Folding Factory Fraction Exploration

In this lesson, students will explore the dragon curve fractal by folding strips of paper and investigating patterns.

Step 1: Entry level folding position

“As a recently hired employee at the folding factory, your first job is to learn to fold paper properly. It takes two steps:

1. ALWAYS fold the **right** edge over to the **left** edge, matching up the edges and folding in half.
2. Always make a good crease.”

[This process is called an iteration]

Watch this video:

<https://www.youtube.com/watch?v=KR8pY-aWQl0>

Step 2: Research and development

After students have had a chance to do some folds, have them look at their paper strips and ask “What do you notice? What do you wonder?”

Watch this video.

<https://www.youtube.com/watch?v=HjQTU62eFk8>

After students have had a chance to notice and wonder, watch this video:

<https://www.youtube.com/watch?v=6QAFhT-Enj4>

When iterations are opened back up, folds will either point down (downfolds), or up (upfolds). Make a chart to help see how the pattern of up folds and down folds grows after each iteration.

Investigation: How many upfolds and downfolds will there be if you fold the paper 10 times?

Students can set up their charts however they choose, but if they are struggling, suggest something like this.

|  |  |  |  |
| --- | --- | --- | --- |
| Iteration | Upfolds | Downfolds | Total Folds |
| 1 |  |  |  |
| 2 |  |  |  |
| 3 |  |  |  |
| 4 |  |  |  |

(Note that the pattern of folds is predictable. Students may notice a doubling pattern, they may notice the number of up folds is always one less that the down folds. In the end, the generalization for downfolds is

downfolds = 2(iteration number – 1)

and the generalization for upfolds is

upfolds = 2(iteration number – 1) – 1

Step 3: Further r&d on the geometry.

What would happen if after each iteration, you looked at the unfolded shape, where all of the folds become 90° angles.

Watch this video:

<https://www.youtube.com/watch?v=NFE1IJ1Te98>

Clearly, something neat is happening but it is really hard to see it precisely and infinitely with paper folding.

Watch this video:

https://www.youtube.com/watch?v=3WBvS\_n2oTY

For further interest, watch this video:

https://www.youtube.com/watch?v=EdyociU35u8