

## STRATEGIES TO BECOME A HAFIDZ AND HAFIDZAH WITH MATHEMATICAL MODELING

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### Abstract:

Based on the reasoning of the Qur'an and Hadith, the practice of memorizing the Qur'an was a specific devotion and the Sunnah of the Prophet that was highly noble and had exceptional value for people who carry it out. The goal of this research was to examine the approach of memorizing the Qur'an in a specific amount of time based on mathematical modelling. The Salafiyah Syafi'iyah Islamic Boarding School Sukorejo, Situbondo, Indonesia, was used for this study. The research approach utilized in this discussion to remember 30 juz of the Qur'an was the Research and Development method. The study's findings show that: (1) there were several methods of memorizing the Qur'an, such as kaisa, tasalsuli, jam'ii, muqsam, and so on; (2) there were patterns of deposit in memorizing the Qur'an every week, namely 2/5 juz per week or 6/5 juz per month; and (3) there was a mathematical formula for memorizing the Qur'an, namely  $y = 0.3x$  with R.

**Keywords:** Memorizing Strategy, Memorizing, Al-Qur'an, Hafidz, Hafidzah, Mathematical Modeling

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## INTRODUCTION

Man cannot avoid using his mind and thoughts in his daily actions. Culture is everything that comes from human work, creativity, and taste; it may show how humans have used their minds and thoughts to fulfil their daily needs. All human actions include the use of physical parts, including the brain. The brain is a vital component of the human body because it is constantly used to think, remember, identify, and regulate all actions, including memorizing the Qur'an.

Tahfidz is a procedure used to maintain the purity of the Al-Qur'an, such as memorizing it so that there is no modification and falsification of the contents of the Qur'an and can protect against forgetfulness in its entirety or parts. There are suli tasal, jam'ii, and various memorization methods available. It is better to remember the Qur'an with a Suli tasal approach, which is accompanied by a menaqror (repeating what has been memorized). This was obtained during an interview with PP. Hafidz Syafi'iyah Safi'iyah Sukorejo.

Memorizing the Qur'an is one type of worship practice that has many benefits that come from the Qur'an and hadith. As in the Qur'an Surah Al-Muzammil verse 20.

إِنَّ رَبَّكَ يَعْلَمُ أَنَّكَ تَقُومُ أَدْنَىٰ مِنْ ثُلُثِي اللَّيْلِ وَنِصْفَهُ وَثُلُثَهُ وَطَائِفَةٌ مِنَ الَّذِينَ مَعَكَ ۗ وَاللَّهُ يُقَدِّرُ اللَّيْلَ وَالنَّهَارَ ۗ عَلِمَ أَنْ لَنْ تُحْصُوهُ فَتَابَ عَلَيْكُمْ ۖ فَاقْرَءُوا مَا تَيَسَّرَ مِنَ الْقُرْآنِ ۗ عَلِمَ أَنْ سَيَكُونُ مِنْكُمْ مَرْضَىٰ ۖ وَأَخْرُوجُنَّ يَضْرِبُونَ فِي الْأَرْضِ يَبْتَغُونَ مِنْ فَضْلِ اللَّهِ ۗ وَأَخْرُوجُنَّ يُفَاتِلُونَ فِي سَبِيلِ اللَّهِ ۖ فَاقْرَءُوا مَا تَيَسَّرَ مِنْهُ ۗ وَأَقِيمُوا الصَّلَاةَ وَآتُوا الزَّكَاةَ وَأَقْرِضُوا اللَّهَ قَرْضًا حَسَنًا ۗ وَمَا تُقَدِّمُوا لِأَنْفُسِكُمْ مِنْ خَيْرٍ تَجِدُوهُ عِنْدَ اللَّهِ هُوَ خَيْرًا وَأَعْظَمَ أَجْرًا ۗ وَاسْتَغْفِرُوا لِلَّهِ ۖ إِنَّ اللَّهَ غَفُورٌ رَحِيمٌ

*Translation:* "Verily your Lord knows that you stand (praying) less than two-thirds of the night, or one-third of it and (as well as) a group of people who are with you. And Allah determined the measure of the night and the day. Allah knows that you can never determine the limits of those times, so He makes it easy for you. Therefore, read what is easy (for you) from the Qur'an. He knows that there will be among you people who are sick and those who walk the earth seeking some of Allah's bounty; others are fighting in the cause of Allah, so read what is easy (for you) from the Qur'an and establish prayer, pay zakat and give Allah a good loan. And whatever good you do for yourself, you will surely find it with Allah as the best and the greatest reward, and ask Allah for forgiveness; Verily Allah is Forgiving and Merciful."<sup>1</sup>

Hadith of the Prophet SAW: "Rather than Anas RA. He claims that the Messenger of Allah said, "Verily Allah has a human family." Then Anas repeated himself, and the Messenger of Allah asked, "Who are they, O Messenger of Allah?" "They are experts of the Qur'an," said His Holiness (people who read or memorize the Qur'an and practice its contents). They are God's family and God's unique people. People who memorize the Koran will also be placed in a paradise that "Instead of Abdullah Bin Amr Bin Al Ash RA of the Prophet S.A.W, the king said: In the afterlife, the scholars of the Quran will be commanded, "Read and ascend to heaven." And recite the Qur'an in tartil as you would anywhere else. Your location in Paradise is determined by the last verse you read."<sup>2</sup>

Based on the description above, it is very clear and firm that Muslims learn the Qur'an and are encouraged to teach it to other Muslims. In this case, Muslims are encouraged to turn on taklim majlis, dhikr majlis, or other assemblies related to studying the Koran, studying the Koran, and memorizing the Koran. This argument recommends that all Muslims or at least some Muslims can memorize the Qur'an. How to memorize the Qur'an can be done by utilizing mathematics related to the strategy of memorizing it from time to time. Based on the research results obtained by Tantri and Soro, it shows that students with high Al-Qur'an memorization skills have better mathematical critical thinking skills than students with moderate Al-Qur'an memorization abilities, while students with moderate Al-Qur'an memorization abilities -

<sup>1</sup> Sarwo Edi, "Teori Dan Ilustrasi Syirkah Dalam Ekonomi Islam", *Aghniya: Jurnal Ekonomi Islam*, 2.2 (2020).

<sup>2</sup> Indah Nursupriah, "Pemodelan Matematika Rentang Waktu Yang Dibutuhkan Dalam Menghafal Al-Qur'an", *Jurnal Theorems (The Original Research of Mathematics)*, 2017, 1–10.

The Qur'an has better mathematical critical thinking skills than students with low Al-Qur'an memorization skills<sup>3</sup>.

According to Saiful et al., said that mathematics is one of the subjects that plays a very important role in education<sup>4</sup>. According to Tohir et al., said that the ability to think in identifying and constructing formulas in mathematics is needed to grow students' understanding of the material and produce meaningful learning<sup>5'6</sup>. Furthermore, Tohir said that the ability to solve mathematical problems is seen as a certain process in combining mathematical rules with the problems at hand<sup>7'8'9</sup>. Therefore, mathematics plays an active role in finding strategies for memorizing the Qur'an properly and correctly. So that one's skills in memorizing the Qur'an can play an active role in their mathematical thinking abilities.

A memorizer of the Qur'an can memorize it in various ways<sup>10</sup>. Some people memorize 1-10 verses or more in a day. This is determined by the circumstances of the time spent studying the Qur'an, as well as the capacity to memorize it. Memorizing the Qur'an is common in Islamic boarding schools, especially in Indonesia, where there is a special dormitory for tahfidzul-Qur'an. To encourage students to study the Qur'an and something relevant to memorizing the Qur'an, we are interested in developing a mathematical model to determine the time it takes for a person to memorize the Qur'an. Based on the foregoing, the following problem formulations can be identified: (a) How do students at the Syafi'iyah Islamic Boarding School Sukorejo, Sitobondo memorize the Qur'an?; (b) How many verses must be deposited by each student in a week or a month?; (c) How to do mathematical modelling when you know what a hafiz needs?

<sup>3</sup> Rahmawati Ainun Tantri and Slamet Soro, 'Kemampuan Berpikir Kritis Matematis Ditinjau dari Kemampuan Menghafal Al-Qur'an', *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 11.1 (2022).

<sup>4</sup> Saiful Saiful, Hobri Hobri, and Mohammad Tohir, 'Analisis Metakognisi Siswa Berbasis Lesson Study For Learning Community (LSLC) Ditinjau Dari Gaya Kognitif', *Alifmatika: Jurnal Pendidikan Dan Pembelajaran Matematika*, 2.1 (2020), 73–91 <<https://doi.org/10.35316/alifmatika.2020.v2i1.73-91>>.

<sup>5</sup> Mohammad Tohir, Z. Abidin, and others, 'Students Creative Thinking Skills in Solving Two Dimensional Arithmetic Series Through Research-Based Learning', *Journal of Physics: Conference Series*, 1008.1 (2018), 012072 <<https://doi.org/10.1088/1742-6596/1008/1/012072>>.

<sup>6</sup> Mohammad Tohir and Muhasshanah Muhasshanah, 'Mathematical Issues in Two-Dimensional Arithmetic for Analyze Students' Metacognition and Creative Thinking Skills', *Alifmatika: Jurnal Pendidikan Dan Pembelajaran Matematika*, 3.2 (2021), 170–83 <<https://doi.org/10.35316/alifmatika.2021.v3i2.170-183>>.

<sup>7</sup> Mohammad Tohir, 'Pengembangan Bahan Ajar Olimpiade Matematika Berdasarkan Model Pemecahan Masalah Untuk Meningkatkan Kemampuan Penalaran Matematis Siswa', in *Tesis. Magister Pendidikan Matematika Universitas Jember* (Jember: Program Pascasarjana Universitas Jember, 2017) <<https://doi.org/10.13140/RG.2.2.31121.79200>>.

<sup>8</sup> Muzayyanatun Munawwarah, Nurul Laili, and Mohammad Tohir, 'Keterampilan Berpikir Kritis Mahasiswa Dalam Memecahkan Masalah Matematika Berdasarkan Keterampilan Abad 21', *Alifmatika: Jurnal Pendidikan Dan Pembelajaran Matematika*, 2.1 (2020), 37–58 <<https://doi.org/10.35316/alifmatika.2020.v2i1.37-58>>.

<sup>9</sup> Mohammad Tohir, Maswar Maswar, and others, 'Prospective Teachers' Expectations of Students' Mathematical Thinking Processes in Solving Problems', *European Journal of Educational Research*, 9.4 (2020), 1735–48 <<https://doi.org/10.12973/EU-JER.9.4.1735>>.

<sup>10</sup> Muhammad Ilyas, 'Metode Muraja'ah Dalam Menjaga Hafalan Al-Qur'an', *Al-Liqo: Jurnal Pendidikan Islam*, 5.01 (2020), 1–24.

## Literature Review

### a. Definition of Al-Qur'an

When viewed in terms of etymology (language), the word Al-Qur'an comes from the word قُرْآنًا - يَقرَأُ - قرأً which means reading, while according to the term (terminology) of the Qur'an it is defined by several scholars' are:

According to Muhammad Abduh:

القران هو لكتاب مكتوب في المصاحف المحفوظ في صدور من عنى بحفظه من المسلمين

*Translation:* The Qur'an is a book of reading that is written in the form of manuscripts that are preserved by someone who keeps it rote from Muslims<sup>11</sup>.

As for the opinion of M. Khudari Beik:

القران هو اللفظ العربى المنزل على محمد صلى الله عليه وسلم للتدبر والتذكر المنقول متواترا وهو ما دفتين المبدوء بسورة الفاتحة والمختوم بسورة الناس

*Translation:* Al-Qur'an is the Arabic language that has been revealed to the Prophet Muhammad SAW. to understand its contents, to remember it, to convey it in a mutawatir way, to be written in the form of a manuscript starting with Surah Al-Fatihah and ending with Surah An-Nas<sup>12</sup>.

According to Subhi Salih:

القران هو الكتاب المعجز المنزل على النبى صلى الله عليه وسلم المكتوب في المصاحف المنقول عليه بالتواتر المتعبد بتلاوته

Al-Qur'an is a book that contains miracles that were revealed to the prophet Muhammad saw., written in Mushaf (sheets), delivered with mutawatir (narrative path), and is of worship value for those who read it<sup>13</sup>.

The Qur'an, according to the various definitions put forward by the experts above, is a revelation (whispers in the soul and hidden signs that Allah gave to the Prophets and Messengers) that Allah revealed to Prophet Muhammad SAW, as well as miracles that were revealed to the Prophet Muhammad. Prophet Muhammad SAW.

<sup>11</sup> Syukron Affani, *Tafsir Al-Qur'an Dalam Sejarah Perkembangannya* (Surabaya: Kencana, 2019).

<sup>12</sup> Sari Tamara Natalia, 'Penerapan Metode One Day One Ayat Dalam Menghafal Al-Qur'an Juz 30 Pada Santri Di TPA Amaliah Desa Karang Endah Selatan Kecamatan Gelumbang Kabupaten Muara Enim' (UIN Raden Fatah Palembang, 2022).

<sup>13</sup> Arfin Syazi, 'Kontribusi Pembelajaran BTQ (Baca Tulis Al-Qur'an) Dalam Menunjang Prestasi Belajar PAI Siswa Di SMP YANURI Jakarta Barat' (Fakultas Ilmu Tarbiyah Dan Keguruan Universitas Islam Negeri Syarif ...).

### b. Definition of Tahfidz

Tahfidz Al-Qur'an consists of two words, namely tahfidz and Al-Qur'an. The word tahfidz is taken from the masdar ghoir mim form of the word **تَحْفِيزًا - يُحْفِظُ - حَفَظَ** which means to memorize. Meanwhile, tahfidz or memorization is defined by Abdul Aziz Abdul Rauf as the process of repeating something by reading, hearing, or seeing. A task will be remembered if it is repeated frequently. Memorizing the Qur'an is an act of preserving, protecting, and not forgetting the history of the Qur'an which was given to the Prophet Muhammad by memorizing, so as not to be damaged and falsified, and so as not to forget all or part of it<sup>14</sup>. Memorizing the Qur'an also needs to pay attention to the supporting factors, by maintaining health which is one of the most important factors for people who will memorize the Qur'an. If the body is healthy, the memorization process will be faster without any obstacles, and the time limit for memorizing will be relatively fast<sup>15</sup>. The results of research by Hanafi et al. showed that even though Al-Qur'an reading ability in both groups increased significantly, the increase in the e-BBQ group was higher than in the group without eBBQ. Students' and instructors' perceptions of e-BBQ showed that e-BBQ was considered easy and useful. In conclusion, e-BBQ is capable of enhancing students' Al-Qur'an reading ability. The usefulness and ease of use perceived by students became the main factors in this LMS acceptance and helped them to improve their Al-Qur'an reading ability<sup>16</sup>.

### c. Mathematical Modeling

Memorizing the Al-Qur'an is a human effort to worship the Almighty, to be able to start memorizing the Qur'an smoothly, one must be able to find a method that can lead to this. One of them is mathematical modelling. The mathematical model aims to enable the decision-making process regarding the real situation by analyzing the model, with the understanding that a good model makes decisions unbiased<sup>17</sup>.

In everyday life, a person cannot be separated from mathematics. Because mathematics is a subject that can develop creative abilities and emphasize problem-solving. In addition to mathematics, there is also a so-called model. Model theory in mathematics is a science that presents mathematical concepts through the concept of sets, or the science of models that support a mathematical system. So mathematical modelling is a process of developing mathematical knowledge that includes real-world problems presented in mathematical models.

### d. Arithmetic progression

An arithmetic series is a numeric sequence where the next value is the sum of the previous numbers plus the given integer. 3, 5, 7, 9, 11, 13, ... are some examples. The following formulas can be used to express this arithmetic series.:  $a$ ,  $a + b$ ,  $a + 2b$ ,  $a + 3b$ , ... In this case the  $n$ th term<sup>18</sup>:

<sup>14</sup> M Nasimin, Marwazi Marwazi, and Abd Ghaffar, 'Implementasi Program Tahfidz Juz 30 Dalam Meningkatkan Kemampuan Baca Al-Qur'an Siswa Di Madrasah Tsanawiyah Swasta Nurul Huda Mendalo Darat Jambi Luar Kota' (UIN Sulthan Thaha Saifuddin Jambi, 2021).

<sup>15</sup> Marliza Oktapiani, 'Tingkat Kecerdasan Spiritual Dan Kemampuan Menghafal Al-Qur'an', *Tahdzib Al-Akhlaq: Jurnal Pendidikan Islam*, 3.1 (2020), 95–108.

<sup>16</sup> Yusuf Hanafi and others, 'Student's and Instructor's Perception toward the Effectiveness of E-BBQ Enhances Al-Qur'an Reading Ability.', *International Journal of Instruction*, 12.3 (2019), 51–68.

<sup>17</sup> David M Eddy and others, 'Model Transparency and Validation: A Report of the ISPOR-SMDM Modeling Good Research Practices Task Force-7', *Medical Decision Making*, 32.5 (2012), 733–43.

<sup>18</sup> A R As'ari and others, 'Matematika Untuk SMP', *MTs Kelas VII Semester*, 1 (2016).

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$$a_n = a + (n - 1)b,$$

Sum of all terms:

$$\begin{aligned} S_n &= \frac{n}{2} (a + a_n) \\ &= \frac{n}{2} [2a + (n - 1)b] \end{aligned}$$

Proof of the nth term

$$\begin{aligned} a_1 &= a \\ a_2 &= a + b \\ a_3 &= a + 2b \\ &\vdots \\ a_n &= a + (n - 1)b \end{aligned}$$

Thus, the sum of the nth terms:

$$a_n = a + (n - 1)b.$$

Number of nth term:

$$S_n = a + a + b + a + 2b + \dots + a + (n - 1)b \dots (1)$$

$$S_n = a + (n - 1)b + a + (n - 2)b + a + (n - 3)b + \dots + a + 2b + a + b + a \dots (2)$$

When (1) plus (2) is reversed using the mirror equation, it becomes as follows:

$$S_n + S_n = 2a + (n - 1)b + 2a + (n - 1)b + \dots + 2a + (n - 1)b$$

because  $2a + (n - 1)b$  is equal to the sum of n :

$$\begin{aligned} 2 S_n &= n [2a + (n - 1)b] \\ S_n &= \frac{n}{2} [2a + (n - 1)b] \end{aligned}$$

### e. Geometry Series

A geometric series is a numerical sequence in which the next value is the product of the previous number multiplied by a fixed number of ratios. The following formulas can be used to express geometric series<sup>19</sup>:

$$a_0 = a, a_1 = ar, a_2 = ar^2, a_3 = ar^3, \dots$$

where  $r \neq 0$  is the multiplier ratio number and  $a$  is the scale factor.

In this case the nth term:

$$a_n = ar^{n-1}$$

<sup>19</sup> Abdur Rahman As'ari and others, 'Matematika Untuk SMP/MTs Kelas VII Semester 1' (Jakarta: Pusat Kurikulum dan Perbukuan, Balitbang, Kemdikbud, 2016).

Sum of all tribes:

$$\sum_{k=0}^{n-1} ar^k = \frac{a(r^n-1)}{r-1} \text{ untuk } r > 1$$

$$\sum_{k=0}^{n-1} ar^k = \frac{a(1-r^n)}{1-r} \text{ untuk } r < 1.$$

Proof. nth term:

$$a_1 = a$$

$$a_2 = ar_1$$

$$a_3 = ar_2$$

$$\vdots$$

$$a_n = ar_{n-1}$$

Thus, the sum of the nth terms is:

$$a_n = ar_{n-1}$$

Number of nth term:

$$S_n = a + ar_1 + ar_2 + \dots + ar_{n-2} + ar_{n-1} \dots (1)$$

$$S_n r = ar_1 + ar_2 + ar_3 + \dots + ar_{n-1} + ar_n \dots (2) \text{ dikalikan dengan } r.$$

Equation (1) is reduced (2) to be as follows:

$$S_n - S_n r = a - ar_1 + ar_1 - ar_2 + ar_2 - ar_3 + \dots + ar_{n-2} - ar_{n-1} + ar_{n-1} - ar_n$$

$$S_n (1 - r) = a - ar_n$$

$$S_n = \frac{a(1-r^n)}{1-r}$$

## RESEARCH METHODS

The Research and Development approach was used in this study to memorize the Qur'an. there are nine steps in the process of developing a conceptual model adapted from the instructional design of Dick & Carey and Gall modified into 4 stages of development among others (1) phase I preliminary study and need analysis, (2) phase II planning and developing a model, (3) phase III validation and revision, (4) phase IV implementation of models<sup>20</sup>. Santri at the Salafiyah Syafi'iyah Islamic Boarding School Sukorejo, Sitobondo made a mathematical model of the 30 juz memorization time of the Qur'an. The memorization strategy is to memorize 2/5 juz every week and recite the memorization every four weeks for the juz memorized the previous week. As a result, if it is done continuously without repetition during the recitation because it is not learned, and so on, the pattern can be seen in the Table 1 below:

<sup>20</sup> Hisban Thaha, Edhy Rustan, and Subhan Subhan, 'Learning Model Development of Memorizing The Qur'an Through Integration of Internal and External Representation', *Journal of Education, Teaching and Learning*, 6.1 (2021), 95-101.

**Table 1.** Method of Memorizing the Qur'an in Mathematical Modeling I

nth week	Activity	Number of Recitation
1	Recitation	$\frac{2}{5}$
2	Recitation	$\frac{4}{5}$
3	Recitation	$\frac{6}{5}$
4	Review	$\frac{6}{5}$
⋮	⋮	⋮
97	Recitation	$29\frac{1}{5}$
98	Recitation	$29\frac{3}{5}$
99	Recitation	30
100	Review	30

## RESULTS AND DISCUSSION

### Mathematical Modeling I

Based on Table 1 above, overall it can be written in the form of the following series.

$0, \frac{2}{5}, \frac{4}{5}, 1\frac{1}{5}, 1\frac{1}{5}, 1\frac{3}{5}, 2, 2\frac{2}{5}, 2\frac{2}{5}, 2\frac{4}{5}, 3\frac{1}{5}, 3\frac{3}{5}, 3\frac{3}{5}, 4, 4\frac{2}{5}, 4\frac{4}{5},$
$4\frac{4}{5}, 5\frac{1}{5}, 5\frac{3}{5}, 6, 6\frac{2}{5}, 6\frac{4}{5}, 7\frac{1}{5}, 7\frac{1}{5}, 7\frac{3}{5}, 8, 8\frac{2}{5}, 8\frac{2}{5}, 8\frac{4}{5}, 9\frac{1}{5},$
$9\frac{3}{5}, 9\frac{3}{5}, 10, 10\frac{2}{5}, 10\frac{4}{5}, 10\frac{4}{5}, 11\frac{1}{5}, 11\frac{3}{5}, 12, 12, 12\frac{2}{5}, 12\frac{4}{5},$
$13\frac{1}{5}, 13\frac{1}{5}, 13\frac{3}{5}, 14, 14\frac{2}{5}, 14\frac{2}{5}, 14\frac{4}{5}, 15\frac{1}{5}, 15\frac{3}{5}, 15\frac{3}{5}, 16,$
$16\frac{2}{5}, 16\frac{4}{5}, 16\frac{4}{5}, 17\frac{1}{5}, 17\frac{3}{5}, 18, 18, 18\frac{2}{5}, 18\frac{4}{5}, 19\frac{1}{5}, 19\frac{1}{5},$
$9\frac{3}{5}, 20, 20\frac{2}{5}, 20\frac{2}{5}, 20\frac{4}{5}, 21\frac{1}{5}, 21\frac{3}{5}, 21\frac{3}{5}, 22, 22\frac{2}{5}, 22\frac{4}{5},$
$22\frac{4}{5}, 23\frac{1}{5}, 23\frac{3}{5}, 24, 24, 24\frac{2}{5}, 24\frac{4}{5}, 25\frac{1}{5}, 25\frac{1}{5}, 25\frac{3}{5}, 26, 26\frac{2}{5},$
$26\frac{2}{5}, 26\frac{4}{5}, 27\frac{1}{5}, 27\frac{3}{5}, 27\frac{3}{5}, 28, 28\frac{2}{5}, 28\frac{4}{5}, 28\frac{4}{5}, 29\frac{1}{5}, 29\frac{3}{5}, 30, 30$

Thus, the above series knows the pattern for each term, but when generalizing the formula for the nth term based on the assumptions shown above, the zero-value term is not taken into account in calculating the pattern of the first term.



For  $n = 1$  then the first term is 0  
 $n = 2$  then the second term is  $2/5$   
 $n = 3$  then the third term is  $4/5$   
 $n = 100$  then the 100th term is 30

The above pattern can be generalized to:

$$u_n = \frac{2}{5} \cdot n \cdot b_n - \frac{2}{5} \cdot c_n$$

Whit  $b_n = \frac{1}{4}(n - 1)$  and  $c_n$  is:  
 for  $n = 1,2,3,4$  so  $c_n = 0$   
 $n = 5,6,7,8$  so  $c_n = 1$   
 $n = 97,98,99,100$  so  $c_n = 24$

The generalization result is then simplified starting by substituting  $b_n$ .

$$u_n = \frac{2}{5} \cdot n \cdot b_n - \frac{2}{5} \cdot c_n$$

$$u_n = \frac{2}{5} \cdot n \cdot \frac{1}{4}(n - 1) - \frac{2}{5} \cdot c_n$$

$$u_n = \frac{2}{5} \cdot (n - 1) - \frac{2}{5} \cdot c_n$$

$$u_n = \frac{2}{5}((n - 1) - c_n)$$

The next step is to simplify the form of  $C_n$  after finding the simpler formula for  $U_n$ . The form  $C_n$  is rewritten as a contiguous matrix.

$$a_n = c_n$$

$$\begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 9 & 10 & 11 & 12 \\ \vdots & \vdots & & \\ 97 & 98 & 99 & 100 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 1 & 1 & 1 & 1 \\ 2 & 2 & 2 & 2 \\ \vdots & \vdots & \vdots & \vdots \\ 24 & 24 & 24 & 24 \end{bmatrix}$$

If examined from each column, the matrix creates an arithmetic series with a difference of 4, as does the matrix  $c_n$ , which forms an arithmetic series with a difference of 1. The first column in the matrix  $a_n$  is a number which when divided by 4 leaves one or written  $(4i - 3)$ , column the second is in the form of a number which when divided by 4 leaves two or  $(4i - 2)$ , the third column is in the form of a number which when divided by 4 leaves a remainder of three or  $[4i - (-1)]$ , and the fourth column is a multiple of four or  $(4i)$ . As a result, it can be generalized as follows.

- $n = 4i - 3$
- $n = 4i - 2$
- $n = 4i - 1$
- $n = 4i$
- $\vdots$

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$$c = i - 1$$

This matrix can be used to assist in the creation of new ones.

for  $n = (4i - 3)$  whit  $c = (i - 1)$

$$u_n = \frac{2}{5}((n - 1) - c_n)$$

$$u_n = \frac{2}{5}(3i - 3)$$

for  $n = (4i - 2)$  whit  $c = (i - 1)$

$$u_n = \frac{2}{5}((n - 1) - c_n)$$

$$u_n = \frac{2}{5}(3i - 2)$$

for  $n = (4i - 1)$  whit  $c_n = (i - 1)$

$$u_n = \frac{2}{5}((n - 1) - c)$$

$$u_n = \frac{2}{5}(3i - 1)$$

for  $n = 4i$  whit  $c_n = (i - 1)$

$$u_n = \frac{2}{5}((n - 1) - c_n)$$

$$u_n = \frac{2}{5}(3i)$$

Because the formula  $U_n$  contains the variable  $i$ , the forms  $n = (3i - 2)$ ,  $n = (3i - 1)$ , and  $n = 3i$  are changed to their  $i$  form, namely:

$$n = (4i - 3)$$

$$n + 3 = 4i$$

$$\frac{n + 3}{4} = i$$

$$n = (4i - 2)$$

$$n + 2 = 4i$$

$$\frac{n + 2}{4} = i$$

$$n = (4i - 1)$$

$$n + 1 = 4i$$

$$\frac{n + 1}{4} = i$$

$$n = 4i$$

$$\frac{n}{4} = i$$

After determining the value of  $I$ , the value of  $i$  is converted into the  $n$ th term formula with the value of  $i$ .

➤ for  $n = (4i - 3)$  whit  $c_n = (i - 1)$ , so  $i = \frac{n+3}{4}$

$$u_n = \frac{2}{5}(3i - 3)$$

$$u_n = \frac{3n - 3}{10}$$

for  $n = (4i - 2)$  whit  $c_n = (i - 1)$ , so  $i = \frac{n+2}{4}$

$$u_n = \frac{2}{5}(3i - 2)$$

$$u_n = \frac{3n - 2}{10}$$

for  $n = (4i - 1)$  whit  $c_n = (i - 1)$ , so  $i = \frac{n+1}{4}$

$$u_n = \frac{2}{5}(3i - 1)$$

$$u_n = \frac{3n - 1}{10}$$

for  $n = 4i$  whit  $c_n = (i - 1)$ , so  $i = \frac{n}{4}$

$$u_n = \frac{2}{5}(3i)$$

$$u_n = \frac{3n}{10}$$

### Mathematical Modeling II

Mathematical modeling II to calculate the memorization of the Qur'an is to use linear regression. The following is data from the process of memorizing the Al-Qur'an.

**Table 2. Mathematical Modeling II**

nth Week	Many Recitation
1	$\frac{2}{5}$
2	$\frac{4}{5}$
3	$\frac{6}{5}$
4	$\frac{6}{5}$
⋮	⋮
97	$29\frac{1}{5}$
98	$29\frac{3}{5}$
99	30
100	30

Based on Table 2 above, the linear regression was searched with the help of Microsoft Excel and a graph was obtained, namely: a very strong one between the x-axis (nth week) and the y-axis (number of juz).

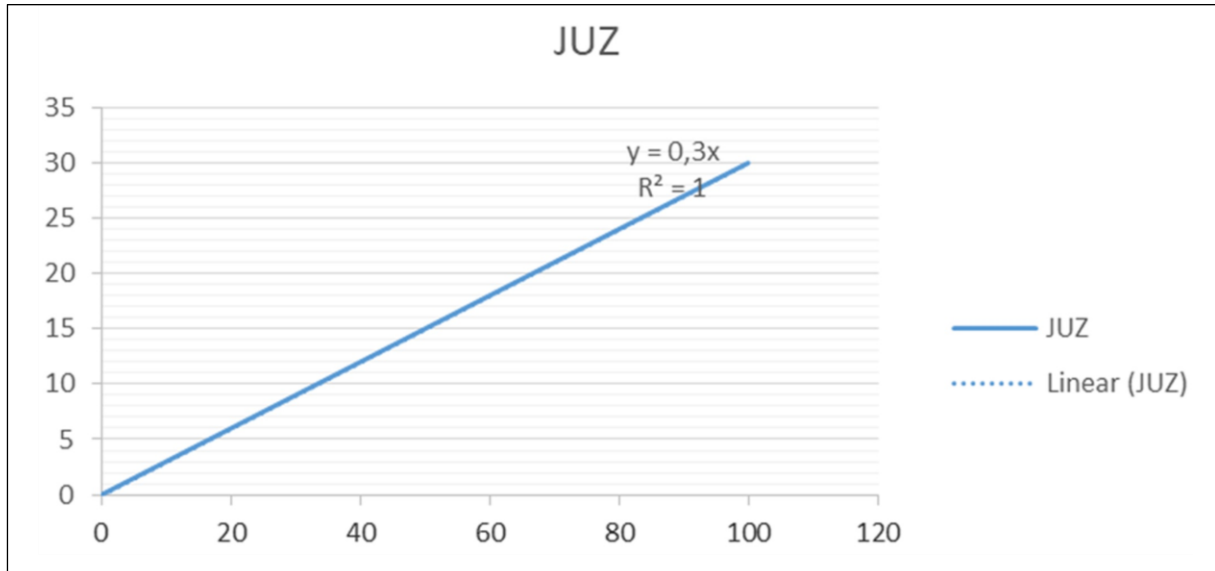


Figure 1. Graph of linear equation

Based on Figure 1, the linear equations are  $Y = 0.3x$  and  $R^2 = 1$ , where  $Y$  is the number of chapters studied and  $x$  is the number of weeks spent memorizing the Al-Qur'an.  $R^2 = 1$ , indicating that the previous equation has a very strong relationship between the x-axis (nth week) and the y-axis (number of juz).

**a. Mathematical Modeling I**

$$u_n \begin{cases} \frac{3n - 3}{10}; & \text{for } n \text{ which has the form of a number when divided by 4 will have a remainder of one or } (4i - 3) \\ \frac{3n - 2}{10}; & \text{for } n \text{ which has the form of a number when divided by 4 the remainder will be two or } (4i - 2) \\ \frac{3n - 1}{10}; & \text{for } n \text{ which has the form of a number when divided by 4 will have a remainder of three or } (4i - 1) \\ \frac{3n}{10}; & \text{for } n \text{ which has the form of a multiple of four or } (4i) \end{cases}$$

The formula for the nth term above can be used to calculate the number of chapters studied in the nth week. Before determining how many juz have been memorized since the nth week, we must determine the form of n; if the form n is divided by four, the residue is 1, so apply the formula  $U_n$  first. Use the second  $U_n$  formula if the form n is divided by four and has a remainder of 2. If the form n is divided by four and the remainder is 3, use the third  $U_n$  formula; otherwise, if the n-form is a multiple of four, use the fourth  $U_n$  formula. This algorithm can also be used to determine which week the person who has memorized x juz is in. However, the number of juz which is an integer (not a fraction) value can be found using the fourth version of the nth term formula. The nth formula is used between the first, second, and third nth term formulas

to calculate the number of juz that are not rounded (fractions). The memorizer will have difficulty finding the formula to apply if the memorizer wants to know the nth week with fractional juz using the above method.

It can also be used to count the number of memorized chapters and the nth week of the known chapters. This formula can be used to determine the activities carried out in the nth week. The trick is to divide n by 4, and if there is one left, the person is in the process of memorizing the first one; if n is divided by four and leaves 2, the person is in the process of memorizing the second week; and if n is divided by four and leaves a remainder of 3, the person is in the process of memorizing week three. In the case of n, which is divisible by four, the individual is in the process of remembering what was previously remembered three weeks ago.

The author will present various techniques using manual calculations based on the formula found for the nth term. Meanwhile, to calculate the number of juz in the 26th week, divide 20 by 4 and get the remainder, which is 26:  $4 = (6 \times 4) + 2$ . Then n = 26 will be divisible by 4 with a remainder of 2 and the formula for the second term will be used. number two-n

$$U_n = \frac{3n - 2}{10}$$

$$U_n = \frac{3 \cdot 26 - 2}{10}$$

$$U_n = 7 \frac{3}{5}$$

If you want to know how long someone has studied 18 chapters, you can use the fourth nth term formula.

$$U_n = \frac{3n}{10}$$

$$18 = \frac{3n}{10}$$

$$n = 60$$

Thus, the person has been learning to memorize for 60 weeks.

A person who is remembering in the 30th week can be identified as being in memorizing or reciting activities by dividing 30 by 4 and finding the remainder of the division, which is 30:  $4 = (7 \times 4) + 2$ . The remainder of the division is two, and if any of the remaining two, the individual is in the process of learning the second after the reading procedure.

### b. Mathematical Modeling II

By using the linear regression formula, the equation obtained is as follows:

$$Y = 0,3x$$

This approach can be used to determine the nth week as well as the number of chapters memorized by a memorizer. Using the second mathematical model, we can easily determine which chapter has been studied by looking at the number of nth weeks.

Thus, one's mathematical thinking ability in memorizing the Qur'an is needed to find strategies for becoming a match between Hafid and Hafidzah. In this scenario, mathematics is very significant and actively contributes to the advancement of knowledge. Mathematics can also be considered the mother or father of all human sciences. This is following Carl Friedrich Gauss's claim that mathematics is the queen of science<sup>21</sup>. Mathematics is a scientific field that can be used to understand other sciences<sup>22</sup>. Mathematics is an important subject to learn, so it must be a fun subject to learn so that students are further involved and enjoy learning mathematics, and the value obtained by students is very valuable and students can use the mathematics they have learned in everyday life<sup>23</sup>. Thus, his knowledge of mathematics seems to help himself and others. This is because understanding content and meaningful student learning require the ability to find and develop formulas in mathematics. Designing a learning model for remembering the Qur'an necessitates careful consideration of internal and exterior representations. This concept supports the brain's nature, which necessitates a balance between content projected for memorization and material supplied throughout the learning process. As a result, memory progressivity, as one of the key factors in memorizing the Qur'an, may increase, be effective and efficient in organizing and storing knowledge, and therefore considerably improve the capacity to memorize the Qur'an<sup>24</sup>.

## CONCLUSION

The mathematical model to memorize the Quran has a deposit method pattern of 2/5 juz per week and memorizes it every four weeks, based on the answers to the questions above. The algorithm that has been found in research can be used to calculate how long it takes to memorize the Qur'an up to 30 juz. In addition, as previously explained, it can be used to determine how much memorization is obtained with the specified goal time. By using the above calculation, the student's memory savings in one week is 2/5 juz, one month is 6/5 juz, and so on. Santri will finish memorizing in the 100th week, or 2 years and 1 month. The linear regression mathematical model is obtained as follows to determine the length of time and the amount of memorization by using the rote process of repeating verses that have been memorized, either because of forgetting or for other reasons:  $Y = 0,3x$  and  $R^2 = 1$ . Where Y is the number of chapters memorized and x is the number of weeks spent memorizing the Koran. The correlation coefficient value of 1 implies that there is a very high correlation between the x-axis (nth week) and the y-axis in the above equation (number of juz).

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<sup>21</sup> Jayant V Narlikar, *Mathematics: The Queen of Sciences* (India: Inter-University Center for Astronomy and Astrophysics, 2013).

<sup>22</sup> Zainal Abidin and Mohammad Tohir, 'Keterampilan Berpikir Tingkat Tinggi Dalam Memecahkan Deret Aritmatika Dua Dimensi Berdasarkan Taksonomi Bloom', *Alifmatika: Jurnal Pendidikan Dan Pembelajaran Matematika*, 1.1 (2019), 44–60 <<https://doi.org/10.35316/alifmatika.2019.v1i1.44-60>>.

<sup>23</sup> Mohammad Tohir, 'Keterampilan Berpikir Kreatif Siswa Dalam Menyelesaikan Soal Olimpiade Matematika Berdasarkan Level Metakognisi', *Alifmatika: Jurnal Pendidikan Dan Pembelajaran Matematika*, 1.1 (2019), 1–14 <<https://doi.org/10.35316/alifmatika.2019.v1i1.1-14>>.

<sup>24</sup> Thaha, Rustan, and Subhan.

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