

# Reasoning “Mathematically”



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## Learning Objectives

You will be able to develop and use your logical reasoning by:

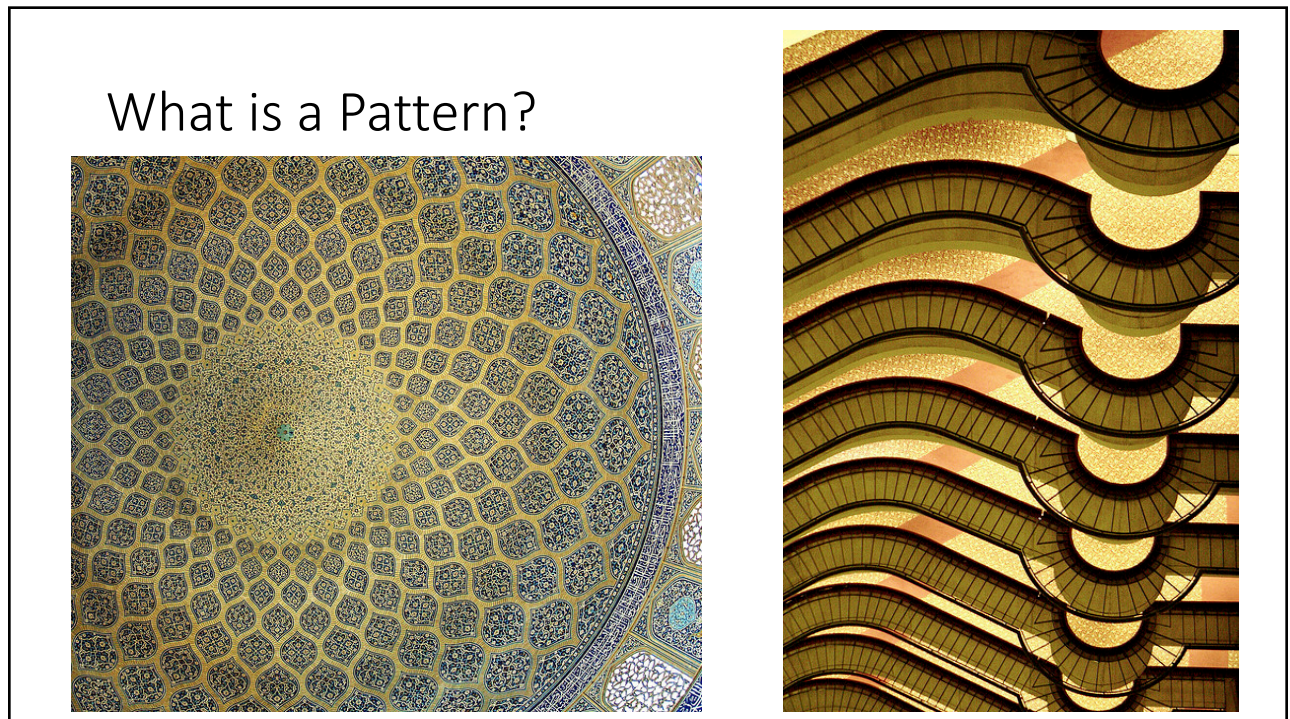
- ✓ Understanding and using patterns to make logical conclusions
- ✓ Forming and analyzing conjectures
- ✓ Proving or disproving conjectures to solve problems
- ✓ Analyzing puzzles & games theory



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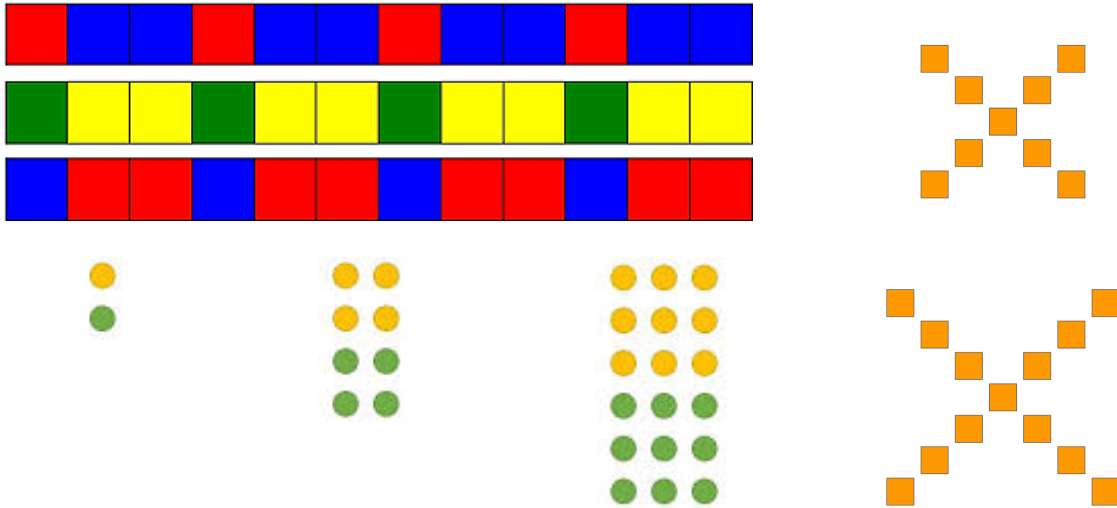


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## What is a Pattern?



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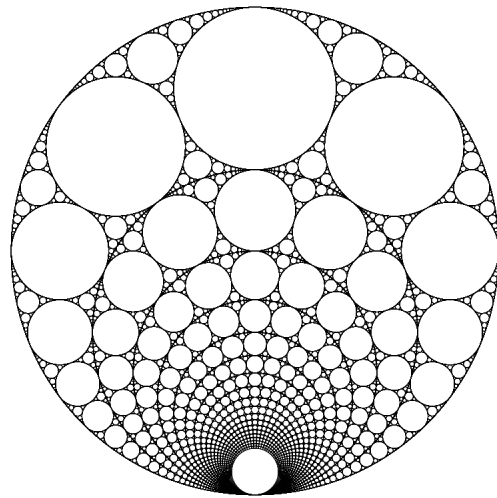
## What is a Pattern?

### Definition:

A particular way in which something is done, is organized, or happens.  
Repeatable and Predictable design

### Specific for Mathematics:

Specifically a number pattern is a pattern or sequence in a series of numbers. This pattern generally establishes a common relationship between all numbers.



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## Why Do We Use Patterns in Mathematics?

In math as well as in problem solving patterns are used in to reach **logical conclusions**.

### Caveat:

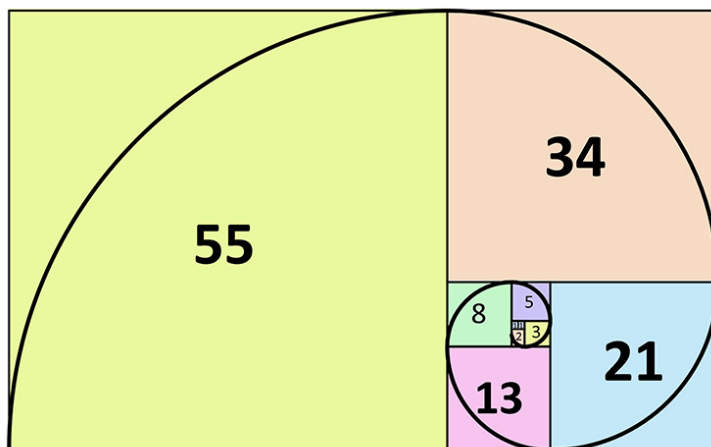
Not all patterns that you find may be, but are **not necessarily true!**



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## What Are Some Famous Mathematical Patterns?

**Fibonacci:** 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, etc.....

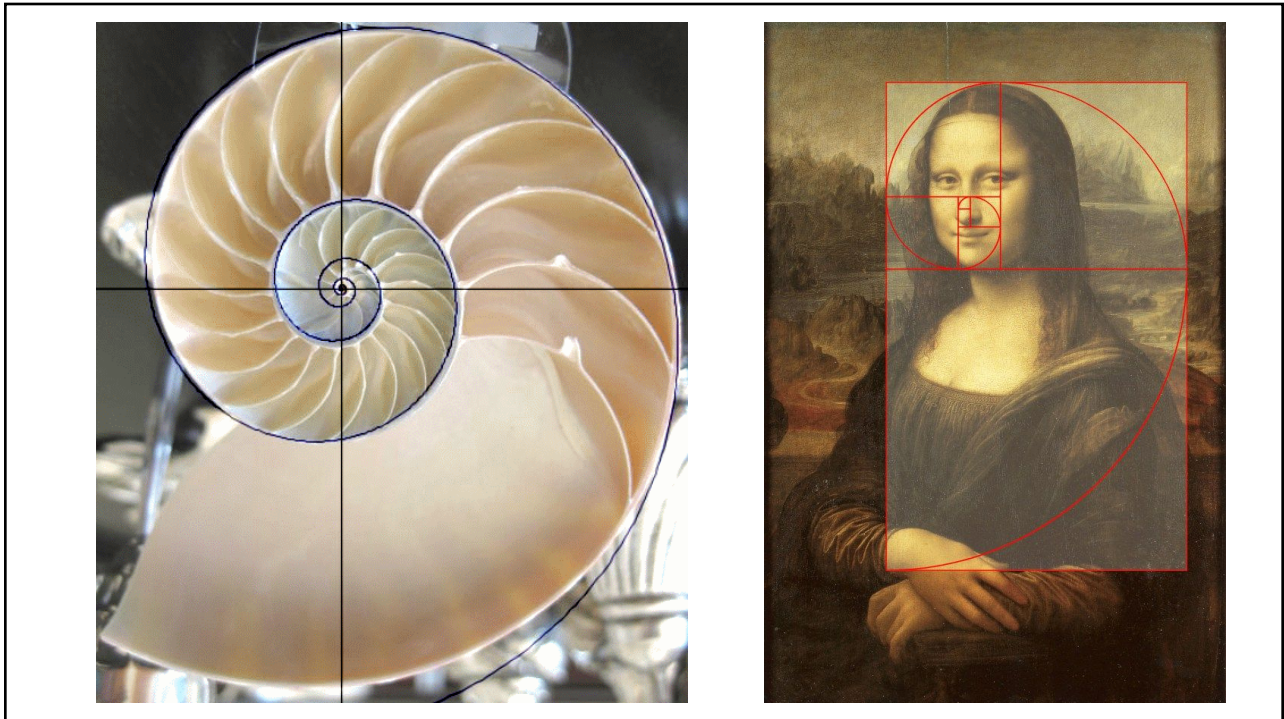


When you divide the last number in the Fibonacci sequence by the previous perm you get the GOLDEN RATIO known as Phi ( $\phi$ )

$$\phi = 1.618033988749894\dots$$

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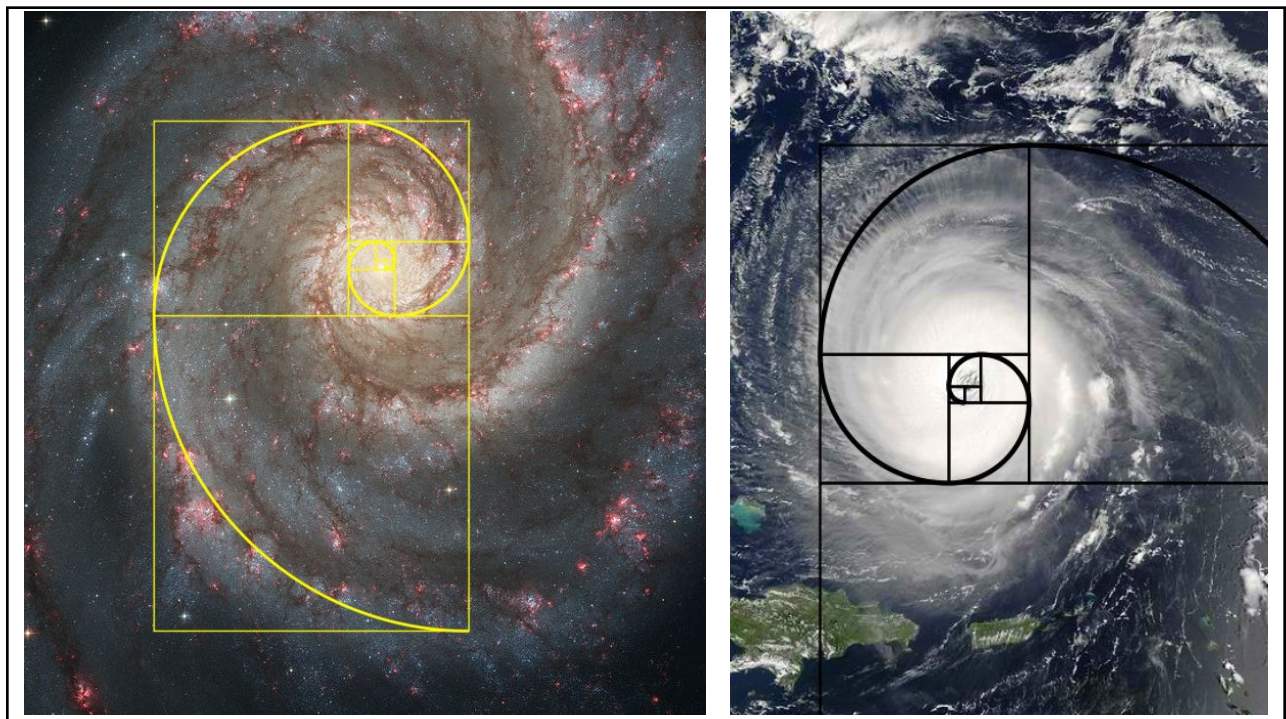


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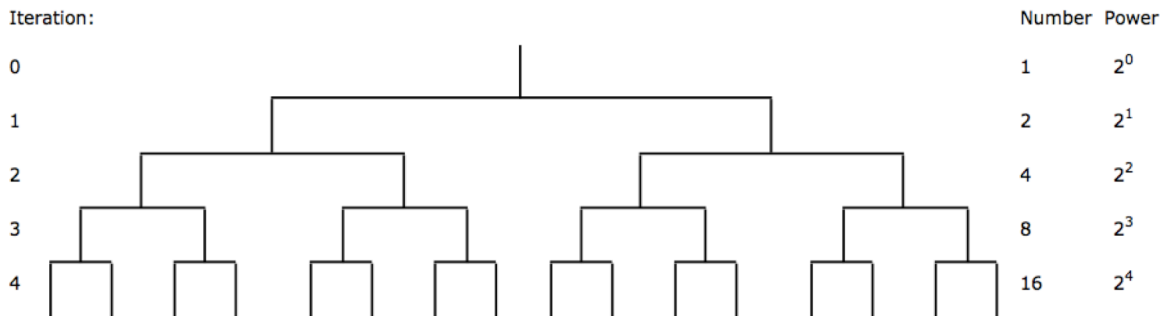
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## What Are Some Famous Mathematical Patterns?

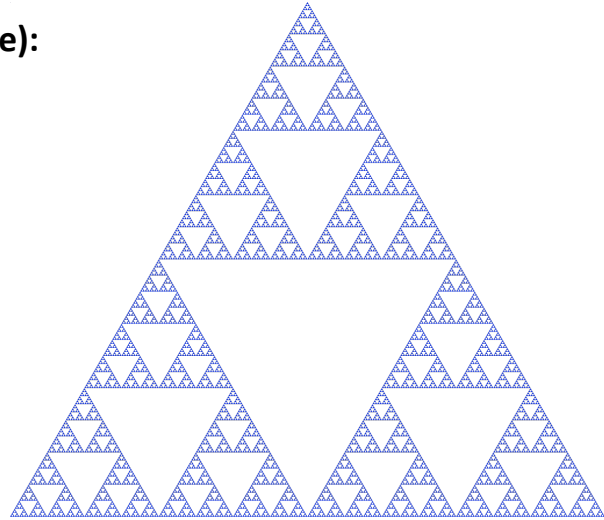
### Binary Branching:



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## What Are Some Famous Mathematical Patterns?

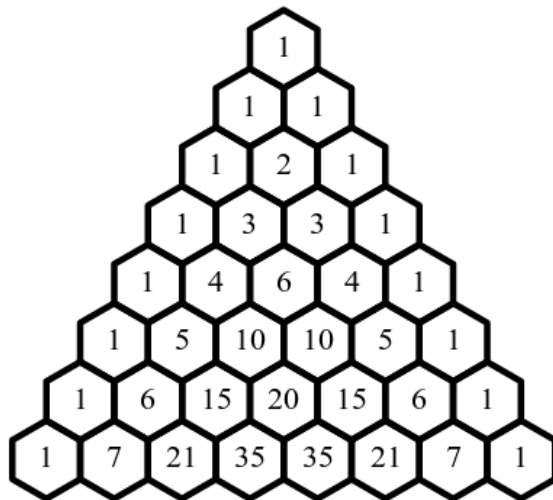
### Cubic Branching (Sierpinski Triangle):



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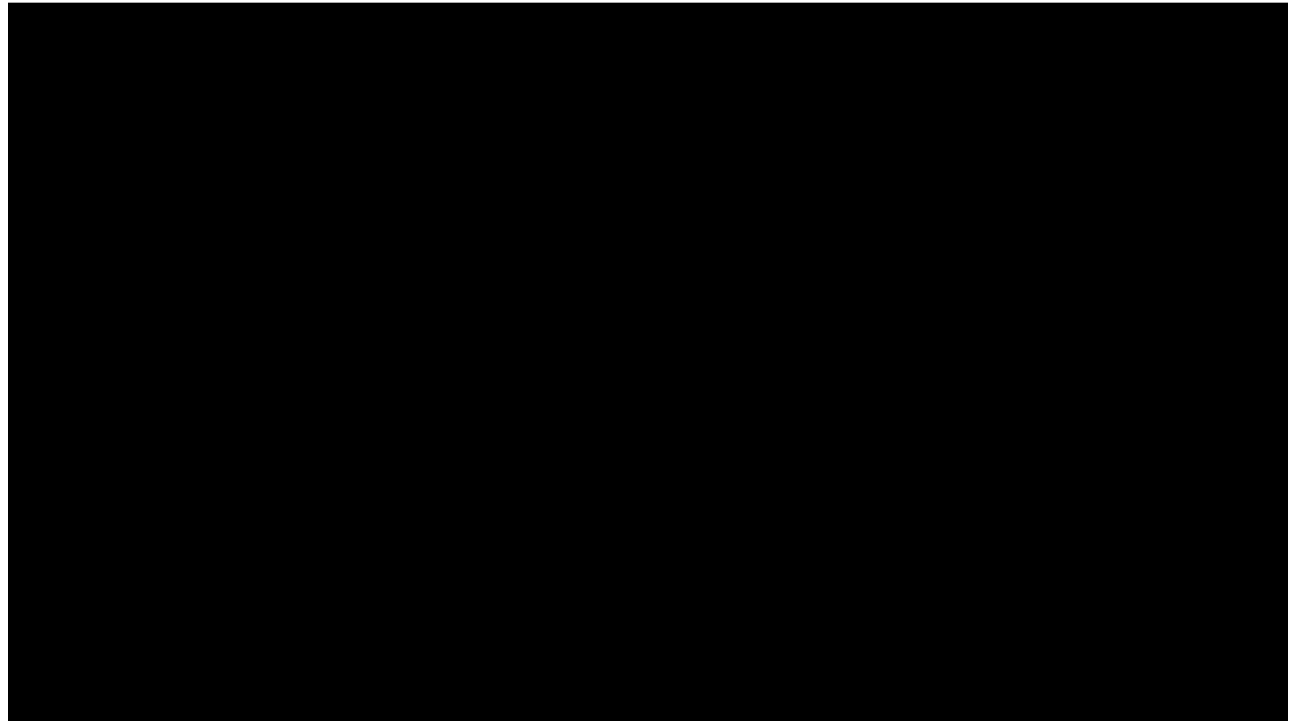
## What Are Some Famous Mathematical Patterns?

### Pascal's Triangle:



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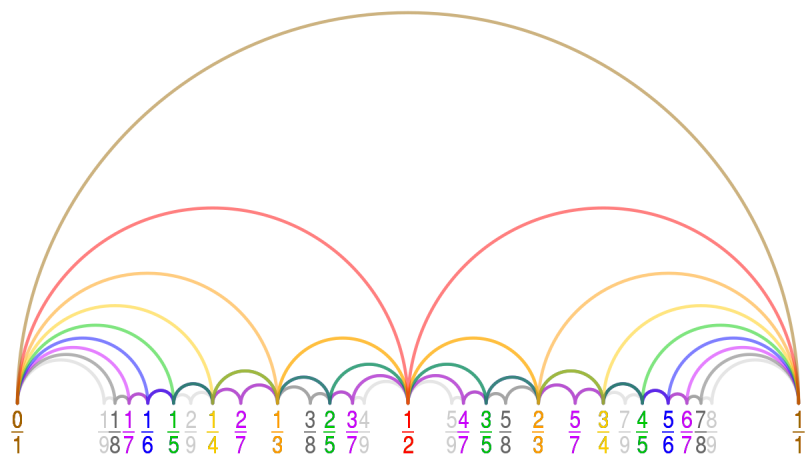




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# What Are Some Famous Mathematical Patterns?

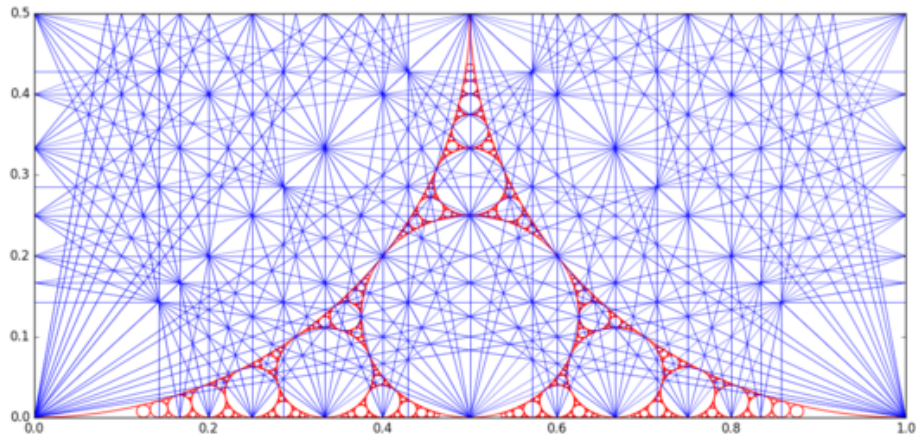
## Farey Sequence:



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# What Are Some Famous Mathematical Patterns?

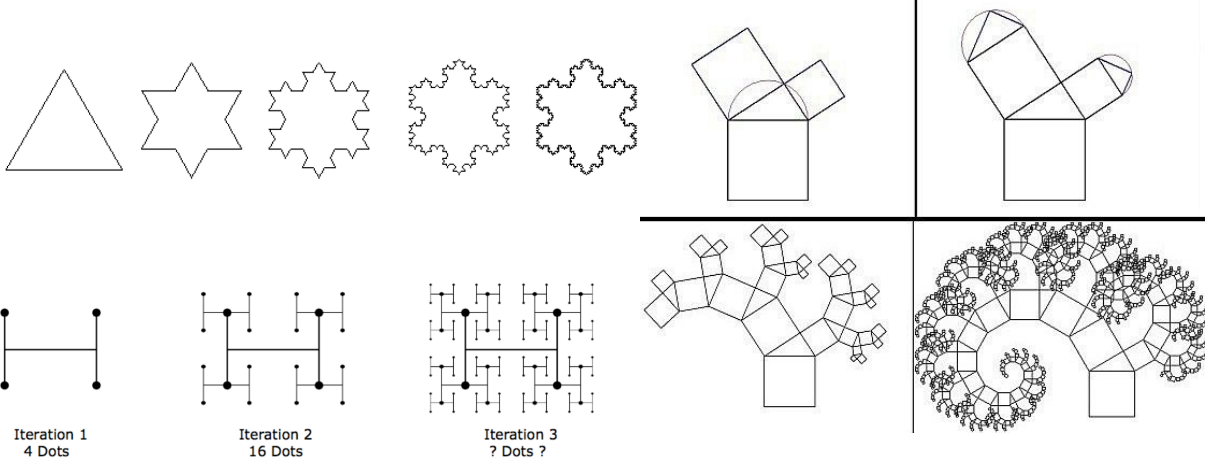
## Farey Sequence:



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# What Are Some Famous Mathematical Patterns?

## Fractals:



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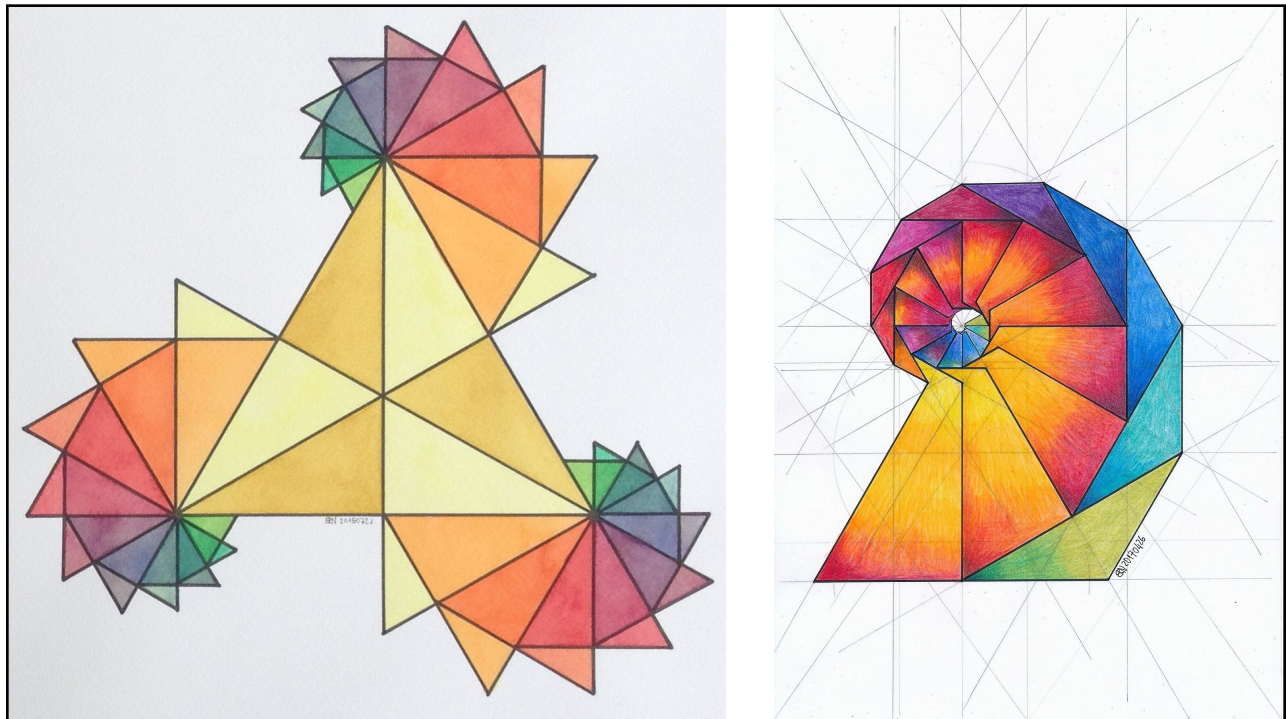


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## Activity: Math Art

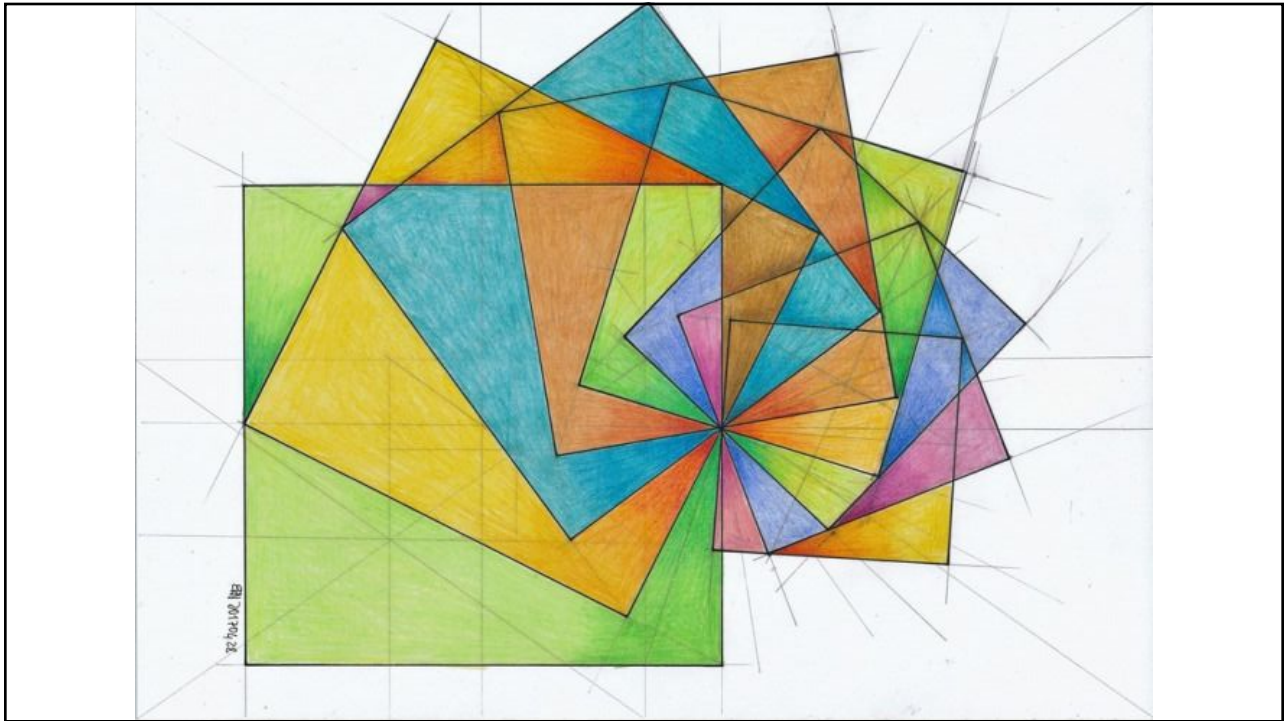
- I would like you to create your own mathematical pattern/relationship.
- After you have created your pattern, I would like you to transform the “math” into a geometric piece of art that represents your pattern.
- If you are having difficulties creating your own pattern you are welcome to use one of the previous examples as a starting point.
- To go along with your artwork I would like you to provide a reasonable list of values of your pattern, the logic used in your pattern, and a short-written description explaining details of your pattern/artwork.

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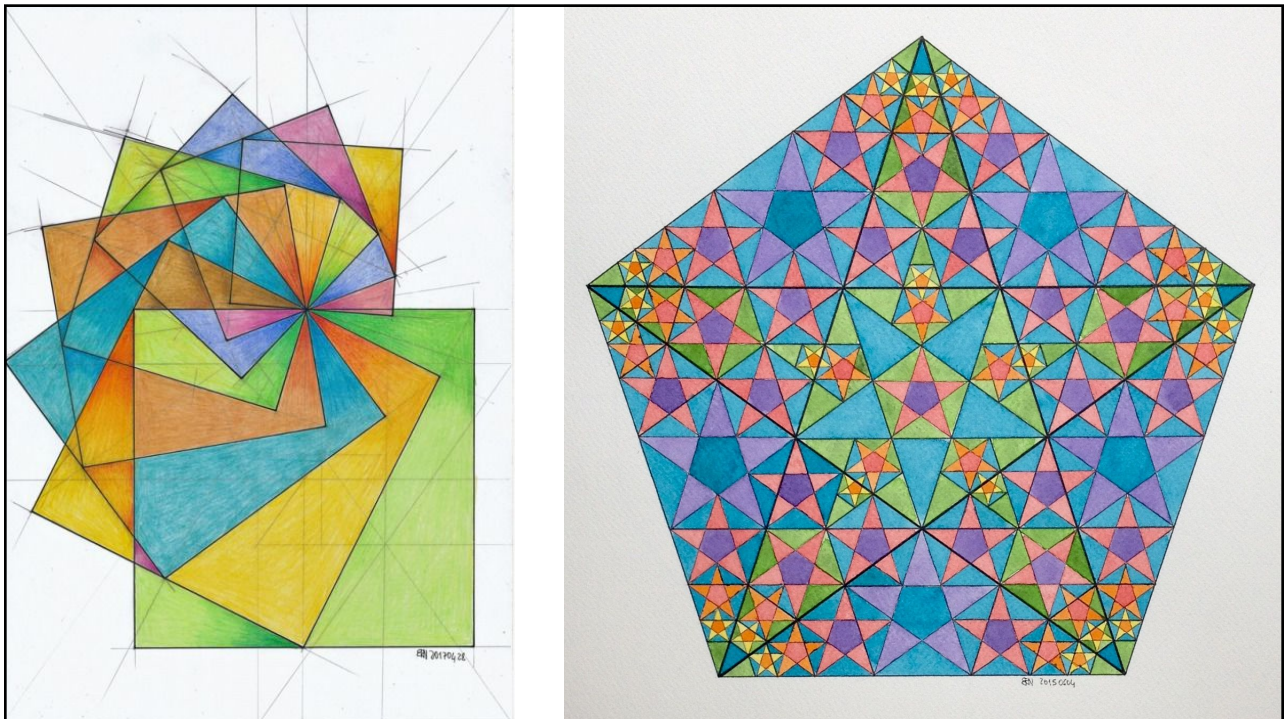


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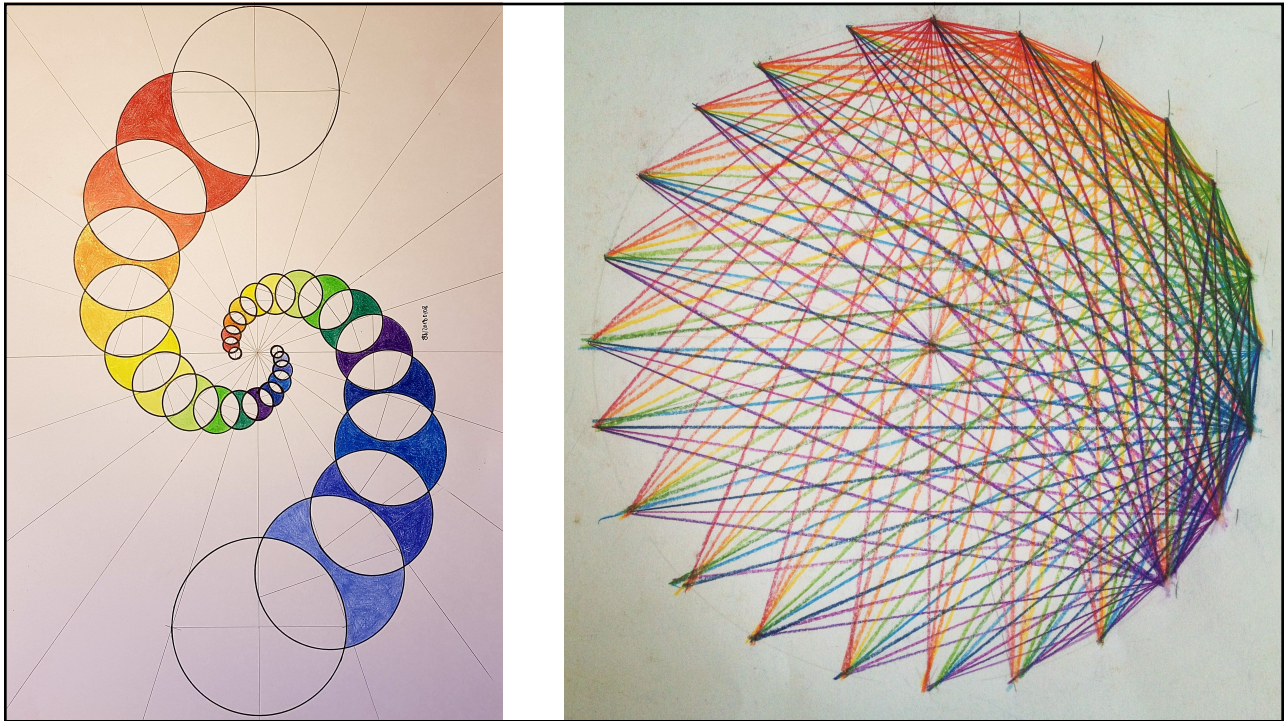


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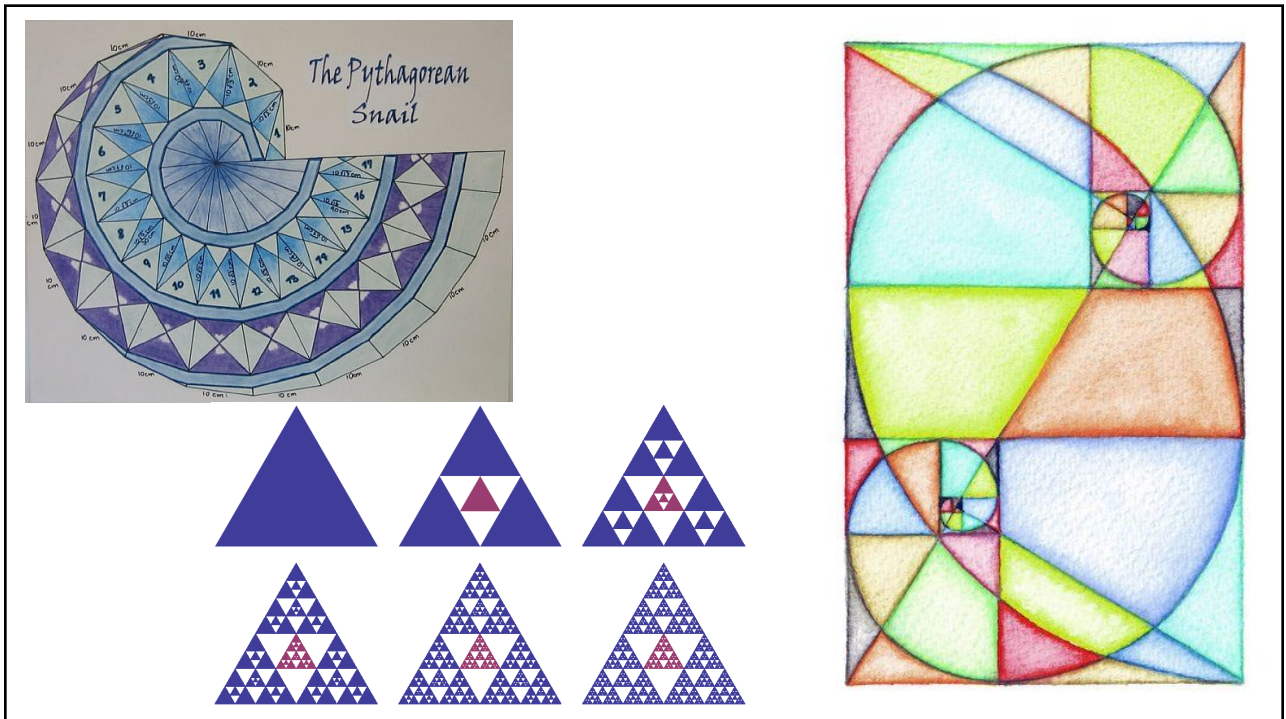


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