West Science Islamic Studies
Vol. 1, No. 01, October 2023, pp. 120-131

Exploration of the Concept of Relation and Function in the Quran with the Theme of Q.S. Ar-Rahman

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Article Info

Article history:

Received October 2023
Revised October 2023
Accepted October 2023

Keywords:

Relation and Function
Islamic Integrated Maths
Al-Quran
Q.S. Ar-Rahman

ABSTRACT

Islamic value-integrated mathematics education not only plays a role in training students' thinking and reasoning but also forms a human personality that is faithful an31 2d pious to Allah SWT. This research aims to reveal the concept of relationship and function in Q.S. Ar-Rahman. The research was conducted with a qualitative approach with the type of literature study. The data was obtained through literature studies from the Quran, books, journals, proceedings, and scientific papers. The results showed the concept of relation and function in Q.S. Ar-Rahman. The concept of relation is found in the arrangement of letters to verse numbers and many letters to verse numbers. The concept of function found consists of bijective, surjective, and injective functions. The concepts of relation and function are then represented as graphs and ordered pairs. The results of this research can be used in learning mathematics material on relations and functions at junior high and senior high school levels.

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1. INTRODUCTION

Education is a powerful center of excellence in preparing the quality and formation of human character to face global challenges [1]. Its role in producing high-quality human resources and good character that can contribute to the nation and state is undeniable [2]. National education is a clear testament to this, aiming to cultivate individuals who are faithful and devoted to God Almighty, noble, healthy, knowledgeable, capable, creative, independent, and able to become democratic and responsible citizens [3].

To achieve this goal, the cultivation of character and morals to form a person of faith and piety is not only given in certain subjects [4], [5]. Still, it is given integratively in every subject, including mathematics [6]–[8]. In other words, Integrated mathematics not only plays a role in training students in problem-solving [9], [10], and thinking skills [11], [12] but also has a responsibility for the moral and behavioral aspects of students. [13], [14]. Therefore, integrated learning of mathematics is essential in education. [15].

Some integration of mathematics has been conducted across different fields. For example, applying mathematical concepts to culture and customs is commonly referred to as ethnomathematics [16]–[18]. Whereas mathematics integrated with Islamic values to develop a person with Islamic understanding and behavior is termed Islamic-integrated mathematics [19]–[21].

Furthermore, there is a growing demand for Islamic-integrated mathematics learning, as evidenced by the numerous models implemented in primary, secondary, and tertiary education institutions. [21], [22]. A mathematics olympiad contains integrated Islamic mathematics, known as *Kompetisi Sains Madrasah (KSM)* or the Madrasah Science Competition [23]. In addition, Islamic integrated mathematics has also been applied in various modules, learning media, and other learning tools [24]–[27].

The integration of mathematics with Islam can be done through various sources and guidelines derived from Islam, such as the Quran, hadiths, Islamic history, and others [28]–[31]. As the holy book for Muslims, the Quran is the most outstanding guide to life, grace, and guidance from Allah SWT for human beings [20], [32]. It includes *hudan li al-nas* (guidance for humankind), *al-bayyinat* (explanation), *al-furqan* (the criterion), and *syifa'un wa Rahmah* (compassionate medicine) [33]. The Quran includes science teachings, particularly in biology, astronomy, geology, and mathematics, and stories, laws, and Muslim guidelines. [34], [35].

Furthermore, efforts to introduce Islamic integrated mathematics derived from the Quran are still ongoing in some literature. Among them are shown in several books such as *Rahasia Bilangan Dalam Al-Quran* (Secrets of Numbers in the Quran) [36], *Al-Quran Empat Dimensi* (The Four-Dimensional Quran) [28], *Matematika dalam Al-Quran* (Maths in the Quran) [37], dan *Matematika Islam* (Islamic Maths) [38]. In addition, several studies have also examined it, such as fraction numbers [30], [39], Set theory [40], number operations [41]–[43], and number concepts in the Quran [44], [45]. Specifically, [46] discussed mathematical concepts and numerical values in Q.S. An-Nur, and [47] discussed mathematical patterns in Q.S. Quraysh.

However, previous studies have only discussed simple mathematical concepts derived from the Quran, such as sets, numbers, and their operations. The mathematical concepts that students learn from elementary school to college level are diverse, one of which is the concept of relations and functions [26], [48], [49]. Therefore, the researcher needed to explore the concept of relation and function from the Quran.

To simplify and deepen the mathematical study, the researcher restricts the letters in the Quran that are studied. This study uses the verses in Surah Ar-Rahman as the object to be explored mathematically. Surah Ar-Rahman was chosen because the verses in the surah are relatively short, but there are many of them, so it will be easier to calculate the letters. In

addition, there are verses in Surah Ar-Rahman repeated 31 times in a certain range of verses, giving the impression of a form of mathematical pattern and uniqueness in the letter. Therefore, this research explores the concept of relation and function in the Quran with the theme of Q.S. Ar-Rahman.

2. LITERATURE REVIEW

2.1 Q.S. Ar-Rahman verses 1-5

ٱلرَّحۡمَٰنُ ١ عَلَّمَ ٱلۡقُرۡءَانَ ٢ خَلَقَ ٱلۡإِنسَٰنَ ٣ عَلَّمَهُ ٱلۡبَيَانَ ٤
ٱلشَّمۡسُ وَٱلۡقَمَرُ بِحُسۡبَانٖ ٥

"The Most Merciful (1) Taught the Qur'an (2) Created man (3) [And] taught him eloquence (4) The sun and the moon [move] by precise calculation (5)." (Q.S. Ar-Rahman verses 1-5)

2.2 Verse repeated in Q.S Ar-Rahman

فَبِأَيِّ ءَالَآءِ رَبِّكُمَا تُكَذِّبَانِ

"So which of the favors of your lord would you deny?" (Q.S. Ar-Rahman verse 13)

The verse is repeated in Q.S Ar-Rahman 31 times. It starts in the 13th verse and ends in the 77th verse. The entire repetition of the verse is presented in Table 1.

Table 1. Repetition of verses in Q.S Ar-Rahman

Verse Number	Number of Repetitions
13, 16, 18, 21, 23, 25, 28, 30, 32, 34, 36, 38, 40, 42, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77	31

2.3 Numerical Value (Gematria) of Hijaiyah Letters

The numerical value in Hijaiyah letters in Indonesia is *Abajadun* [37]. In common parlance, this study is called Gematria, which examines the numerical values of an alphabet and relates them to certain phenomena [50], [51]. The numerical values of the *hijaiyyah* letters are shown in Table 2.

Table 2. Numerical Value of Hijaiyah Letters

Letter Name	Symbol	Numeric Value
Alif	ا	1
Ba'	ب	2
Jim	ج	3
Dal	د	4
Hha	ه	5
Wau	و	6
Za	ز	7
Ha'	ح	8
Tha'	ط	9
Ya	ي	10
Kaf	ك	20
Lam	ل	30
Mim	م	40
Nuun	ن	50
Sin	س	60
'Ain	ع	70
Fa'	ف	80
Shad	ص	90
Qaf	ق	100
Ra'	ر	200
Syin	ش	300
Ta'	ت	400
Tsa'	ث	500
Kha'	خ	600
Dzal	ذ	700
Dhad	ض	800
Dzad	ظ	900
Ghin	غ	1000

3. METHODS

This research uses a qualitative approach with the type of literature study. The literature study was conducted through the study of the Quran, mathematics books related to relations and functions, proceedings articles, and journal articles. Then, the researchers grouped the literature according to the research theme. Furthermore, researchers conducted an in-depth and detailed review of each literature.

The data collection technique uses secondary sources. That means the research data is not provided directly to researchers but through intermediaries such as books and articles. This research uses four stages of activities, namely (1) preparing the equipment needed, (2) preparing a working bibliography, (3) conducting a review, and (4) recording and analyzing research materials [52].

The results of the analysis were then reduced and synthesized into specific data. Furthermore, the analysis results are written and compared with other studies in the discussion section. That is so researchers can obtain clear conclusions to answer research questions [53].

4. RESULTS AND DISCUSSION

4.1 The Concept of Relation in Q.S Ar-Rahman Verses 1-5

As for Q.S Ar-Rahman verses 1-5, there are various letter arrangements with many letters in each verse, as shown in Table 3 below.

Table 3. Arrangement and Number of Letters of Q.S. Ar-Rahman Verses 1-5

Verse Number	Verse *Lafadz*	Composing Letters	Number of Letters
1	اَلرَّحْمٰنُۙ	ا ل ر ح م ن	6
2	عَلَّمَ الْقُرْاٰنَۗ	ع ل م ا ق ر ن	9
3	خَلَقَ الْاِنْسَانَۙ	خ ل ق ا ن س	10
4	عَلَّمَهُ الْبَيَانَ	ع ل م ه ا ب ي ن	10
5	اَلشَّمْسُ وَالْقَمَرُ بِحُسْبَانٍۙ	ا ل ش م س و ق ر ب ح ن	17

4.1.1 Concept of Relation from Composing Letters to Verse Number

In mathematics, a relation is a set of ordered pairs. A relation is also defined as a relationship between a domain and a codomain [49]. Each relationship in the domain and codomain of the relation has no restrictions, so relations have differences with functions [54].

Based on the constituent letters and many letters in Table 3, let's assume the set A is an arrangement of letters consisting of ا,ب,ح,س, ل ,ر which is written as A = {ا,ب,ح,س,ل,ر}. As for the set B denoted as a verse number consisting of $1, 2, 3, 4, 5$, which is written as $B = \{1, 2, 3, 4, 5\}$. Thus, the relation from set A to set B can be interpreted in Figure 1.

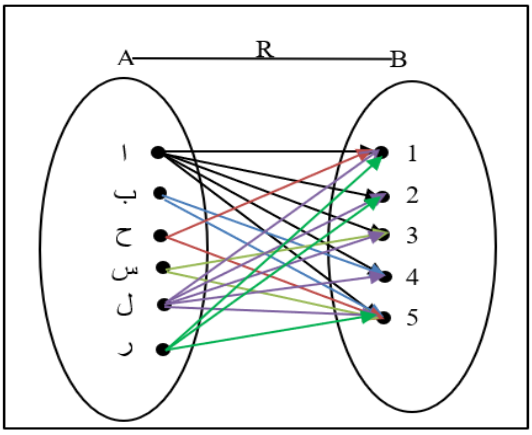

Figure 1. The relation of verse letter arrangement to verse number

Based on Figure 1, the relationship between set A and set B forms a relation. That means the relation has a domain, codomain, and range. The domain part is shown in the set A = {ا,ب,ح,س,ل,ر}, which is the region of origin. The codomain part is shown by the set $B = \{1,2,3,4,5\}$, the neighborhood area. At the same time, the range part is shown as the set $B = \{1,2,3,4,5\}$, which is the result area.

4.1.2 Relation from Number of Letters to Verse Number

Suppose set A is the number of letters consisting of 6,9,10,17, which can be written as $A = \{6,9,10,17\}$. The set B is the verse number consisting of 1,2,3,4,5, which can be written as $B = \{1,2,3,4,5\}$. Thus, the relation of set A to set B can be presented in Figure 2 below.

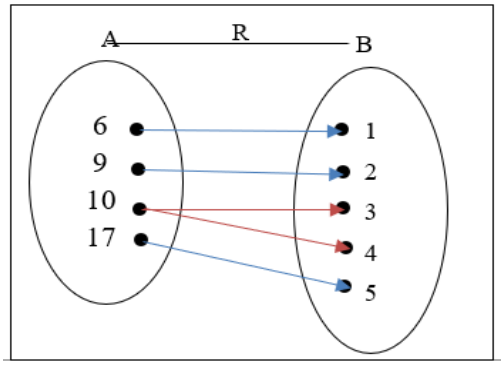

Figure 2. The relation from the Number of Letters to Verse Number

Based on Figure 2, the relationship between set A and set B forms a relation. That means the relation has a domain, codomain, and range. The domain part is shown in set

$A = \{6,9,10,17\}$, which is the origin. The codomain part is shown in set $B = \{1,2,3,4,5\}$, the friend region. In comparison, the range part is set $B = \{1,2,3,4,5\}$, which is the result area.

4.1.3 The Presentation of Relationship Concepts

a. Arrow Diagram

An example of the relations presentation on an arrow diagram is seen in Figure 1 and Figure 2.

b. Cartesian Diagram

In addition to Figure 1, the relation from letter arrangement to verse number can be presented with a Cartesian diagram, as in Figure 3.

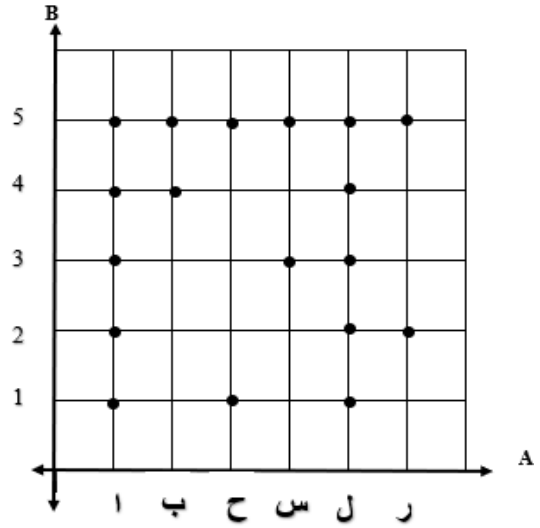

Figure 3. Presentation of Relation from Letter Arrangement to Verse Number with Cartesian Diagram

In addition to Figure 2, the relation from many letters to verse number can be presented with a Cartesian diagram, as in Figure 4.

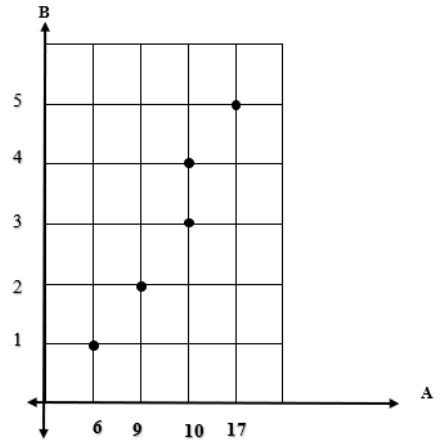

Figure 4. Presentation of the Relationship from Number of Letters to Verse Number with Cartesian Diagrams.

c. Set of Ordered Pairs

Apart from arrow and cartesian diagrams, the relation from alphabets to verse numbers can be presented with consecutive pairs.

R = {(ا, 1); (ا, 2); (ا, 3); (ا, 4); (ا, 5); (ب, 4); (ب, 5); (ح, 1); (ح, 5); (س, 3); (س, 5); (ل, 1); (ل, 2); (ل, 3); (ل, 4); (ل, 5); (ر, 2), (ر, 5)}

Meanwhile, the relation from many letters to verse number can be presented with sequential pairs as follows.

$R = \{(6,1), (9,2), (10,3), (10,4), (17,5)\}$

4.2 Function Concept in Q.S. Ar-Rahman

A function is a relationship between a domain and a codomain, where every domain member is exactly paired with one member of the codomain [49]. That means that functions are a specialized form of relation. Every function is undoubtedly a relation, but every relation is not necessarily a function. [54].

In Q.S Ar-Rahman verse 1, functions are formed, namely bijective functions and surjective functions. Bijective functions are shown from the arrangement of letters and numerical values. The surjective function is compared to numerical values and value categories. The arrangement of letters, numerical values, and numerical value categories are shown in Table 4.

Table 4. Letter Arrays, Numerical Values, and Value Categories in Q.S Ar-Rahman verse 1

Verse *Lafadz*	Letter Arrangement	Numeric Value	Value Category

اَلرَّحۡمٰنُۙ	ا	1	Odd
	ل	30	Even
	ر	200	Even
	ح	8	Even
	م	40	Even
	ن	50	Even

4.2.1 Bijective Function

A bijective function is a function whose codomain members cannot be unpaired, and every member of the codomain must pair with exactly one member of the domain [49]. A bijective function is a function whose codomain members cannot be unpaired, and every member of the codomain must pair with exactly one member of the domain. [26].

Based on Q.S. Ar-Rahman verse 1 and Table 4, the known arrangement of letters and numerical values forms a bijective function. Suppose set A is a sequence of letters in Q.S. Ar-Rahman verse 1, and set B is the numerical Hijaiyah letters. So, it can be written $A = (ا, ل, ر, ح, م, ن)$ and $B = (1, 30, 200, 8, 40, 50)$. The bijective function from set A to set B is presented in Figure 5.

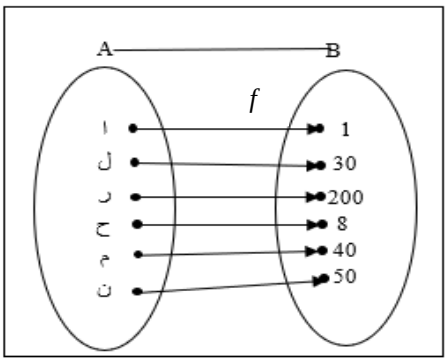

Figure 5. Bijective Function in Q.S. Ar-Rahman verse 1

Based on Figure 5, the relationship between set A and set B forms a bijective function. The domain formed is $A = \{ا, ل, ر, ح, م, ن\}$. At the same time, the codomain and range are indicated by the set of $B = \{1, 30, 200, 8, 40, 50\}$.

4.2.2 Surjective Function

A surjective function is a function whose codomain members cannot be unpaired. In a surjective function, each member of the codomain can be paired with more than one member of the domain [49].

In Q.S Ar-Rahman verse 1, numerical values and value categories form a surjective function. Suppose set A means numerical value in Q.S Ar-Rahman verse 1, and set B means value category. So it can be written as $A = (1,30,200,8,40,50)$, and $B = (Odd, Even)$. The surjective function of set A to set B is presented in Figure 6.

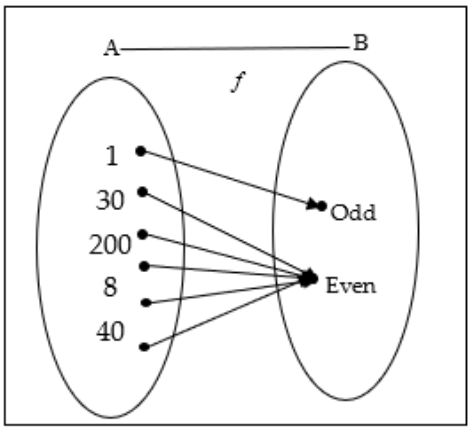

Figure 6. Surjective Function in Q.S. Ar-Rahman verse 1

Based on Figure 6, the relationship between set A and set B forms a surjective function. The domain formed is the set of $A = \{1, 30, 200, 8, 40, 50\}$. In contrast, the codomain and range formed, shown by the set of $B = \{Odd, Even\}$.

4.2.3 Injektive Function

An injective function is one whose codomain members can only pair with one domain member. In an injective function, the members of the codomain may not be paired. The injective function in Surah Ar-Rahman is obtained from the arrangement and number of letters in Q.S. Ar-Rahman verse 13. That is shown in Table 5.

Table 5. Letter Arrangement and Number of Letters in Q.S. Ar-Rahman verse 13

Verse *Lafadz*	Letter Arrangement	Number of Letters
فَبِاَيِّ اٰلَآءِ رَبِّكُمَا تُكَذِّبٰنِ	ف	1
	ب	3
	ا	4
	ي	1
	ل	1
	ء	1
	ر	1

	ك	2
	م	1
	ت	1
	ذ	1
	ن	1

Suppose set A denotes the arrangement of letters and set B denotes the number of letters. Then it can be written A = (ف, ب, ا, ي, ل, ء, ر, ك, م, ت, ذ, ن) and B = (1, 2, 3, 4, 5). The injective function of set A to set B is presented in Figure 7.

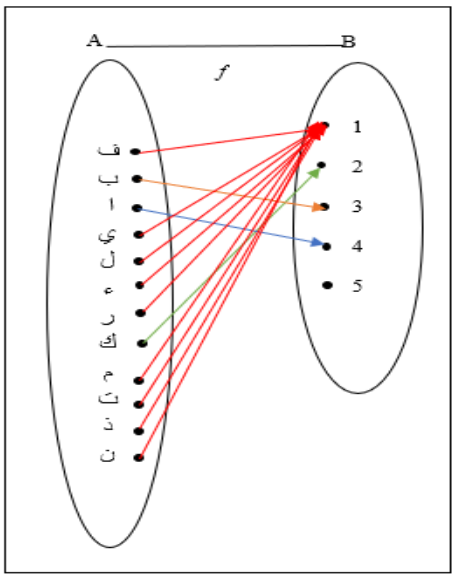

Figure 7. Injective Function in Q.S. Ar-Rahman verse 13

Based on Figure 7, the relationship between set A and set B forms an injective function. The domain formed is A ={ف,ب,ا,ي,ل,ء,ر,ك,م,ت,ذ,ن}. The codomain part is represented by the set B = {1,2,3,4,5} and the range by the set B = {1,2,3,4,}.

4.2.4 Presentation of Function Concept

a. Function Graph *y = f(x)*

Besides using arrow diagrams, functions can also be represented with function graphs. The function graph of a bijective function is shown in Figure 8, a surjective function in Figure 9, and an injective function in Figure 10.

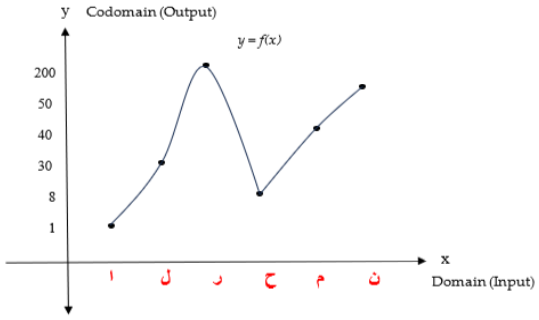

Figure 8. Bijective Function Graph

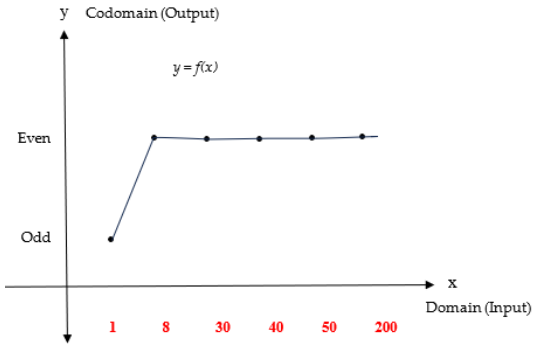

Figure 9. Surjective Function Graph

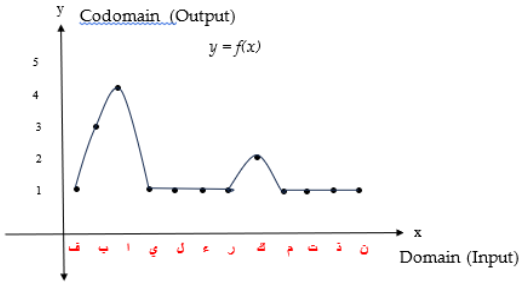

Figure 10. Injective Function Graph

b. Set of ordered pairs

Apart from arrow diagrams and graphs, bijective functions can also be represented by sets of ordered pairs, namely: f = {(ا,1), (ل, 30), (ر, 200), (ح, 8), (م, 40), (ن, 50)}.

The representation of the set of consecutive pairs on the surjective function, namely f = {(1, odd), (8, even), (30, even), (40, even), (50, even), (200, even). While the representation of the set of ordered pairs on the injective function, namely f = {(ف, 1), (ب, 3), (ا, 4), (ي, 1), (ل, 1), (ء, 1), (ر, 1), (ك, 2), (م, 1), (ت, 1), (ذ, 1), (ن, 1)}.

4.3 Integrating the Concept of Relation and Function in Q.S Ar-Rahman in Mathematics Learning

a. Junior High School Level

The concept of relations and functions related to Q.S Ar-Rahman can be applied in junior high school mathematics. Suppose the teacher gives the problem described in Table 6 below.

Table 6. The arrangement of letters, numerical values, and their categories in Q.S Ar-Rahman verse 64

Verse *Lafadz*	Letter Arrangement	Numeric Value	Numerical Value Category
مُدْهَامَّتٰنِۚ	م	40	Even
	د	4	Even
	ه	5	Odd
	ا	1	Odd
	ت	400	Even
	ن	50	Even

Based on Table 6, students are asked to distinguish between relations and functions. Suppose given:

1. A = The set of Letter arrangement of Q.S. Ar-Rahman verse 64
   B = The set of numerical values of Q.S. Ar-Rahman verse 64
2. X = The set of numerical value categories in Q.S. Ar-Rahman verse 64
   Y = The set of numerical values in Q.S Ar-Rahman verse 64

After being given the information in parts 1 and 2, students are then asked to pair each member of set A to B or set X to Y using arrow diagrams and cartesian diagrams. Then, students are asked to determine which is a relation and which is a function.

By integrating mathematics and the Quran, teachers can use Q.S Ar-Rahman to modify the form of the problem to be presented. That is useful in training students' problem-solving skills, bringing them closer, and familiarising them with the Quran.

b. High School Level

If, at the junior high school level, students are confronted with the difference between relations and functions, then at the senior high school level, students will be confronted with the kinds of functions and the presentation of functions. Suppose the teacher provides information about the arrangement of letters and many letters in Q.S Ar-Rahman verse 26, presented in Table 7.

Table 7. Letter arrangement and number of letters in Q.S Ar-Rahman verse 26

Verse *Lafadz*	Letter Arrangement	Number of Letters
كُلُّ مَنْ عَلَيْهَا فَانٍۖ	ك	1
	ل	2
	م	1
	ن	2
	ع	1
	ي	1
	ه	1
	ا	2
	ف	1

Based on Table 7, the teacher modeled the set on the arrangement of letters and many letters, for example.

X = The set of letter arrays of Q.S Ar-Rahman verse 26

Y = The set of the number of letters of Q.S Ar-Rahman verse 26

Then, students are asked to pair each member of set X to Y using arrow diagrams and function graphs. Furthermore, students are asked to determine the type of function that fulfills the relation of set X to set Y and the reason why.

Teachers can use Q.S Ar-Rahman verse 26 to modify the function-related problems presented by integrating mathematics and the Quran. The benefits of this integration are that it can train and improve students' memory, especially in understanding the concept of function. In addition, it is hoped that integrating mathematics with the Quran can bring students closer and familiarise them with the Quran in learning mathematics.

5. CONCLUSION

The concepts of relation and function can be found through an integrated

mathematical exploration of Q.S Ar-Rahman. The concept of relation is shown in the number of letters to the verse number and the number of letters to the verse number in Q.S Ar-Rahman verses 1 to 5. The relations can be presented with arrow diagrams, cartesian diagrams, and sets of consecutive pairs.

The function concepts found are bijective, injective, and surjective functions. The concept of the bijective function is found in the arrangement of letters to the numerical value of Q.S Ar-Rahman: 1. The concept of the surjective function is found in the numerical value to the numerical value category in Q.S Ar-Rahman verse 1. At the same time, the injective function is found in the arrangement of letters to many letters in Q.S Ar-Rahman verse 13. The presentation of functions can be done with arrow diagrams, function graphs, and sequential pairs.

It is hoped that the mathematics of Islamic integration on the concept of relations and functions can provide a new color for the formation of students' problem-solving skills while increasing students' faith when learning mathematics at school.

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