Ethnomathematical Study on Traditional Wedding *Hantaran*: 44-Fold Cloth from Lingga Regency

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Abstract. Several cultures in the Riau Islands Province are closely related to mathematics, but many people are unaware of this. Therefore, researchers are interested in further researching the mathematical practices found in the culture of Lingga Regency, Riau Islands, namely in making 44-fold cloth. There are indications of mathematical activities in making process of this traditional *wedding hantaran*. This research aims to describe the results of ethnomathematics research in making 44-fold cloth in Lingga, Riau Islands, including mathematical activities and concepts. This qualitative research uses an ethnographic approach. Data was collected through observations, interviews, and documentation to identify mathematical activities and concepts behind making 44-fold cloths. The researchers are the main instrument in this study. The data obtained from the instruments were analyzed based on data analysis for ethnographic qualitative research. The research results show embodied mathematical activities in making 44-fold cloth: measuring with standard units, folding with standard fold lines (axis of symmetry), and counting. Meanwhile, there are rooted mathematical concepts such as length measurement, plane figure, fold symmetry, rotation symmetry, angle, congruency, and basic numbers in making 44-fold cloth. This study suggests for using common occurrences to teach mathematics as a foundational subject before formal mathematics instruction.

1 Introduction

Indonesia is a country that has so many different cultures in each region, namely Sabang to Merauke. Culture is what is characteristic of an area. The world has recognized several cultures in Indonesia, such as batik, which comes from Java, and the saman dance, which comes from Aceh. The word culture comes from Sanskrit, namely Buddhayah, which has the plural form of the word Budhi so that it can be interpreted as culture being anything or things related to reason. Culture can also be interpreted as "cultivation and power," so culture is all the powers of the mind, namely intention, taste, and creativity [1]. Several

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cultures in Indonesia are closely related to mathematics, but many people need to be made aware of this. According to them, mathematics is only related to calculations and very difficult formulas, even though, in reality, it is not like that.

In addition, it is stated that Mathematics is generally defined as a field of science that studies patterns and structures, change, and space [2]. Informally, it can also be called the science of numbers. In the formalist view, mathematics studies abstract structures that are defined axiomatically using symbolic logic and notation.

The relationship between culture and mathematics is known as ethnomathematics. The term ethnomathematics has been used by [3] to explain that ethnomathematics is mathematics practiced in identified cultural groups such as ethnic, national communities, labor groups, children of certain age groups, and professional classes. Meanwhile, from a research perspective, ethnomathematics is defined as the cultural anthropology of mathematics from mathematics and mathematics education.

Several studies have shown that cultures contain elements of mathematics in them. As done by Riyanti with the topic Exploration of *Besurek* Cloth in Bengkulu, there are counting concepts, measuring activities, comparison concepts, point concepts, straight line concepts, curved line concepts, and flat shape concepts [4]. The research conducted by Febrian, Astuti, and Susanti with the topic Ethnomathematics in Creating *Tanjak* from Tanjungpinang contained the concept of the relationship between flat shapes, diagonal symmetry, area of flat shapes, length comparisons, and length measurements [5].

Apart from that, research is conducted to explore the ethnomathematics of 44 Folded Cloths from Lingga Regency. Researchers are interested in conducting re-research on the results of this study because, according to researchers, there still needs to be more explanation for the mathematical activities that previous researchers have explained. Researchers examine the mathematical practices found in Lingga culture, Riau Islands, in making 44-fold cloth.

This research aims to describe the results of ethnomathematics exploration in making 44-fold cloth in Lingga, Riau Islands, including mathematical activities and concepts.

2 Method

This type of study is qualitative research using an ethnographic approach. This research was conducted to identify the mathematical elements behind making 44-fold cloth. Data was collected by conducting observations, interviews, and documentation with the main research instrument, the researcher himself. The instruments and other tools used in the research are observation sheets, interview guides, and video recorders.

An informant, namely a native Lingga resident who lives in Tanjungpinang, was chosen to obtain research data. From the informant activity, researchers observed the process of making 44-fold cloth in detail and identified the ethnomathematics contained in it. The data obtained from the instrument was analyzed based on data analysis for ethnographic qualitative research. Designing data analysis into domain analysis, taxonomic analysis, component analysis, and cultural theme analysis. Data reduction, presentation, and conclusion drawing are carried out in each analysis. Finally, all processes are directed at identifying ethnomathematics in making 44-fold cloth.

Table 1 provides an overview of how this research was conducted.

Table 1. Ethnographic study framework for the making of 44-fold cloth

Guiding questions	Initial responses	Analysis stages	Point of view	Activities

Where to start looking?	In making the 44-fold cloth by one of the Lingga community leaders in Tanjungpinang, there is potential for mathematical practice.	Domain	Culture	Conduct observations and interviews with Lingga community leaders in Tanjungpinang who make this 44-fold cloth.
How to look at it?	Looking at the aspects or steps for making 44-fold cloth by one of the Lingga community leaders in Tanjungpinang, which contains the potential for mathematical activities.	Taxonomy	Alternative thinking	Determine the potential, ideas, methods, or techniques used by the makers of 44-fold cloth related to mathematical practices or activities.
What is it?	Proof (mathematical activity or concept as a result of alternative thinking).	Componential	Mathematics and Philosophy	Recognize and distinguish certain potential characteristics in making 44-fold cloth related to mathematics.
What is its meaning?	Cultural values learned	Cultural themes	Anthropology	Describe ethnomathematics in making 44-fold cloth by focusing on the relationship between activities and mathematical ideas or concepts.

3 Results and Discussion

3.1 44-Fold Cloth

Based on the results of an interview with one of Lingga's community leaders, information was obtained that 44-fold cloth is one of the cultures in Lingga when carrying out weddings. This 44-fold cloth is used as a wedding gift (*hantaran*) given by the man to the woman. The Lingga people believe that the 44-fold cloth symbolizes a woman's life after marriage and having children. The term 44 in this folded cloth is intended as a reminder that after marriage, a woman will conceive and give birth to a child; there will be 44 days of abstinence for women after giving birth to a child, which is said to be intended to protect them from unwanted disturbances.

When folding a 44-fold cloth, it does not contain 44 folds as the name suggests, which contains 44 folds, this cloth only has around 20 more folds. The existing folds are used to tuck away money as wedding gifts (*hantaran*). In the past, the amount of money that slipped was 44 *ringgit*, but currently, the amount is only around 44 thousand *rupiah*.

Generally, the fabric used to carry the 44-fold cloth on the phallus uses *songket* cloth. However, when folding this cloth, a long cloth has yet to be sewn can be used. The tools and materials used are a few, you only need cloth and pins to hold the folds so they stay neat.

3.2 Ethnomathematics in the making of 44-fold cloth

3.2.1 Measuring cloth

When measuring 44-fold cloth, it needs the same size on each side. The general shape of the cloth used is rectangular, influencing the final result of this 44-fold cloth. This rectangular shape is chosen to make folding easier so that the final result produces neatly folded cloth. The type of cloth used is the ona that is somewhat stiff but easy to shape, like *songket* cloth. In doing so, the artisans measured the length of the side of the cloth. The dimensions of the cloth chosen are 106 cm x 106 cm, which means that artisans use standard units to measure length. The initial form of Fabric used can be seen in Figure 1.

Fig.1. The initial form for making 44-fold cloth

3.2.2 Folding cloth

The resource person starts the process by folding the top and bottom sides, which form a flat, rectangular shape. Cloth folding is the process of making the fold supporting components to form the desired folds according to the shape of the 44-fold cloth. In the folding process, the resource person pays attention to the width between the right and left folds of the fabric, which must be the same size. The resource person uses a ruler to measure the width of the fabric with a size of 26.5 cm. The cloth is then shaped into a rectangle measuring 106 cm x 53 cm. See Figure 2.

Fig. 2. Initial stage of folding cloth

Next, the resource person folded the long side into two parts to form a rectangular fold of cloth. The folds of the cloth form a rectangle measuring 53 cm x 53 cm. This information

shows a folding process using a vertical fold line technique to form symmetrical folds. See Figure 3.

Fig. 3. Symmetrical fold of the cloth

Then, the resource person continued to fold the cloth by taking each corner towards the center point or main axis until each corner came together, and in the end, the cloth would form several flat shapes. The flat shape formed is 4 equilateral triangles arranged to form a symmetrical quadrilateral. This information shows that the source folded using a diagonal fold line technique to form symmetrical folds. Se Figure 4.

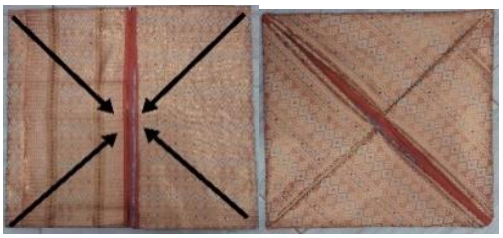

Fig. 4. Diagonal folding creating symmetrical folds

In this section, the resource person shows the inside of the cloth where the folds can be opened. Then, the resource person opened the side of the cloth so that the cloth formed a rectangle. See Figure 5.

Fig. 5. Rectangular cloth

The resource person continued folding by taking the corner of the cloth and folding it in the opposite direction until it formed two rectangular sides. Both sides of the quadrilateral formed are the same size. Then, from the two quadrilaterals, the resource person took the

corners of the two sides of the quadrilateral and folded them to form a triangular shape. See Figure 6.

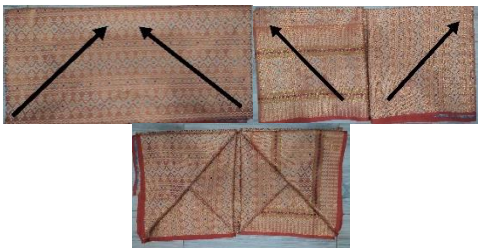

Fig. 6. The folding process creates a triangular form

The resource person repeats the previous steps on the back of the cloth until the cloth forms two right triangles and one equilateral triangle located in the middle between the right triangles, where the triangles formed are the same size and the angles are congruent (congruent). See Figure 7.

Fig. 7. Creating congruent triangle

Then, the resource person took an equilateral triangle and folded it into two parts. Moreover, in the right triangle section, the source unites the folds of the right triangles into three equilateral triangles, where one triangle formed is large, and the other two triangles are small, only half the size of the large triangle formed. Alternatively, we can see below that the small triangle formed is part of a large triangle. The triangles are neatly arranged in a square shape with symmetrical dimensions. See Figure 8.

Fig. 8. Creating triangular fold symmetrically

The resource person took a large corner of the triangle and shaped it into a symmetrical rectangular covering the existing triangle shape. See Figure 9.

Fig. 9. Fold symmetry concept

Then the resource person folded the top corner of the cloth again to form a rectangular slit in the shape of a triangle. The resource person did the same thing on the back of the cloth so that the top and bottom folds had the same shape and could lock the folds of the cloth. From the folding results of the fabric, we can see that 4-fold symmetries and 4 rotational symmetries are formed. See Figure 10.

Fig. 10. Fold symmetry and rotational symmetry concepts

Then, in the last fold that the resource person does, the resource person takes each corner of the rectangular shape that is formed and tucks the corner folds inward to form 4 rectangular folds of fabric. The resource person also did the folding repeatedly on the back of the cloth. See Figure 11.

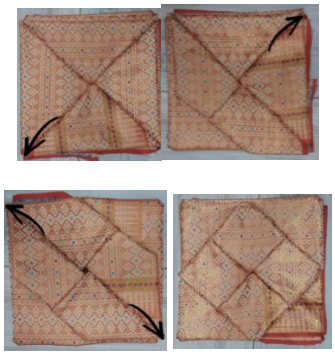

Fig. 11. Last process of folding

3.2.3 Counting

In folding, the resource person shows the concept of counting, namely when the resource person calculates several formed folds. In the folding process, several numbers are formed, namely the numbers 1, 2, 3, 4, 5, 6, 7, and 8. We can calculate the folds formed by counting

the folds for each process carried out by the source from the front and back sides. This process is also related to mathematical material, related to odd and even numbers. Hartoyo [4]) explains that the counting activity occurs when the resource person counts the number of folds formed when he wants to form 4 folds above and below the side of the fabric.

The research results show mathematical activities in making 44-fold cloths, namely in measuring activities using standard units, folding using standard fold lines (axis of symmetry) and counting activities. See Table 2.

Table 2. The overview of research results

Mathematical Activites	**Idea, way, mathematical techniques**	**Emerging Mathematical Concepts**
Measuring length by standardized unit	• Using a standardized length measuring tool (cm units), measure the length of the square-shaped cloth	• Plane figure • Length measurement by standardized unit
Folding with symmetrical property	• Fold using a diagonal fold line technique to form symmetrical folds • Fold using a horizontal fold line technique to form symmetrical folds • Fold using a vertical line technique to form symmetrical folds • Then fold the cloth in a triangle shape of the same size and the corners are congruent (congruent)	• Fold symmetry • Fold symmetry axis • Rotational symmetry • Plane figure diagonal • Angle • Congruence
Counting	• Fold number • The number of repetition process	• Numbers • Multiples of numbers

Based on the study's findings, it can be said that the main central idea in the mathematical practice of creating 44-fold cloth—which serves as the foundation for two related tasks, counting and measuring—is symmetry. That lends credence to the claim by [6] that symmetry is a fundamental mathematical idea and the source of all mathematical operations.

The findings of the study demonstrate that length measurement is a key component in cloth making in addition to the idea of symmetry. These findings are consistent with earlier ethnomathematical research in which the primary focus was on length measurement [5], [7], [8], [9].

Therefore, it is suggested that measurement—particularly the length dimension—is an essential component of everyday life for humans.

3.2.4 Mathematical concepts in the 44-fold cloth-making process

1. Plane Figure
The plane figures are found in 44-fold cloth shapes in the form of rectangles, squares, and triangles. The concept of plane figures is found in mathematics learning at junior high school (SMP) class VII, with basic competency 4.11, namely solving contextual problems related to the area and perimeter of quadrilaterals (squares, rectangles, rhombuses, parallelograms, trapeziums, kite) and triangle.

2. Fold Symmetry
The fold symmetry material in the 44-fold cloth is found in the number of folds that contain a plane figure, which is formed from folding the 44-fold cloth when it is folded into 2 parts that are the same size as the original size. The concept of fold symmetry is found in mathematics taught at the grade 3 elementary school level, with basic competency 3.9, namely explaining fold symmetry and rotational symmetry in plane figures using concrete objects, and basic competency 4.9, namely identifying fold symmetry and rotational symmetry in plane figures using objects. This finding aligns with research conducted by [10], which included material on fold symmetry and rotational symmetry on triangular and rectangular shapes in conducting ethnomathematics research on developing Tuban gedhog batik motifs for mathematics in elementary schools.

3. Congruence
The congruence material in 44-fold cloth is found in the folded part of the fabric with the same shape and size in the fold; this can be seen in Figure 7, which was explained previously. This concept of congruence is found in junior high school (SMP) mathematics learning for class IX (nine), with basic competency 4.6, namely solving problems related to congruence and congruence between flat shapes. This finding aligns with research conducted by [11] that there are concepts of congruence and congruence in conducting ethnomathematics exploration research at Sanggrahan Tulungagung temple.

4. Numbers
The number of materials on the 44-fold cloth was identified when the resource person calculated the several folds formed. This number concept is found in mathematics taught at junior high school (SMP) class VII, with basic competency 3.1, namely explaining and determining the order of whole numbers (positive and negative) and fractions (ordinary, mixed, decimal, percent). This finding aligns with research conducted by [4] where there were several materials in conducting research exploring the ethnomathematics of woven fabrics in the Oeolo NTT community to reveal mathematical concepts.

All things considered, the study's findings can reveal that mathematical ideas and activities are present in people's daily lives. We might not even be aware that we use or possess mathematical notions and activities in everyday happenings. Therefore, it is suggested that people are inherently intelligent when it comes to math. Understanding this enables one to use common occurrences to alter the way mathematics is taught. It implies that the foundational concepts of everyday life can support for formal mathematics learning [5]. As a result, research on ethnomathematics has the potential to benefit mathematics teaching. According to certain research findings [12], [13] incorporating ethnomathematical studies into the mathematics learning process can help students communicate their thoughts, interests, comprehension, and creativity.

4 Conclusion

The research results show mathematical activities in making 44-fold cloth, namely measuring with standard units, folding with standard fold lines (axis of symmetry), and counting. From the research results, it can be concluded that several mathematical concepts

emerge in the manufacture of 44-fold cloth. There are rooted mathematical concepts such as length measurement, plane figure, fold symmetry, rotation symmetry, angle, congruency, and basic numbers in making 44-fold cloth. Apart from that, this research can show that elements of mathematics exist in a culture that develops in society. This study suggests for using common occurrences to teach mathematics as a foundational subject before formal mathematics instruction.

References

1. M. Purbaningrum, et al, *Etnomatematika beberapa sistem budaya di indonesia* (1st Ed.). Zifatama Jawara, Sidoarjo, (2021)
2. S. A. F. N. L. Komariyah, JPPDPM, **4**, 2 (2018)
3. U. D'Ambrosio, MTaL, **1,** 2 (1999), http://dx.doi.org/10.1207/s15327833mtl0102_3
4. S. Banase, H. Disnawati, S. Nahak, S, E-M.JPM, **10**, 1 (2022).
5. F. Febrian, F, P. Astuti, S. Susanti, S. *Ethnomathematics in creating tanjak from tanjungpinang*. In European Union Digital Library, EAI, 21 January 2022, Tanjungpinang, Indonesia (2022)
6. J. Constant, *The concept of symmetry or self similarity often relates to elements of proportion, harmony and elegance*. In G. Darvas (Ed.), Symmetry: Culture and science. Symmetrion, (2016)
7. R. Embong, N. Aziz, M. A. Wahab, Z. A, H. Maidinsah, (2010), *An insight into the mathematical thinking of the Malay songket weavers.* In Procedia - Social and Behavioral Sciences, 8 December 2010, (2010) https://doi.org/10.1016/j.sbspro.2010.12.099
8. F. Febrian. (2016). *Recognizing ethnomathematics in wau kite and corak-ragi of tenun melayu from Kepulauan Riau Province and using its potentials towards learning of school mathematics*, In Proceedings of the 2nd SULE – IC 2016, FKIP, Unsri, Palembang, (2016)
9. R. N. F., Utami, R. Hermanto, D. Muhtadi, S. Sukirwan, JP3M, **7**, 1 (2021), https://doi.org/10.37058/jp3m.v7i1.2551
10. E. Amalia, JPPGSD, **9**, 4 (2021)
11. T. D, Jayanti, R. Puspasari, JP2M, , **6,** 2, 53 (2020)
12. U D'Ambrosio, (2007), NASGoE, **2**, 1 (2007)
13. H. Freudhental, *Revisiting mathematics education*: In China lectures (9th ed.). Cham: Springer Science & Business Media, (2006)