

Name _____

Patterns: Math In Nature!

What do a pinecone, snail shell, pineapple, and sunflower have in common?

Look at this picture of a pinecone.



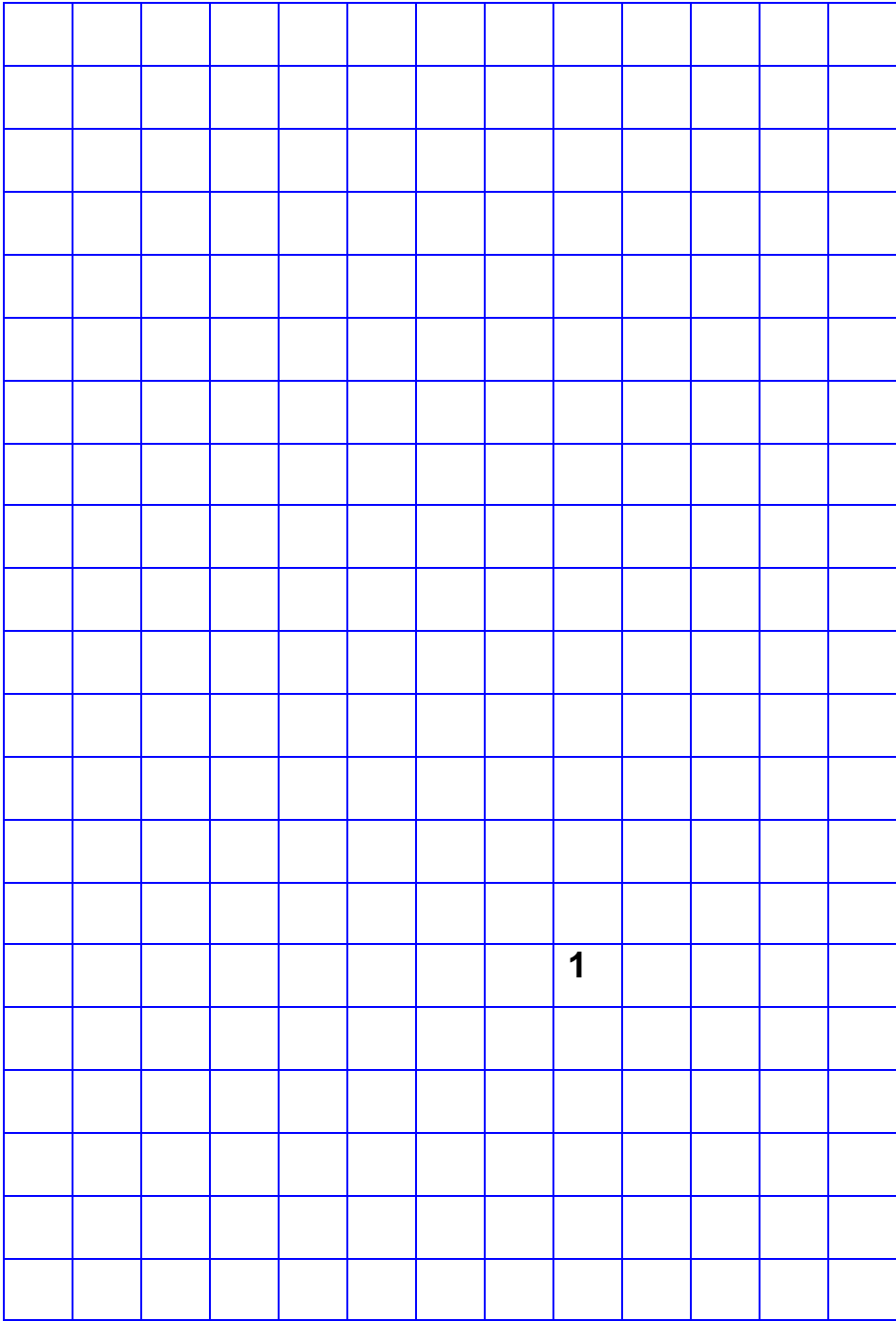
Do you see a pattern in the way the seeds are arranged? A pinecone, pineapple, and snail shell have this pattern, too. So do lots of other plants and animals. This is called the **Fibonacci Spiral**. (For more information about Leonardo Fibonacci, read “Thank You Leonardo Fibonacci!” and “Fibonacci and the Golden Number” found at www.missmaggie.org)

The Fibonacci Spiral is based upon the Fibonacci numbers. These numbers are 1, 1, 2, 3, 5, 8, 13, ... As you can see, the pattern in this sequence of numbers is made by adding two numbers to get the next number in the sequence.

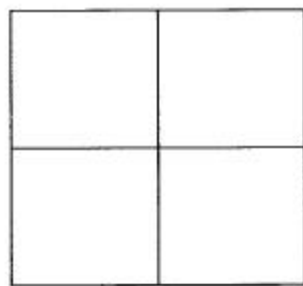
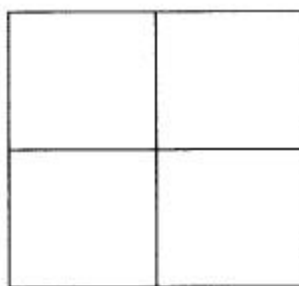
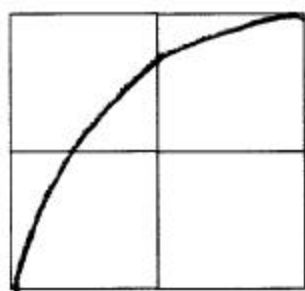
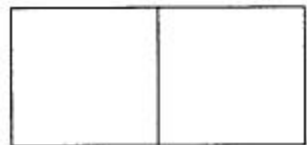
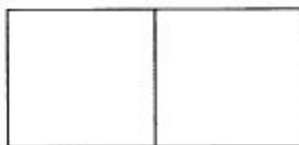
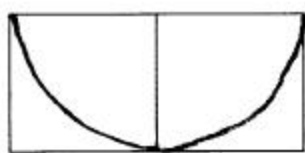
We can use these numbers to create this spiral that is so common in nature. Read the directions on the next page to help you draw squares on the graph paper. If you follow each step carefully, you will make a Fibonacci spiral!

1. Look at the graph paper. The first number in the Fibonacci sequence, 1, has been drawn for you.
2. Go to the square to the right of the 1. Outline that little square to represent the next number in the pattern, another 1!
3. Use the line above the two 1 squares to outline a square that is 2 little squares long and 2 little squares high. This represents the next number in the sequence – 2.
4. Now move to the right of the 1 and 2 squares. Use the right side of the 2 square and the right side of the second 1 square to draw a square that is 3 little squares high and 3 little squares long. 3 is the next number in Fibonacci's pattern!
5. Use the bottom of both 1 squares and the bottom of the 3 square to make the next number in the pattern – a big square that is 5 little squares long and five little squares high.
6. Move to the left of the 2 square, the 1 square, and the 5 square. Use their left edges to make the 8 square.
7. Finally use the top of the 8 square along with the top of the 2 and 3 square to make a 13 square.

If you followed directions, you will have used the entire graph paper to make Fibonacci's Rectangle!



The next step is to draw Fibonacci's spiral. All you have to do is connect one corner of each square with the opposite corner of that square with a sweeping curve. You may need to practice a few times to get it right. Here are some squares for practice.



Now, you are ready to draw Fibonacci's Spiral. Go back to the page where you drew your Fibonacci Rectangle. Put your pencil in the upper right corner of the first 1 square that YOU drew. Touch it to the opposite corner and keep sweeping around!

Compare what you've made to patterns in nature – you are sure to spot this spiral in many unexpected places! Keep a list of animals and plants that have this spiral. Send it to us at Kathy@missmaggie.org. Let's see how many things we can find!

Here is what your completed paper will look like:

