Journal of Research in Education and Society
Volume 11, Number 2, August 2020; ISSN: 2141-6753
Published By
International Centre for Integrated Development Research, Nigeria
In collaboration with
Copperstone University, Luanshya, Zambia

The Development of Mathematical Science and Application to Practical Human Needs

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ABSTRACT

This paper attempts to briefly review some aspects of the early development of mathematics in response to practical human needs. The purpose is to clear some misconceptions about mathematics and its roles in human progress. In the average, many people see mathematics as the game of numbers associated with some magical arts or witchcraft manipulations and that the mathematician can only teach. Others see it as an abstract subject which has little or no relevance to our everyday life. Consequently, many, including students easily develop negative attitude towards the subject which results to a lot of problems that affect the progress of the individual, family and the society at large. It is therefore necessary, timely and important to get such impression corrected. In this technology and information driven age, mathematics is the bedrock of all progress. Therefore our youth, in particular need proper re-orientation on the role of mathematics. The paper attempted to briefly demonstrate, theoretically that mathematics is a practical subject which evolved in response to practical human needs.

Keywords: *Mathematics, Application, Development, Recreation.*

INTRODUCTION

This work attempts to briefly review the history of the development of mathematical science, and its application to practical human needs. First, we need to know what mathematics is. There are many definitions of mathematics but there is no unique definition that can summarize all the mathematical activities. Yadav (2017) stresses that there is no definition of mathematics, or at least no commonly accepted one. So individuals and schools of thoughts give their own definitions and reconciliation has not been possible. Aristotle (385 – 323 BC) defines mathematics as the science of quantity. This is the basic definition which prevailed until the 18th Century. However, through the use of abstraction and logics mathematics advanced from counting, calculation, measurement and the systematic study of shapes and motions of physical objects to its complex form we have today. During the 19th century the study of mathematics increased in rigor, and mathematicians begin to address group theory and projective geometry which had no close relation with quantity as described above.

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Consequently, mathematicians began to propose other definitions. This leads to the emergence of the Logicist, Intuitionist and the Formalist Schools of Thought. According to the logicist school of thought, "all mathematics is symbolic". The Intuitionists on the other hand, holds that mathematics is a mental activity which consists in carrying out constructs one after the other (Brouwer, 2000). Hence they rejected all none constructible objects. The formalists see mathematics as a series of formal system; that is a set of symbol, or tokens and some rules on how the tokens are to be combined into a formulas (Brouwer, 2000). The formalists based their views on axioms which have special meaning. This has been the lines of argument in the core mathematics. This arguments were kept parallel among these three schools of thoughts.

In recent time, some mathematicians have tried to bring out a more unified definition of mathematics. Amongst the general definitions we have those recorded in general sources such as the encyclopedias and Wikipedia. The Wikipedia defines mathematics as the study of quantity, structure, space. Mathematics seeks out patterns and uses them to formulate new conjectures. The Oxford Dictionary defines mathematics as the abstract science of number, quantity and space, either as abstract concept or as applied to other disciplines. One of the recent general definitions was given by Yadav (2017) who defines mathematics as the study of assumptions, its properties and applications. In teaching, we must maintain the order of assumptions, properties, and applications. This definition was an attempt to unify the definition of mathematical activities, including its applications to real life situations. Mathematical science then, is meant the exacting sciences like mathematics, statistics, operations research and computer science. Sometimes, near-related subjects like astronomy, physics and engineering would not be completely out of bound. The development or history of mathematics is a very wide area than can be discussed in a single paper of this length, so only the earliest aspects were addressed.

The choice of this topic was informed by the author's personal observations of students' attitudes and approach towards the mathematical sciences, and the painful consequences many have suffered over the years. Equally, in a post graduate research project conducted on the effects of students' attitude on their performance in mathematics, the results indicated "the general misconceptions about mathematics and the mathematician. This consciously or unconsciously leads to manifestation of several negative attitudes towards mathematics. Amongst these, we have the problems of (i) laizez-faire attitude by students, (ii) numero-phobia, fear of the subject, (iii) face-off attitude to the subject and its teachers, and (iv) wrong approach or method of studying mathematics e.g. cramming or rot learning just to get a pass grade. The consequence of such attitude is that the victim cannot grasp the basic/fundamental principles of the subject. The more the attitude is manifested the more difficult mathematics becomes, and the more fear and hatred for the subject grows. The resultant consequences among others include: (i) failure in external and internal examinations, (ii) failure to meet up admission requirement, (iii) failure to enjoy the uses of mathematics in daily life, (iv) failure to make progress in one's career due to deficiency in mathematics.

To avoid the above consequences, there is need to get the wrong impression corrected so that students can realize that mathematical knowledge is necessary, irrespective of field of specialization, trade or organization. Salomon (1992) states that mathematical knowledge is commonly deemed to have a high degree of validity, irrespective of culture, condition and predilection. Kondo (1997) also stresses on the scope of application of mathematics when he said "actually it [mathematics] is deeply rooted in almost every kind of human activities, from the world of every day affairs to the advanced researches of authorities in very many fields of science. All of us are mathematicians [suppose to be], to some extent". Affandi, Aqmariah, Khalid and Affandi (2014) also note that "mathematics is the background of every engineering fields..., mathematics has helped engineering develop. Without it, engineering cannot evolved so fast we can have today. Without mathematics, engineering cannot become so fascinating as it is now". The truth therefore remains that mathematics is relevant and necessary for human progress but many are yet to understand this and are still busy discriminating against the queen, servant, language and catalyst of scientific discoveries, development and growth.

This paper aims at reviewing the earlier aspects of the development of the mathematical sciences, with the view to demonstrating that mathematics has grown out of its applicability to practical human needs. This will address the various misconceptions about mathematics and to alleviate the attitude, tantamount to it and the grievous consequences it attracts. It is also worth stating that the recent applications of mathematics to specific areas are not the focus of this paper, though they will not be totally ruled out. The purpose of this paper therefore is to review the history of mathematical science, development and application. This is to clear some of the common misconceptions about mathematics. Consequently, the objectives of this paper are to:

1) Outline the basic stages of the development of mathematics
2) Expose the fallacies in the misconceptions about mathematics
3) Encourage the reader to appreciate the role and relevance of mathematics and
4) Challenge the readers to seek the minimum level of numeracy.

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Development of Mathematical Science

The origin of mathematics can be traced to the origin of science itself. According to Brouwer (2000), for one to understand the development of the existing theories in mathematics, there is need to understand the concept of science, because it came to human thought as a part of science. Mostafa (1988) agrees that mathematics was and is central to the creation and emergence of science and through it scientific truths are expressed, formulated and communicated. The question is, where and when did science start? Dake (1997) in his commentary on Daniel's Chapter one verse four reports that "science begun in Egypt and Babylon with the birth of mathematics, metallurgy, anatomy and astronomy" and that the Babylonians were responsible for the "exact measurement of the lunar and solar cycles, the tracing of the paths of the planets, the division of the circle into 360 degrees and the design of constellation".

From the foregoing it can be observed that mathematics started where and when science started, and that it was (is still) a part, parcel and a catalyst or medium of its growth and development. Mostafa (1988) and Kline (1995) also agree that mathematics, originated in Egypt and Babylon, the chief centre of ancient civilization, around the period of 5th, 4th and 3rd millennia B.C.

How did this happen? To answer the question, how, is necessary to note the foundation of mathematics. The vast edifice of mathematical science has, as its origin, the entity number as a foundation (Ezekute & Ihezue, 2006). The need for numbers, according to Mostafa (1988), "arose out of man's impulse to keep tract of passage of time and as such, to record the changing face of the heavens. This interest in the heavenly bodies grew out of a need for calendar, a seasonal time-table for sowing, reaping and religion (making ritual sacrifices)'. Later, the need was also felt in connection with solutions of practical problems such as counting, record keeping, surveying (land), commerce, trade, taxes and construction. Mathematics then "arose as a tool in solutions of practical problems in man's every day activities" (Kline, 1995). That has been the role of mathematics up to today.

The origin and growth of mathematics has always rolled around the concept of numbers. The term, number can be understood in three perspectives: (**i**) it means quantity, for example, 3 yams, 2 buckets, 10 bags and so on. (ii) it means a symbol (or numeral) representing a quantity, such as: the symbol 1, 2, 3, and so on; and (iii) it means a position of an object, for instance, house address, say 34, Udo Usoro Street, that is the 34th house along Udo Usoro Street. This is the beginning and nucleus of mathematics. The number system has gone through a lot of developments, both in terms of notation and increase in types. At present, there are seven set or type of numbers that mathematicians have discovered and used over the years. This includes the counting numbers or whole number, integers, rational numbers, irrational numbers, real numbers, and the complex numbers. Infinity (+ " and - ") are used to describe what is so large or so small that cannot be counted. The figure 1 below illustrates the evolution of the number system as human needs arise over time.

Application of Mathematics

On why the development of mathematics, it has been shown that it developed to meet human needs. This is because it is difficult, if not impossible to describe clearly, the distinction between the development of mathematics and its applications to practical human needs. This is because almost every new discovery/invention made was necessitated by an existing practical problem in real life as it "… is used in a large variety of real world applications" (Wilson, 2009). Through the expansive development motivated by practical applications, mathematics has so many branches, that some of them are independent field on their own; statistics and computer science for example. With the 'seed', number planted into the human mind, it has 'germinated' and grown into a huge 'tree' with many branches, yielding much fruits of applications to various areas of human endeavour. "Mathematics is all around us, in everything we do. It is the building block for everything in our daily lives, including mobile devices, architecture (ancient and modern), art, money, engineering, and even sports" (Hom, 2013). Figure 2 indicates the various branches of mathematical sciences.

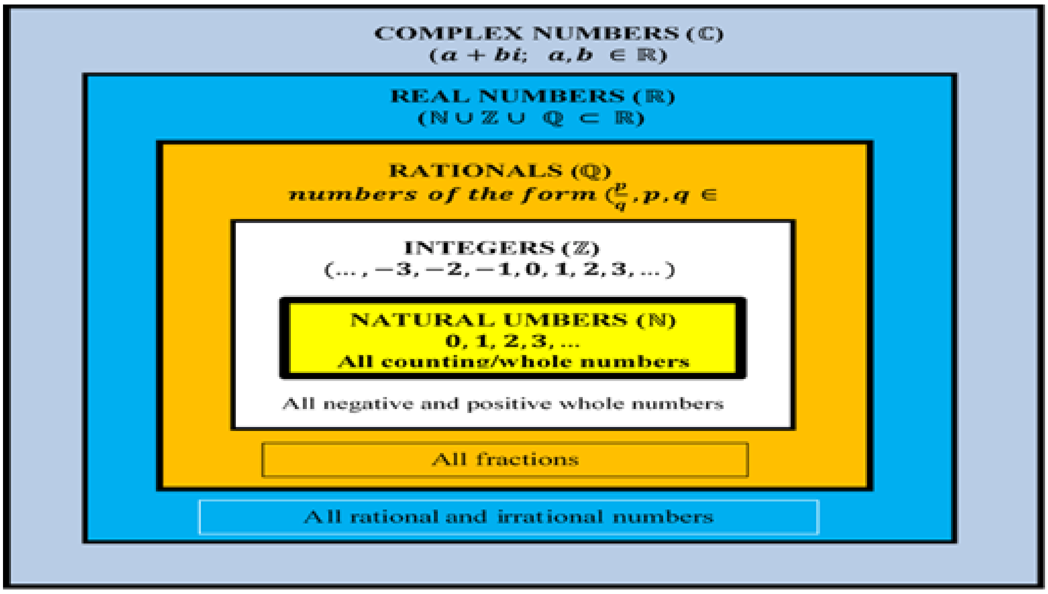

Figure 1: Elements of the Number System

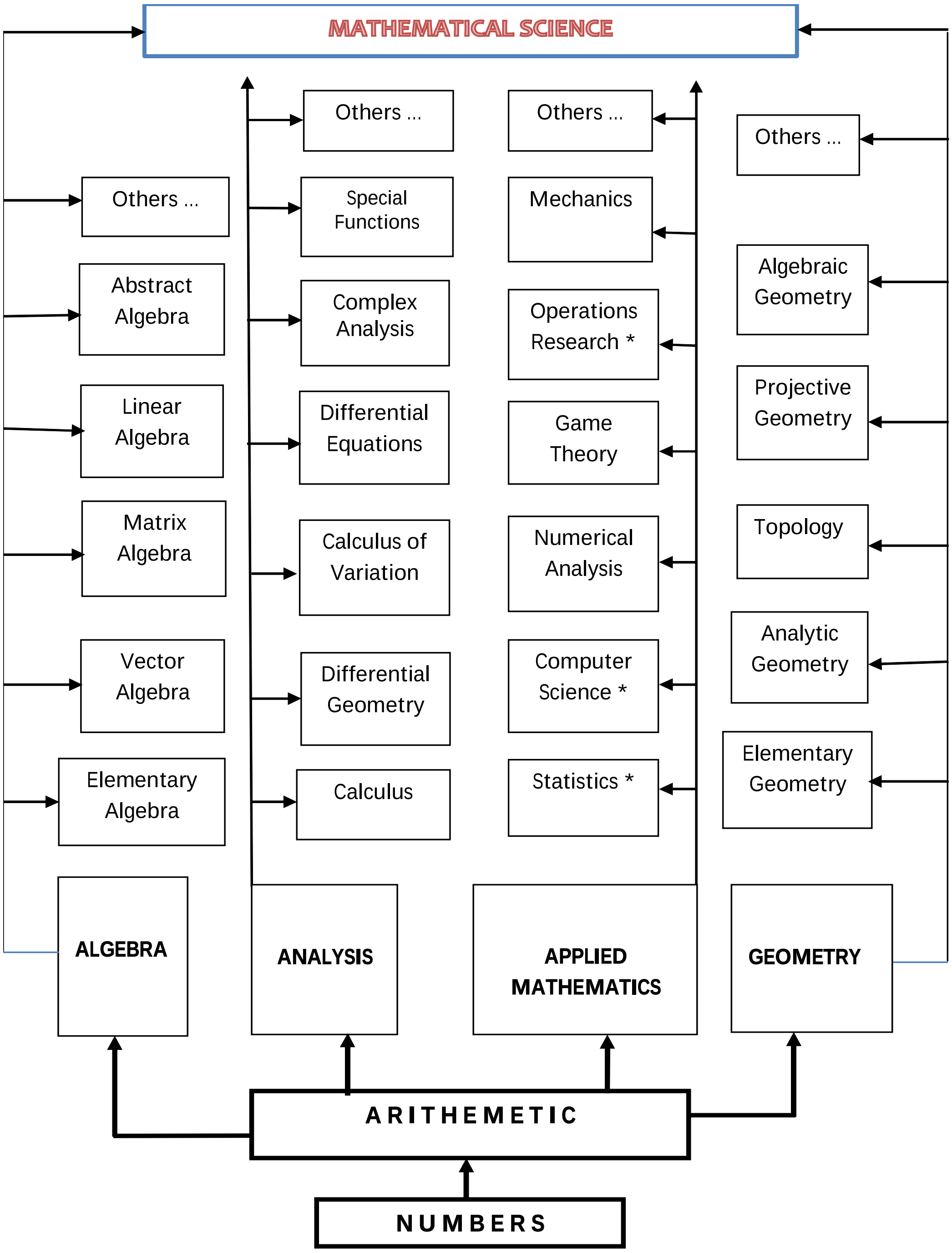

Figure 2: Branches Mathematical science

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THE MOTIVATION FOR THE DEVELOPMENT

The question is what are the major motivations for the development of new mathematics (areas or branches)? Kline (1995) acknowledges that there are three major motivations for the development of the various branches of mathematics, which include physical application, search for mathematical beauty and pursuit of intellectual challenge.

(1) **Physical application.** According to Ayeni (2011), the earliest records of mathematics show that it arose in response to practical needs in agriculture, business and industry. This simply means that the new areas are developed to solve current physical problems in sciences, technology and industry. Example of areas developed in this way include Theory of relativity, quantum mechanics, differential equations, among others (Ayeni, 2011).

(2) **Mathematical Beauty.** There are certain mathematical theories that have no immediate relation of application in science, yet they appear appealing to mathematicians as beautiful. Example, Euclid's proof that "there is infinite number of prime numbers", the field number theory and projective geometry all developed that way (Ale and Adetula, 2011). This aspect presents mathematics as an art. The mathematician, in this respect is like an artist. No wonder, Hilbert as reported by Mostafa (1988), once said "mathematics is nothing more than a game played according to certain rules with meaningless marks on papers". Most aspects of modern pure mathematics fall into this category. However, some of the once 'useless' proof and derivations made in pure mathematics finds applications in some fields. For instance, number theory is applied in cryptography (security communication system) and Boolean algebra initiated in 1858 is now used in complicated electrical circuits in computer hardware (Ale and Adetula, 2011).

(3) **Intellectual Challenge:** This challenge may be posed by a problem of science or otherwise. Examples include the Gold back problem which states that "every even number is a sum of two primes" (Mostafa, 1988). It has been worked upon for long without any likely elegant proof but mathematicians are still working on it. The motivation is the pursuit to overcome the intellectual challenge posed by such a simple statement?

It is therefore clear from the foregoing discussion that, the major motivation for the development of mathematical theories is applications to practical needs; other motivations appear to be secondary. This happens to be the preoccupation of modern pure mathematics, concentrating on abstraction. There is none, all is misconception- misconception creating fear and that of the unknown. Our concern in this paper is to review the history of mathematical development and application.

THE MAJOR FOUNDATIONS

Having seen the motivations, it will suffice to briefly review the basic branches of mathematics; which include arithmetic, algebra, geometry, analysis, calculus, computer science and statistics.

1) **Arithmetic:** Arithmetic, the founding block of mathematics originated from the Sumerians of Babylon (Hom, 2013). This is the basic branch of mathematics that deals with addition, subtraction, multiplication and division. Simply put, it is the science of numbers, which deals with the elementary properties of numbers and the rules of calculations; using the four arithmetic operations, addition (+), subtraction (-), multiplication (x) and division (÷), with the equal sign (=). It was once the earliest aspect of mathematics developed to meet the needs of calculations used in everyday transactions such as trade, commerce, administration and others. These arithmetic operations are still in use today and mathematicians have developed better ways of doing arithmetic e.g. the use of adding machines, calculators and computers. You can imagine a community where arithmetic does not exist. All calculation recording and counting will be in great confusion.

2) **Geometry:** The Wikipedia defines the word geometry as "earth measurement", owing to its Greek origin; revealing also that it was deviced for and used in land surveying. Remember, mathematics started in Babylon and then flourished along the valley of the Nile; so as to meet the need of man (Mostafa, 1988). The subject of geometry arose in response to two basic needs: land surveying and building. The annual flooding of the Nile frequently obliterate land marks, hence the recurring need for land survey. Kline (1995) reported that "the annual flooding of the Nile valley forced the Egyptians to formulate geometrical formulas" for surveying their lands. This was done as a basis for exacting tribute from peasant farmers (Mostafa, 1988). That means it was government instrument for providing tax information about the income of subjects. On the other hand, the ancient Egyptians used to build magnificent edifices such as the pyramids, tombs, temples, barns etc, creating the need for earth measurement (geometry) as well as lengths, distances and angle measurements (mensuration). Today

surveyors, civil engineers and architects are still using the formulas of elementary geometry and mensuration for their measurements and calculations.

3) **Algebra:** The Arab merchants were the pioneers of this branch of mathematics. It was invented by the mercantile class as a rule of quick calculation developed by mathematicians such as Mohammed ibn-Musa al-Khowarizmi and Omar Khayyam (Hom, 2013). Algebra is the generalization of the rules of arithmetic Omar Khayyam and Al-Khwarizmi were the chief inventors of algebra, owing to the Arabic phrase "*al'gbr*", meaning "restoration and reduction" (Hom, 2013). Today algebra is one of the fruitful areas of mathematics with several branches and applications.

4) **Latitude and Longitude:** The need for the knowledge of latitude and longitude was necessitated by navigation. Mostafa (Mostafa, 1988 & Kells, Kern & Bland (1940) explains how the two comes about when he said "early explorers had traversed routes mainly along coastlines which closely followed a north-south direction. They ventured but little on unfamiliar sea lanes. Knowledge of latitude therefore sufficed for the captain's needs. When Columbus and Magellan set their courses westward across the uncharted expanse of the Atlantic or the Pacific, knowledge of longitude became equally essential" (Mostafa, 1988). Today, captains on board ships and airplanes apply this area of mathematics at daily basis. Kells (1992)_admitted that "…navigators on ships and airplanes apply the formulas of spherical trigonometry to find such values as the time of the day, directions of motions, and positions of ships and airplanes, and reference points. Thus, "spherical trigonometry is basic in … navigation" (Todhunter, 2006). It is quite obvious that this area is also developed to meet an aspect of human needs.

5) **Analytic Geometry:** The Wikipedia defines analytic geometry as the study of geometry using the coordinate system and algebraic methods. It is an amalgamation of algebra and geometry. That is solving geometrical problems using algebraic methods or formulas. Two major needs brought about the invention of analytic geometry. These include military warfare and navigation (Kells, Kern & Bland, 1940). (1) The introduction canons into European warfare brought in the need for the knowledge of the coordinate system and its algebra. The challenge of knowing the path and trajectory of a missile (for successful aiming) led to the development of this field. (2) To locate the course of a ship in the sea, we need the knowledge of the coordinate system as well as longitude and latitude (Todhunter, 2006).

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Descartes (1596 - 1650), a French mathematician and philosopher was the inventor of this branch. It is based on the principle of locus, i.e. location of points in the two dimensional space. These loci include the conics which were discovered by the ancient Greeks and are still studied today because they have a lot of modern applications. For instance, the television dish aerial and the giant radio telescopes, depend upon 'reflective property' of the conic sections.

6) **Calculus:** This is the branch of mathematics which deals with the motion of change and rate of change. It is the mathematical tool for analyzing small changes in any variable with the respect to another, applied in many areas. It is the principle instrument of applied mathematics, used in construction of models observed in nature. Amongst the inventors of calculus were: (1) Isaac Newton (Hom, 2013), responsible for the discovery of motion and its manifestation in form of velocity, acceleration and momentum (Hom, 2013). (2) Leibniz who discovered calculus at almost the same time with Newton and was responsible for devising the notations we are using today in differentiation, integration and differential equations (Hom, 2013 & Mostafa, 1988). (3) Maxwell, often called Newton of the 19th Century predicted on the basis of his differential equations that "electromagnetic waves travel with the speed of light (Mostafa, 1988). (4) Hertz later verify this experimentally and from that we have the wireless radio and television industry.

7) **Statistics:** The science of decision making under uncertainty is one of the branches of arithmetic. Today statistics is applied in all fields of human endeavour. Think of research, administration, management and other areas without statistics? Croxton (1967) noted that "without adequate knowledge of statistics' the researcher …may frequently be like a blind man grubbing in a dark closet for a black cat that is not there". Statistics started as an aspect of administration but today it finds application in almost all fields of human endeavour.

8) **Computer Science:** Computer science is one of the powerful development in the history of the whole world. It is worth noting that computer science took her root from mathematics. The whole computer system is based on the binary system of numeration (numbers 0 and 1). Computing initially started as a means of quick, accurate and easy calculation. Today, computers are the key component of every business on earth. Instead of talking of what computer can do we should rather search what computer cannot do.

It can therefore be concluded that wherever there is a problem (of any kind), there is a mathematical formula, model or solution for it. And if there is none, mathematicians can be invited to develop one to address it. What therefore we need to do is to learn how to use mathematics. There is no need avoiding the queen of sciences if we must make progress in science and technology.

We have already demonstrated that mathematics is a tool as well as an art. Two other aspects of mathematics which need to be clarified are that mathematics is a language and an amusement or recreational science.

MATHEMATICS AS A LANGUAGE

Mathematics is a language with its own vocabulary and grammar. Failure to understand this may be the reason many of us do not understand mathematics. Galileo (1564 - 1642) according to Mostafa (1988) asserts that "philosophy is written in that vast book which forever stands before our eyes, I mean the universe; but it cannot be read until we have learnt the language and become familiar with the character in which it is written. It is written in mathematical language and the letters are triangles, circles, and other geometrical figures, without which means it is humanly impossible to comprehend a single word". To make this point clear, Mustafa (1988) affirms that "mathematics is the most powerful language that man has ever invented". Algebra is one of the areas that made this possible and clear. According to Mostafa (1988) "Euler (1707 - 1783), a Swiss mathematician once defeated an opponent, Diderot (1713 - 1784), a French intellectual and perhaps an atheist in a great debate using a simple algebraic equation". Euler who was invited to debate with Diderot confronted Diderot with the equation,

$$\frac{a+b^n}{n} = x \text{ , } \textit{Dons Dieu existe repondez}$$

The result of the debate was that "Diderot got so much frightened by the expression that he left the court in defeat, demanded a safe conduct and promptly returned to France simply because he had no knowledge of Algebra" (Mostafa, 1988). But what does this mean? Ordinary language, Euler's equation simply means, "a numbers x can be obtained by adding a number to a number b multiplied by itself n-times divided by number of times b was multiplied. So God exists after all. What do you have to say now**"?** Euler's equation has infinitely many solutions and the existence of God not one of them (See figures A to F below for illustrations).

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Table D	**a, b in n and N constant**		
a	B	N	$x = (a + b^n)/n$
1	1	2	1
2	2	2	3
3	3	2	6.00
…	…	…	…
Table E	**For a, b < 1 and n in M**		
a	B	N	$x = (a + b^n)/n$
0.1	0.1	1	0.2
0.2	0.2	2	0.12
0.3	0.3	3	0.11
…	…	…	…
Table F	**For a, b in Z and n in Z**		
a	B	N	$x = (a + b^n)/n$
1	1	-1	-2
-3	-3	-2	1.44
5	5	-3	-1.67
…	…	…	…

MATHEMATICAL RECREATION

In this section of the paper, we intend to use mathematical recreation to clear the misconception that mathematics is witchcraft, magic and so on. Greitzer (1997) calls mathematical recreation "lighter moments with mathematics", because it creates a sense of entertainment. Many wonderful and amazing results can be obtained by manipulating the denary symbols $1, 2, 3, 4, 5, 6, 7, 8, 9$ and 0 (zero); yet nothing magical can be seen in it. To the layman it may seem so. Ball (1892) declared that "mathematical recreation, which involves fundamental methods and notions, had their chief appeal as games or puzzles rather than the usefulness of their conclusions, has provided entertainment for over eighty years". There are many mathematical puzzles but here we shall practically demonstrate prediction of numbers, cyclical numbers and special number squares.

PREDICTION OF NUMBERS

One of the fascinating characteristics of numbers/mathematics which form its aspect called recreational mathematics is *prediction of numbers*. We have two examples to demonstrate here.

a) Pick up any number, x say, of your choice and do the following and I will tell you the number you choose:
   1) multiply x by 5;
   2) add 6 to the result;
   3) multiply the result by 4;
   4) add 9 to the result;
   5) multiply the result by 5 and then
   6) Tell me the answer.

In equation for the above steps can be summarized as

$$[(5x + 6) \times 4 + 9] \times 5 = (x - 1)65$$

You will see that the last two digits of the answer are always 65 and the number you picked is 1 less than the remaining number. If you picked x and we go through the operations, the resulting answer is $(x - 1)65$. Now it looks magical to predict but there is nothing magical really. No ritual, no ceremony; it is numbers.

b) Pick any three numbers amongst 1, 2, 3, 4, 5, and 6. Carry out the following operation and we will tell you the numbers you picked.
   1) multiply the first number by 2;
   2) add 5 to the result;

3) multiply by 5;
4) add the second digit;
5) multiply by 10;
6) add the last number
7) give me the answer

In equation the above, steps can be summarized as

$$[(2A + 5) \times 5 + B] \times 10 = (A + 2)\,(B + 5)\,C$$

Suppose the three digits picked were A, B and C then the final answer will be XYC, where $A = X - 2$; $B = Y - 5$ and $C = Z$. In other words the first digit picked is 2 less than the first digits of the answer, the second is 5 less than the second digit in the answer and the last digit picked remain the last in the answer. Since this is always the case I can tell you what number you picked among the six. There is no miracle, magic or mystery at all.

(c) Mind reading: Very similar to these predictions is the idea of mind reading using mathematical calculations. Ale and Adetula (2011) reveal that mathematicians can predict the number of brothers and sisters of an individual using mathematics. The steps:

1) take number of brothers you have, say x;
2) double it;
3) add 1;
4) multiply by number of sisters you have;
5) add the number of sisters you have;
6) tell your answer.

From the result subtract 5. The number of brothers is the tens digit of the result while the number of sisters is the unit digit of the result. This is amazing but it gives true result. Try it in real life situation and find it true. Yet there is no mystery.

CYCLIC NUMBERS

The term cyclical has nothing to do with circles. It rather simply means that the digits occur in cycles of certain group of digits. Examples of such fractions include reciprocals of 7, 11, 17 and others. Take for instance the fraction $\frac{1}{7} = 0.142857$ to six decimal places. Now all other decimal places will be repetitions of these same digits so that they repeat themselves in cycles without stop like this

If we multiply this decimal by the positive integers only the positions of the digits will change the digits but the digits remain the same. For every multiple of 7 the result will be approximating an integer value. No magic or miracle. See the following table for illustration.

CYCLIC NUMBER ($\frac{1}{7}$ = 0.142857)

X	$^1/_7$	$^1/_7$ * X	X	$^1/_7$	($^1/_7$) * X
1	0.142857	0.142857143	36	0.142857	5.142857143
2	0.142857	0.285714286	37	0.142857	5.285714286
3	0.142857	0.428571429	38	0.142857	5.428571429
4	0.142857	0.571428571	39	0.142857	5.571428571
5	0.142857	0.714285714	40	0.142857	5.714285714
6	0.142857	0.857142857	41	0.142857	5.857142857
7	**0.142857**	**1**	**42**	**0.142857**	**6**
8	0.142857	1.142857143	43	0.142857	6.142857143
9	0.142857	1.285714286	44	0.142857	6.285714286
10	0.142857	1.428571429	45	0.142857	6.428571429
11	0.142857	1.571428571	46	0.142857	6.571428571
12	0.142857	1.714285714	47	0.142857	6.714285714
13	0.142857	1.857142857	48	0.142857	6.857142857
14	**0.142857**	**2**	**49**	**0.142857**	**7**
15	0.142857	2.142857143	50	0.142857	7.142857143
16	0.142857	2.285714286	51	0.142857	7.285714286
17	0.142857	2.428571429	52	0.142857	7.428571429
18	0.142857	2.571428571	53	0.142857	7.571428571
19	0.142857	2.714285714	54	0.142857	7.714285714
20	0.142857	2.857142857	55	0.142857	7.857142857
21	**0.142857**	**3**	**56**	**0.142857**	**8**
22	0.142857	3.142857143	57	0.142857	8.142857143
23	0.142857	3.285714286	58	0.142857	8.285714286
24	0.142857	3.428571429	59	0.142857	8.428571429
25	0.142857	3.571428571	60	0.142857	8.571428571
26	0.142857	3.714285714	61	0.142857	8.714285714
27	0.142857	3.857142857	62	0.142857	8.857142857
28	**0.142857**	**4**	**63**	**0.142857**	**9**
29	0.142857	4.142857143	64	0.142857	9.142857143
30	0.142857	4.285714286	65	0.142857	9.285714286
31	0.142857	4.428571429	66	0.142857	9.428571429
32	0.142857	4.571428571	67	0.142857	9.571428571
33	0.142857	4.714285714	68	0.142857	9.714285714
34	0.142857	4.857142857	69	0.142857	9.857142857
35	**0.142857**	**5**	**70**	**0.142857**	**10**

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SPECIAL NUMBER SQUARES

This is yet another mathematical wonder that has been constructed. It usually consists of a square matrix of certain digits that have equal column and row sums. The following is a special square of order 4.

SPECIAL NUMBER SQUARE

	C1	C2	C3	C4	**SUM**
R1	7	12	1	14	**34**
R2	2	13	8	11	**34**
R3	16	3	10	5	**34**
R4	9	6	15	4	**34**
SUM	**34**	**34**	**34**	**34**	

It will be noted that it consists of the integers 1 to 16 inclusive. The sum of each column is 34 and that of each row is 34. Special squares of orders, 5, 6, 7, and so on can also be constructed.

CONCLUSION AND RECOMMENDATIONS

This paper briefly reviewed the early history of mathematical development and application. It has been explained clearly that mathematics is a tool in the hands of the scientist/others, and that the so called difficulty and mysticism is not real. All depends on the attitude and approach adopted by the user. Hence it is recommended that the following be taken serious by any one affected.

1. Everyone should stop fearing mathematics. It is not difficult, what is needed is patience and hard work. Neither is it abstract, all depends on the approach.
2. Younger generation should be properly informed about the importance of mathematics in their lives and career.
3. Teachers of mathematics should be encouraged by all; students, parents, school authority and Government. Training and retraining of teachers should also be done at all levels.
4. Government and school authorities should endeavour to provide modern teaching aids such as text books, computer software and hardware, mathematics laboratory, etc. for teaching the subject.

Journal of Research in Education and Society
Volume 11, Number 2, August 2020; ISSN: 2141-6753
Published By
International Centre for Integrated Development Research, Nigeria
In collaboration with
Copperstone University, Luanshya, Zambia

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