Name: _____

Fibonacci Sequence and Fractal Spirals

1. First, we're going to figure out the Fibonacci sequence. Fill out the blanks below:

$0 + 1 =$ __1__

$1 +$ __1__ $=$ __2__

__1__ $+$ __2__ $=$ __3__

__2__ $+$ __3__ $=$ __5__

__3__ $+$ __5__ $=$ __8__

__5__ $+$ __8__ $=$ __13__

__8__ $+$ __13__ $=$ __21__

__13__ $+$ __21__ $=$ __34__

2. List each number after the equal sign: 1 2 __3__ __5__ __8__ __13__ __21__ __34__

3. Let's do some graphing to see more about how this pattern makes a spiral!

On the graph paper at the end of this handout, there is square that is 1 x 1.

a. What's the first number of the Fibonacci sequence? __1__
Right **above** the square that is drawn, draw another 1 x 1 square.

b. What's the second number in the Fibonacci sequence? __2__
Directly to the **left** of the two existing squares, draw in a 2 x 2 square.

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c. What's the next number in the Fibonacci sequence? __3__
Right **below** your existing squares, draw a 3 x 3 square. __5__

d. What's the next number in the Fibonacci sequence? _____
To the **right** of all that you've drawn, draw a 5 x 5 square.

e. What's the next number in the Fibonacci sequence? __8__
Above all that you've drawn, draw an 8 x 8 square.

f. What's the next number? __13__
To the **left** of all that you've drawn, draw a 13 x 13 square.

g. What's the next number? __21__
Below all that you've drawn, draw a 21 x 21 square.

... To the right of that would be the next square, but we've run out of room.

4. Now let's see how we can make a pattern out of these squares.

In the original square, draw a line from the bottom left to the top right.
On the next 1 x 1 square, continue that line across your square, from the bottom right to the top left.
Cross the 2 x 2 square from the top right to bottom left. Cross the 3 x 3 square from the top left to bottom right. Cross the 5 x 5 square from bottom left to top right. Cross the 8 x 8 square from bottom right to top left. Continue the line across the 13 x 13 square and the 21 x 21 square, wrapping up with a line that would go through the 34 x 34 square.

5. What pattern do you get? spiral

6. Where do we find spirals naturally?
Snails, flowers, tornadoes, hurricanes, pine cones, froccoli, pineapple
↓brocoli
Romanesco

7. Count the number of things that make up a spiral on a pineapple or a pine cone or the number of petals on a flower or number of spirals on a froccoli or seeds of a sunflower.

They all occur in Fibonacci numbers! Nature is full of mathematical patterns! Amazing, huh? See what other cool patterns you can figure out in nature.

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