A Study of Applications of Mathematics in Nature

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Abstract : Mathematics has been interpreted and explained in various ways . this is due to various of experiences . It deals with quantitative , facts logic reasoning as well as with problems involving space . In school , those subjects which are included in curriculum must have certain aims and objective on the basis of which nature is decided . it holds strong and unbreakable position . The mathematics belongs to universe because many and more concepts belong to real life . The theories and concepts given help us to understand and solve various types of issues in real world things . As living things and non-living things surviving in nature , mathematics is creating vibes to make things easy . It has enormous scope in every field of life.

Keywords – Explained , Quantitative , curriculum , Nature, Belong .

I. Introduction

Mathematics found everywhere and nature is one of them where concepts and theories of mathematics can be analysis . The beauty of a flower , majesty of tree , even the rocks upon which we walk can exhibit natures sense of symmetry. From the classic signs that an animal has been in an area, to the source of water that is necessary for life surrounded by mathematics. Early Greek philosophers , Plato, Pythagoras and Empedocles studied to explain order in nature. sunflower, snail shells, outer space , trees and many more examples of mathematics in nature. The Fibonacci, who some call the greatest European mathematician of the middle-ages. As humans discover more about our environment and our surroundings, we see that nature can be described mathematically. It is Important to understand use of analytical thinking which help us to solve problems of mathematics .

II. Objective

1. To understand concepts/theory of mathematics more easily .
2. How we can find mathematics in nature .
3. To generate interest in mathematics .
4. To be able to interact with nature using mathematics.
5. To know more about nature in perspective of math's .

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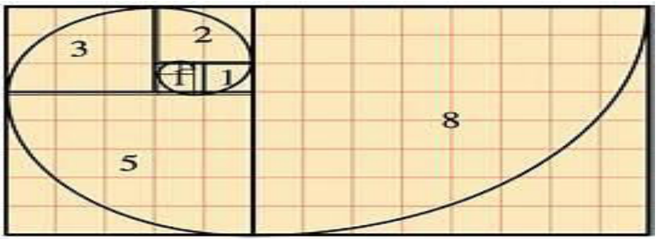
III. A Study of Applications of Mathematics concepts In Nature

A. Fibonacci sequence

a sequence of numbers in which each successive number in the sequence is obtained by adding the two previous numbers in the sequence i.e., Fibonacci sequence which has been seen in nature. Fibonacci first introduced to the western world in 1202 . This series had been noted by Indian mathematicians in the sixth century .

formula for Fibonacci sequence :
FN = FN-1 + FN-2

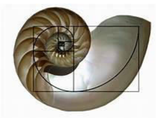
A rectangle with the length and breadth of any two of the number of this sequence (1, 1 , 2 , 3, 5 ,8 ,13 ,21 34) A rectangle can be broken down into squares the size of next Fibonacci numbers can be down or below . It would take perfect rectangle . after we begin to Fibonacci spiral .



following are some beautiful examples of Fibonacci sequence which found in nature .

- ***Shell***

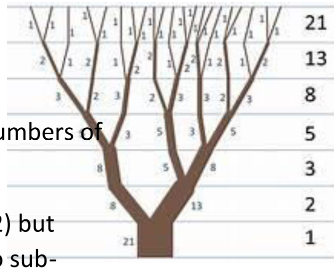
As we know shells have curve shape which follow the progressive proportional increase of the Fibonacci Sequence . we can observe the lines are very clean and clear to see .



- ***Tree***

According to the study lets know how actually Fibonacci sequence works in tree .A tree has been cut by following rules :

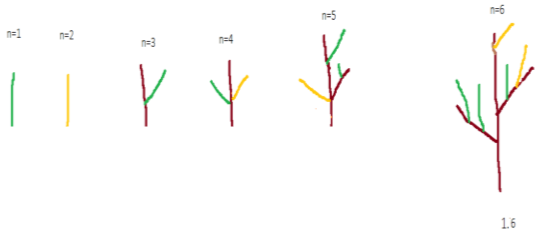
1. All sub-branches of branch are cut in first / second year of main branch.
2. From the third year on , one sub-branch will not be cut.



To Show total number of branches = Fibonacci number

n=4 (n= Here are branches of 1year old , 2-year-old , 3 year or older where n=1 , n=2 , n=3 , numbers of year)

We have one branch which is a year old(1.1) . In 2nd year initial branch become 2-year-old (1.2) but because of the 1st rule all new sub-branches removed from main branch hence, branch has no sub-branches in the end of 2nd year . after n=3 this branch to keep one sub-branch therefore one sub-branch re



B. Concentric Circles :

Another concept of maths which found in nature is concentric circles . Concentric circles are nothing but circles which share the same centre, but have different radii. This means the circles are all different sizes, one inside the other.

We found here Fibonacci sequence which is 1 , 1, 2 , 3 , 5 , 8 (i.e., total number of branches for each figure.)

- *Onion*

The outer layers are dependent on the core where the innermost circle is the core . Each layer is dependent upon the layer inside of it . This is how we found concentric circle in onion.

- ***Water***

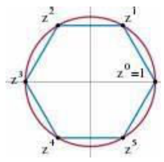
The ripple form by dropping a small object in still water or vibration can create concentric circles in water . Concentric circles can form during the rain on the surface of the water cover the granite area of the city sidewalk. Heavy rain, large drops also form as well as Closeup to water drops making circles on the surface in bowl.

C. Cyclic group :

Let (G,*) be a group , x ∈ G. If G ={ x^n / n ∈ Z } then G is called as cyclic group i.e., every element of G is an integer power of element x ∈ G.

i.e. G = <x> , x∈G

x is called as generator f group G.



In simple words ,Cyclic group is simplest group which is generated by a single element . groups can also be thought of as rotations, if we rotate an object enough time, we will eventually return to the original position.

- ***Snowflake*** **:**

A cyclic group made from the slice added again and again, until it is back to the first slice. here ,we can notice that we can either add each slice clockwise or counter clockwise to create this circle. We can observe here particular shape / element repeated to form an object .

- ***Flowers*****:**

Some flowers have parts which are arranged in a whorl. Cyclic flowers are characteristic of most flowering plants, including those of the families . Most flowers can be divided into 3 or more identical sectors which are related to each other by rotation about the centre of the flower. Typically, each sector might contain one tepal or one petal and one sepal and so on.

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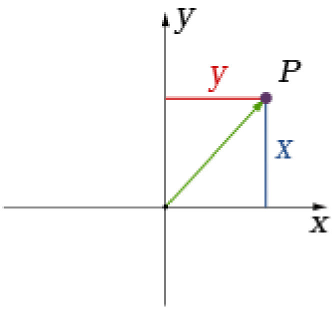
D. *Two-Dimensional Space:*

Two values (parameter) are required to determine the position of an element in geometric this is called as two dimensional . the two-dimensional image is an independent artifact with added semantic value . 2D space is also known as Bi-Dimensional space . analytic geometry describes every point in two-dimensional space by means of two coordinates. Two perpendicular coordinate axes are cross each other at the origin. The position of any point in two-dimensional space is given by an ordered pair , each number giving the distance of that point from the origin measured along the given axis , which is equal to the distance of that point from the other axis. The objects around us come in various shapes and sizes. In general, we can see shapes such as triangles, squares, and circles everywhere around us which included in nature .



In nature mostly objects are in 3D but We can observe 2D objects in nature .

- ***Leaves*** :

Leaf shape can be of various types . The most common shape includes oval , truncate , elliptical , lanceolate and linear . We can draw these shapes on a page which is again a 2D plane consisting of x-y plane . so, the leaf can be considered as two-dimensional shape that has length and width but no depth . Leaf margins of simple leaves may be lobed in one of two patterns , pinnate or palmate. In pinnately lobed margins the leaf blade is indented equally deep along each side of the midrib and in palmately lobed margins the lamina is indented along several major veins (as in the red maple , Acer rubrum).

- ***Petals of flower :***

Petals have variety of shapes including saucer, cup , bowl , tubular, bell or spherical shapes or it can vary considerably. Petals of flower can

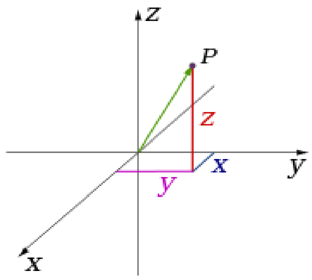
considered as two-dimensional shape which has length and width but no depth . In mathematics , shapes are derived from objects in real world that have common geometric attributes . According to study petals are modified leaves that surround the reproductive

parts of flowers. . We can draw these shapes on a page which is again a 2D plane consisting of x-y plane .

Petals are usually accompanied by another set of modified leaves in nature.

E. *Three-Dimensional space :*

Three-dimensional space is a geometric setting where three values (called parameters) are required to determine the position of an element this is what three-dimensional space . 3D is also known as tri-dimensional space . Three values can be labelled by any combination of three chosen from the term's width, height, depth, and length. Cartesian geometry which i.e., analytic geometry describes every point in three-dimensional space . Three coordinate axes are given were , each perpendicular to the other two at the origin . They are usually x, y, and z which are relative to these axes, the position of any point in three-dimensional space is given by an ordered, each number giving the distance of that point from the origin measured along the given axis, which is equal to the distance of that point from the plane determined by the other axes .



Mostly we are surrounded by 3D objects in nature .

- ***Animals :***

As we know In three-dimensional , Three values can be labelled by any combination of three chosen from the terms width, height, depth, and length . We can observe three-dimensional shape hight , width and length in animals which are belong to nature . Real world id made up of 3D object . Now days , in movies 3D object applied for real feel .

- ***Trunk of a tree :***

the trunk associated with voluntary unilateral upper limb movement. The directions of angular motion produced by moments reactive to limb movement in each direction were predicted using a three-dimensional model of the body. Trunk has length , width as well as hight therefore we say trunk as a three-dimensional object which exit in nature .

Conclusion

According to the study most of the concepts of mathematics belongs to nature about which students are not aware. Mathematics is the most interesting subject but due to lack of understanding many students are facing problemsand it takes plenty of effort to understand the concepts. It is a subject that sometimes require students to devote lots of time and energy. This means, the problem has little to do with brainpower. Nature is something with which we all are connected but because of covid-19 we were quarantined and got disconnected with nature. if we canrelate some more applications of maths with nature then it'll be more convenient to understand andwill also develop interest in learning concepts . This is what I concluded while studying applications of Mathematics in nature.

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