Activity
– *Fibonacci Spiral* –

Step 1: Introduction

Look closely at the following image:

It is a pine cone. We notice that the scales of the pine cone form a spiral shape. If we count the number of spirals (as done on the image), we find that there are 8 clockwise spirals and 13 counterclockwise spirals.

Try to find a pine cone or a pineapple. With a marking pen, draw the spirals created by the scales (as done on the drawing). Count how many spirals there are.

## Step 2: The Fibonacci spiral

In this section of the activity, we invite you to draw a particular spiral called the Fibonacci spiral. This spiral is considered to be a "perfect" spiral.
Here are the steps to follow:
1. Take a sheet of paper.
2. Starting approximately in the middle of the sheet, draw two squares that have 1 cm sides. They must be side by side and touching each other.
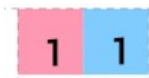
3. Under these two squares, and attached to them, add a square which side is 2 cm.
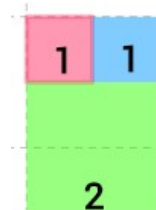
4. Then, on the left, add a square which side is 3 cm. It must touch the previous squares (so, we use the 2 cm and 1 cm sides to make a 3 cm side). Continue that way, drawing a square, which side is 5 cm, above the squares that were already drawn, then always drawing squares that use the previous squares' sides as their sides, going clockwise.

5. Starting from the bottom left corner of the first square you drew (the one with a 1 cm side, the farthest to the left), draw a quarter of a circle up to the upper right corner of the same square.

6. In the second square (the other one with 1 cm sides), also draw a quarter of a circle. This time, begin where you ended at step 5.
7. Continue that way: join the squares' corners with arcs of circle in the same order than you drew the squares. Here is what you should get:
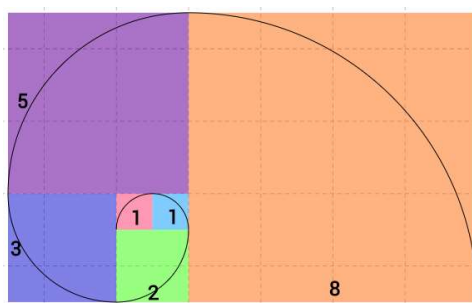
It is the *Fibonacci spiral*.

An example of the drawing described here can be found in the "Fibonacci Spiral" Geogebra document available on the Internet via this link: https://www.geogebra.org/m/XnUkTse6. By moving the cursor[1], you can see the process step by step.

Step 3: The Fibonacci sequence

Here is the beginning of the Fibonacci sequence: 1, 1, 2, 3, 5, 8, 13, 21,…

Do you notice something?
Each Fibonacci number is the result of the addition of the two previous numbers.

Do you understand the link with the drawing you made during step 2?
In the drawing, adding together the sides of two squares gives the side of the next square. *So, the squares all have Fibonacci numbers as their side measurement.*

Why is it an interesting sequence?
The Fibonacci numbers can be found, among others, in nature. Look carefully at the pine cone in step 1. What do you notice? That's right! The number of spirals, in either directions, is part of the Fibonacci sequence!

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[1] The cursor is at the bottom of the Geogebra page. It is shaped like a dot that we can move along a line. By moving that dot, we change the value of "a" and that progressively forms the drawing.