

Div 2 – Elective GeoGebra, Art & Math

FIBONACCI SPIRAL – part 1

Period 1 (paper and pencil)

Use graph paper to make a Fibonacci spiral using pencil and compass.

Materials:

- print grid 1 cm (3 copies each student)
- compass
- markers / pencils

Period 2 (GeoGebra)

Step one: create a new ggb tool

Step two: create a Fibonacci spiral

adapted from:

https://www3.risc.jku.at/conferences/cadgme2009/Judith_Hohenwarter/presentation_files/GeoGebra_WS_7.pdf

Homework creative paper work

FIBONACCI SPIRAL – part2

- How to *Review Steps of Construction*
- Create a check box
- Use the slider
- Create a Fibonacci animated (beating) heart

Creating a Square Tool

Preparations

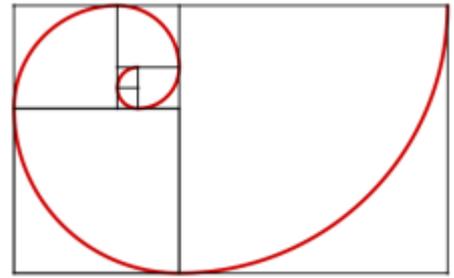
- Open a new GeoGebra classic
- Hide the algebra window, input field, and coordinate axes
- Change the labeling setting to All new objects

Step by step

1		Segment a with endpoints AB
2		Perpendicular line b to segment AB through point B
3		Circle c with center B through point A
4		Intersect circle c and perpendicular line b to get intersection point C
5		Parallel line d to perpendicular line b through point A
6		Parallel line e to segment a through point C
7		Intersect lines d and e to get intersection point D
8		Square $ABCD$
9		Hide auxiliary objects (lines and circle).
10		Hide labels of all objects.
11		Set the square's color to black and set the filling to 0%.
12		Create your square tool (menu <i>Tools – Create new tool...</i>). <u>Output objects</u> : square, sides of the square, points C and D <u>Input objects</u> : points A and B <u>Name</u> : Square <u>Toolbar help</u> : Click on two points
13		Save your square tool as file <i>Square_Tool.ggt</i> <u>Hint</u> : Menu <i>Tools – Manage tools... – Save as...</i>

Creating a Fibonacci Spiral

A Fibonacci spiral can be created by drawing arcs connecting the opposite corners of squares in the Fibonacci tiling which uses squares of sizes 1, 1, 2, 3, 5, 8, 13, 21,...



Preparations

- Show the grid

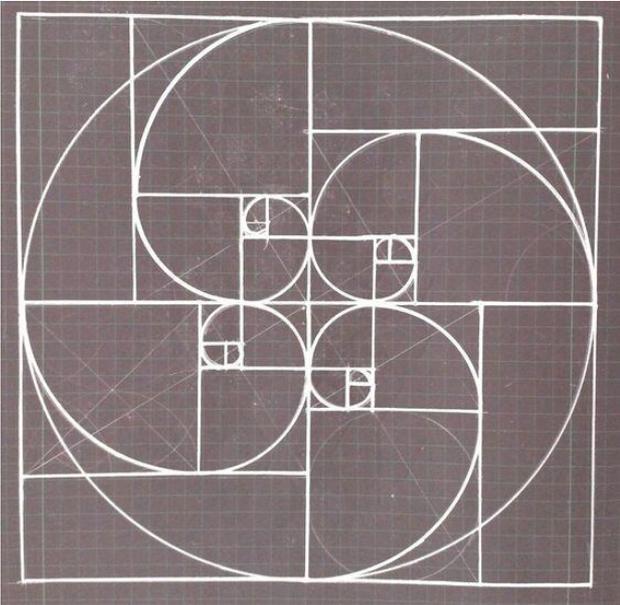
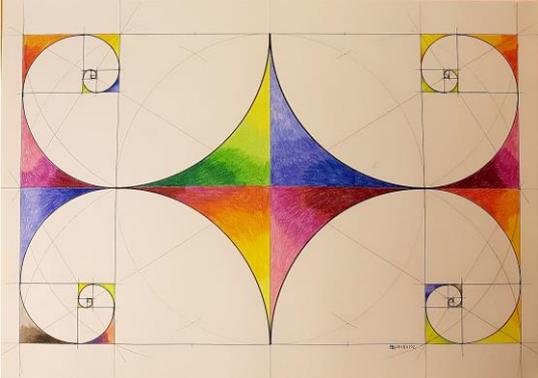
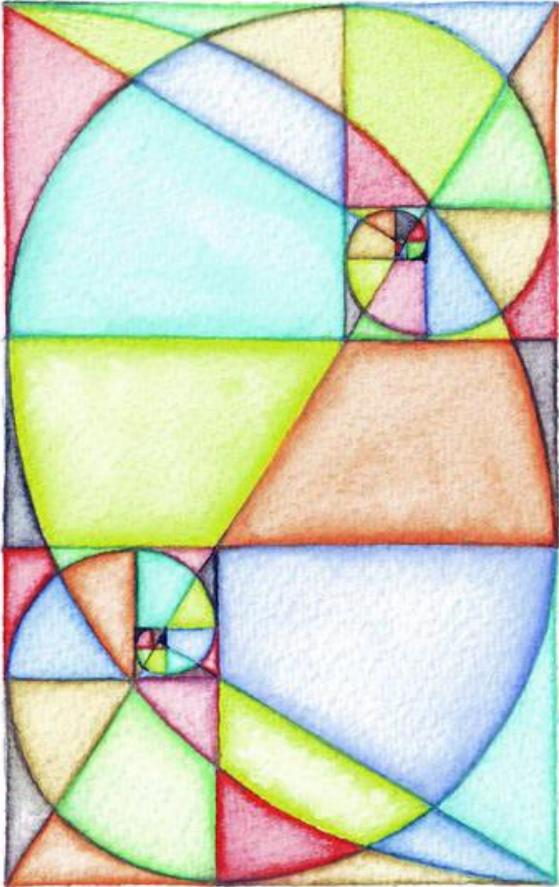
Instructions

1		Use your Square tool to create a square with side length 1 <u>Hint:</u> Place the two points on grid points that are next to each other.
2		Create a second square with side length 1 below the first square. <u>Hint:</u> Use already existing points to connect both squares.
3		Create a third square with side length 2 on the right hand side of the two smaller squares.
4		Continue creating squares with side lengths 3, 5, 8, and 13 in counter clockwise direction.
5		Create a circular arc within the first square you created. <u>Hint:</u> Specify the lower right vertex of the square as the center of the arc. Select two opposite vertices of the square in counter clockwise orientation.
6		Repeat step 5 for each of the squares in order to construct the Fibonacci spiral.
7		Enhance your construction using the <i>Properties dialog</i> .

Homework:

Colored paper with a spiral printed to take home for a colage. Send email to parents.

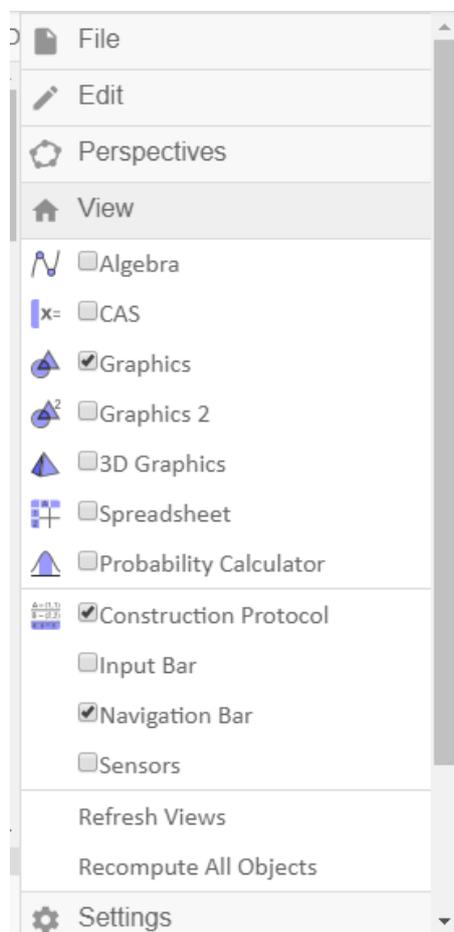
Some ideas to inspire



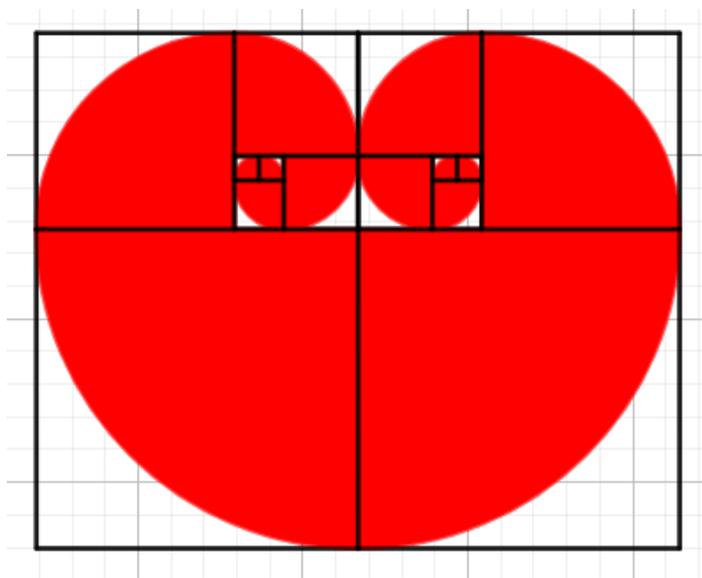
FIBONACCI SPIRAL – part2

Show:

- How to *Review Steps of Construction*
- Create a check box
- Use the slider



Creating a Fibonacci Beating Heart



Step by step:

1	Open your ggb file in which you created a square tool
2	Save it with a different name. Example: Marina Fibonacci heart
3	Delete the entire construction
4	Create a slider
	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 5px; width: 45%;"> <p>Slider</p> <p>Name a = 1</p> <p><input checked="" type="radio"/> Number <input type="radio"/> Angle <input type="radio"/> Integer</p> <p>Interval Slider Animation</p> <p>Min: 0.5 Max: 2 Increment: 0.5</p> <p style="text-align: right;">OK Cancel</p> </div> <div style="border: 1px solid black; padding: 5px; width: 45%;"> <p>Slider</p> <p>Name a = 1</p> <p><input checked="" type="radio"/> Number <input type="radio"/> Angle <input type="radio"/> Integer</p> <p>Interval Slider Animation</p> <p>Speed: 5</p> <p>Repeat: ⇌ Oscillating</p> <p style="text-align: right;">OK Cancel</p> </div> </div>
5	Create a segment with a given length
6	Select the two points as your input for your square tool
7	Keep working on your spiral as you did before
8	Once your spiral is finished, you can color it, rotate and reflect to complete the heart