Mathematics in the Holy Quran

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ABSTRACT

Mathematics is an understanding about numbers, shapes and connections. The research done by Islamic scholars in the past was actually based on the concept of Tawhid (the oneness of God) from the teaching of Islam itself. This paper discusses the verses from the Holy Quran that explain the concepts of mathematics such as numbers, shapes and connections. All of the verses do not only bring up the mathematical concept but also reveal to us its application in each situation that suits us as human beings. It is hoped that readers will find this article useful as a guide for them to search for mathematical facts and reference from the holy Quran as a form of knowledge-based resource.

***Keywords**: numbers, shapes, connections, mathematic, Holy Quran*

Introduction

Mathematics is the study of numbers, shapes and connections. Mathematician seeks out patterns, formulate new conjectures and establish truth by rigorous deduction from appropriately chosen axioms and definition. Mathematics or '*Al Hisab*' has been used for 48 times in the al-Quran. It illustrates that Mathematics play a big role in our life. The word "*Hisab*' or calculation is used widely in al-Quran and it covers a lot of meaning.

One of the examples is in Surah Yunus (10: 5) that brings the meaning on how to calculate the time:

'It is He who made the sun to be a shining glory and the moon to be a light (of beauty), and measured out stages for her; that ye might know the number of years and the count (of time). Nowise did Allah create this but in truth and righteousness. (Thus) doth He explain His Signs in detail, for those who understand'.

Mathematics is used throughout the world as an essential tool in many fields. The earliest used of mathematics were in trading, land measurement, painting, weaving patterns and the recording of time. More complex mathematics did not appear until 3000 BC where Babylonians and Egyptians began to use mathematics for taxation and other financial calculations for building, construction and for astronomy. In modern world, mathematics is being used in natural science, engineering, medical and social science. Applied mathematics inspires and makes use of new mathematical discoveries and sometimes leads to development of entirely new mathematical disciplines such as statistics and game theory.

The History of Mathematics

The area of study known as the 'history of mathematics' is an investigation into the origin of discoveries in mathematics. The study of mathematics begins in the 6 century B.C. with the Pythagoreans who coined the term 'Mathematics' from the ancient Greek meaning 'subject of instruction'. Chinese mathematics made early contribution including a place value system. Hindu-Arabic numeral systems and the use of its operations is in used throughout the world today. Islamic mathematics in turn developed and expanded the mathematics known to this civilization. In the history of Islam mathematics is an ancient knowledge that has been exposed in the east and west by the only resource that leads to it being a gift from God to His servants. God taught this knowledge to Adam A.S. Mathematic also is a knowledgeable data for the Arabic people for they used it in the business, in dividing the value of the ancestors' properties and so on.

The number is actually written in a word not with the figure. After that, the Arabic people change the word system to the numbers after the numeral system in many languages has been used. During Prophet Muhammad's time, mathematics is used in their business, architecture and also war. This knowledge has spreading to the entire world and keeps on expanding during the Islamic glorification period between 7H until 13H. The Islamic figures have contributing and creating a lot of new things in this field such as, plus, minus, multiply and divide. This mathematical fact has been published in Arabic language by mathematicians from Persia. From ancient times through Middle Ages burst of mathematical creativity were often followed by stagnation. Beginnings in Renaissance Italy in the 16th century new mathematical

development interacting with new scientific discoveries were made at an increasing pace.

The Invention of Mathematical Knowledge by Islamic Scholars

According to Shahari Md Zain and Abdul Latif Samian (2007), the invention of mathematical knowledge by Islamic scholars can be described in the cycle diagram below.
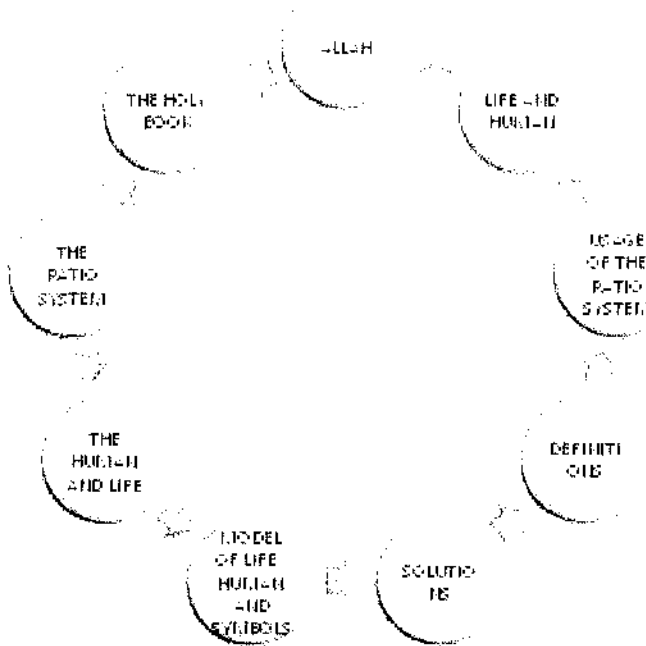

Figure 1: The Cycle Diagram

In the above diagram, the basic source of mathematical studies starts from Allah, the creator, inspiring the knowledge to human kind through the Holy Quran. Due to the understanding of the concept that has been revealed in the Holy Quran Muslims scholar then proceed with a research and discover new mathematical knowledge. The knowledge can then be applied to the needs of the societies to solve any problem

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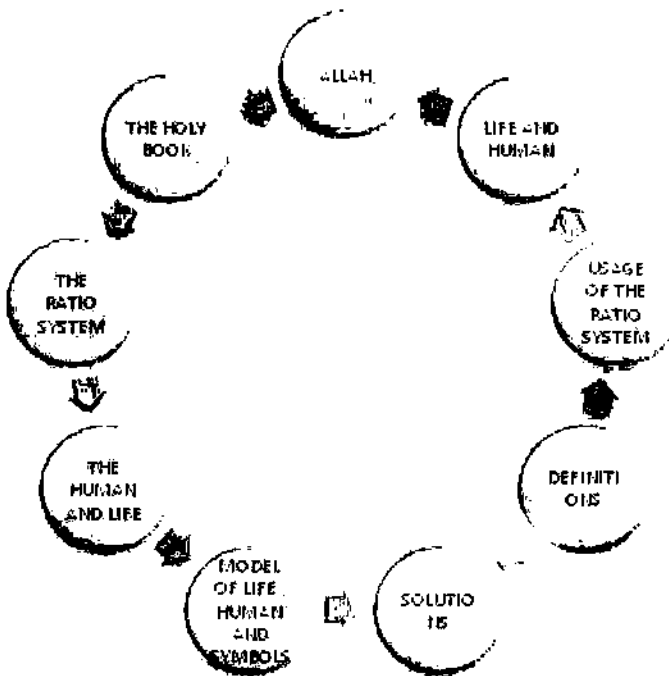

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related to mathematics. The mathematical scholar then realized that the intelligence in them is actually comes from Allah. Therefore the awareness will increase their faith to Allah.

The above mentioned fact is supported by many researchers in mathematics. According to Afzalur Rahman (1994), mathematical scholars of Islamic intellectual tradition are to make al-Quran as a source of stimulus to continue research in Mathematic. Dr Maurice Bucaille (1979) said, al-Quran is the source that motivates the Muslim mathematician to pursue their study in this field. The cleverness of Muslim has been recognized by Prof Dr Carra de Paux. 'Muslims already have the development in their knowledge. They taught us how to do the calculation until we mastered it. They got the algebra and logic knowledge. They developed it until they get the analytical facts. There is no doubt that they are the first who obtained this trigonometry data from the Yunans before. Thus, the development of arithmetic, algebra and other knowledge has been search out by the Muslims because all of the main points are all found in the al-Quran.

For the Islamic Mathematic scholars, mathematic is the obligation or responsibility that they have to do to find the easy way to the paradise later. There are differences between Islamic and non Islamic scholars way of thinking. For the Islamic scholars, when they found difficulties they will pray and seek for Allah's help. They will raise their performances toward the Creator such as staying longer in the mosque.

There are several examples on how mathematics being used in different situations and context. The latter discussion will focus on numbers, shapes and connections.

The Concept of Numbers in the Holy Quran

A number is a mathematical object used in counting and measuring. A notational symbol which represents a number is called as 'numeral'. Numerals are often used for labels (phone numbers), for ordering (serial numbers) and for codes (ISBN). The first known use of numbers dates back to around 3500 BC in Mesopotamia and the earliest known base 10 system dates to 3100 BC in Egypt. The usage of bones and artifacts has been used for counting time like number of days and keeping a record of quantities such as animals. Al-Quran has already mentioned the important

digits used in mathematical knowledge such as number 1 until 10. As the example

a.   Number 1, 2, 3 and 4 in Surah Al-Nisa' verse 3.
'If ye fear that ye shall not be able to deal justly with the orphans, marry women of your choice, two, three or four but if ye fear that ye shall not be able to deal justly (with them) then only one or a captive that your right hands possess. That will be more suitable to prevent you from doing injustice'(4: 3).
      The knowledge of numbers 1 to 4 has been used especially in Islamic marriage. In Islam, a man is allowed to marry a woman of his choice. He may marry two, three or four women under the circumstance that he can be fair to all his wives.

b.   Number 5,6,7,8 in Surah Al-Kahfi verse 22
'(Some) say they were three, the dog being the fourth among them Lothers) say they were five, the dog being the sixth, guessing at the unseen; (yet others) say they were seven, the dog being the eight. Say (O Muhammad SAW): "My lord knows best their number: none knows them but a few" So debate not (about their number, etc) except with the clear proof (which We revealed to you). And consult not any of them (people of the Scripture, Jews and Christians) about the affair of the people of the cave' (18: 22).

c.   Number 9, in Surah Al-Naml verse 48
'There were in the city nine men of a family, who made mischief in the land, and would not reform' (27:48).

      Other than that there are also, other numbers in mathematic such as:

d.   Number 300 in surah Al-Kahfi verse 25
'So they stayed in their Cave three hundred years, and (some) add nine (more)'

      The discovery of the concepts of numbers in the Holy Quran played a great role to mathematical knowledge because it inspires the mathematician to go further in expanding the knowledge. One of the famous Islamic Mathematical scholars is Al Khindi (801-873). His real name is Abu Yusuf Yaqub Ibni Ishaq Al Khindi. His greatest contribution is about the 11 texts used to elaborate about numbers and how to analyze

them. Other famous Islamic Mathematical Scholars is Al Khawarizmi (835-844) or the real name is Muhamad Musa Al Khawarizmi. He is famous for his intelligence in mathematics. He produced "Al Jabar Wal Muqabalah' that has more than 800 solutions for mathematical problems. During 12th century, this book has been translated to the Latin language and has been taught in European High School until the end of 16th century. Another Muslim contributor, Al Hassar, a mathematician from the Maghreb (North Africa) in the 12th century has developed the modern symbol mathematical notation for fractions where the nominator and denominator are separated by a horizontal line.

The Middle Ages saw the acceptance of zero negative and fractional numbers. Islamic mathematicians merged the concept of number and magnitude into a more general idea of real number. The Egyptian Mathematician Abu Kamil Shuja Ibnu Aslam was the first to accept irrational numbers as solution quadratic equations. Then, in 10th century the Iraqi mathematician Al Hashimi provided general roofs for irrational numbers. In number theory, Ibnu Al Haytham solved problems involving congruence using what is now called as Wilson's Theorem. Another contribution to number theory is his work on perfect numbers.

In the abovementioned discussion it is proven that the Holy Quran has played a vital role in encouraging Muslims scholar to do great research and reach to new discoveries in mathematics.

The Concept of Shapes in the Holy Quran

A shape is a geometric figure that can be mathematically defined. Shapes are defined in terms of the mathematical objects they are embedded in two dimensional shapes are defined in terms of the plane, three dimensional objects in terms of the space. The examples of 2D shapes are circles, squares, triangles and ovals. The 3D shapes are spheres, cubes, cones, pyramids, hemispheres, cuboids and cylinders. The knowledge of shapes is important to find the solutions for daily problems such as to know the exact width and length of the length, to create the design for buildings, earthenware and carpet.

The concept of shapes has been mentioned in the Holy Quran .The most easy example is about the shape of earth .For many centuries people believed that the is flat with no idea that earth is spherical. The Quran mentions the actual shape of the earth in the following verse:

'And we have made the earth egg shaped' (An-Naziat: 30)

The Arabic word *'Dahaha'* means egg shaped. It also means an expanse. *Dahaha* is derived from *Duhiya* which specifically refers to the egg of an ostrich which is geospherical in shape, exactly like the shape of the earth.

From this knowledge, Sheikh Ahmad Al Khatib in his book 'Raudat Al Hussab fi Ilm Al Hisab' do the research and said that the sphere has a surface with the same line from the centre of it and has been showed in 3 matra while the round shape in 2 matra. Also in Raudat Al Hussab, sphere is mentioned as *'Alkurrah'* and the example for *'Alkurrah'* is *al Ard* (the earth).

Length is another element in geometry. There are verses in al-Quran that discussed about how to evaluate the length. This is happened because of the tilt of the earth's axis for 23.5 degree and with the circular movement on the axis and also on the same time it loops around the sun. Allah has mentioned in Surah Al-Fatir verse 13 about the differences between the length of night and the day. He merges Night into Day, and he merges Day into Night, and he has subjected the sun and the moon (to his Law): each one runs its course for a term appointed. Such is Allah your Lord: to Him belongs all Dominion. And those whom ye invoke besides Him have not the least power. There are a lot of verses that describe about the architecture. One of the verses is Surah Al-Shu'ara': 129

'And do ye get for yourselves fine buildings in the hope of living therein (for ever)?'

The description of the art of bricks in Surah Al-Qasas verse 38

Pharaoh said: "O Chiefs! No god do I know for you but myself: therefore, O Haman! Light me a (kiln to bake bricks) out of clay, and build me a lofty palace, that I may mount up to the god of Moses: but as far as I am concerned, I think (Moses) is a liar!'

The art of weapon in Surah Al-Hadid verse 25

'We sent aforetime our apostles with Clear Signs and sent down with them the Book and the Balance (of Right and Wrong), that men may stand forth in justice; and We sent down Iron, in which is (material for) mighty war, as well as many benefits for

mankind, that Allah may test who it is that will help, Unseen, Him and His apostles: For Allah is Full of Strength, Exalted in Might (and able to enforce His Will).

The art of the carpet in Surah Al-Kahfi verse 31

'For them will be Gardens of Eternity; beneath them rivers will flow; they will be adorned therein with bracelets of gold, and they will wear green garments of fine silk and heavy brocade: They will recline therein on raised thrones. How good the recompense! How beautiful a couch to recline on!'

The art of porcelain in Surah Al-Waqiah verse 18

'With goblets, (shining) beakers, and cups (filled) out of clear-flowing fountains'.

Although Muslim Mathematicians are most famed for their work on number systems they also made considerable contributions on the development of algebraic geometry. The motivation that comes from the al-Quran creates the idea to Syeikh Tantawi Jauhari to write Al Jawahir fi Tafsir al-Quran where in this book there are about 750 verses related to science and mathematics. This translation is recognized as the translation of the knowledge and it is different with the others.

A famous mathematician, Al Khawarizmi has undertaken a systematic application of algebra to geometry. Al Mahani (820C) conceived the idea of reducing geometrical problems such as duplicating the cube to problems in algebra. Thabit Ibn Qurra (836C) played an important role in preparing the way for such important mathematical discoveries such as analytic geometry and non-eucledian geometry.

The knowledge of the concept of shapes in the Holy Quran too, has given a lot of benefit not only to the mathematicians but for the layman to use it in building professions such as carpentry and engineering, land surveying, navigation and astronomy.

The Concept of Connections in the Holy Quran

A connection is a relationship of entities. It is also called as 'the structure of mathematics'. The set of real numbers has several connections or structures, for example, an order is an organization of numbers where

each number is either less or more than other number, algebraic structure is an operation of addition, subtraction, multiplication, division, ratio and a measure is an interval along the real line that have a certain length.

There are a lot of concepts in the al-Quran that mentioned about connections such addition, minus, multiplication and division.

The Concept of Addition

The concept of addition has been mentioned in the Holy Quran whereby Allah said in Surah Al-Kahfi verse 25 meaning:

> *'And they stayed in their cave three hundred solar years and add nine for lunar years'*

The concept of addition can be used especially in the field of business where the profit can be calculated. It can also be used in accounting where all the entities can be put in a table an all the debits and credits can be counted.

The Concept of Minus

The minus concept in Surah Al-Ankabut verse 14

> *'We (once) sent Noah to his people, and he tarried among them a thousand years less fifty: but the Deluge overwhelmed them while they (persisted in) sin'.*

Also, the concept of minus can be applied to the field of business to calculate the balance of money that the customer will received after giving an amount of money to the cashier .

The Concept of Multiply

The multiply concept in Surah Al-Hadid verse 18

> *'For those who give in Charity, men and women, and loan to Allah a Beautiful Loan, it shall be increased manifold (to their credit), and they shall have (besides) a liberal reward'.*

The multiply concept can be seen in our lives when we are doing good deeds to other people.Allah will blessed us with double or triple rewards in the Day-After.

The Concept of Divide

The divide concept in Surah Aal-Nisa' verse 11

> *'Allah commands you as regards your children inheritance: to the male a portion equal to that of two females: if there are only daughters two or more, their share is two thirds of the inheritance; if only one, her share is half. For parents, a sixth share of inheritance to each if the deceased left children; if no children and the parents are the only heirs the mother has a third; if the deceased left brothers or sisters the mother has a sixth. The distribution in all cases is after the payment of legacies he may have bequeathed or debts. You know not which of them, whether your parents or your children are nearest to you in benefit these fixed shares are ordained by Allah. And Allah is Ever All Knower All Wise'.*

The concept of division is applied in the distribution of the heritage from a dead person. It is called as *'Faraid'*. This law will ensure justice where every person will get a real proportion that he should obtained.

The Concept of Ratio

The concept of ratio in Surah An Nisa' verse 7

> *'There is a share for men and a share for women from what is left by parents and those nearest related, whether the property be small or large- a legal share'.*

Again, the concept of ratio which is similar to the concept of division can be used the distribution of heritage

The basis of mathematics is the knowledge about compare and contrast that had been mentioned in surah Al-Hajj verse 47

> *'And they ask you to hasten on the torment! And Allah fails not His promise. And verily a day with your Lord is as a thousand years of what you reckon'.*

The knowledge about the differences between the number of the days in the earth and other planets has been used by the astronauts.

There are a lot more concepts that have been mentioned in the Holy Quran in the purpose of guiding men to reveal more knowledge on

it. Thus, it is the duty of mankind to go and search for the knowledge in the Holy Quran.

Conclusion

The Holy Quran is ʿa precious gift of knowledge from the God to the human being. It contains a lot of concepts in all fields especially in mathematics. Therefore, it is the obligation of human being to start searching for the concepts recorded in the Holy Quran and do great research on it for the benefit of the society.

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