Dragon Folding

1. Take a strip of paper, fold the right edge to the left. Unfold. You will see one "valley" fold in the middle of the strip. Now make two consecutive folds folding right edge to left. Unfold. You will see "mountain" "valley" "valley folds.

   We will use a V for a valley fold, and Λ for a mountain fold.

   1st iteration: V

   2nd iteration: Λ V V

   Can you predict the next iteration?

2. Create and document several more iterations. What patterns do you see? Can you predict each subsequent iteration? Can you write a rule for any iteration?

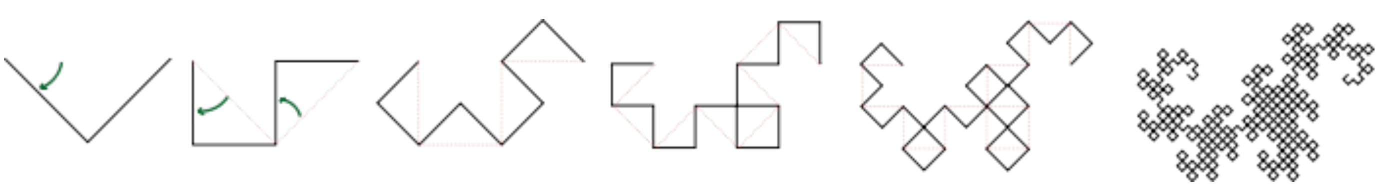
3. Fold your strip of paper as many times as you can. Do you see a pattern as you unfold the strip?

4. You can only fold a piece of paper in half so many times (12 was the last record I heard of). Can you create a recursive rule that will generate any number of folds? You may want to use 1s and 0s to represent the mountain and valley folds.

5. If you unfold your strip of paper, and lie it on its side with each fold making a 90-degree angle, what shape do you have? Do you notice that it never doubles back on itself? Why do you think this is true?

   The result of your folds is called the Dragon Curve. It is a self-similar space-filling curve which can also tile the plane.

   If possible, see if you can connect several of your curves together to make a larger Dragon Curve. I find it helps to fold the paper in half lengthwise to get it to stand up.



Some more information on the Dragon Curve

You can generate it using rewrite rules. Here is a recursive formula:

variables: F G
constants: + –
start: F
rules: (F → F+G), (G → F-G)
angle: 90°

F and G both mean "draw forward",
+ means "turn left by angle", and
– means "turn right by angle".

Try it out!

F
F+G
(F+G)+(F-G)

And so on.

Here is a Dragon Curve after 11 iterations. Notice the self-similarity. Consider how the self-similar shapes change in size and orientation.