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Application of Maths in Real Life

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Abstract: ***Historically, most students have been struggling with mathematics subject which makes them wonder if they will ever apply the knowledge in real world life. Teachers and parent admit when they have been asked that students have very few knowledge about the relevance of mathematics in real life. That is why this paper is based on application of maths in real life. In this paper the most common and essential applications of mathematics in real life is discussed such as finance and banking, weather prediction, computers and its games, search engines (goggle), music and Transportation and logistics. Apart from these some advanced applications are also discussed such as satellite navigation, military and Defence and crime prediction.***

Keywords: Mathematics, Real life, Finance and Banking, Satellite Navigation, Military and Defence

1. Introduction

Mathematics is the key to opportunity. No longer just the language of science. Mathematics now contributes in direct and fundamental ways to Business, Health, Finance and Defence. For students it is very important subject because it opens doors to careers therefore students must be capable to relate this subject with their real life. Therefore teachers of mathematics have to teach mathematics through real concepts in personal life of students. If mathematical concepts taught via teachers formally then students will face many problems which cannot solve it.

The principal and standards for school mathematics has stated that mathematical instructions should enable students to

1) Recognize and use connection among mathematics ideas.
2) Understand how mathematics ideas interconnect and builds on one another to produce a coherent whole and finally.
3) Recognize and apply mathematics in contents of mathematics [1].

According to NCTM cited for students of grades 9 to 12th-

1) Students should have ability to use their knowledge of mathematical modeling and data analysis to understand societal issues and workplace problems in reasonable depth.
2) They should be confident to explain complete applications in the outside world by using mathematics.
3) They not only learn to execute connections but they learn to take advantage of them using insights gamed in one context to solve problems in another [2].
4) Students should have ability to use their knowledge of mathematical modeling and data analysis to understand societal issues and workplace problems in reasonable depth.
5) They should be confident to explain complete applications in the outside world by using mathematics.
6) They not only learn to execute connections but they learn to take advantage of them using insights gamed in one context to solve problems in another [2].

2. Literature Study

In this section, we stated several papers that are about mathematical concepts and its relation to real life. Costu (2009) indicated that students who were successful in mathematics were also found to be fail to apply mathematics in real problems in everyday life. This may be due to lack of building relationships between mathematics and real life [3]. In other study Salout (2013) studied the high school students conception about the relation of mathematics to real life in 3 strands; mathematics, experimental science and humanities. In this study he found that it is necessary to modify curriculums and textbooks in terms of mathematics development and students needs in real life [4]. Also Arthur (2018) studied about teacher's ability to connect mathematics to real life problems so that students build their interest in mathematics. This study found that teachers ability to connect mathematics to real life problem can be put into 2 principal components and these components significantly predicts 57.4% students interest in mathematics. The study also found that if mathematic teachers spend mostly time for practicing class exercise then students will be more interested in mathematics [5]. After study all this research papers it has been concluded that paper will has to be designed which told about all the essential application of mathematics in real life, so that students will more understand the subject deeply and connect this subject to their real life problems.

3. Real Life Applications of Mathematics

3.1 Finance and Banking

To exhibit the importance of Mathematics in the Banking sector, we have compiled a few points below:

(a) Daily Accounting Operations*:* Right from the teller to the branch manager; anyone working in the Banking sector handles large sum of money on a daily basis. Therefore, they have to have the basic arithmetic skills like addition, subtraction, multiplication, division. The calculations involved are centred on debit-credit and account balancing.

(b) Policy Formulation*:* Top ranking banking officials have the responsibility of creating a practical and implementable financial policy for the bank that may help the organization reach its goals for the financial year or any predefined time period.

(c) Risk Assessment*:* Mortgages and Loans form the crux of the banking industry and risk assessment for such cases can only be evaluated using complex mathematical models. Risk assessment is a very important aspect for which banking professional will have to employ complex mathematical skills and models to measure the amount of risk exposure for the organization and deploy counter measure to control the damage.

(d) Economics*:* Keeping an eye on contemporary macro actions and trends, in order to calculate and predict the future course for domestic as well as international economy.

(e) Financial Trends & Predictions: This is another very important aspect of the banking industry that completely relies upon mathematics. In order to arrive at credible and actionable predictions for the future; banking professionals may have to rely upon models like Stochastic calculus or Black-Sholes.

(f) Investment Banking*:* Although relatively new and evolving aspect; investment banking has emerged as one of the fastest growing fields of the banking industry. When it comes to investment banking, professionals have to rely on multifaceted financial mathematics. These may include **partial differential calculus, probability, stochastic calculus** and others similar concepts [6].

3.2 Predicting the Weather

The weather is a fantastically complex system, with billions of molecules interacting. This makes predicting the weather an incredibly difficult tasks, even using the extensive network of weather stations, satellites, and the world's largest supercomputers.

The computations related to weather forecast is connected to **fluid dynamics** and the equation used for weather forecast is **Navier stock equation**. To be more precise, we solve equations related to fluid flow under certain conditions like **conservation of mass, energy and continuity equation**. The initial state of the atmosphere is defined with various parameters such as temperature, pressure, humidity etc. Then a future predicted state is reached through computations. In view of the non-linearity of the relations between various state parameters, the exact solution of equations becomes very tedious. Hence numerical approach is adopted where in the atmosphere is divided into grids and levels and equations are solved.

But even tiny differences in measurements and the simulation parameters can have great effect on these predictions. Therefore it is still impossible to accurately predict the weather more than a few weeks in advance – but the accuracy of mathematical models and speed of computers will only improve in the future [7,8].

3.3 Computers

Computer can be understood as combination of mathematics and physics used for technology, engineering and research. Along with physics, mathematics is one of the foundations of computer sciences. Although advanced mathematics is not applied frequently, basic mathematics and most importantly, **algebra** is the main reason for success behind a successful computer scientist. The main branches where mathematics is applied in computer science is as follows:

- Arithmetic, comparison, logical, assignment and conditional operators make use of mathematics.
- Algorithm that lay the foundation of computer science relies heavily on mathematics.
- Theoretical computer science involves a lot of mathematics which deals with mathematical structure that are discrete rather than continuous.
- Theoretical computer science involves a lot of mathematics in the form of graphs, algorithms, algebra, quantum computation, computational geometry and computational number theory.
- Computer operates on binary digits which is basically mathematics.

A computer programmer may not need mathematics in the beginning but as programmer advances, more advanced mathematics is used [9].

3.4 Making Music

The notations of composers and sounds made by musicians are connected to mathematics. The next time we hear or play classical, rock, folk, religious, ceremonial, jazz, opera, pop, or contemporary types of music, think of what mathematics and music have in common and how mathematics is used to create the music we enjoy.

Reading Notes and Fractions

Musical pieces are read much like we would read math symbols. The symbols represent some bit of information about the piece. Musical pieces are divided into sections called measures or bars. Each measure embodies an equal amount of time. Furthermore, each measure is divided into equal portions called beats. These are all mathematical divisions of time.

Fractions are used in music to indicate lengths of notes. In a musical piece, the time signature tells the musician information about the rhythm of the piece. A time signature is generally written as two integers, one above the other. The number on the bottom tells the musician which note in the piece gets a single beat (count). The top number tells the musician how many of this note is in each measure. Numbers can tell us a lot about musical pieces.

Each note has a different shape to indicate its beat length or time. Notes are classified in terms of numbers as well. There are whole notes (one note per measure), half notes (two notes per measure), quarter notes (four notes per measure), eighth notes (eight notes per measure), and sixteenth notes (sixteen notes per measure). These numbers signify how long the notes last. That is, a whole note would last through the entire measure whereas a quarter note would only last ¼ of the measure and thus there is enough time for four quarter notes in one measure. This can be expressed mathematically since 4 x 1/4 = 1. A note with a dot after it lengthens the note by half. For example, a quarter note with

a dot after it would be held for 3/8 of a measure, since

$$\frac{1}{4} + \frac{1}{2}\left(\frac{1}{4}\right) = \frac{3}{8}$$

Three eights of a measure is midway between a quarter note and a half note. It is important for musicians to understand the relationships and values of fractions in order to correctly hold a note [10].

3.5 Transportation and Logistics

The mathematics of transport and logistics aims at optimizing the design and the operation of networks for the movement of persons and goods. Such networks can be modelled as graphs, in which commodities flow from their sources to their destinations. The mathematical treatment of such models leads to large-scale integer programming problems, whose solution requires the development of novel efficient algorithms.

Transportation and logistics problems often have a special flavour that depends on the application. Train composition in railway planning leads to algorithmic **hyper graph theory**, user behaviour in public and road traffic requires algorithmic game theory, aircraft performance is treated best by discrete-continues models, sustainable manufacturing network gives rise to multicriteria optimization, operation theatre scheduling leads to robust optimization, and so on. To solve such problems, we combine problem specific research that aims at understanding this special structure with general approaches to deal with very large networks. Foci of our work are on the development of adaptive coarse-to-fine graph generation approaches in discrete analogy to finite element methods, and on decomposition methods for the integrated treatment of multiple model layers [11].

3.6 Search Engines

Millions of peoples use the internet every day because internet makes it so easy to find information quickly, for example using search engines like goggle.

> In order to find the most useful websites and display them at the top, Google represents all pages on the internet in a *gigantic matrix*. The matrix knows about how the various websites are linked, and you can use linear algebra, probability, and graph theory to find the most popular sites. Apart from these goggle uses mathematics for many other services also such as finding directions in Maps, spam detection in Gmail, voice recognition on Android, text recognition when scanning books, compressing YouTube videos, detecting faces in

3.7 Crime Prediction

If we have seen the TV series you will remember many ways in which mathematics was used by the FBI. And while most of these examples were made up, mathematics does have real applications when mapping, predicting and preventing crime. For example, the behaviour of a burglar could be modelled as a Random Walk, thus allowing for more effective police patrols.

Research developed during the last few decades in the field of crime analysis has reached a very important conclusion: some specific types of crime always happen in the same places, giving rise to the formation of crime hotspots. Mathematicians worked with the LAPD to understand the development and dynamics of "crime hotspots". Using **probability, statistics** and swarm dynamics, they found that there are two kinds of hotspots which react very differently on police intervention [13].

3.8 Computer Games

Many computer games use 3D graphics. Moving and animating these on a 2-D screen, also light and shadows, rendering colours requires **matrices, vectors** and many other concepts from **3D geometry and linear algebra**. In computer games realistic water and animate moving and colliding physical objects. For this, they use numerical solutions to the appropriate partial differential equations, such as Navier-Stokes equations which model fluids [14].

3.9 Satellite Navigation

To determine any location on earth such as position, speed and local time of a person and vehicle satellite navigation systems like **GPS (Global Positioning System)** use signals from satellites. These signals are extremely accurate times. By finding their delay, a computer can calculate how far away the satellites are. If know the distance from at least three different satellites, and the position of these satellites, we can find the unique and exact position of the receiver on Earth. **Metrics** are the mathematics generalisation of measuring distance. Because of general relativity, GPS receivers have to use Kerr metric to calculate distances, rather than usual Euclidean metric [15].

3.10 Defence and Military

In addition to providing the framework for designing new technologies and weapons, or solutions to logistical problems like the transportation of soldiers, weapons and food, mathematical models can be used to develop and simulate complex military strategies. These simulations might involve **game theory, statistics or probability.** In recent years, cyperwarfare has become increasingly important, for counterintelligence, industrial espionage, and terrorism. Organizations like the NSA or GCHQ develop and attempt to break secret codes.

4. Conclusion

Maths is unavoidable. It is a deeply fundamental thing. It is a main matter of the real-life that can cover all aspects of real world. As it seen from all above applications that maths is very important tool in making music, computer games, in designing websites, in search engines like goggle and also in money management. By this we can understand, mathematics is really useful and significant in our daily life as is

associated with our everyday activities, developing our critical and practical abilities. Therefore students must be capable to relate this subject with their real life. For these educational systems have to create new circumferences for mathematics education and teachers of mathematics have to teach mathematics through real concepts in personal life of students.

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