

# Mathematical Concepts In The Implementation of Tawaf According to The Quran

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## Abstrak

Al-Quran mencakup matematika secara rinci, terutama perkalian dan perhitungan angka dalam berbagai situasi dan keadaan. Matematika sebagai queen of science memiliki peranan penting sebagai roda penterjemah konsep-konsep dalam sains. sehingga sains dan matematika saling berhubungan dan terkait. Sains dan matematika terhubung dengan ayat-ayat Al-Qur'an. Ayat-ayat dalam Alquran sebagai sumber dari segala hal mencakup teknologi, sains, ekonomi dan memberikan makna bahwa semua cabang ilmu pengetahuan dapat dicari kebenarannya dari sumbernya dalam Al-Qur'an. Metode yang digunakan dalam jurnal ini menggunakan metode penelitian kualitatif dengan jenis penelitian adalah studi pustaka (study literature). Contoh konsep matematika yang memiliki korelasi dengan sumber Al-Qur'an yaitu mengenai konsep matematika dalam pelaksanaan tawaf yaitu ketika jamaah mengelilingi Ka'bah membentuk bangun datar lingkaran.

**Kata kunci:** haji, lingkaran, phi, tawaf

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## Abstract

*The Koran covers mathematics in detail, especially multiplication and calculating numbers in various situations and circumstances. Mathematics as the queen of science has an important role as a means of translating concepts in science. so science and mathematics are interconnected and related. Science and mathematics are connected to the verses of the Qur'an. The verses in the Qur'an as the source of everything include technology, science, economics and provide the meaning that all branches of knowledge can be sought for truth from their source in the Qur'an. The method used in this journal uses qualitative research methods with the type of research being literature study. An example of a mathematical concept that has a correlation with the source of the Al-Qur'an is regarding the mathematical concept in the implementation of tawaf, namely when the congregation circles the Kaaba to form a flat circular shape*

**Keywords:** Circle, hajj, phi, tawaf

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## 1. INTRODUCTION

Islam is a religion with a mission for its followers to establish education and teaching. Islam has an educational foundation consisting of three aspects: the Quran, the Sunnah, and legislation. The Quran and the Sunnah are positioned as sources of teachings, both theologically and ethically. As sources of guidance for the Islamic community, the Quran and the Sunnah contain fundamental concepts through a process that is highly potential for the development and empowerment of Islamic sciences. Indeed, the Quran provides significant possibilities to be used as a mode of thinking or a method for acquiring knowledge (Huda, 2017)

The contents of the Quran are highly comprehensive, covering everything from worship, monotheism, and daily activities to spiritual matters and physical issues. It addresses topics ranging from the rights and responsibilities of individuals to discussions on morality and the "attitude and laws of the world." In addition to addressing the challenges of basic life, the Quran delves into mathematics in detail, especially multiplication and numerical calculations in various situations and circumstances (Syafri, 2019)

In Surah Al-Ghashiyah, Chapter 88, verses 17 to 30, it explains: "Do they not look at how camels are created, the sky is raised high, the mountains are set firm, and the earth is spread out?" This verse carries a profound meaning, inviting and urging humanity to seek in-depth knowledge through research about the universe. The Quran conveys messages that can be interpreted from a scientific perspective, especially in mathematics. Mathematics encompasses concepts such as algebra, statistics, geometry, measurement, logic, and other topics.

"Mathematics has two worlds, namely the real (observable) and the unseen (ghaibiyah). Thus, mathematics also possesses both aspects, that is, 'half real and half unseen.' To comprehend the real, rational, empirical, and logical approaches are required. Meanwhile, to understand the unseen, intuitive, imaginative, and metaphysical approaches are necessary. It is clear that mathematical concepts are closely related and deeply intertwined with the Qur'an. Thus, the Qur'an also explains mathematical concepts correlated to daily life (Soimah & Fitriana, 2020)

Mathematics, as the queen of science, plays a crucial role as the interpreter of concepts in science. Like a queen, mathematics serves other fields related to it and can be applied specifically in the realm of science (Sugilar & Nuraida, 2019).

Science and mathematics complement each other in the effort to discover true new knowledge. Both movements work to uncover accurate patterns of regularity from various phenomena. Science employs a series of experiments and critical thinking, while mathematics uses activities of reasoning and logic. The Quran unifies mathematics and science in every in-depth study. In the Quranic perspective, nothing happens by chance. Everything occurs within a 'counting,' whether it can be explained by the known laws of nature or those yet unknown to humans. For a Muslim mathematician who believes in the codification of the universe, discovering the relationships between various things, including sacred texts, humans, and cosmic objects, is a 'decree unto itself' (Mahfudzoh, 2011)

Science and mathematics are two disciplines that have strong integrity and correlation both in language and calculation. Science cannot develop without mathematics, as the concepts in science rely on mathematical calculations, especially in proving scientific ideas. Conversely, mathematics cannot progress without science, so science and mathematics are interconnected and related. Science and mathematics are linked to the verses of the Quran.

The Qur'an is positioned as the source of truth for all aspects of knowledge, including science. Science, as a product of human thought, aims to discover the laws within the signs of Allah's creation, rather than to prove the existence of these signs. The signs of creation already possess the certainty of laws established by Allah SWT. Therefore, the Qur'an serves as a guide in the field of science to discover the truth (Hasan, 2020)

## **2. LITERATURE REVIEW**

The application of mathematics can be applied in various stages of the Hajj pilgrimage. The application of mathematics in the implementation of the Hajj rituals includes calculating the distance covered by an individual during Tawaf using the circumference formula of a circle, as well as counting the total number of steps taken to complete the Sa'i (Rohmah, 2018)

The verses in the Quran serve as a source for everything, including technology, economics, and science. This indicates that all branches of knowledge can seek their truths in the Quran. For example, in the worship of Hajj during the performance of Tawaf around the Ka'bah seven times, there are mathematical concepts developed based on the Quran. Verses related to Hajj can also be used as a basis for examining the value of phi and the

formula for the circumference of a circle. In this writing, we will delve deeply into the mathematical concepts related to the implementation of Tawaf according to the Quran.

### 3. METHOD

The method employed in this journal is a qualitative research method with the type of study being a literature review. The data collection method used is literature study, involving data retrieval from various sources such as journals, books, and other relevant sources related to the topic under discussion. The research stages include literature search, content analysis, and journal review. The collected data in the study are descriptive in the form of words or images.

### 4. RESULT AND DISCUSSION

Islam has affirmed that worship is directed only to Allah by performing a series of pillars of Islam. Some of the pillars of Islam include: (a) Shahada, which is a declaration of belief in the oneness of Allah SWT and acknowledgment that Prophet Muhammad is His messenger, bringing all the laws of Allah SWT. (b) Salat, which means prayer starting with the takbir and ending with the salutation. Salat consists of standing, bowing, prostrating, remembering Allah, praising Him, and praying. A Muslim is obligated to perform salat five times a day. (c) Zakat; giving a certain amount of wealth that has reached the specified conditions to those who are eligible to receive it. (d) Fasting; refraining from things that invalidate it during the daylight hours of the month of Ramadan. (e) Hajj; the pilgrimage to the Ka'bah.

The pilgrimage (Hajj) is one of the fifth pillars of Islam. Allah says in Surah Al-Imran, verse 97, regarding the pilgrimage:

فِيهِ آيَاتٌ بَيِّنَاتٌ مَّقَامُ إِبْرَاهِيمَ ۖ وَمَنْ دَخَلَهُ كَانَ آمِنًا ۗ وَلِلَّهِ عَلَى النَّاسِ حِجُّ الْبَيْتِ مَنِ اسْتَطَاعَ إِلَيْهِ سَبِيلًا ۚ وَمَنْ كَفَرَ فَإِنَّ اللَّهَ غَنِيٌّ عَنِ الْعَالَمِينَ

It means: "*In it are clear signs (such as) the Station of Abraham. And whoever enters it (the House of Allah) shall be safe. And (due) to Allah from the people is a pilgrimage to the House - for whoever is able to find thereto a way. But whoever disbelieves - then indeed, Allah is free from need of the worlds.*"

The meaning of "able" is that one's needs have been fulfilled, such as health, wealth, family, safety, and others (Abu, 2020). Regarding the timing of the pilgrimage, it is stated in Surah Al-Baqarah, verse 197, where Allah SWT says:

الْحَجُّ أَشْهُرٌ مَعْلُومَةٌ ۖ فَمَنْ فَرَضَ فِيهِنَّ الْحَجَّ فَلَا رَفَثَ وَلَا فُسُوقَ وَلَا جِدَالَ فِي الْحَجِّ ۗ وَمَا تَفْعَلُوا مِنْ خَيْرٍ يَعْلَمُهُ اللَّهُ ۗ وَتَزَوَّدُوا فَإِنَّ خَيْرَ الزَّادِ التَّقْوَىٰ وَاتَّقُونِ يَا أُولِيَ الْأَلْبَابِ

It means: "*The pilgrimage (Hajj) is (performed in) months well-known. So whoever has made Hajj obligatory upon himself therein, there is (to be for him) no sexual relations and no disobedience and no disputing during Hajj. And whatever good you do - Allah knows it. And take provisions, but indeed, the best provision is Taqwa (piety, righteousness). So fear Me, O you of understanding.*"

Based on that verse, scholars agree that the time for performing Hajj occurs during the months of Shawwal, Dhu al-Qi'dah, and Dhu al-Hijjah. The verses discussing Hajj are found in Surah Al-Hajj, which is the 22nd chapter in the Quran.

In Surah Al-Hajj, verse 29, Allah says:

ثُمَّ لِيَقْضُوا تَفَثَهُمْ وَلِيُوفُوا نُذُورَهُمْ وَلِيَطَّوَّفُوا بِالْبَيْتِ الْعَتِيقِ

It mean: *"Then they should cleanse themselves from any impurity, fulfill their vows, and perform Tawaf around the Ancient House (the Kaaba)."*

Based on the above verse, removing impurities refers to actions such as cutting hair, trimming nails, and the like. Al-Bait al-'Atiq means 'ancient house.' This term is used to refer to the Kaaba, which is the first place of worship built on Earth. Al-'Atiq also carries the meaning 'freed from the threats of the disobedient.' The verse explains the connection between the act of Tawaf worship and the Kaaba. The verses discussing the activity of performing Tawaf are found in verse 26:

وَأَذِّبْنَا بِنُورِهِمْ مَكَانَ الْبَيْتِ أَنْ لَا تُشْرِكَ بِي شَيْئًا وَطَهِّرْ بَيْتِيَ لِلطَّائِفِينَ وَالْقَائِمِينَ وَالرُّكَّعِ السُّجُودِ

It means: *And (Remember) when We appointed Ibrahim at the House, saying, 'Do not associate anything with Me and purify My House for those who walk around it, those who stand (in prayer), and those who bow and prostrate.'*

Tawaf is a fundamental ritual of Hajj involving the act of circumambulating the Kaaba. It is analogous to the Earth's rotation around the sun in the solar system. Humans perform Tawaf by circling the Kaaba, the focal point or center of the Qibla. Tawaf is done by walking around the Kaaba seven times in a counterclockwise direction. The Tawaf begins from the corner of the Black Stone (the corner of the Kaaba where the 'Black Stone' is located, believed by Muslims to have originated from paradise). Throughout the Tawaf, the Kaaba remains on the left side, and the Tawaf concludes at the corner of the Black Stone. If someone does not start Tawaf in alignment with the Black Stone, that round will not be counted until they reach the position of the Black Stone, at which point it is then considered the beginning of the Tawaf.

Performing Tawaf is recommended to walk around the Kaaba, gradually getting closer to the Black Stone (Hajar Aswad) to be able to kiss it, although this is considered a recommended practice. Therefore, if one is unable to kiss the Black Stone, they can wave their right hand towards it. Prophet Muhammad once used a staff (mihjan), as narrated in a hadith:

وَعَنْ أَبِي الطَّفَيْلِ رَضِيَ اللَّهُ عَنْهُ قَالَ: رَأَيْتُ رَسُولَ اللَّهِ صَلَّى اللَّهُ عَلَيْهِ وَسَلَّمَ يَطُوفُ بِالْبَيْتِ وَيَسْتَلِمُ الرُّكْنَ بِمِخْجَنٍ مَعَهُ وَيُقَبِّلُ الْمِخْجَنَ. رَوَاهُ مُسْلِمٌ

Translation: *"Abu Thufail (may Allah be pleased with him) said, 'I once saw the Prophet Muhammad (peace be upon him) circumambulating the Kaaba and touching the Black Stone with a staff (mihjan), then he kissed it.'" (Narrated by Muslim)*

The Prophet Muhammad (peace be upon him) said: "When Prophet Muhammad (peace be upon him) arrived in Mecca, he approached the Black Stone and wiped it with his hand. Then, he walked to the right and performed three quick rounds around the Kaaba, followed by four regular rounds." (Narrated by Muslim and Nasai).

In this writing, Tawaf that will be correlated with the concept of a circle is Tawaf that begins from the corner of the Black Stone and ends at the same corner, namely the corner of the Black Stone. In performing Tawaf, Muslims circumambulate the Kaaba forming a circle. This Tawaf activity correlates with the geometric concept of a two-dimensional shape, namely a circle. Forming a circle symbolizes the unity and obedience of the Muslim community to Allah SWT.

A circle is a simple closed curve in which every point on the curve is equidistant from a specific point called the center of the circle. The equal distance is called the radius of the circle (Djumanta, 2020).

The Kaaba serves as the central point when Muslims perform Tawaf, and the movement around the Kaaba forms a circle. Therefore, it can be concluded that:

$$\text{Circumference of the circle (C)} = \text{Tawaf (T)}$$

To determine the circumference of a circle, a measuring tool called the value of phi is used, which is equal to  $\frac{22}{7}$  or 3.14. This value is obtained from the ratio of the circumference of the circle to the diameter or the radius of the circle. The value of phi, which is  $\frac{22}{7}$ , has a connection between the Hajj worship and the pillar of Tawaf. The number 22 correlates with the Quranic verses related to Hajj in Surah Al-Hajj, which is the 22nd chapter, while the number 7 correlates with the Tawaf activity, which involves circumambulating the Kaaba seven times to form a circle.

In addition to the value of phi in the circle, there is also the diameter or the central line. The diameter is a line segment connecting two points on the circle that passes through the center point. This central line will divide the circle into two parts. The correlation of the central line in the act of Tawaf with the verses of Al-Hajj is that the central line divides two things or serves as a separator that explains the separation between actions desired by Allah. This explanation is found in Surah Al-Hajj, verse 19:

﴿ هَذَانِ خَصْمَانِ اخْتَصَمُوا فِي رَبِّهِمْ فَالَّذِينَ كَفَرُوا قُطِعَتْ لَهُمْ ثِيَابٌ مِنْ نَارٍ يُصَبُّ مِنْ فَوْقِ رُءُوسِهِمُ الْحَمِيمُ ۝﴾

Translation: "Here are two groups (believers and disbelievers) who dispute. They argue about their Lord. For those who disbelieve, garments of fire will be cut out for them; boiling water will be poured over their heads."

In verse 23 of Surah Al-Hajj, Allah says:

﴿ إِنَّ اللَّهَ يُدْخِلُ الَّذِينَ آمَنُوا وَعَمِلُوا الصَّالِحَاتِ جَنَّاتٍ تَجْرِي مِنْ تَحْتِهَا الْأَنْهَارُ يُحَلَّوْنَ فِيهَا مِنْ أَسَاوِرَ مِنْ ذَهَبٍ وَلُؤْلُؤًا وَلِبَاسُهُمْ فِيهَا حَرِيرٌ ۝﴾

Translation: "Indeed, Allah will admit those who believe and do righteous deeds to gardens beneath which rivers flow. They will be adorned therein with bracelets of gold and pearls, and their garments therein will be silk."

From verses 19 and 23 of Surah Al-Hajj, we can infer the central line or the dividing symmetry line between actions that are liked by Allah and those that are disliked by Allah. Thus, the central line is a line that starts from the edge of the circle, passing through the center point, dividing the circle into two parts. If correlated with Surah Al-Hajj, this central line distinguishes between the inhabitants of paradise and the inhabitants of hell. Therefore, if symbolized, Surah Al-Hajj, which is the 22nd chapter, is related to the diameter, and it can be symbolized as  $22x d$ .

When viewed from the concept of determining the circumference of a circle by correlating it with the concept of Tawaf: circling the Kaaba seven times and correlating with Surah Al-Hajj, which is the 22nd chapter in the Quran. If written based on mathematical rules, it is as follows:

$$7 (\text{Circumference of the circle/Tawaf}) = 22 \times \text{diameter}$$

The circumference of the circle is symbolized by "K," and the diameter is symbolized by "d." Therefore:

$$7K = 22d \quad \text{sehingga} \quad K = \frac{22}{7} \times d$$

Thus, the formula for the circumference of a circle is "phi multiplied by the diameter" or  $K = \frac{22}{7} \times d$ , with the value  $\frac{22}{7}$  representing phi or symbolized as " $\pi$ ."

## 5. CONCLUSION

Based on the explanation above, it can be concluded that there is a correlation between the mathematical concept in the implementation of Tawaf with the verses of the Quran. The Quran, as the book for Muslims, contains religious guidance that is free of doubt and has been guaranteed for its truth by Allah SWT, serving as a guide for Muslims in their lives. The Quran is a source of truth for all aspects or fields of knowledge, including science. Science and mathematics are two disciplines with strong integrity and correlation in both language and computation, as scientific knowledge cannot develop without mathematics. Science and mathematics are connected to the verses of the Quran.

In the context of Tawaf, mathematical concepts such as the value of phi and the formula for the circumference of a circle, related to the implementation of Tawaf, are explained in the Quran, especially in Surah Al-Hajj, the 22nd chapter. The implementation of Tawaf, circling the Kaaba seven times, is also related to Surah Al-Hajj, the 22nd chapter. The value of phi, which is  $22/7$ , and the formula for the circumference of a circle =  $22/7 \times d$ , have connections with mathematical concepts in the Quran.

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