| | **Grade / Age:** 10 – 14 ages |
|---|---|
| STEAM BOX | **Topic:** mathematics, biology, STEAM |
| | **Subject area:** Geometry |
| | **Keywords:** Fibonacci – number, Fibonacci - spiral |
| | **Single/ team work:** both |
| | **Language:** (English or Local) English |
| | **Duration:** 2 hours |

**Description of the Task:**

Collect different parts of plants, e.g. pine cones, sunflower plates, pagoda cauliflower, cactus, pineapple. We are now interested in plants with a spiral twisting in two directions.
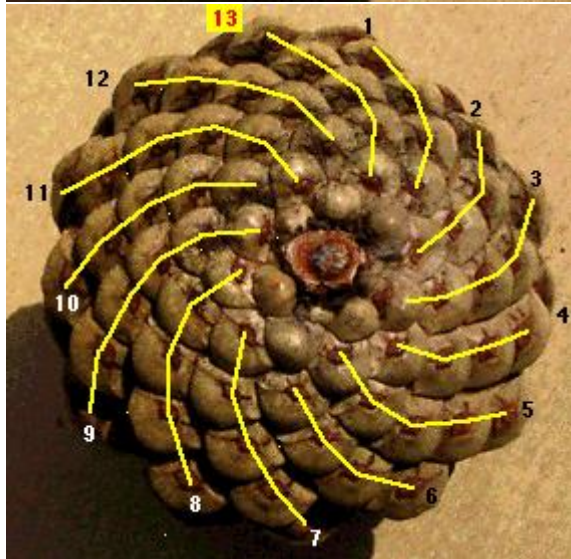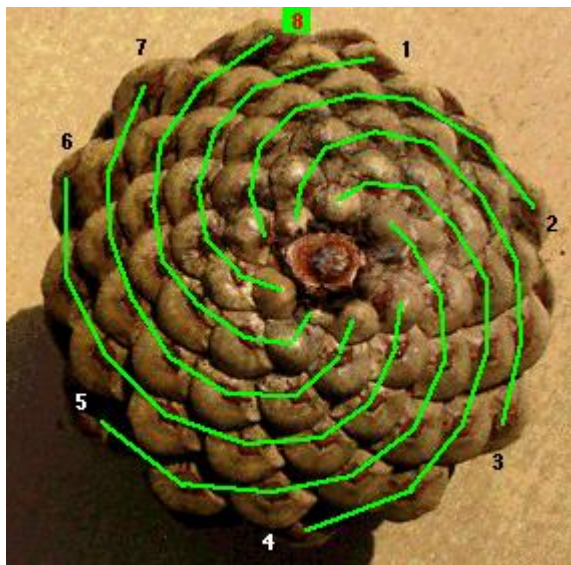


Count the number of spiral lines to the right and to the left.

Collect flowers. Count their petals. Record both the number of spiral arms and the number of petals. What do we notice?

The series beginning with 1, 1, 2, 3, 5, 8, 13, 21, ... is called the Fibonacci series. How can we continue? What is the rule? Do the recorded petal numbers and spiral arm numbers fit into the Fibonacci numbers?

Do an Internet search to find out whose name is associated with the Fibonacci series? What was the original illustration of the series?

Fibonacci numbers can be used to construct beautiful spirals using squares and quarter circles.

The illustration shows a gingerbread cookie baked for Christmas, on which we have made a spiral using egg white.
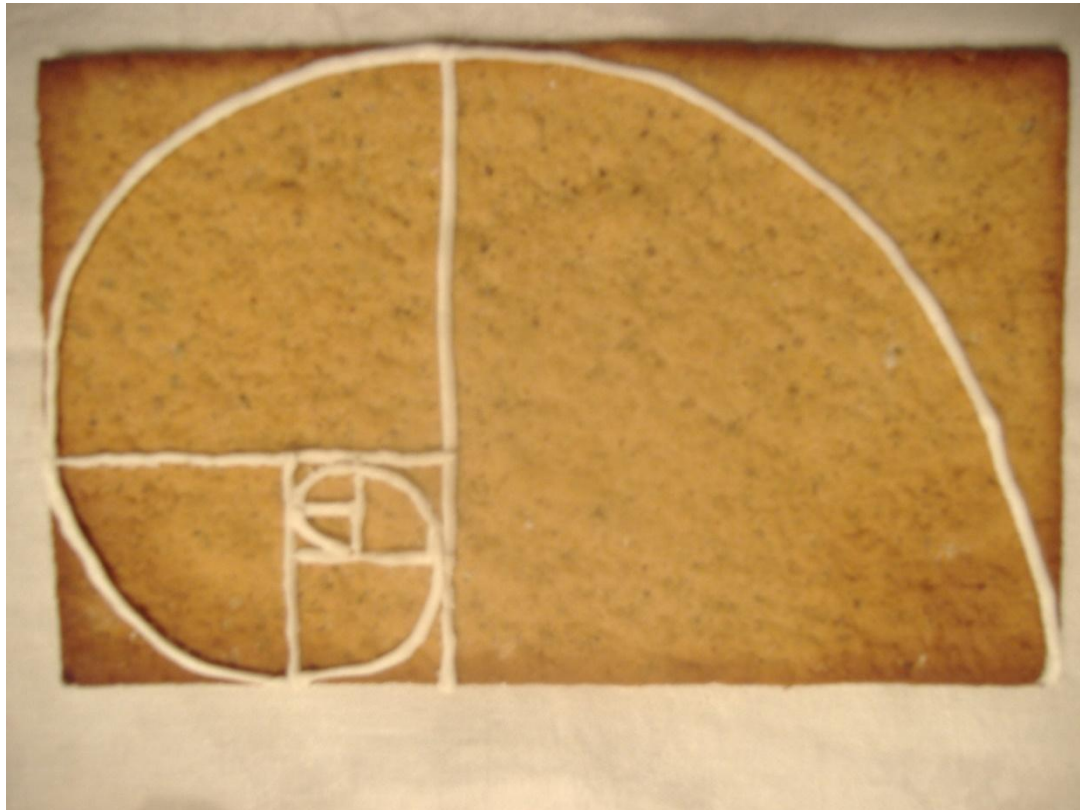


Do the editing on paper with a pair of compasses, then also in GeoGebra.

Of course, if you want, you can also do it on gingerbread 😊

Let's collect spirals from nature, art, objects of our use on the Internet. Not all spirals are Fibonacci spirals. Group the spirals you collected. Which one is similar to the Fibonacci spiral, which one is essentially different?

**Solutions of the Task:**

Projection of the images collected, Internet searches explained by the students of course.

Fibonacci sequences are those sequences where the first two members are given (both 1), then each member is the sum of the two members before it. Formula: $f_1=f_2=1$ and $f_n=f_{n-1}+f_{n-2}$.

Editing in GeoGebra:
https://www.geogebra.org/classic/tbyxnuwy

How can we use the properties of the Fibonacci series to solve the following problems?

How many ways can 10 $ be paid with 1 and 2 $ coins, taking into account the order of the coins?

How many ways are there to get to the top of a 20-step staircase, given that you can go up one or two steps at a time?

How many ways are there to cover a 2x15 table with 2x1 dominoes? (The dominoes do not overlap and do not hang out of the table.)

Make a chain of red and blue marbles with a length of ten marbles. How many ways can we do this if we don't want blue balls next to each other?

How many ways can you seat boys and girls on a bench with n seats so that a girl cannot sit next to a girl?

The Eden Project in Cornwall is also worth a look:
https://www.edenproject.com/

**Prior knowledge:**
square, circle editing

**Comments:**


**Connection to other subjects/topics/areas:**
biology, technology, IT