



Geometry of flowers

SEQUENCE 1

Age group	6-9 y.o.
Prior knowledge	None
Material needed	White paper, pencils. Images of flowers whose number of petals matches the Fibonacci sequence.
Subjects	Fibonacci numbers
Skills involved	- Simple addition operations. - Identify images of flowers who have a Fibonacci numbers of petals.
Time to carry out the sequence	1 hour

Step 1. Introduction

For a short introduction to the subject, you can claim, as many school children, that mathematics is a hard and useless science. Today, we will prove that flowers are pure geometry and Universe has a mathematical code.

Step 2: Initial concepts

If the subject has not yet been discussed with the pupils, it might be interesting to gather their initial ideas by asking them questions like:

1) Are flowers geometric? Look at some flowers.

Flowers, and nature in general, exhibit mathematical patterns in various ways.



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Once you start noticing the patterns, you can pick them out in nearly every species.

2) Who was Fibonacci?

Fibonacci (1170–1240), also known as Leonardo of Pisa, was an Italian mathematician who is considered to be "the most talented Western mathematician of the Middle Ages."

3) Why is Fibonacci so famous.

Fibonacci is known in the maths world for his Fibonacci numbers. He got the idea for this from the Hindu Arabic number system and introduced this number system to the Western world.

Step 3: Discovering the content of the box

This step aims at having pupils look at the box content: the material and the notice. Children should have enough time to discover and familiarise themselves with the box.

In the box, the children will discover:

- tools for writing and calculating Fibonacci numbers;
- images of flowers that have a Fibonacci number of petals.

Step 4: "Build" the Fibonacci Sequences

The materials in the box will help the children calculate Fibonacci numbers and associate them with images of flowers with a Fibonacci number of petals.

The first kid will write number 0 and 1.

Every next student writes the number equal to the sum of the preceding two numbers.



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$$0 + 1 = 1$$

$$1 + 1 = 2$$

$$1 + 2 = 3$$

$$2 + 3 = 5$$

$$3 + 5 = 8$$

$$5 + 8 = 13$$

$$8 + 13 = 21$$

$$13 + 21 = 34$$

$$21 + 34 = 55 \dots$$

Try to associate Fibonacci numbers with images of flowers which have a Fibonacci number of petals using what they have learned from the box..

*Conclusion:

The Fibonacci numbers are: 1, 1, 2, 3, 5, 8, 13, 21, 34, 55...

Step 5: Extension/reinvestment

1. Nature Detective

Here's a great outdoor activity for discovering the Fibonacci sequence in nature. Kids can explore their backyard or nearby parks to search for magical numbers by counting petals on flowers or searching for a snail! Have fun discovering how the sequence appears in nature.

Disclaimer: The children should not pick every flower they see and must leave the snails where they are. If they want, they can take a photo to show in class.



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2. Fibonacci Poetry

Students will combine creative writing and math to create awesome poems that use the Fibonacci sequence to determine the number of words (or syllables) contained in each line.

Example with words:

One (1)

Petal (1)

One flower (2)

One red flower (3)

One red flower with petals (5)



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SEQUENCE 2

Age group	9-12 y.o.
Prior knowledge	Concepts of squares and circles
Material needed	Math worksheet, ruler, compass, coloured pencils, image of The spiral arms of galaxies, the image of ram horn, the image of Nautilus, the image of shells, the image of snail shell
Subjects	Fibonacci spiral Geometry of the Universe
Skills involved	- calculate the perimeter and area of a square -calculate the area and circumferences of the circle
Time to carry out the sequence	1 hour

Step 1: Research

Ask the students to identify the squares of paper with different sizes and how to draw $\frac{1}{4}$ circles in each of the squares using the compass (based on their knowledge or by trying to guess). If they have no ideas, do a little research. This is also an excellent time to learn how to do a good internet search (use keywords, search engines, and trust a source).

Step 2: Discover the box

Give the students time to observe the different parts of the box and ask them what they think can be done with the material.

Step 3: Formalisation

Using the materials in the box, the children will draw the Fibonacci spiral, as specified



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in “How to create your elements”.

Step4. Calculate

For an accurate mathematical conclusion, every child who draws the squares and the $\frac{1}{4}$ circle with the compass can colour it and calculate the perimeter and area.

Perimeter of a square: $P=4 \times l$

Area of a square: $A= l \times l$

Every child who draws the $\frac{1}{4}$ circle with the compass can colour it and calculate its circumference and area

Area of a circle: $A= \pi r^2 \cdot (\pi \times r \times r)$

Circumference of a circle: $2 \times \pi \times r$

After finding the area and circumference of the circle, students can calculate the area and circumference of the drawn quarter circle.

Teachers can ask to calculate the sum of perimeters and areas.

Step 4: Extension/reinvestment

1. Spirals in nature and the universe

Using transparent paper (the delicate paper you can see through) and markers, you can draw the spiral associated with the Fibonacci sequence.

From this sequence, you can start to overlap the spiral associated with the Fibonacci sequence with:

- the image of The spiral arms of galaxies



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- the image of Aram's horn
- the image of Nautilus
- the image of shells
- the image of a snail shell



2. Painting Pinecones

This is the perfect project to learn math through art. Students learn about the Fibonacci sequence spirals in art and nature by painting spirals on a pinecone. Give students some paint and have them paint along the spirals on a pinecone.

3. Fibonacci Spiral Art

When students apply mathematics to art, beautiful art is created. Students will use a compass to create circles based on the Fibonacci number sequence. They will create many different-sized circles on coloured construction paper and then cut them out. Once the circles are cut out, students can arrange them in artistic patterns.



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