# Programming Assignment 2

Darin Goldstein

1 Deadline

3/1/2021 at 5 PM

2 Sierpinski

(Wikipedia) The Sierpinski triangle, also called the Sierpinski gasket or Sierpinski sieve, is a fractal attractive fixed set with the overall shape of an equilateral triangle, subdivided recursively into smaller equilateral triangles. Originally constructed as a curve, this is one of the basic examples of self-similar sets—that is, it is a mathematically generated pattern that is reproducible at any magnification or reduction. It is named after the Polish mathematician Wacław Sierpinski, but appeared as a decorative pattern many centuries before the work of Sierpinski.
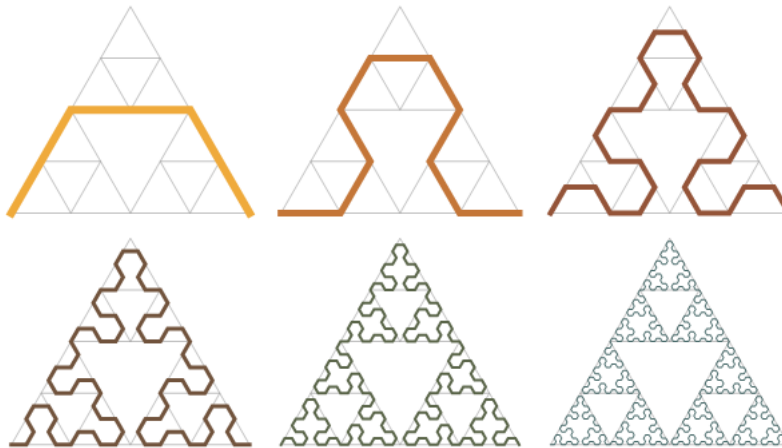
Your goal for this assignment will be to deterine whether certain given line segments intersect the Sierpinski triangle of a given order n on a hexagonal grid.

The $n = 1$ Sierpinski triangle goes 1 step 60 degrees counterclockwise from horizontal (Horizontal is directly east.), 1 step horizontal, then 1 step 300 degrees counterclockwise from horizontal. Given the nth Sierpinski triangle, in order to get the $n + 1$th triangle,

1. Draw the nth Sierpinski triangle reflected about the x-axis and rotated by 60 degrees counterclockwise.

2. Draw the nth Sierpinski triangle with the beginning of this attached to the end of the first.

3. Draw the nth Sierpinski triangle reflected about the x-axis and rotated by 60 degrees clockwise with the beginning of this attached to the end of the second.

The difference between the Sierpinski triangle and the triangle that you will create is that the steps in the Sierpinski triangle get smaller with each iteration. Your steps will always be length exactly 1.

You will take in m line segments and determine whether each intersects the Sierpinski triangle of order n.

3   Input/Output

The input (input.txt) will contain the value of n and then a sequence of values that represent line segments. Each line segment will be of the form (x_1, y_1) to (x_2, y_2), and each line holds the values in order $x_1 y_1 x_2 y_2$.

For example,

```
2
1.0760331826619962 0.3768219377107604 1.3886840037284933 0.8428993719422269
2.5761061173445765 0.48088033384281753 2.912440888830008 0.7802824833362976
1.0838045293362306 2.1113441674425886 1.3753554984450607 1.8283532673592844
```

The output (output.txt) should just hold a 0 (does not intersect the Sierpinski structure) or 1 (does intersect the Sierpinski structure), one per line. For example, in this case:

```
0
1
1
```

The second and third line segments intersect the Sierpinski structure of order 2 but the first doesn't.