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EXPLORATION OF GEOMETRY CONCEPTS AT THE TRADITIONAL HOUSE OF TAFATIK MAROMAK OAN MALAKA

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Abstract

Ethnomatematics is an intersection between mathematics and culture, making it a study of mathematical concepts within a specific cultural context. In line with this, the present research aimed to explore the mathematical concepts present in the Tafatik Maromak Oan traditional house. This research is qualitative research with an ethnographic approach. This research was conducted in August 2022 in Wehali Village, Central Malaka District, Malaka Regency. The instruments used are observation guidelines, interview guidelines, and documentation. Participants in this study consisted of 4 people with details of 1 King *(Nain*), 1 traditional housekeeper (*fukun),* 1 craftsman and 1 community member. The stages in this study consisted of domain analysis, taxation analysis, componential analysis, analysis of cultural themes, and drawing conclusions. The results of this study indicate that the mathematical concepts contained in the Tafatik Maromak Oan Malaka traditional house are geometric concepts including rectangles, squares, triangles, circles, lines, cylinders and trapezoids.

Keywords: Ethnomatematics, Exploration, Traditional house of tafatik maromak oan malaka.

Abstrak

Etnomatematika merupakan ruang irisan antara matematika dan budaya, menjadikannya studi tentang konsep matematika dalam konteks budaya tertentu. Sejalan dengan itu, penelitian ini bertujuan untuk menggali konsep matematika yang ada pada rumah adat Tafatik Maromak Oan. Penelitian ini merupakan penelitian kualitatif dengan pendekatan etnografi. Penelitian ini dilaksanakan pada bulan Agustus 2022 di Desa Wehali, Kecamatan Malaka Tengah Kabupaten Malaka.Instrumen yang digunakan adalah pedoman observasi, pedoman wawancara, dan dokumentasi. Partisipan dalam penelitian ini terdiri dari 4 orang dengan perincian 1 orang Raja (Nain), 1 orang penjaga rumah adat (fukun),1 orang tukang dan 1 orang anggota masyarakat. Tahapan dalam penelitian ini terdiri dari analisis domain, analisis taksionamianalisis komponensial, analisis tema budaya, dan penarik kesimpulan. Hasil penelitian ini menunjukan bahwa konsep geometri yang terdapat pada rumah adat Tafatik Maromak Oan Malaka adalah konsep geometri diantaranya, persegi panjang, persegi, segitiga, lingkaran, garis, slinders dan trapisium.

Kata Kunci: *Eksplorasi, Etnomatematika, Rumah adat tafatik maromak oan malaka*.

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INTRODUCTION

Mathematics is actually used by everyone in everyday life. However, many people often fail to realize the practical applications of mathematics in their daily routines. They often perceive mathematics solely as a subject studied in school. In reality, mathematics is an integral part of culture that has existed since ancient times and can be utilized to

analyze innovative ideas and embody the values inherent in human culture. Its aesthetic sense and human creativity demonstrate its strength. Human activities in everyday life extensively employ mathematical concepts, including calculation, analysis, and data management (Nuh & Dardiri, 2016).

Mathematics and culture are interrelated and cannot be separated from human life. The relationship between mathematics and culture that underlies human activity is called ethnomathematics (Sari et al., 2021; Alghadari & Son, 2018; Ditasona, 2018; Ditasona, Turmudi, & Rosjanuardi, 2021). The idea of incorporating sociocultural elements into mathematics was initiated in 1977 by a Brazilian mathematician named Ubiratan D'Ambrosio. He coined the term "ethnomathematics" to refer to mathematics practiced by cultural groups or indigenous peoples, which is considered a lens for viewing and understanding mathematics as a cultural product (D'Ambrosio, 2016). Mathematics is a science that helps us understand how ethnomathematics is derived from culture, revealing the relationship between culture and mathematics (Prawati, 2016). According to Wahyuni, Tias, and Sani (2013) ethnomathematics serves as a bridge between education and culture, particularly in mathematics education.

Furthermore, D'Ambrosio (2016) states that the aim of ethnomathematics is to recognize that there are different ways of engaging with mathematics, taking into account the academic mathematical knowledge developed by different sectors of society and considering the various modes through which different cultures negotiate their mathematical practices, such as classification, counting, measuring, designing buildings or tools, and playing. Ethnomathematics is a study that bridges mathematics and culture (Jayanti & Puspasari, 2020).

Various studies on ethnomathematics, such as the ones conducted by Amsikan and Nahak (2017) have found that the concept of space and symbolic systems are integral parts of geometry, closely related to architecture, traditional structures, and modern buildings. The concept of space represents the outcomes of systematic human thinking about existing objects, while the representation results in traditional or modern symbols (Richardo, 2017).

Based on the aforementioned research findings, it becomes evident that traditional houses encompass rich mathematical concepts. This realization has motivated researchers to conduct ethnomathematics research on the Tafatik Maromak oan Malaka

traditional house. The Maromak Oan traditional house is located in Laran, Wehali Village, Central Malaka District. It features a thatched roof with gewang ropes, and the walls are constructed using wood and planks. Due to its distinctive characteristics and deeply rooted traditional nature, conducting research on this traditional house is considered important. The aim is to explore the geometry concepts embedded within the Tafatik Maromak Oan Malaka traditional house.

RESEARCH METHOD

This study is an exploratory qualitative research with ethnographic approach . Qualitative research is research that intends to understand phenomena about what is experienced by research subjects, for example behavior, perceptions, motivations, actions and so on, holistically and through descriptions in the form of words and language, in a special natural context. and, by utilizing various scientific methods (Aulia & Rista, 2019).

The approach used in this research is ethnography. This approach focuses on efforts to discover how humans organize their culture in their minds and then use this culture in everyday life, this culture exists in the human mind. The task of ethnography is to find and describe the organization of thought.

This study was carried out at the Tafatik Maromak Oan Malaka traditional house in Wehali Village, Malaka Regency throughout August 2022. Actually, there are many traditional houses in Malaka because each custom has its own traditional house. However, this study focuses only on one particular traditional house, namely the Tafatik Maromak Oan traditional house. The interesting aspect of this traditional house, especially in terms of its name, is that "Maromak Oan" translates to "Child of God" in English. The subjects in this study consisted of 4 people with details of 1 king, 1 traditional house guard or commonly called fukun, 1 builder, and 1 community member from the Maromak Oan Malaka tribe who can provide information about the concept of the Tafatik Maromak Oan Malaka traditional house.

Data collection techniques used in this study are observation, interviews, and documentation. In this study the research instruments used were researchers (human instruments), observation guidelines, interview guidelines, documentation. The data analysis technique adopted a techniques in qualitative research with an ethnographic

approach according to Sugiyono (2011), namely domain analysis, taxonomic analysis, componential analysis, and analysis of cultural themes and drawing conclusions.

Data analysis techniques in qualitative research for ethnography consist of domain analysis, taxonomic analysis, component analysis, and analysis of cultural themes. Each of the stages of data analysis carried out in this study, in domain analysis, the researcher conducted a small analysis related to the research and found several domains of ethnomathematics activity that would be used as research centers. Taxonomic analysis is the stage for describing the selected domains in more detail to obtain their internal structure, from the domains or activities that have been determined by the researcher, namely grouping and counting domains/activities, the researcher will focus more on the research carried out. After carrying out a taxonomic analysis, a componential analysis is carried out which aims to organize data that selects differences based on data collection, so the results of the taxonomic analysis will develop into more specific components.

Analysis of cultural themes is the final stage in the data analysis process. Based on the components that have been determined in the componential analysis, the research results will be obtained in the form of cultural findings (ethnomatematic findings). by removing unnecessary data. After the data reduction process, the data presentation will be carried out to continue the data analysis stage. Observations made in this study were direct observations, namely direct observations on Tafatik Maromak Oan. Observations made in this study were direct observations, namely direct observations on Tafatik Maromak Oan. Also in this study, documentation in the form of photos, videos, and interview audio data will be used as supporting data for the results of the observations and interviews.

RESULTS AND DISCUSSION

The parts that are the object of this research are the shape of the roof, *kakuluk mane, kakuluk feto*, walls, floors, pillars, doors, musical instruments, betel nut, brooms, *kelewang*, each of which is explained as follows.

The shape of the roof of a traditional house

The shape of the roof of the Tafatik Maromak Oan traditional house is different when viewed from the front and side, as shown in Figure 1.

(a) front view (b) side view

Figure 1. The Shape of the Roof

The roof of the Maromak Oan Tafatik traditional house uses gewang leaves. This traditional house has a different size from traditional houses in general in Malaka. The size of the traditional house is 9×7 meters. When viewed from the front (Figure 1a), the roof of this traditional house is triangular. The shape is said to be a triangle because it is a flat shape bounded by three sides and three vertices. This is in accordance with the notion of a triangle according to Suharjana, Markaban, and Sasongko (2009) that a triangle is a plane figure consisting of three-line segments and all two-line segments meet at the ends. Each line segment that forms a triangle is called a side and the ends where the line segments meet is called vertices.

Figure 1(b) is the roof of a traditional house when viewed from the side. The shape resembles a trapezoid because it is done with accurate calculations. A roof shaped like this has a connection between the pillars of the house in the form of a trapezoidal triangle. It is called a trapezoid because it has four sides that are parallel but not the same length and has vertices, sides and angles. This is in accordance with the definition of Nuharini and Wayuni (2008) that a trapezoid is a quadrilateral that has a pair of parallel opposite sides. The parallel sides are called the base and top sides, while the other sides are called the legs of the trapezoid.

Kakuluk

Kakuluk in the Tafatik Maromak Oan traditional house consist of *Kakuluk mane* and *Kakuluk feto*. The basic material for kakulukmane is round wood with a height of 7 meters and a diameter of 35-40 cm. *Kakuluk mane* is bigger than Kakuluk feto. This differentiates men and women based on the degree in their tribe, that the degree of men is higher than that of women. In *Kakuluk mane* there is a place used to hang betel nut bags, spears (riman) and under *Kakuluk mane* there is a place to store offerings for people who die during traditional ceremonies, while in Kaluk Feto there is Hadak leten

as a place to store baskets, barfai (nyiru), dishes (bikan) and other cooking utensils, as well as under Kakuluk. feto also has a stove (lalian) which is used for cooking during traditional ceremonies. The forms of kalukuk mane and feto are shown in Figure 2.

(a) *Kakuluk mane* (b) *Kakuluk feto*

Figure 2. *Kakuluk mane* dan feto

It can be seen in Figure 2 that the mane and feto kakuluk are in the shape of a right triangle. The shape is said to be triangular because it is a flat shape bounded by the presence of three vertices, so it is called a triangular shape. This is in accordance with the notion of a triangle according to Suharjana et al. (2009), a triangle is a flat figure consisting of three-line segments and two-line segments meeting at the ends. Each line segment that forms a triangle is called a side, and the points where the ends of the line segments meet are called vertices. While the center pillar is cylindrical.

Wall

On the wall of Tafatik Maromak aon there are sub-Tafatik which are studied one by one based on their relation to the concept of geometry. For the walls, the material used is a board with a height of two meters, installed virtually around Tafatik Maromak Oan, each wall is limited by 2 (two) small pillars. The geometry concept on the walls and boards is a rectangular flat shape, as shown in Figure 3.

Figure 3. Walls and boards

A wall is called a rectangle because it has the same side lengths and has four angles. The wall is a flat shape formed by two pairs of ribs that are the same length. This is in accordance with the definition developed by Sujatmiko (2005), that a rectangle is a rectangular flat shape that has two pairs of parallel and equal sides and has

four right angles where the two sides face each other with the same length and parallel and have two diagonals (crosses) that intersect into two equal parts.

Floor (*Labis*)

Shape of the *labis* after it is made with a height of 1 meter above the ground. Judging from its shape, the geometric concept contained in the Tafatik Maromak Oan *labis* is a rectangle, as shown in Figure 4.

Figure 4. The shape of the floor (*labis*)

It is said to be a rectangle because it is seen from the shape of the *labis* which has the same side lengths and has four angles. *Labis* is a flat shape formed by two pairs of ribs that are the same length. This is in accordance with the definition developed by Sujatmiko (2005), that a rectangle is a rectangular flat shape that has two pairs of parallel sides and the same length and has four equal right angles, namely 90 degrees and has two axes symmetry.

Pole shape

At Tafatik Maromak Oan there are 12 pillars with a height of 3 meters and 28 pillars, each pillar is a circle resembling a tube. This traditional house is different from traditional houses in Malaka Regency as a whole because it has more poles compared to others. This pole has a geometry concept of a tube, as shown in Figure 5.

Figure 5. The shape of the pole

The pole has a tube-like shape. This can be seen from its shape which resembles a circle that is maintained and parallel and has a line that surrounds the two circles.

According to Draja, Peni, and Wondo (2021), a tube is a space in the form of a regular upright prism with a circular base. A tube is a space bounded by two parallel circles of the same shape and size) and a blanket.

Door shape

The door of the Tafatik Maromak Oan Malaka traditional house has 4 doors. Each door has a different meaning, namely the door of the rising sun (omat lasaen). The door is always closed every day, the door is only opened when there is a traditional ceremony. Sunset door (Odamatnrae) This door has the same size as the other doors but has a different meaning. This door is used When the female traditional house guard performs traditional rituals, the door at the front is called (omattlor) as access in and out of the male traditional house -men (fukun mane) and omatsae function as access to and from the women's traditional house (fukun feto) when performing traditional rituals as shown in Figure 6.

Figure 6. The shape of the door (*omatrae)*

It is said to be a square because it has four corners that are the same length and the corners are the same. The door is said to be square because it has a size of one meter square. This is in accordance with the definition of a square according to Nuharini and Wayuni (2008), a square is a rectangular flat shape that has four sides of the same length and has four right angles of 90 degrees and has four axes of folding and rotating symmetry.

Musical instruments

The musical instrument at the Tafatik Maromak Oan Malaka traditional house is the bibiliku or commonly called a drum or likurai which is made of teak or mahogany trees at the bottom, also affixed with goat skin or cow skin at the top, this drum is in the form of a tube where the top diameter is large, and at the bottom in the form of a circle with a small diameter as shown in Figure 7.

Figure 7. The shape of the drum (*my lips)*

If you make a line according to the shape of my aunt, it looks like a tube. Based on its formation, through a circle that is maintained and long and has a line that surrounds the two circles. According to Draja et al (2021), a tube is a space in the form of a regular upright prism with a circular base. A cylinder is a space bounded by two parallel circles of the same shape and size and a blanket.

Betel nut holder (*Kabir feto*)

The place for betel nut is used to put betel nut, lime, good for welcoming guests, traditional ceremonies and this *kabir* has a flat shape when the outline is made like a square, this *kabir* is stored in Tafatik Maromak Oan so it is used for offering areca nut to ancestors who are grave as seen in Figure 8.

Figure 8. Female betel nut (*Kabir feto)*

Judging from the shape of the *kabir*, feto has four corners that are the same length and the same angles, so *kabir* is called a square. *Kabir feto* is made square to store betel nuts. This is in accordance with the definition of a square according to Nuharini and Wayuni (2008), a square is a rectangular flat shape that has four sides of the same length and has four right angles of 90 degrees and has four axes of folding and rotating symmetry.

Men's bag (*Kakaluk mane*)

Kakaluk mane or commonly called this bag is hung right above the *Kakuluk mane*. This bag has a shape or carving like a motif on the bottom with a rhombus-like shape and has a straight-line border in the middle as shown in Figure 9.

Figure 9. Bag (*Kakaluk mane*)

Kakaluk mane is called a rhombus because the shape or image on the *kakaluk mane* stored in the Tafatik Maromak Oan traditional house is rectangular and has an isosceles triangle. This is in accordance with the definition of Sujatmiko (2005) which states that a rhombus is a rectangular flat shape formed from an isosceles triangle and its reflection after being reflected from its base and has two angles that are side by side 180 degrees and have sides that face each other not perpendicular.

Male betel nut holder (*Kabir mane*)

Kabir mane has two models, one is made of woven rope and the other is made of woven cloth, but has the same function, namely to store betel and areca nut. *Kakaluk mane* made of woven has a rectangular shape and each woven is in the form of a parallelogram as shown in Figure 10.

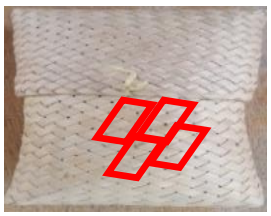


Figure 10. The male betel nut

Kabir mane is called a rectangle because it has the same length of sides and four angles. One of the flat shapes is formed by two pairs of ribs of the same length. This is in accordance with the definition developed by Sujatmiko (2005). *Kabir mane* is woven using a rope and each plait is in the form of a parallelogram, where the two sides face each other with the same length and are parallel and have two diagonals (cross lines) that intersect into two equal parts.

Sweep (right)

This broom has a shape like a line broom which is only used to sweep the Tafatik Maromak Oan traditional house as shown in Figure 11.

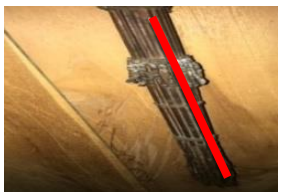


Figure 11. Broom (*Knar*)

A broom is called a line because it has one dimension, namely length. As defined by Gulendra (2010), a line is a geometric shape that is described by a moving point, a line has only one dimension, namely the length of the line, it also has three types, namely a straight line, the shortest connecting line between two points that do not coincide and have no end, or base, and the thickness of the diameter cannot be measured.

***Kalewang* (*Surik naruk*)**

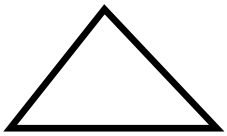
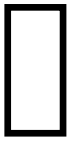
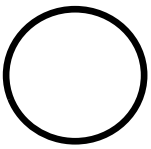
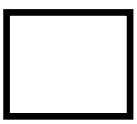
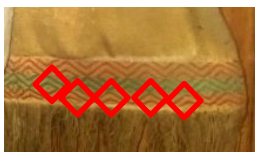
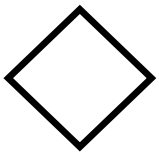
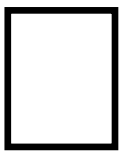
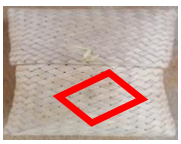
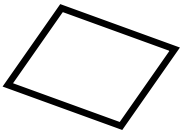
Surik naruk or *Kalewang* is a traditional weapon of the Malaka people which has a shape like a line, *Kalewang* has a long and slender shape with a pointed tip, the *Kalewang* is equipped with a sheath made of wood with carved motifs typical of the Malaka tribe. Wehali community. *Kalewang* is believed by the people, especially in the traditional royal house of Tafatik Maromak Oan Malaka as a means of war in ancient times as shown in Figure 12.

Figure 12. *Kalewang* (*Surik naruk*)

Kelewang is called a line because it has one dimension, namely length. As defined by Gulendra (2010) that a line is a geometric shape that is described by a moving point, a line has only one dimension, namely the length of the line also has three types, namely a straight line, the shortest connecting line between two points that do not coincide and have no end or base, and the thickness of the diameter cannot be measured.

Based on the results of research on the Tafatik Maromak Oan Malaka traditional house, geometry concepts are presented in Table 1.

Table 1. The concept of geometry in the Tafatik Maromak Oan Malaka House

Forming	Geometry Concept	Forming Mathematics	Geometry Concept
 Front look	 Isosceles triangle	 Post	 Cylinder
 Kakuluk	 Triangle	 Door	 Rectangle
 Side view	 Trapezoid	 Drum (my aunt)	 Cylinder
 Wall	 Rectangle	 Circle	 Circle
 Floor (*Labis*)	 Rectangle	 *Surik naruk* (*Klewang*)	Line
 Areca nut holder (*Kabir*)	 rectangle	 Men's bag (*Kakaluk mane*)	 Cut the rice cake
 Areca nut holder (*Kabir mane*)	 Rectangle	 Areca nut holder (*Kabir mane*)	 Parallelogram

CONCLUSION

Based on the results and discussion, it can be concluded that the Tafatik Maromak Oan Malaka traditional house encompasses numerous geometry concepts, including flat shapes and geometric shapes, particularly within the realm of geometry. The geometry concepts are evident in various aspects of the traditional house's construction. For instance, square patterns are displayed on the walls, *labis*, *kabir mane*, and *kabir feto*, while triangles are found on the front and back roofs, trapezoids on the side roofs, circles on the bibiliki, lines on the scallions, and rhombuses on kakaluk mane.

Considering these findings, the researchers recommend that mathematics teachers utilize the outcomes of this study as a valuable resource for teaching mathematics at the school level. Furthermore, it is suggested that future researchers employ the findings of this study as a reference when conducting further research in the field of ethnomathematics, exploring not only traditional houses but also other cultural manifestations.

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