MSc Mathematics Part-1
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MATHS IN NATURE.

NATURE IS A INFINITE SPHERE OF WHICH THE CENTER IS EVERYWHERE AND THE CIRCUMFERENCE IS NOWHERE.

We all think math and nature are poles apart and nothing is common between them however there are many things common in between them.

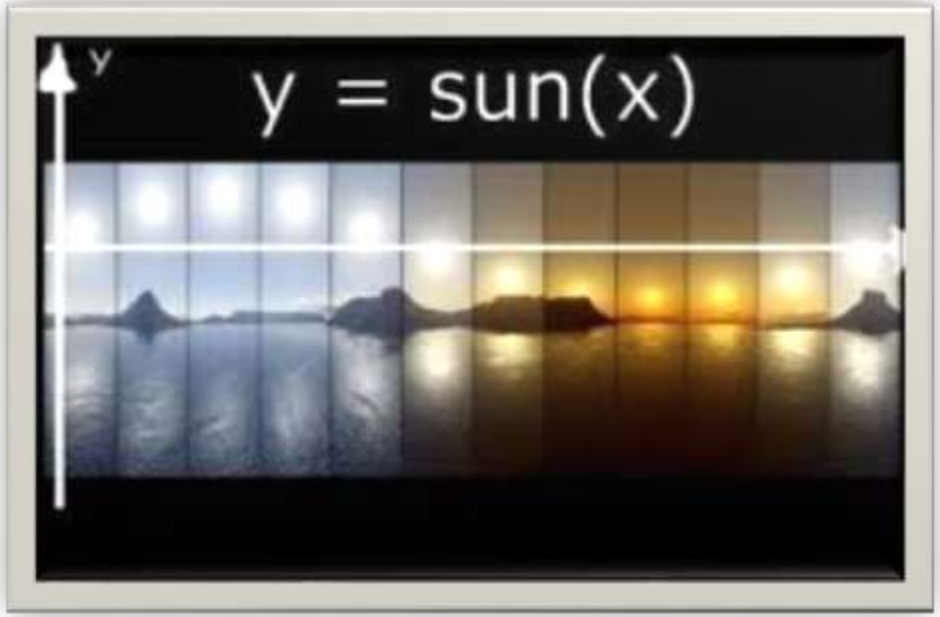
YES!!!

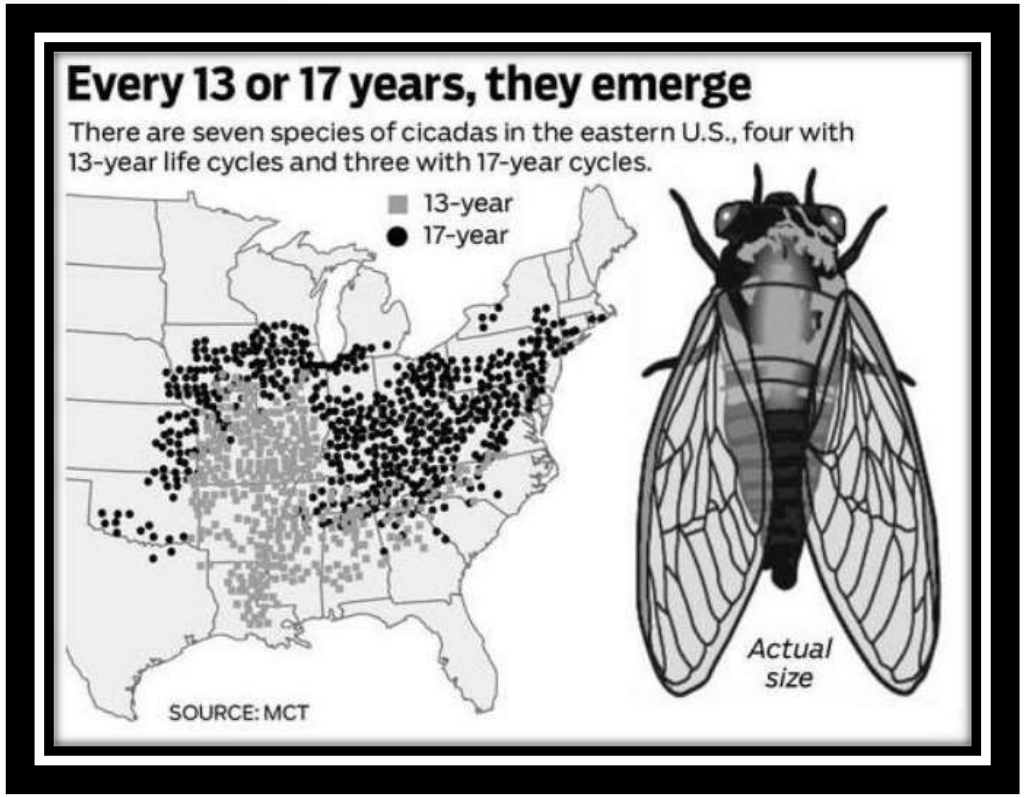
MATHS AND NATURE HAVE A LINK!!!!!!!!!

Mathematics is all around us. As we discover more and more about our environment and our surroundings we see that nature can be described mathematically.

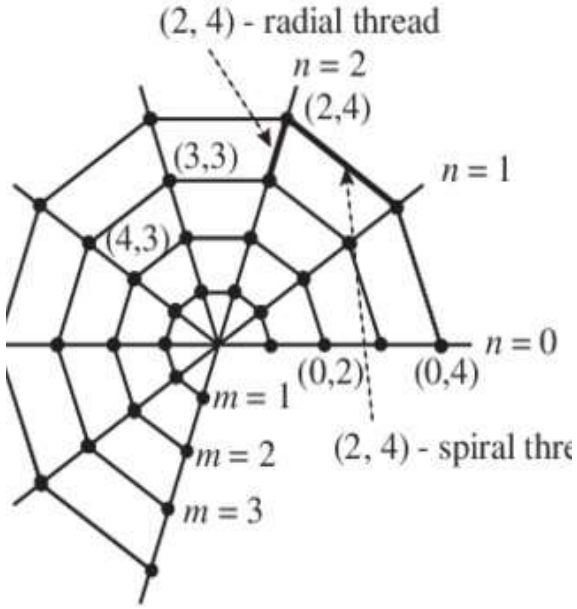
EXAMPLES:

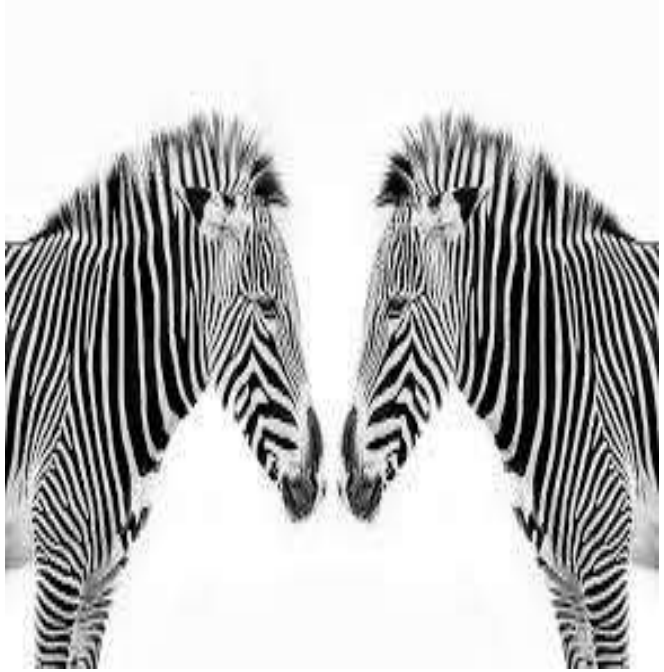
- Rising of the sun from the east and setting in the west is a sine wave.
- Periodic or periodical cicadas are unique in that they have life cycles of either 13 or 17 years 13 and 17 are both prime numbers.Due to which it experiences lesser predator attacks.





- Spider webs illustrate a beautiful geometric pattern. The spider creates this structure by performing simple, innate steps.
- In a zebra's coat the alternating patterns of black and white are due to mathematical rules that govern the pigmentation chemicals of the skin.
- Fishes can count up to four which helps in distinguishing smaller fish and larger fish.





CONCEPTS OF MATHEMATICS IN NATURE.

- GEOMETRICAL SHAPES.
- SYMMETRY.
- FIBONACCI SEQUENCE.
- THE GOLDEN RATIO.
- GEOMETRIC SEQUENCE.
- FRACTALS.

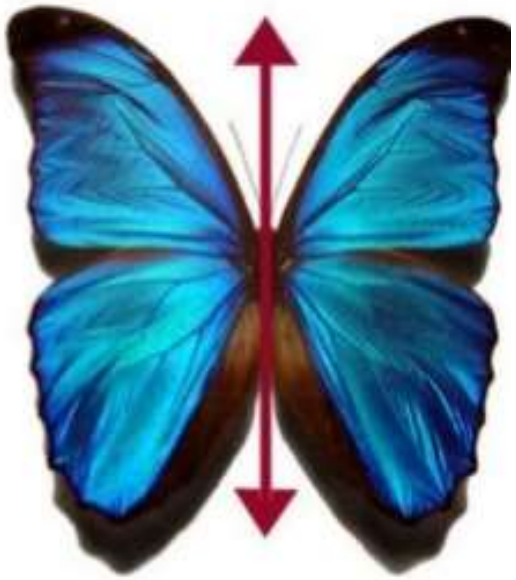
GEOMETRICAL SHAPES.

- Sphere-Earth is the perfect shape for minimizing the pull of gravity on its outer edges. Geometry is the branch of math that describes such shapes.
- Polyhedral-For a beehive, close packing is important to maximize the use of shape. Hexagons fit most closely together without any gaps .
- Cones-Volcanoes form cones, the steepness and height of which depends on the viscosity of lava.

SYMMETRY.

Symmetry is when a figure has two sides which are mirror image of each other..

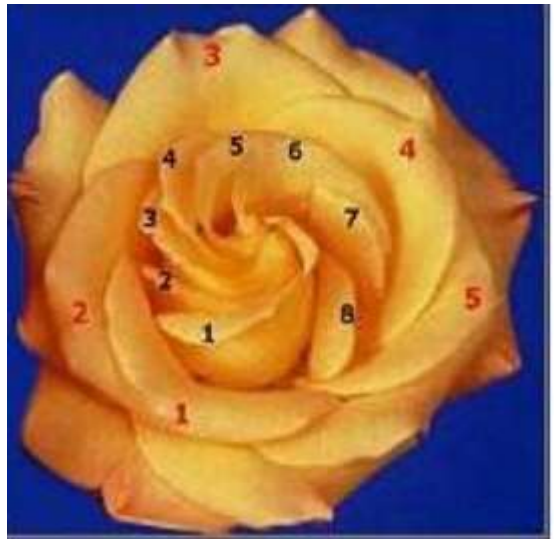
BILATERAL SYMMETRY-IN WHICH AN OBJECT HAS TWO SIDES THAT ARE MIRROR IMAGES OF EACH OTHER.

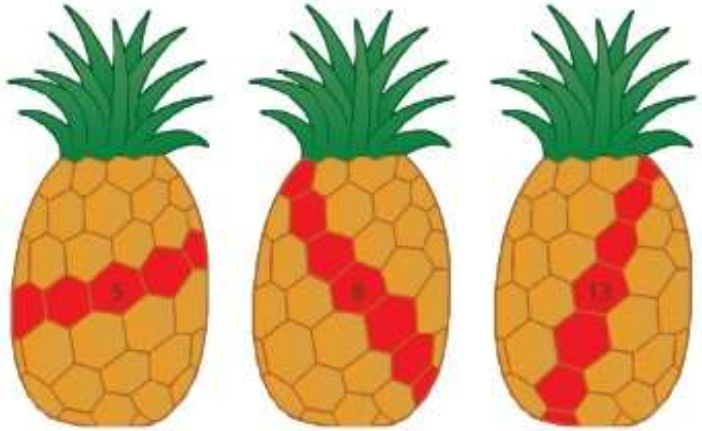


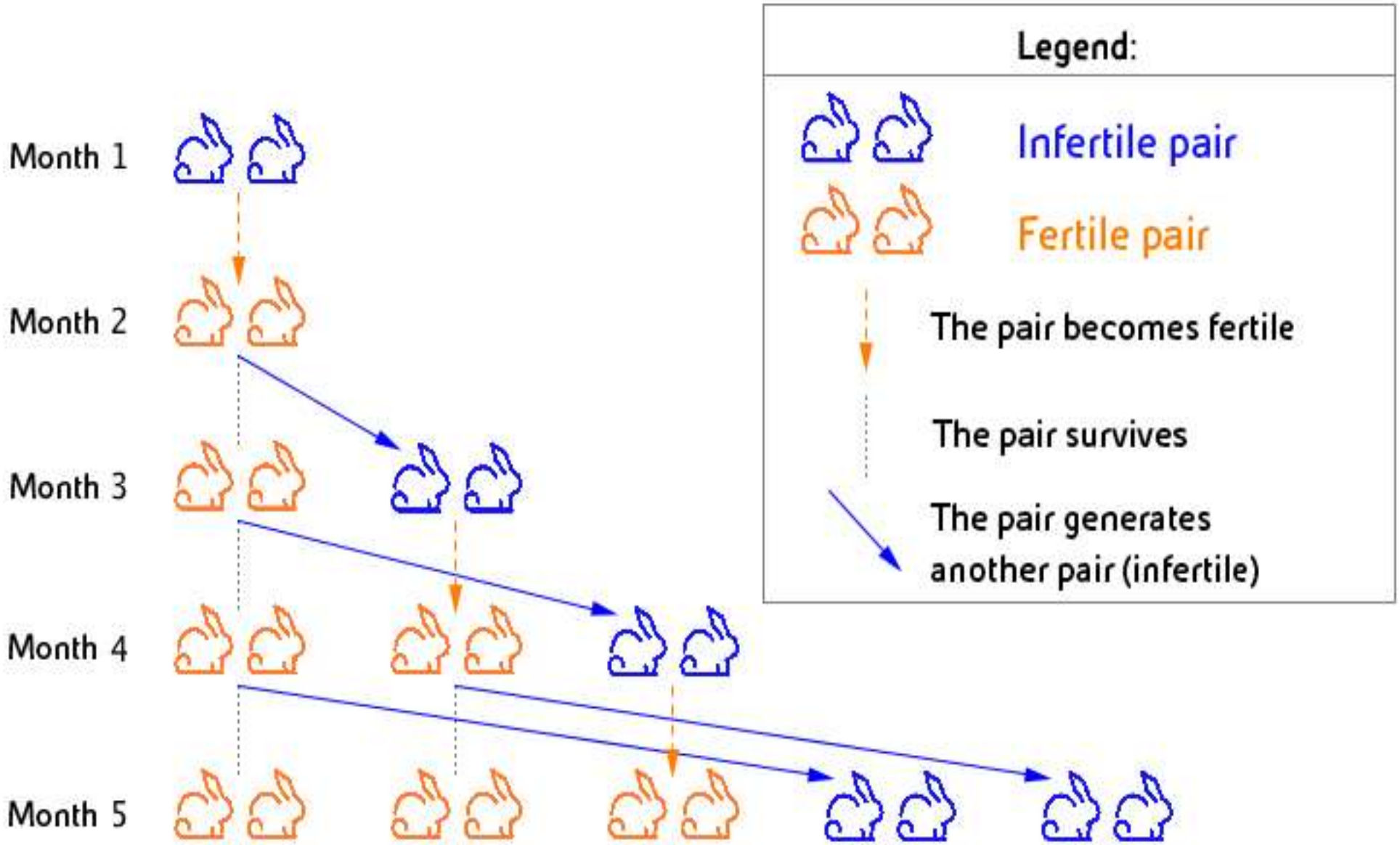
RADIAL SYMMETRY-THIS IS WHERE THERE IS A CENTER POINT AND NUMEROUS LINES OF SYMMETRY COULD BE DRAWN.

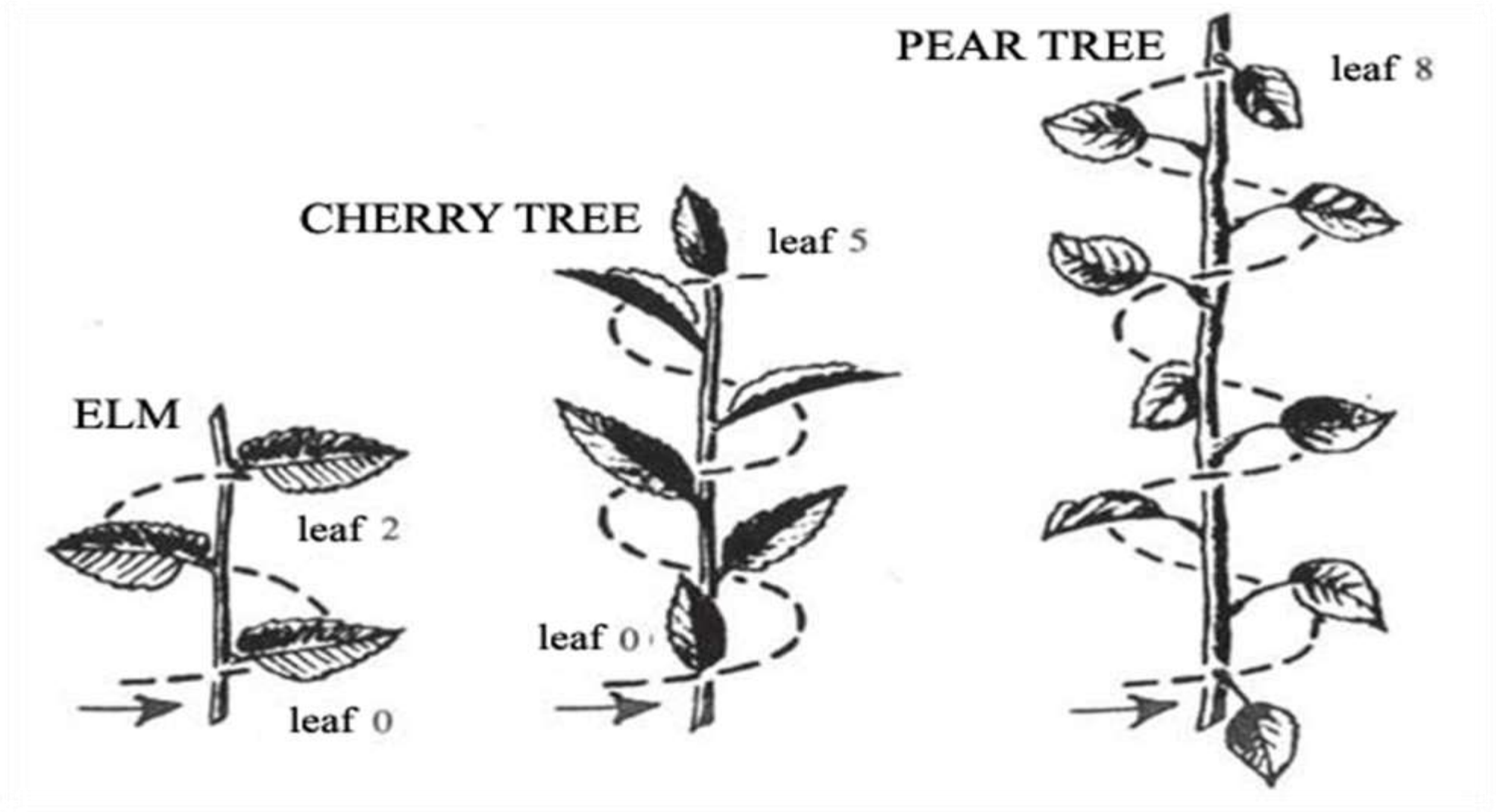
FIBONACCI SEQUENCE·

If you construct a series of squares with length equal to the Fibonacci numbers(1,1,2,3,5,...) and trace a line trough the diagonals of each square, it forms a Fibonacci spiral· Many examples of Fibonacci spiral can be seen in nature·





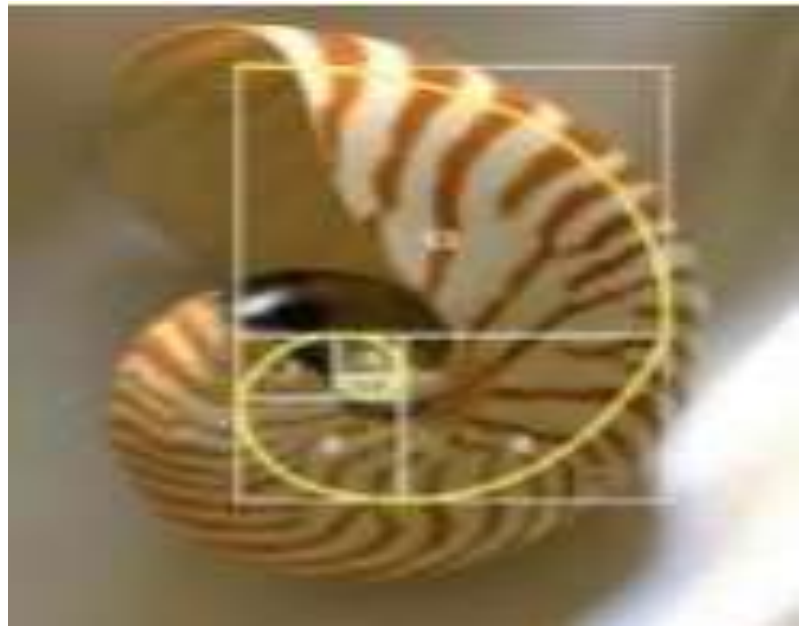

Month 1
Month 2
Month 3
Month 4
Month 5
Legend:
Infertile pair
Fertile pair
The pair becomes fertile
The pair survives
The pair generates another pair (infertile)

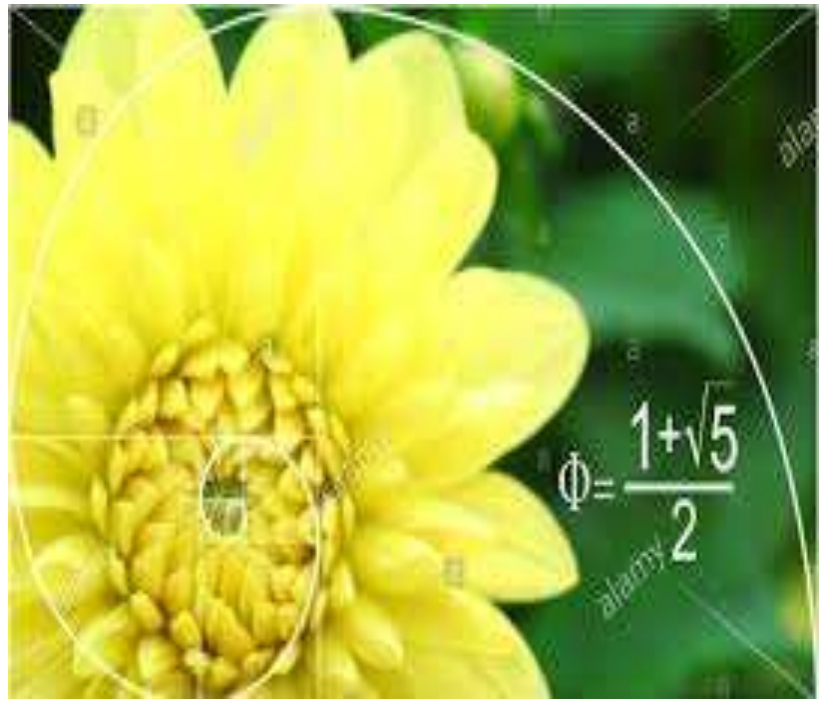


Arrangement of leaves on a stem.

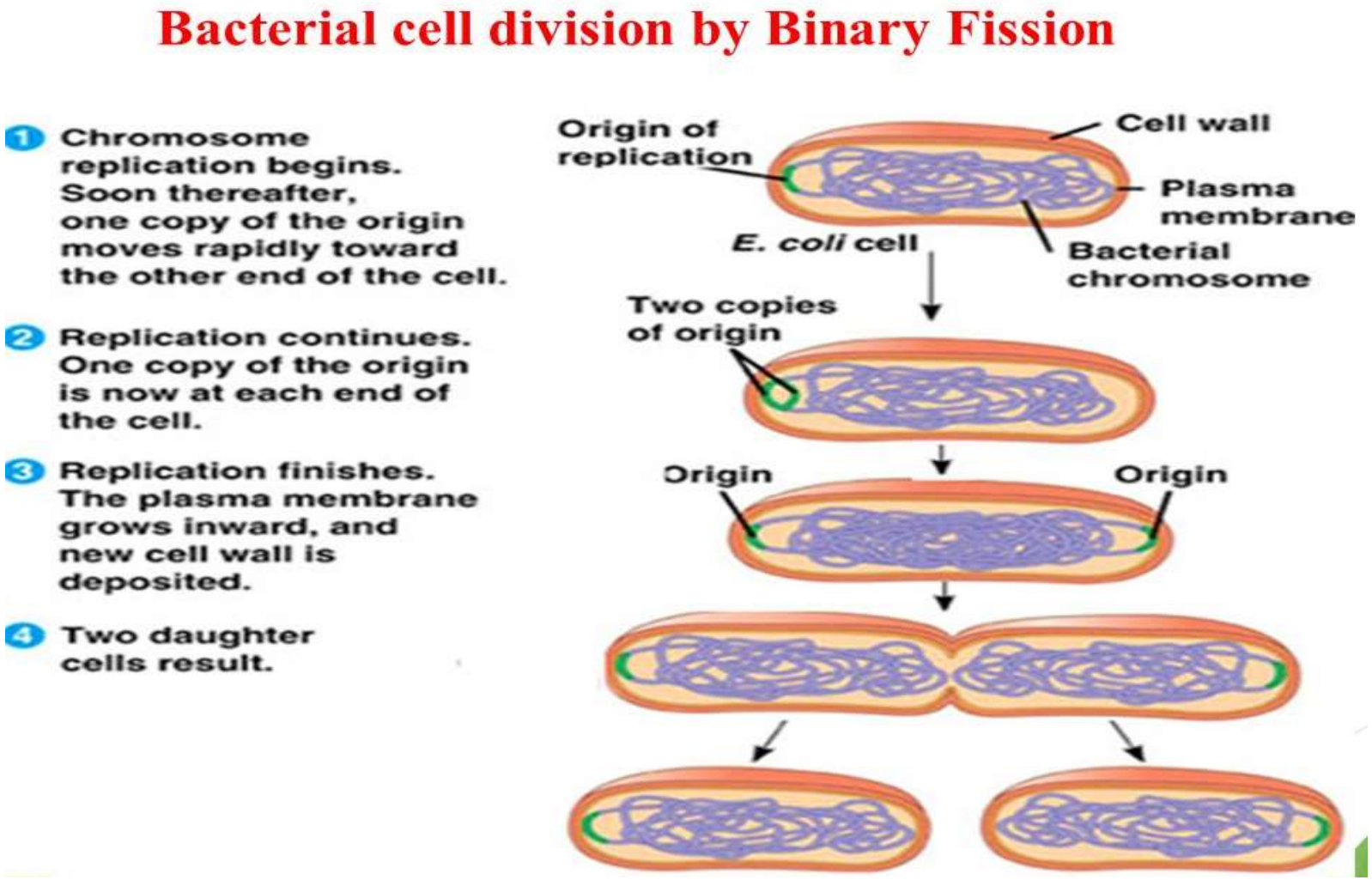
THE GOLDEN RATIO·

When a Fibonacci number is divided by the Fibonacci number that came before it, it approaches the golden ratio, which is an irrational number that starts out as 1·6180339887… and, once again, goes on forever· When the golden ratio is applied as a growth factor, you get a type of logarithmic spiral known as a golden spiral·





GEOMETRIC SEQUENCE·



Bacteria multiply by following a geometric sequence where each number is double the previous number thus multiplying quickly in a short span of time·

FRACTAL·

A fractal is a never ending pattern· Fractals are infinitely complex patterns that are self similar across different scales· They are created by repeating a simple process over and over in an ongoing feedback loop· Driven by recursion, fractals are images of dynamic systems -the pictures of chaos·

Examples:

- ✓ Trees
- ✓ River Delta
- ✓ Fingerprints
- ✓ Romanesco Broccoli
- ✓ Flowers

MATHEMATICS IS EVERYWHERE IN THIS UNIVERSE·WE SELDOM NOTE IT·WE ENJOY NATURE AND ARE NOT INTERESTED IN GOING DEEP ABOUT WHAT MATEHMATICAL IDEA IS IN IT·MATEMATICS EXPRESSES ITSELF EVERYWHERE··