

1 Symmetries of a Triangle

If you would like to toy with the symmetries of the equilateral triangle you can run the `triangle.txt` file¹ on [SAGE](#)'s online platform.

[SAGEMATH](#) is a python based mathematics software²

2 Fractals

The fractal image was generated in \TeX ; You can start experimenting with it [here](#). The image can be generated in multiple different languages, for instance - python's [turtle](#) library.

The `fractal.txt` file contains an L-system³ implementation.

3 Assignment

This is not evaluative

The file `fractal.pdf` contains an image of the fractal. This assignment will cover what happens when the *mr \overline{m} r* rule is enforced.

Pick any point on the biggest triangle as your starting location.

In a counter-clockwise manner, label all sides of the biggest triangle with arrows. You cannot traverse against the direction of the arrow.

Lines that move out from a bigger triangle can be considered as downward escalators that drop you to a smaller triangle.

Consider the input strings *m*, *rmr*, *rrmrr*. Move along the fractal and see where you end up in each case. Under the *mr \overline{m} r* rule what happens to these strings?

Repeat the same with the input strings *rm*, *mrr*, *rrmr* and *rmrr*, *mr*, *rrm*.

Can you say the all triangles at depth 1 (let the biggest triangle be at depth 0) are essentially the same under the *mr \overline{m} r* rule?

¹If the same can be displayed in shorter lines of code, please send your implementation.

²You could do a [GSoC](#) with them.

³Read more [here](#)

Consider the input strings $mrmr$, rmm , $rrmrmrr$, where are they on the fractal? What happens to them under the $mrmr$ rule?

Can you say all triangles at an even depth are the same as the one at depth 0 and that all triangles at an odd depth are the same as the three (essentially the same) at depth 1?

With these two triangles can you relate the crumpled fractal to the `roadmap.png` file?