

-	Set1	Set2	Set3	Set4
a	0.0	0.2	-0.15	0.85
b	0.0	-0.26	0.28	0.04
c	0.0	0.23	0.26	-0.04
d	0.16	0.22	0.24	0.85
e	0.0	0.0	0.0	0.0
f	0.0	1.6	0.44	1.6
probability	0.01	0.07	0.07	0.85



Name your program fern.html and fern.js.
The following interactions are required:

- When your program runs, it should show a pleasing picture of the first fern. A mouse click will cause a pleasing picture of the second fern to show up in the browser. Another mouse click will cause the first fern to appear again and so on.

- Suppose the first fern is showing in the browser. Pressing the key 'c' will produce the same fern only using a different shade of green Another press of the key 'c' will again change the color of green.

Since we are drawing within the clip coordinate, i.e., x: -1 to 1, y: -1 to 1, it is necessary to scale the coordinates to be within this range.

Documentation: You are required to add comments to logically related statements.
Functional Decomposition: Decompose the program properly where user defined functions are used appropriately.

Instruction to turn in the program:

- Electronically submit your program through Dropbox "Project 1" on D2L.
- Please zip the directory containing these two files, and submit the zip file.