

The background features a dark blue gradient with a starry space pattern. On the left side, there are several technical diagrams, including circular gauges with numerical scales (140, 150, 160, 170, 180, 190, 200, 210, 220, 230, 240, 250, 260) and various circular arrows indicating movement or rotation. The main title is centered on the right side.

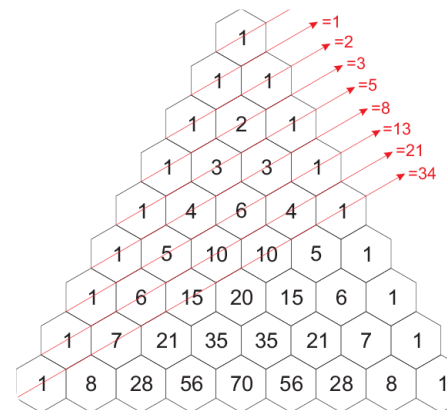
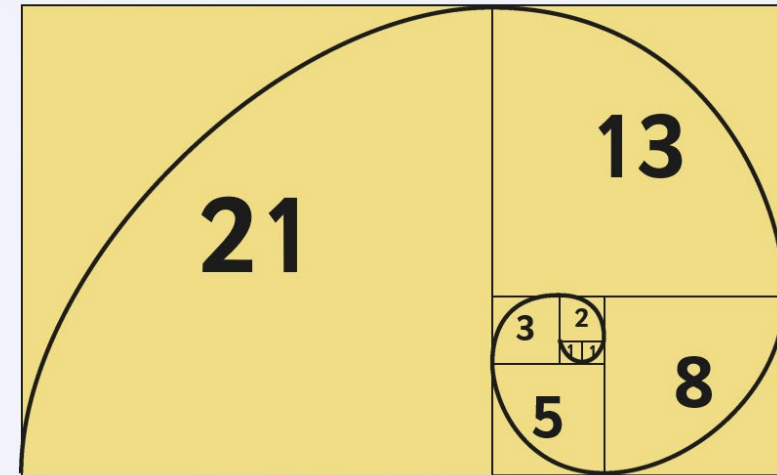
FIBONACCI RESEARCH TASK

BY NAWAT

WHAT IS THE FIBONACCI SEQUENCE?

In mathematics, the well-known Fibonacci sequence, or Fibonacci numbers, is the sequence of numbers named after Italian Mathematician, Leonardo Fibonacci in which each number in the sequence is equal to the sum of two numbers before it. For example, the first set of numbers in the sequence is, 0, 1, 1, 2, 3, 5, 8, 13, and 21, and so on, this will continue infinitely.

Fibonacci Spirals



The Fibonacci Sequence

1,1,2,3,5,8,13,21,34,55,89,144,233,377...

1+1=2	13+21=34
1+2=3	21+34=55
2+3=5	34+55=89
3+5=8	55+89=144
5+8=13	89+144=233
8+13=21	144+233=377

WHO IS FIBONACCI?

Leonardo Fibonacci, or Leonardo Bonacci, or Leonardo Bigollo Pisano was an Italian mathematician known for his mathematical discoveries, specifically the Fibonacci sequence. He was born around 1170 in Pisa, a Tuscan town known for its leaning tower. The name Fibonacci (pronounced fib-on-ach-ee) is short for “Filius Bonacci “ or “son of Bonacci.” He passed away around 1250 in Pisa (modern-day Italy).



WHAT WAS HIS LIFE LIKE?

Little is known about him and his personal life other than his mathematical discoveries. Although he was born in Pisa, Italy, he was educated in North Africa, where his father held a diplomatic post, his job consisted of representing brokers and dealers of the Republic of Pisa who were working in Bugia, now known as Bejaia. Bejaia is a Mediterranean port in the northeastern region of Algeria. The town is located near Mount Gouraya and Cape Carbon where Fibonacci learned about the Hindu-Arabic numerical system and mathematics. Fibonacci ended his travels around 1200 in Pisa, where he wrote many texts relating to mathematics and its significance to the world. Fibonacci lived in the days before printing, so for him to have another copy of his book, he had to handwrite it again. Fortunately, we can have access to 4 of his texts, although, we are aware he wrote other text which weren't recovered.

One might have assumed that during a period when Europe showed little interest in scholarship, Fibonacci would have been overlooked. However, this was not the case. The widespread interest in his work played a significant role in his importance. Although Fibonacci was a contemporary of Jordanus, he was a much more advanced mathematician. His contemporaries recognized his achievements, although it was the practical applications of his work rather than abstract theorems that made him famous.

The exact time, location, and cause of his death isn't pinpointed, but many speculate that he died around 1240 – 1250 in Pisa, shortly after he passed his name disappeared from the pages of the history of mathematics, it wasn't until the late 18th century, approximately 400 years later, where his name resurfaced.



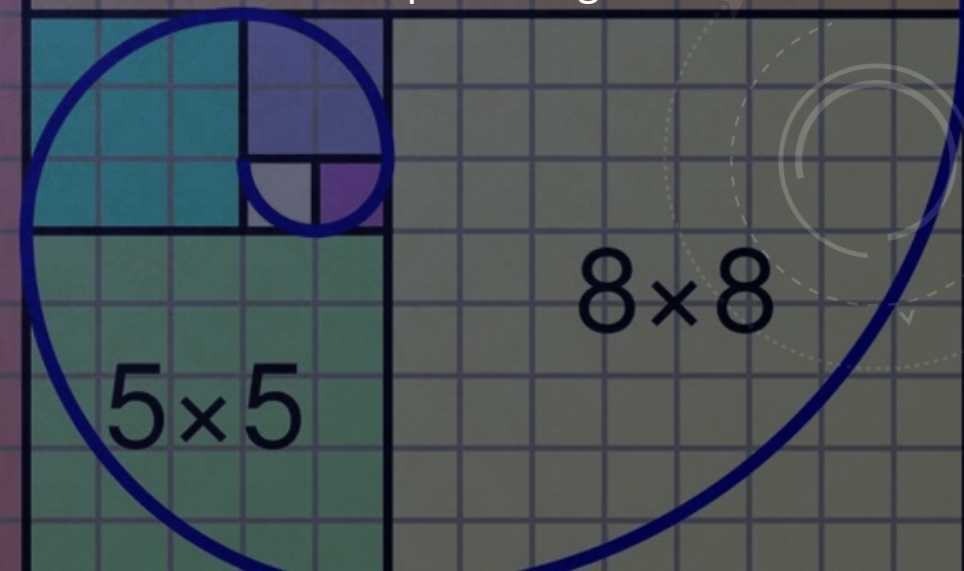
HOW DID FIBONACCI DISCOVER THE FIBONACCI SEQUENCE?

The Fibonacci sequence was introduced to the world in Fibonacci's book which was published in 1202, "Liber Abaci" through a problem he discovered during his travels in the middle-east about rabbit population growth. Fibonacci presented a scenario where each pair of rabbits matures in one month and then reproduces monthly. This led to a sequence where each number is the sum of the two preceding ones.

$$13 \times 13$$

$$5 \times 5$$

$$8 \times 8$$





WHERE DO WE SEE THE FIBONACCI SEQUENCE IN NATURE?

We can see the famous Fibonacci sequence in many forms of nature in our daily lives, some consist of:

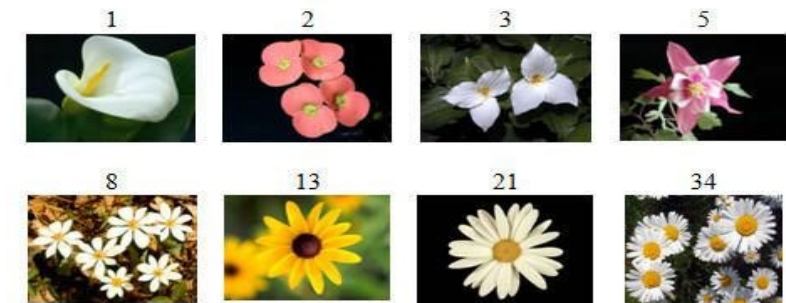
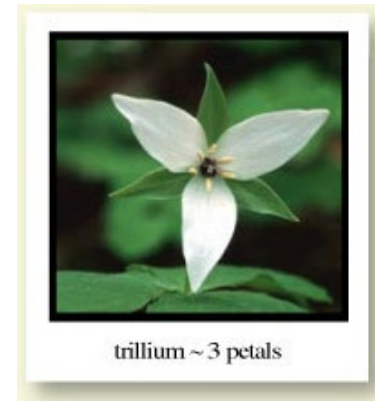
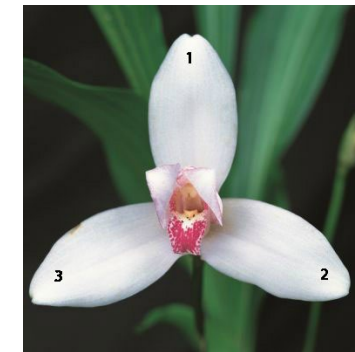
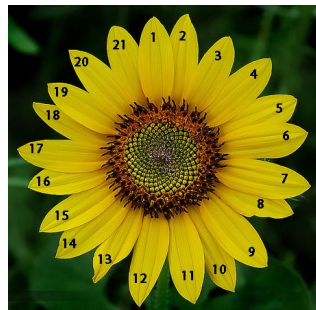
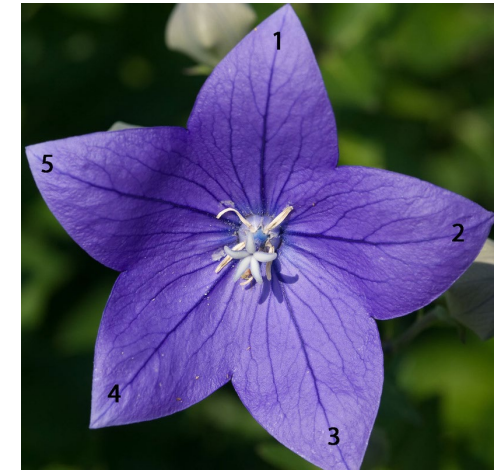
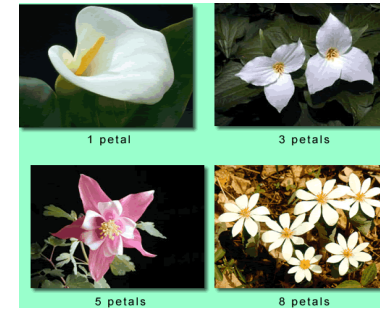
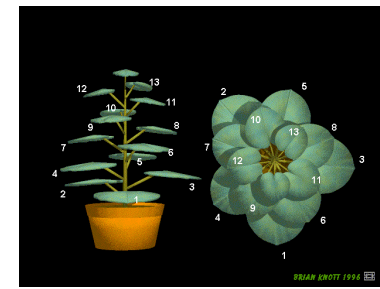
Flower Petals: Flower petals are probably the most common place where we will find the Fibonacci sequence, the number of petals in a flower consistently follow the Fibonacci sequence.

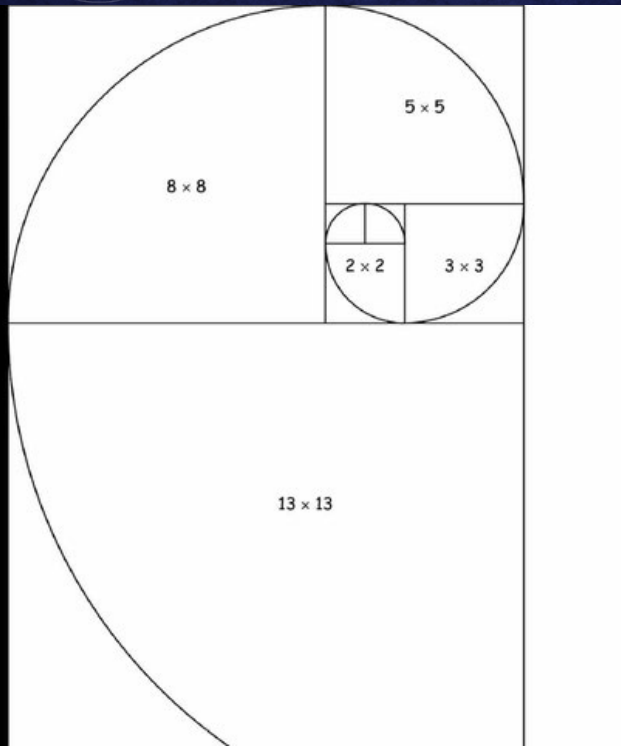
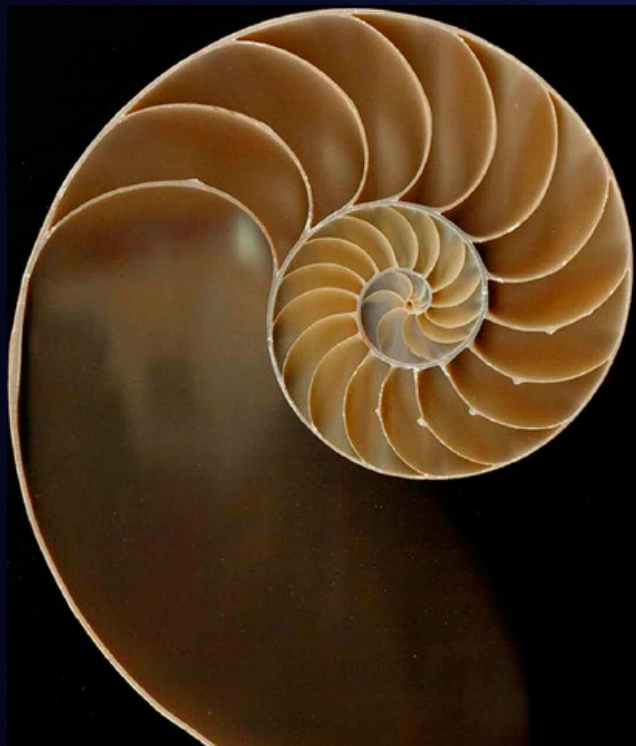
Shells and Spirals: The shells of certain mollusks, such as the nautilus, follow a logarithmic spiral that grows in proportion to the Fibonacci sequence. This pattern allows for the shell to grow without changing shape.

Pinecones and Pineapples: The scales of pinecones and the eyes of pineapples are arranged in spirals that correspond to Fibonacci numbers. If you count the spirals in either direction, you'll often find consecutive Fibonacci numbers.

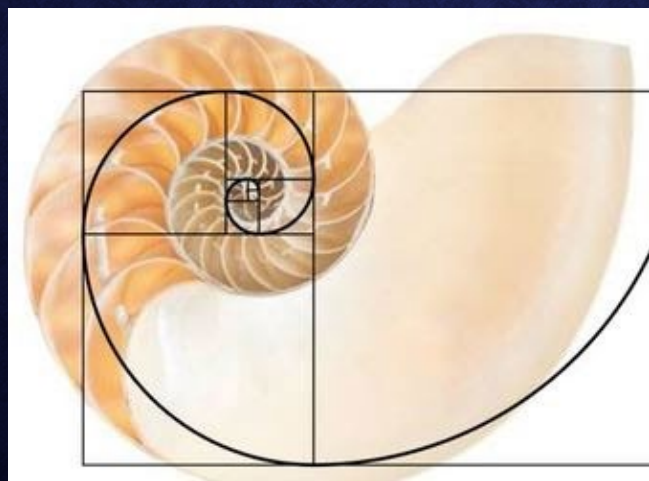
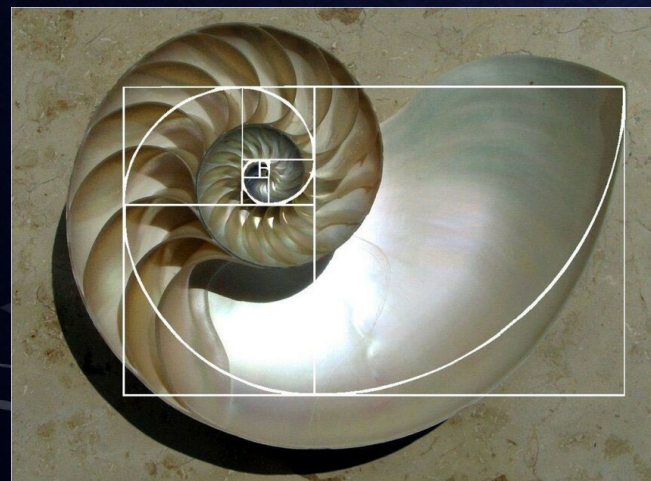
Seed Heads: The arrangement of seeds in flower heads, such as sunflowers, are usually organized in spiral patterns that relate to the Fibonacci sequence. This optimizes the packing of seeds and maximizes exposure to sunlight and other elements.

FIBONACCI SEQUENCE IN FLOWER PEDALS

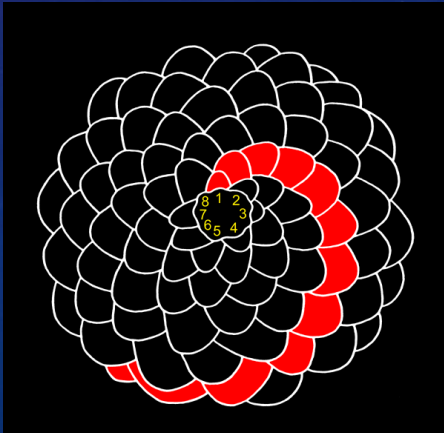
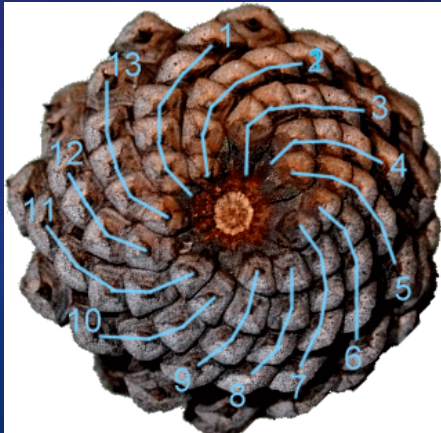
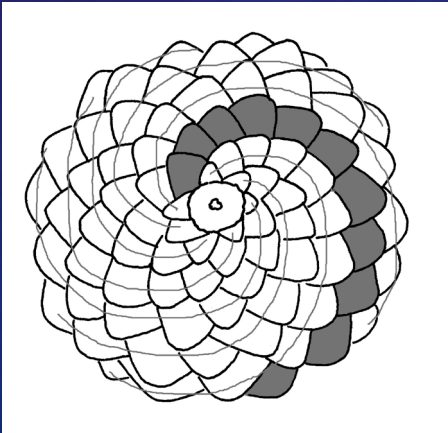
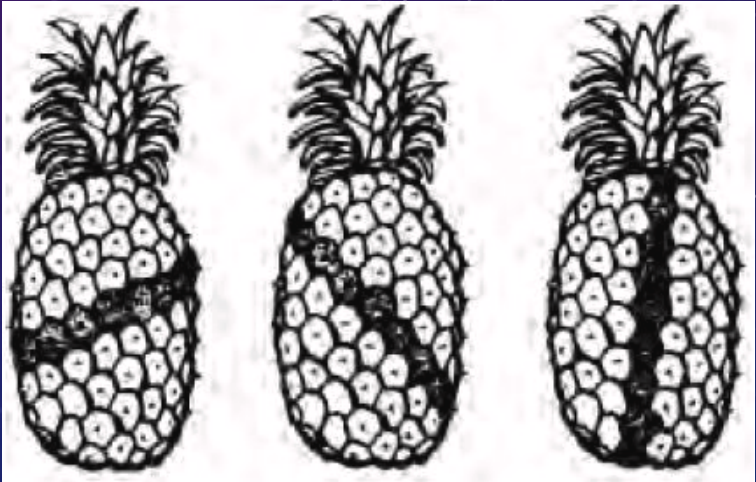
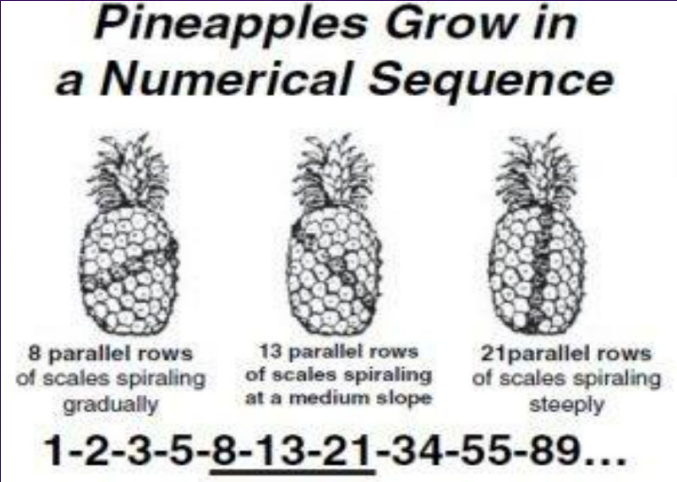




FIBONACCI SEQUENCE IN SHELLS AND SPIRALS



FIBONACCI SEQUENCE IN PINEAPPLES AND PINECONES



FIBONACCI SEQUENCE IN SEED HEADS

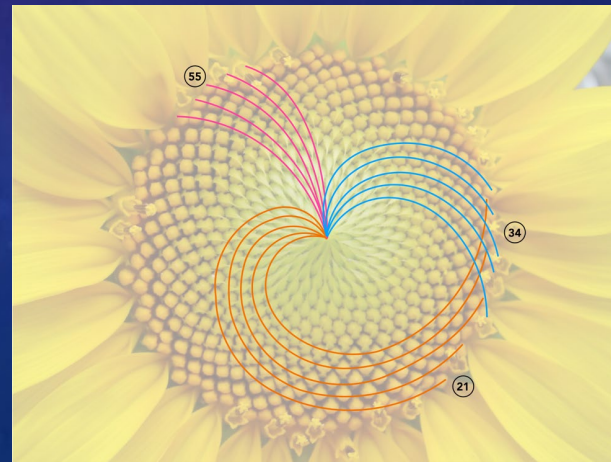
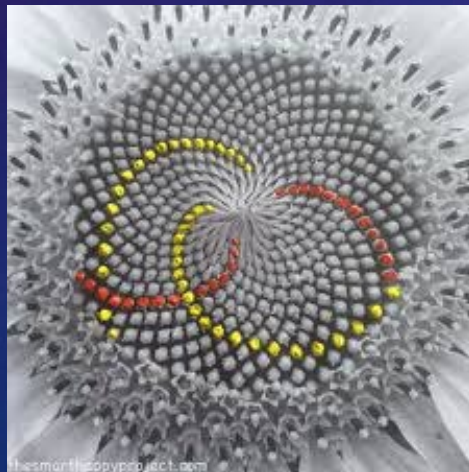
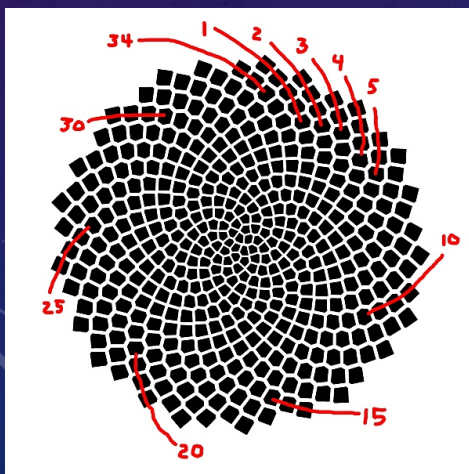
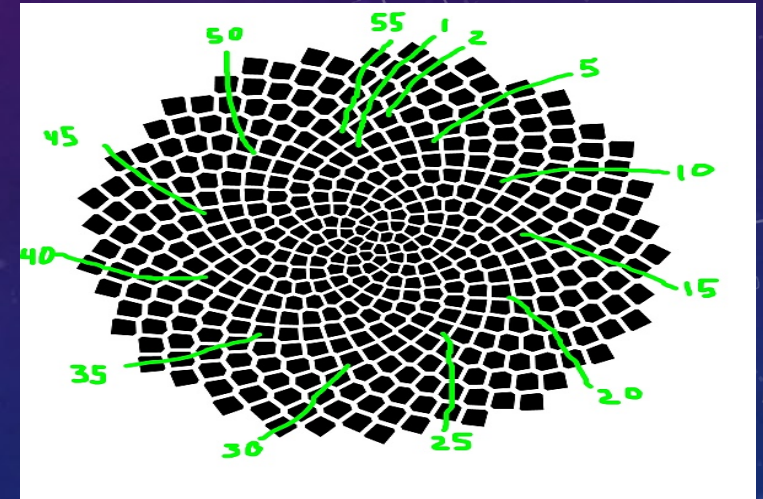
BIOLOGICAL STRATEGY
Sunflowers' Spiral Secret

Each floret grows from the center at a particular angle from the last one. When that angle is the golden angle of $\sim 137.5^\circ$, the flowerhead gets packed most densely and evenly.

Golden Angle -1°
136,508...°

Golden Angle $+1^\circ$
138,508...°

Golden Angle
137,508...°



MORE ABOUT THE FIBONACCI SEQUENCE

- The Fibonacci sequence formula is used to find missing terms in the Fibonacci sequence. The formula is expressed as $F_n = F_{n-1} + F_{n-2}$, applicable when $n > 1$. This means that each term in the sequence is generated by adding the two preceding terms.
- We can see that the first 30 values of the Fibonacci sequence are: 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377, 610, 987, 1597, 2584, 4181, 6765, 10946, 17711, 28657, 46368, 75025, 121393, 196418, 317811, 514229. A noticeable pattern in the sequence is that every 3rd number is an even number.

CONCLUSION

In conclusion, the Fibonacci sequence is a numerical sequence in which each number is the sum of the 2 preceding numbers and was discovered by Leonardo Fibonacci around the 13th century.