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Ethnomathematics Study on the Ornamentation Of The Traditional Malay House Of Selaso Jatuh Kembar

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ABSTRACT

Purpose: This study aims to explore the application of ethnomathematics concepts to the ornaments of the Selaso Jatuh Kembar Malay traditional house, emphasizing the mathematical principles of geometric transformations and patterns. The study highlights the cultural and mathematical significance of these ornaments, providing insights into the integration of mathematics and culture.

Patients and Methods: A qualitative research approach with an ethnographic method was employed. Data collection involved direct observations, semi-structured interviews with cultural experts, and documentation of ornamental patterns. Analytical techniques focused on identifying geometric transformations, including reflection, translation, rotation, and dilation, as well as frieze patterns in the traditional house ornaments.

Results: The findings reveal that the ornaments of the Selaso Jatuh Kembar Malay traditional house encompass diverse geometric transformations and symbolic meanings. These ornaments include various motifs such as clouds, plants, and animals, each showcasing mathematical elements like symmetry and pattern repetition. Notably, several ornaments exhibit frieze patterns, such as patterns F1, F3, and F7, reflecting continuous repetition and symmetry principles.

Conclusion: The study concludes that the Selaso Jatuh Kembar traditional house ornaments exemplify a rich integration of mathematical concepts and cultural heritage. These findings underscore the importance of preserving traditional knowledge while enriching the understanding of ethnomathematics as a bridge between mathematics and cultural traditions.

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KEYWORDS:
ethnomathematics, traditional house ornaments, Malay Selaso Jatuh Kembar, geometry, symmetry, culture.

1. INTRODUCTION

Mathematics is a universal discipline that serves as the foundation for the advancement of modern science and technology. Its role spans across various fields, influencing numerous disciplines and contributing significantly to modern technological innovations. Furthermore, mathematics is a structured collection of abstract ideas and concepts organized systematically through logical reasoning (Tyas et al., 2022). Beyond its scientific applications, mathematics also plays a crucial role in shaping good character traits, fostering values such as respect, discipline, honesty, hard work, creativity, curiosity, independence, communication skills, responsibility, and humility (Panggabean et al., 2022; Panggabean et al., 2018). Mathematics and culture are integral aspects of daily life. Culture encompasses the comprehensive way of life in a society, while mathematics addresses the fundamental needs of individuals within that society. The concept connecting these domains is known as ethnomathematics, which views mathematics through a cultural lens, encompassing concepts, language, traditions, places, and knowledge derived from physical and social contexts. Ethnomathematics, as a learning approach, aims to integrate cultural elements into formal mathematics education, demystifying the subject and addressing common learning challenges (Fitriatien, 2016). One cultural artifact showcasing the interplay of mathematics and culture is the Selaso Jatuh Kembar traditional Malay house in Riau Province. This traditional house serves as a cultural representation of the local community. Its name, "Selaso Jatuh Kembar," refers to its architectural design, characterized by twin hallways (selaso) that are lower than the main building (Pur, 2020; PI, 2020). Historically, the house is also known as "Rumah Selasar Gajah Menyusu," inspired by its resemblance to a suckling elephant, a metaphor reflecting its symbolic and functional design (Helmiawati Kadir, as cited in the research). While not used as a private residence, this house functions as a communal space for meetings, ceremonies, and other traditional activities. The ornaments in the Selaso Jatuh Kembar house encapsulate mathematical elements, predominantly geometric patterns. Symmetrical designs and repetitive motifs exemplify mathematical principles, including geometric transformations and flat group symmetry. These

patterns, deeply rooted in cultural symbolism, illustrate the integration of mathematics into traditional Malay art and architecture. Ethnomathematics, therefore, provides a framework to analyze how mathematical concepts are embedded within these ornaments, reflecting both their aesthetic and functional significance. This study investigates the mathematical principles inherent in the ornaments of the Selaso Jatuh Kembar house, aiming to uncover their underlying geometric transformations and frieze patterns. By examining how these patterns reflect symmetry, proportion, and other mathematical attributes, this research not only highlights the interplay between mathematics and culture but also emphasizes the importance of preserving such heritage. Moreover, the findings serve as a source of inspiration for modern architectural and design practices that respect local wisdom

II. RESEARCH METHODS

This descriptive qualitative study employs an ethnographic approach to examine the ethnomathematics of the Selaso Jatuh Kembar Malay traditional house. Descriptive qualitative research involves collecting data about a phenomenon and presenting it with scientific interpretation, ensuring that the findings reflect real and natural conditions.The research was conducted at the Riau Malay Customary Hall, located on Jl. Diponegoro, Suka Mulia, Kec. Sail, Pekanbaru, Riau. This location was chosen to facilitate the collection of comprehensive data. The focus of the study lies in exploring the ethnomathematics of the Selaso Jatuh Kembar house, particularly the geometric transformations evident in its ornamental designs.Data collection methods included direct observations, semi-structured interviews with cultural experts, and documentation of the house's ornaments. The main instrument for data collection was the researcher, supported by tools such as interview guides, observation sheets, and documentation records. Observations were conducted to examine the shape and form of the ornaments, while interviews with informants such as Helmiawati Kadir and Datuk H. Jonnaidi Dasa provided insights into the symbolic meanings of these designs.The study employed triangulation techniques to validate the data, cross-referencing findings from different sources and methods. Data analysis was conducted simultaneously with data collection, ensuring an iterative process that enhanced the depth and reliability of the results. By focusing on geometric transformations such as translation, reflection, rotation, and dilation, the research aimed to uncover the mathematical principles embedded within the traditional house ornaments. This methodology underscores the importance of combining qualitative ethnographic approaches with rigorous scientific analysis to explore the intersection of mathematics and cultural heritage.

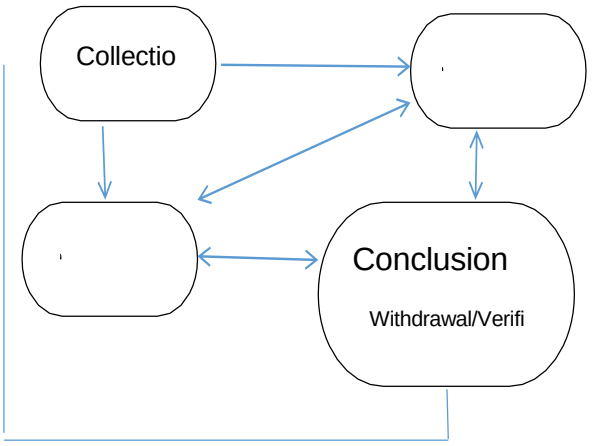


Figure 1: Data Analysis Technique

III. RESULTS

Based on the results of data analysis of documentation, observation and interviews with informants, namely Helmiawati Kadir who is a member of the cultural preservation of the Riau Malay Customary Institute as well as an advisor to Riau artists and Datuk H. Jonnaidi Dasa who is the General Secretary of the Daily Leadership Council of the Riau Malay Customary Institute, researchers obtained the symbolic meaning of the ornaments obtained and found several findings regarding ethnomathematics in ornaments on the Selaso jatuh Kembar Traditional House which has the concept of geometric transformation and *frieze* patterns, the following results were obtained:

1. **Selaso Traditional House Ornament Falling Twin**
   There are three types of ornament motifs in the Selaso Jatuh Kembar Traditional House, namely clouds, plants and animals. The motifs used are more plants than animals, because Malay people used to live along the coast of rivers and estuaries. In the use of animal motifs with the gastiril method, namely not using the whole form, only in certain parts or even just following the basic pattern of the animal's shape.
   a. Selembayung
      Selembayung in the Riau community is often called "selo bayung" and "horn buang" is an ornament that is located crosswise at both ends of the perabung, which is the highest part of the house. Selembayung is one of the characteristics or synonymous of Malay culture. Selembayung has two types of motifs, namely horns and plants, which are used in this traditional house is a plant-patterned selembayung only.

Figure 2. Selembayung Ornament Located on the Roof Top

b. Selok Layang

Selok layang or kite wing has a shape similar to selembayung, this ornament is found in the four corners of the roof . The shape of this kite resembles wings that are flying at each end of the house. Every house that has a selembayung must wear kite wings (selok layang) as a rule. Selok layang is included in the animal ornament.

Figure 3. Selok Layang Ornament Located at the Corner of the Roof Shower

c. Bee Hanging

Dependent bee is an ornament inspired by the shape of a hive or bee house hanging on a tree branch. This motif is included in animal ornaments. In this traditional house, three variations of dependent bees are found, each of which has a different place, namely dependent bees ombak-ombak located on the bidai or singap of the house, dependent bees falling flowers located under the roof (lesplang), dependent bees kuntum setaman located quite uniquely, namely above the stacked froth ornament which becomes a lattice (fence) for the hallway of the house.

Figure 4. Ornaments of Bees Hanging on Waves that Become One of the Motifs of Singap or Bidai

Figure 5: Ornament of Bee Hanging a String of Flowers Located on the Fence of the Hallway

Figure 6. Bee Ornament Hanging Falling Flower Located on the Roof Shower

d. Wajik-Wajik (Belah Wajik)

Wajik-wajik or rhombus ornament is an ornament that has a square shape with a rhombus shape inside. The diamond ornament has 4 parts with equal angles of 90°. This ornament is placed above doors and windows that also function as air vents. This ornament is included in the plant ornament because of the pattern inside. The basic patterns in this ornament are unfinished florets and shoots of bamboo shoots.

Figure 7: Wajik-Wajik Ornament Above the Door and Window as Ventilation

e. Sekawan Ducks

Itik sekawan or also called itik pulang petang is an ornament that is shaped like a group of ducks or ducks that go hand in hand. This ornament is

placed on the wall of the house and as ventilation for doors and windows right next to the diamond. Ducks are poultry animals that have a habit of gathering sitting on water and always go hand in hand in every time they look for food or return home. This animal lives in watery places such as lakes, rivers and swamps which is almost the same as the Malay people who used to live near water sources such as along the river coast.

Figure 8. Duckling Ornaments Located Above Doors and Windows as Ventilation

f. Kaluk

Kaluk is an ornament in the form of ferns or ferns that spread lengthwise and twist or twist. There are three variants of kaluk in this traditional house, namely Kaluk Paku Kuntum Negeri which is located on the bidai or singap or decorative part of the roof of the house, Kaluk Pakis located on the list of walls in the hallway precisely under the fence, and Kaluk Paku located on the pillars of the house.

Figure 9. Kaluk Paku Kuntum Negri Ornament Located on the Roof of the House as One of the Decoration of Bidai or Singap

Figure 10. Kaluk Paku Ornament Located on the Wall of the House Just Below the Hall Fence

Figure 11: Kaluk Ornament Located on the Wall of the House

g. Clouds

The cloud ornament is the only natural motif other than plants and animals in the Selaso Jatuh Kembar Traditional House, namely clouds. This ornament is inspired by clouds that move in the direction of the wind. This ornament is located around the door and window. There are two variants of clouds in this traditional house, namely larat clouds located around the edges of the doors and windows and bergelut clouds located in the center of the bottom of the door of the house .

Figure 12: Larat Cloud Ornament Located on the Edge of Window and Door Leaves

Figure 13. Larat Bergelut Cloud Ornament Located in the Center of the Bottom of the Door Leaf

h. Stacked Froth Cluster

Tebuk froth ornament is an ornament that is formed by hollowing (tebuk), creating a froth-like shape arranged lengthwise. The ornament is used as a decoration that is installed on the fence or lattice of the hallway of the house.

Figure 14. Tebuk Buih Ornament arranged into a fence from the Hallway of the House

i. Elbow Castor

Elbow keluang ornaments are ornaments inspired by the shape of the wings of keluang or bats that form elbows or curves. The pattern of the elbow keluang motif is different in each traditional house, in this traditional house using motifs from kaluk. This ornament is located in every corner of the house including the corner of the outside pole of the Selaso Jatuh Kembar traditional house .

Figure 15: Elbow Ornament Located at the Top Corner of the Pole

The following are aldallalh nalmal dalri ornalmen-ornalmen besertal malknalnyal:

1. Selembayung symbolizes belief in God Almighty, warmth, tranquility and joy.
2. Selok Layang means freedom but has limits and self-awareness and has the meaning of four essential doors or four gates consisting of the gate of sustenance, the gate of the soul, the door of the soul and the door of divinity.
3. The Hanging Bee symbolizes self-sacrifice, selflessness and always providing benefits to others.
4. Wajik-Wajik (Belah Wajik) means good behavior and has 4 equal angles of 90°, symbolizing that every result of deliberation must be equal and fair.
5. Itik Sekawan symbolizes harmonious life, close kinship and always working together in social life.
6. Kaluk symbolizes that every action taken by parents, traditional leaders or elders will have an impact on their descendants and the community.
7. Clouds symbolize gentleness, wisdom, and good wishes for the life to come.
8. Tebuk Buih Bersusun symbolizes good behavior and attitudes when deliberating to maintain harmony and unity.
9. Elbow Keluang symbolizes good attitude, honesty and responsibility in every human being.

2. Implementation of Geometric Transformation on the Ornament of Selaso Jatuh Kembar Traditional House

From a mathematical point of view, it can be seen that this ornament pattern can be connected to geometric transformation material because it experiences translation, reflection, dilation, and rotation. Some ornaments are also seen to experience a one-way loop or what is often called a *frieze* pattern. The *frieze* pattern has seven patterns, namely Pattern F1, Pattern F2, Pattern F3, Pattern F4, Pattern F5, Pattern F6 and Pattern F7. The following are the ornaments on the Selaso Jatuh Kembar Traditional House from the observation results:

a. Selembayung

The selembayung ornament is vertically reflected but there is no repetitive pattern in the motif. In the observation of reflection, let's assume A as the object and A' as the result of its reflection. This shows that the selembayung contains a form of geometric transformation, namely reflection, but does not contain any of the seven *frieze* patterns.

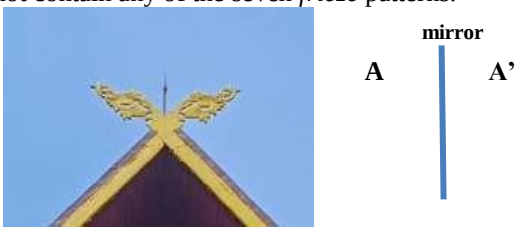


Figure 16. Reflection found in the selembayung ornament

b. Bee Hanging

There are 3 types of Hanging Bee ornaments, namely:

1. Bees Hanging on the Waves

In the wave-dependent bee ornament, reflection and translation are found. The reflection that occurs is a vertical reflection, where W is the object and W' is the result of its reflection. The reflection that occurs in the wave-dependent bee ornament is shown in the following image.

Figure 17. Reflection found in the wave-dependent bee ornament

The reflected pattern becomes a new pattern and undergoes translation. Let B be the object and B' be the displacement. The translation that occurs in the wave-dependent bee ornament is shown in the following image.

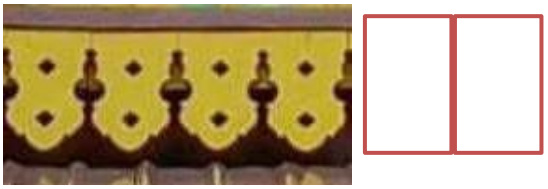


Figure 18. Translations found in bee ornaments hanging on waves

Translations and reflections on the wave-dependent bee ornament are also seen to be looping in a unidirectional manner, From this, a *frieze* pattern is found and the one that meets the characteristics is pattern F3. The *frieze* pattern that occurs on the hanging bee ornament is shown in the following image.

Figure 19. *Frize* pattern type F3 pattern seen on the wave-dependent bee ornament

2. Bee Hanging on a Plantation Flower

In the bee ornament depending on the flowers, reflection and translation are found. The reflection that occurs is a vertical reflection, where A is the object and A' is the result of its reflection. The reflection that occurs in the bee ornament depending on the flowers is shown in the following image.

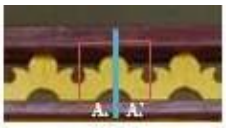


Figure 20. Reflection seen in the bee ornament hanging on the flowers of the setaman

The reflected pattern becomes a new pattern and undergoes translation. Let B be the object and B' be the displacement. The translation that occurs in the bee ornament depending on the flowers is shown in the following image.

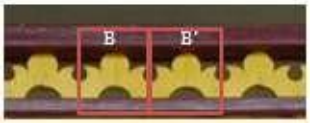


Figure 21: Translations seen in the bee ornament hanging on the flowers of the setaman.

Translations and reflections on the bee ornament depending on the florets are also seen to be looping in a unidirectional manner, from this it is found that there is a *frieze* pattern and the one that meets the characteristics is pattern F3. The *frieze* pattern that occurs in the dependent bee ornament is shown in the following image.

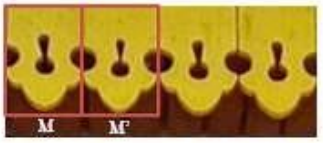
Figure 22. *Frize* pattern type F3 pattern seen on the hanging bee ornament

3. Falling Flower Hanging Bee

The bee ornament depending on the flowers is seen to experience reflection and translation. The reflection that occurs is a vertical reflection, where T is the object and T' is the result of its reflection. The reflection that occurs on the fallen flower dependent bee ornament is shown in the following image**.**

Figure 23. Reflection found in the ornament of a bee hanging from a fallen flower

The reflected pattern becomes a new pattern and undergoes translation. Let M be the object and M' be the displacement. The translation that occurs in the bee ornament depending on the flowers is shown in the following image.



Translations found in the bee ornament hanging from the fallen flower

Translations and reflections on the falling flower dependent bee ornament are also seen to be looping in a unidirectional manner. From this, a *frieze* pattern is found and the one that fulfills the characteristics is pattern F3. The *frieze* pattern that occurs in the falling flower dependent bee ornament is shown in the following image.

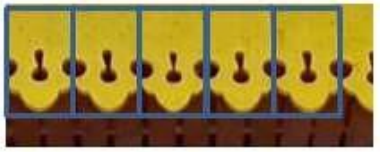


Figure 25. *Frize* pattern type F3 pattern seen in the bee ornament hanging from the fallen flower.

4. Wajik-Wajik (Belah Wajik)

The diamond ornament has several patterns, these patterns can be found in reflection, rotation and dilation. There are five reflections with different pattern shapes. Let's assume that the patterns are A, B, C, D and E (the combination of all patterns that form a new pattern) and A', B', C', D' and E' are the

mirroring results. The reflection that occurs in the diamond ornament is shown in the following image.

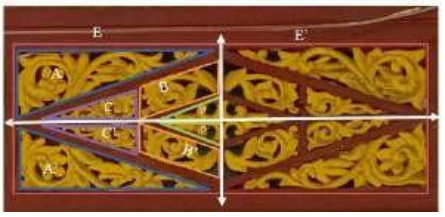


Figure 26. Reflection seen in the wajik-wajik ornament

In dilation, let F be the object and F' be the result of the change in size. The dilation that occurs in the diamond ornament is shown in the following image.

Figure 27: Dilation seen in the diamond ornaments

The rotation that occurs is a 180° rotation, assuming G, H, I, and J are objects and G', H', I', and J' are the results of the rotation. The rotation that occurs in the diamond ornament is shown in the following image.

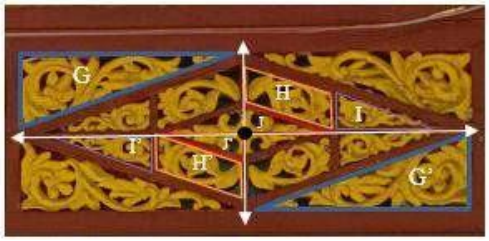


Figure 28. 180-degree rotation seen in the diamond ornament

5. Sekawan Ducks

The duckling ornament undergoes reflection, translation and rotation. The visible reflection is a horizontal reflection, where X is the object and X' is the result of its reflection. The reflection that occurs on the duckling ornament is shown in the following image.

Figure 29. Reflection seen in the duck fist ornament

The rotation that occurs is a 180° rotation, where Y is the object and Y' is the result of the rotation. The rotation that occurs in the duckling ornament is shown in the following image.

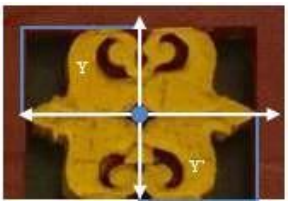


Figure 30. Rotation seen in the duck and duckling ornament

This ornament also has a one-way repeated translation, where Z is the object and Z' is the result of the displacement. From the explanation above, a *frieze* pattern with characteristics leading to the type of pattern type F7 can be found on the ornament. The *frieze* pattern that occurs in the duckling ornament is shown in the following figure.

Figure 31. The *frize* pattern type F7 pattern seen in the duck and pigeon ornament.

6. Kaluk

Researchers found 3 types of kaluk, namely:

1. Kaluk spikes country florets

Kuntum Negeri nail has two patterns and both are seen to be vertically reflected. Suppose B and C as objects and B' and C' as the result of their reflection. However, both patterns do not experience a continuous loop, which means that this kaluk ornament does not have a *frieze* pattern. The reflection that occurs in the kaluk kuntum ornament is shown in the following image.

Figure 32. Reflection seen in the kaluk paku kuntum negeri ornament

2. Kaluk fern

The kaluk pakis ornament has one motif but has two positions, facing down and up. These two positions are next to each other and each undergoes translation. Let A be the object and A' be the displacement. This kaluk pakis ornament is found in a *frieze* pattern because there is a continuous loop. The *frieze* pattern that fulfills is F1, where there is a one-way repeated translation of the ornament. The *frieze* pattern that occurs in the

kaluk pakis ornament is shown in the following image.

Figure 33. Translations seen in kaluk pakis ornaments

3. Kaluk paku

The kaluk paku ornament is found horizontally reflected but there is no repetitive pattern in the motif. In the observation of reflection, let's assume A as the object and A' as the result of its reflection. This shows that kaluk paku contains a form of geometric transformation, namely reflection but does not contain one of the seven *frieze* patterns. The reflection that occurs in the kaluk paku ornament is shown in the following image.

Figure 34. Reflection seen in the kaluk paku ornament

4. Clouds

Researchers found 2 types of clouds, namely:

1. Land clouds

In the larat cloud ornament, translations can be found. The translation that occurs is horizontal translation, assuming T is the object and T' is the shift. This larat cloud ornament is found in the *frieze* pattern because there is a continuous loop. The *frieze* pattern that fulfills is F1, where there is a one-way repeated translation of the ornament. From the explanation above, it is found that the larat cloud ornament contains geometry transformation and *frieze* pattern. The translations and *frieze* patterns that occur in the larat cloud ornament are shown in the following figure.

Translations and *frieze* patterns of F1 pattern found on the larat cloud ornament

2. Struggling Clouds

In the cloud ornament above, reflection and rotation are found. In the observation, the reflection found is a vertical reflection and is visualized with C as the object and C' as the result of its reflection. The reflection that occurs in the cloud ornament is shown in the following image.

Figure 36. Reflection seen in the cloud ornament wrestling

Meanwhile, in the process of observing rotation, a 180° rotation was found by assuming D is the object and D' is the result of its rotation. However, no *frieze* pattern is found because there is no continuous repetition in the pattern of the ornament. The rotation that occurs in the rolling cloud ornament is shown in the following image.

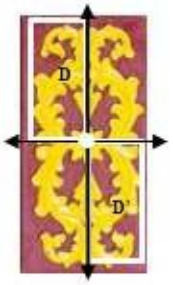


Figure 37. 180-degree rotation seen in the rolling cloud ornament

3. Stacked froth clusters

The frothy froth ornament is seen to experience reflection, translation and rotation. There are two reflections that occur, namely vertical reflection and horizontal reflection, with A as the object and A' as the result of its reflection. The shape of the stacked froth tebuk is produced from a combination of two vertically similar patterns, forming a vertical mirroring (reflection), shown in patterns A and A'. The reflection that occurs in the stacked froth ornament is shown in the following image.

Figure 38. Reflection found in the stacked froth ornament

The rotation that occurs is a 180° rotation, where B is the object and B' is the result of the rotation. The rotation that occurs in the stacked froth ornament is shown in the following image.

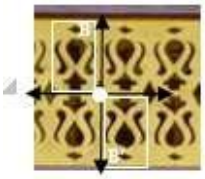


Figure 39. Rotation seen in the stacked froth ornament

This ornament also has a horizontal translation that repeats in one direction, assuming C is the object and C' is the result of the displacement. From the explanation above, a *frieze* pattern with the type of F7 pattern can be found in the ornament.

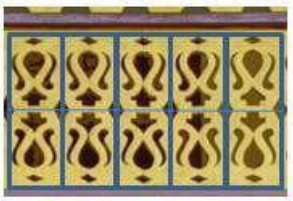


Figure 40. *Frieze* pattern type F7 pattern seen in the stacked f*roth* ornament

4. Elbow Castor

The elbow keluang ornament is found to be vertically reflected but there is no repetitive pattern in the motif. In the observation of reflection, let's assume A as the object and A' as the result of its reflection. This shows that the elbow keluang contains a form of geometric transformation, namely reflection, but does not contain any of the seven *frieze* patterns.

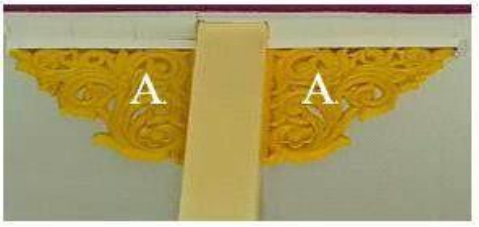


Figure 41. Reflection seen in the elbow keluang ornament

The following summarizes the geometry transformation and *frieze* patterns found in the Selaso Jatuh Kembar traditional house ornaments.

Table 1. Summary of geometry transformation and *frieze* pattern of the traditional house ornament selaso jatuh kembar

No.	Ornament Name	Transformation Geometry Found	*Frieze* Patterns Found
1	Selembayung	Reflection	No *frieze* pattern found
2	Selok Layang	No geometry transformation found	*No frieze* pattern found
3	Bees Hanging on the Waves	Reflection Translation	Pattern F3
4	Bee Hanging on a Plantation Flower	Reflection Translation	Pattern F3
5	Falling Flower Hanging Bee	Reflection Translation	Pattern F3
6	Wajik - Wajik (Belah Wajik)	Reflection Rotation Dilation	No *frieze* pattern found
7	Sekawan Ducks	Reflection Rotation Translation	Pattern F7
8	Kaluk Paku Kuntum Negeri	Reflection Translation	No *frieze* pattern found
9	Kaluk Pakis	Translation	F1 pattern
10	Kaluk Paku	Reflection	No *frieze* pattern found
11	Land clouds	Translation	F1 pattern
12	Struggling Clouds	Reflection Rotation	No *frieze* pattern found
13	Stacked Froth Cluster	Reflection Rotation Translation	Pattern F7
14	Elbow Castor	Reflection	No *frieze* pattern found

Based on the explanation and table above, it can be seen that of all the ornaments there is only one that does not contain the concept of geometric transformation and not all ornaments contain *frieze* patterns. From the previous explanation, it can be seen that the ornaments on the Selaso Jatuh Kembar Traditional House have mathematical elements that lead to geometric transformation. This shows that the Selaso Jatuh Kembar Traditional House is included in ethnomathematics.

IV. DISCUSSION

The findings of this study reveal a profound intersection between mathematics and cultural heritage, as evidenced by the geometric patterns and frieze motifs in the ornaments of the Selaso Jatuh Kembar Malay traditional house. This discussion delves deeper into the implications of these results and the broader context of their significance.

The ornaments of the Selaso Jatuh Kembar house demonstrate a variety of geometric transformations, including reflection, translation, rotation, and dilation. These transformations are not merely decorative but reflect an intrinsic understanding of mathematical principles embedded in cultural practices. For example, the reflection observed in the "Selembayung" ornament symbolizes balance and harmony, aligning with the Malay community's cultural values of unity and coexistence. The study identified frieze patterns F1, F3, and F7 in several ornaments. These patterns signify repetition and continuity, echoing the cultural narratives of persistence and cyclicality in Malay traditions. The presence of frieze patterns in motifs such as "Bee Hanging on Waves" and "Clouds" underscores the community's deep connection to nature and its rhythm, further highlighting the integration of mathematical concepts into cultural expressions. Beyond their mathematical properties, the ornaments are imbued with symbolic meanings. For instance, the "Kaluk" motifs represent the continuity of wisdom from elders to younger generations, while the "Wajik-Wajik" (diamond-shaped) ornaments convey fairness and equality. These dual aspects of aesthetic and symbolic value illustrate how the Malay community has utilized mathematical principles not only for functional purposes but also as carriers of cultural wisdom. The integration of mathematical elements into cultural artifacts, as shown in this study, provides a rich resource for education. Incorporating these ethnomathematical elements into modern mathematics curricula can make learning more relatable and engaging, while also fostering appreciation for cultural heritage. Moreover, such studies emphasize the need to preserve traditional knowledge systems, ensuring they are not lost amidst modernization. The mathematical principles embedded in the Selaso Jatuh Kembar house's ornaments offer inspiration for contemporary architectural and design practices. By drawing on these traditional patterns, modern designs can achieve a harmonious blend of cultural authenticity and mathematical precision. This research demonstrates how mathematical analysis can serve as a tool for documenting and preserving cultural heritage. The detailed study of geometric transformations and patterns in these ornaments provides a framework for similar investigations into other cultural artifacts, ensuring the systematic preservation of traditional knowledge. While the study successfully explored the relationship between mathematics and cultural heritage, further research could expand on these findings by exploring the mathematical aspects of other traditional Malay artifacts or comparing them with those from different cultural contexts. Additionally, digital tools and computational methods could enhance the precision and scope of such analyses..

V. CONCLUSION

The study on the Selaso Jatuh Kembar Malay traditional house ornaments reveals a rich integration of mathematical principles and cultural values, showcasing the relationship between ethnomathematics and heritage preservation. Through a qualitative approach, the research identified the application of geometric transformations, including reflection, translation, rotation, and dilation, as well as frieze patterns such as F1, F3, and F7, across various ornaments. The findings demonstrate that these mathematical elements are deeply embedded in the cultural narratives of the Malay community. Ornaments such as "Bee Hanging," "Kaluk," and "Wajik-Wajik" not only display aesthetic symmetry but also carry symbolic meanings, reflecting the community's values of harmony, continuity, and fairness. These dual functions highlight the role of mathematics in cultural expressions and underscore the importance of traditional knowledge in modern contexts. This research contributes to the broader field of ethnomathematics by providing a concrete example of how mathematical concepts are inherently present in traditional designs. It emphasizes the potential of such studies in enriching educational practices, inspiring contemporary architectural designs, and promoting the preservation of cultural heritage. Furthermore, the insights gained offer a foundation for future investigations into the intersection of mathematics and cultural artifacts in other regions or traditions. The ornaments of the Selaso Jatuh Kembar Malay traditional house stand as a testament to the intricate relationship between culture and mathematics, serving as a valuable resource for both educational development and the preservation of intangible cultural heritage. This study concludes that ethnomathematical research plays a vital role in bridging traditional wisdom with modern scientific understanding.

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