



## Ethnomathematical Exploration in the Geulis Group Tasikmalaya West Java

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### Abstract

In this study, mathematical concepts are used to explore the existence of mathematics in culture, especially in the Tasikmalaya group of geulis. By observing the current conditions, the activity of making kelom geulis is seen as a "mathematical-free" activity. It is still rare and there is still a lack of public knowledge about ethnomathematics which colors the activities of making kelom geulis as a motivation to investigate the mathematical knowledge contained in it. In addition, with the decreasing number of kelom geulis craftsmen as a result of the use of kelom geulis left by the original community producing these products. This study aims to determine and describe the ethnomathematics of the geulis group. The method used is qualitative with ethnographic methods. The subjects in this study were selected using a purposive sampling method with the research subject being a kelom geulis craftsman in the Tamansari (Gobras) area, Mulyasari, Tasikmalaya. Data collection techniques used are interviews, observation and documentation. The data analysis technique used in the research is data reduction, data presentation and drawing conclusions. Based on the results of data analysis, it can be concluded that there are mathematical concepts in the geulis group, especially in the discussion of flat shapes such as rectangles, circles and triangles. This research also produces a linear equation that relates the length of the foot to the size of the geulis group.

*Keywords:* Flat shapes, ethnomathematics, kelom geulis, linear equations.

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### 1. Introduction

Indonesia is a country that is not only rich in natural resources but also rich in diverse cultures. Each region in Indonesia has its own cultural diversity and customs as an inheritance that has been passed down from generation to generation from their ancestors. This diverse culture is a national asset that must be preserved. However, what is happening now is that Indonesian culture continues to be eroded by globalization without a strategy for preservation.

The word "culture" comes from the Sanskrit language, namely buddhayah, the plural form of buddi which means mind or reason. Thus, culture is something related to reason. According to Wiranata (2011), in general it can be said that culture is the whole system of ideas, actions and human works in the context of community life which is made into human beings by learning.

Kelom geulis is one of the Indonesian cultures originating from Tasikmalaya which has aesthetic value and use value. This kelom geulis is a sandal craft product made from mahogany wood. Called by the name kelom geulis because the appearance of this wooden footwear looks beautiful with colorful paint, interesting motif carvings and distinctive shape. This kelom geulis is usually used for every event related to weddings, birthdays, circumcisions and official official events. However, over time, these kelom geulis have become increasingly rare and craftsman shops have become fewer and fewer. This is because of the emergence of sandals produced by factories that attract the market. Therefore, it is necessary to make efforts to maintain the kelom geulis as a national culture that is characteristic, especially Tasikmalaya.

Efforts that can be made for an educator, especially in the field of mathematics, are to link mathematics learning with culture, especially the culture of the geulis. D'Ambriso (1985) says that one thing that can bridge the gap between culture and education is ethnomathematics. Barton (1966) explains that ethnomathematics includes mathematical ideas, mathematical thinking and activities that are developed by all cultures. Alfonso (2013) argues that ethnomathematics is the integration of culture in learning mathematics. This ethnomathematical approach is intended to make mathematics learning in schools more relevant and interesting for students and it is hoped that later students will understand their own culture better. In addition, the presence of ethnomathematics in education is also expected to help students to understand various mathematical concepts taught in schools and can also be used as an arena to promote various kinds of Indonesian culture which are slowly fading away.

Based on the description above, the researcher is interested in conducting research, namely exploring ethnomathematics in the typical Tasikmalaya group of geulis. The results of this study can be used as knowledge and reference in order to know mathematics in everyday life.

Based on the background that has been described, the authors formulate the problem is how the mathematical concepts contained in the Tasikmalaya geulis group. Based on the research formulation that has been described, in carrying out this research the aim is to find out the mathematical concepts contained in the Tasikmalaya geulis group.

To avoid misinterpretation, the following are definitions of the terms used in this study. The term ethnomathematics used in this research is about the mathematical elements found in the culture of the geulis group. The kelom geulis in this research is the kelom geulis with various shapes on the base and the right, both like flat shapes and spatial shapes.

## **2. Literature Review**

### **2.1. Exploration**

According to the Big Indonesian Dictionary, exploration is field exploration with the aim of gaining more knowledge (about the situation), especially the natural resources found in a place or activity to gain new experiences from new situations. Exploration also has a meaning, namely activities carried out to explore and find as much information as possible that is useful for future interests (Purwadi, 2004). Based on this explanation, it can be concluded that exploration is an activity to seek, study, analyze and research something deeper to obtain new knowledge.

### **2.2. Ethnomathematics**

Ethnomathematics in language consists of the prefix "ethno" which is defined as something very broad which refers to the socio-cultural context including language, jargon, code, behavior, myths and symbols. The basic word "mathematics" is defined as explaining, knowing, understanding, carrying out activities such as coding, measuring, clarifying, concluding and modeling. The suffix "tics" comes from the word *techne* which means the same as technique (Rudhito, 2019). Ethnomathematics is defined as a way used by a certain cultural group in carrying out mathematical activities. According to Sirate (2015) there are several activities such as counting, measuring, making designs, determining locations, playing and explaining.

#### **1. The activity of counting**

The activity of counting usually uses media such as stones, leaves or other natural materials. Numbering activities generally show the activity of using and understanding odd and even numbers and others.

#### **2. Activity measuring**

The measuring activity is related to the "how much" question. In ethnomathematics, you will often find traditional measuring tools such as pieces of bamboo and tree branches for counting activities. In addition, traditional people also use their hands as a measuring tool.

#### **3. Activities to make designs**

Another idea of ethnomathematics that is universal and important is the activity of making designs that have been applied by all types of culture, where there is a point if there is an activity to determine the location of the relationship with a person's position and orientation in the natural environment. This shows the activity of designing buildings related to all factory objects and tools produced by culture to strengthen homes, trade wars, games and religious purposes.

#### **4. Activities determine the location**

Many basic concepts of geometry are used in determining the location of locations such as those used in travel routes, determining the direction of the destination or the way home accurately and quickly. Determination of location serves to determine the point of a particular area. In general, traditional communities use natural boundaries as land boundaries for the use of annual crops.

#### **5. Play activities**

Playing activities learned in mathematics are fun activities with a plot that has a certain pattern and has tools and materials that are related to mathematics.

#### **6. Activity explaining**

Making explanations is an activity that raises human understanding related to experience gained from the environment, especially with regard to one's sensitivity in reading natural phenomena. Thus the existing environmental activities always use point numbers in mathematics such as explanations related to why geometric shapes are the same or symmetrical and some natural phenomena on this highway follow the law.

The purpose of ethnomathematics is to recognize that there are different ways of learning mathematics, namely by developing or combining mathematics with the culture that exists in each region. In general, the purpose of ethnomathematical research is to get another perspective on mathematics.

The results of ethnomathematical studies will eventually be packaged into learning materials in the classroom which are then juxtaposed with academic mathematics as it is currently taught in schools. The results of ethnomathematics research are not limited to the consumption of students, but are also prepared as material in the history of mathematics which is generally given as a subject in universities in the Department of Mathematics and Mathematics Education.

The research that has been carried out by Prabowo (2020) has produced a study in Javanese culture regarding the time of the celebration of the death anniversary. In this study, a mathematical model was produced to determine the execution time of death warnings of 1, 7, 40, 100, 365, 720 and 1000 days. Furthermore, Prabowo (2000) also made a mathematical model related to the Aboge calendar used by Aboge Muslims, especially in the Cikakak area, Banyumas.

### 2.3. Kelom Geulis

Kelom geulis is a typical craft product from Tasikmalaya, especially the Gobras area. Before the craft of kelom geulis appeared, the Gobras region was known as a clog or clog craftsman. The name kelom is thought to be taken from the Dutch language, namely *kelompen* which means wooden sandals, while *geulis* comes from the Sundanese language which means beautiful. Called *kelom geulis* because the appearance of the wooden footwear looks beautiful with colorful paint and carvings of interesting motifs so that it is said that women who wear these footwear will look beautiful, elegant and charming. Kelom geulis is usually worn on certain occasions and has become a tradition such as weddings, birthdays, circumcisions and official official events. The existence of this kelom geulis becomes a complement as accessories for women (including mothers).

The beginning of the emergence of the kelom geulis craft began more or less in 1950. At that time, there was a resident of Gobras named Pohar (another version says the name Ohir) often went to Bandung. There is a possibility in Bandung to work as a laborer in a sandal production site. At one time, he and Suryo, Ujer and Aceh Umar discussed the idea of making raw sandals from wood or raw kelom geulis (the bottom of the kelom geulis) or called *bodasan*. The plan was successfully realized by the four people in the form of raw, plain or unengraved kelom geulis. However, finishing the raw geulis kelom into ready-made clams (complete with the top) is quite difficult. They do not have adequate knowledge for it. Finally they brought the product to Bandung to be sold and it was selling well. Then, they received an order for raw kelom geulis from Bandung with a new model, namely kelom with carved decorations.

Making kelom geulis begins by first making a pattern according to the size of the foot, then carving it according to the pattern. In this geulis group, it can be formed without rights, thick heels (wedges) and high heels. The face or rope of the kelom geulis is made of various materials from pesa cloth to imitation leather and to sweeten it sometimes decorative nails are attached. In addition, the footwear is decorated with various motifs ranging from flowers, lines and even landscapes made in a traditional way, which is drawn by hand. After that, the image is polished with paint.

## 3. Research Methods

### 3.1. research types and approaches

The type of research used is qualitative research with an ethnographic approach. Qualitative research is a research method used to examine the condition of natural objects, where the researcher is the key instrument (Sugiyono, 2005). Qualitative research is holistic integrative which means it does not divide or break reality into a number of variables but is seen as a whole. The purpose of qualitative research itself is to explain in detail by collecting detailed data.

The approach used in this research is an ethnographic approach. According to Bugin (2012) ethnography is a systematic depiction and analysis of a culture of a community group that aims to obtain a description of how people use that culture in life. In this study, an ethnographic approach was used to describe, explain and analyze mathematical concepts in the geulis group.

### 3.2. research Subject

The data source in the study is the subject from which the data was obtained (Arikunto, 2013). In qualitative research does not use a population because it departs from a particular case. The sample in qualitative research is not used by the respondent, but as a resource or participant.

The criteria for participating in this research are people who have an understanding of the history and form of the geulis group in such a way that it can be studied from an ethnomathematical point of view. Therefore, the selected research subject is a kelom geulis craftsman.

### 3.3. Sampling Technique

The sampling technique in this study used a purposive sampling technique. According to Sugiyono (2013), purposive sampling is a sampling technique with certain considerations. The particular consideration in question is that the person is considered to know best about what we expect so that it will make it easier for researchers to find out the object being studied.

The resource person in this study was Mrs. Eet. Mrs. Eet is a kelom geulis craftsman who already has her own factory and shop called Ayunna Kelom Geulis. This mother was chosen as a resource person because she met the criteria specified in this study, namely mastering the culture under study and having time to convey detailed information. The resource person in this study was only one person because the researcher used triangulation of sources.

### 3.4. Data Collection Techniques

The data collection technique used in this research is the method of interview, observation and documentation.

#### 1. Interview

Interview is a process of obtaining information or data for research purposes by means of question and answer, while face to face between the interviewer and resource person using a tool called an interview guide (Siregar, 2018). Before conducting the interview, it is determined in advance the problems that must be researched and the questions about what will be asked to find out more detailed things. The results of the interviews obtained are usually in the form of audio recordings and also notes. In this study, interviews were conducted to obtain information on the formulation of the problem regarding ethnomathematics in the geulis group.

#### 2. Observation

Observation is a method or method for analyzing and using records that are carried out systematically, not only limited to people, but also other natural objects (Sugiyono, 2005). The results of these observations are usually in the form of photographs and notes. In this study, observations were made by looking at information from the internet and also visiting the kelom geulis production house.

#### 3. Documentation

Documentation is a record of events that have passed in the form of writing, pictures or monumental works of someone. Document study is a complement to the interview and observation method (Sugiyono, 2005).

### 3.5. data analysis technique

Data analysis is to search and organize systematically obtained from the results of interviews so that it is easier to understand. The steps taken in analyzing the data are as follows:

#### 1. Data Reduction

Reducing data means summarizing, selecting and focusing on things that are more important with the aim that the results of the reduced data can provide a clear picture. In this study, data reduction is the process of choosing which data is relevant to the research objectives so that researchers will select data from interviews and observations related to ethnomathematics in geulis groups, especially geometric shapes.

#### 2. Data Presentation

After data reduction, the researcher will display the data or data presentation. In qualitative research, data presentation can be done in forms such as brief descriptions, charts or relationships between categories. The presentation of the data in this study uses a descriptive data presentation, which describes the results of data reduction in the form of forms, both the shape of the base and the right in the geulis column in terms of geometry.

#### 3. Draw Conclusions

Conclusions in qualitative research from the start may be able to answer the formulation of the problem formulated, but maybe not because they will develop after the researcher is in the field (Sugiyono, 2005). In this study, the purpose of drawing conclusions is to be able to find out what geometric shapes exist in the geulis group.

### 3.6. Research Procedure

Broadly speaking, the research will be carried out with the following steps:

#### 1. Preparation Stage

The preparation stage in this research will be carried out by planning research, time and place of research implementation, as well as techniques that will be used to collect data in achieving research objectives.

#### 2. Data Collection Stage

The data collection stage in this study will be carried out by using interviews, observation and documentation on the geulis group in terms of geometry.

### 3. Data Analysis Stage

The data analysis stage in this study will be carried out by reducing or summarizing data from the results of observations, interviews and documentation. Furthermore, the presentation of data is carried out so that it is easy to understand so that the objectives of the research can be achieved.

### 4. Conclusion Drawing Stage

The conclusion drawing stage in this study will be carried out by analyzing all the data that has been analyzed so as to answer the questions that have been formulated by the researcher.

## 4. Results and Discussion

### 4.1. Research Results

In accordance with the data collection techniques in this study, namely the data obtained from the results of interviews, observations and documentation. Interviews were conducted with the craftsman of Kelom Geulis, Mrs. Eet, she owns a factory and also a shop called Ayunna Kelom Geulis having its address at Jalan Tamansari (Gobras), Mulyasari, Kecamatan Tamansari, Tasikmalaya, West Java. The following is a snippet of the interview with Mrs. Eet listed in Table 1.

**Tabel 1.** Results of interview

Astrid	I'm sorry ma'am in advance, can I tell you about the history of Kelom Geulis that you know? And how and from what year did you become a Kelom Geulis craftsman?
Mrs. Eet	Kelom Geulis was originally in the 1940s in the Gobras region of Tasikmalaya. At that time there was a resident from Gobras named Pohir or Ohir who worked in a sandal factory in Bandung, one day Pohir and his friends wanted to make sandals but they were made of wood. They also managed to make sandals from the wood called Kelom Geulis raw and brought to Bandung and turned out to be sold out. Then, they got an order but with a model that is decorated with carvings. And they succeeded in making sandals with carvings which were later called Kelom Geulis. Until the 1970s, this kelom geulis craftsman experienced a decline due to the entry of factory-made sandals. However, in 1979 this craft business was revived to this day. For my own business, my grandfather happened to be a Kelom Geulis craftsman, then I learned little by little and in 2018 I started my own business.
Astrid	What are the steps or steps in making this Kelom Geulis?
Mrs. Eet	First, mahogany logs are usually made into squares, then patterned and sawed to form a sandal base, after that they are shaved, then dried in the sun, after drying they are smoothed or sanded, then beautified with carvings or airbrushes, and the last is finishing, by pairing the upper or face or the top of the Kelom Geulis.
Astrid	In making Kelom Geulis, usually what sizes are produced and how many? Is there any consideration in determining the size?
Mrs. Eet	Sizes that are made like the size of adult sandals in general are sizes 36 (23cm), 37 (23.5 cm), 38 (24 cm), 39 (24.5 cm) to 40 (25 cm), and are usually made per one kodi. (20 pairs) for the same model with different sizes.
Astrid	In making the base and the right of Kelom Geulis itself, what materials are needed?
Mrs. Eet	The shape of the base and heels are made of logs that have been patterned, shaved, dried and smoothed in such a way as to form the desired base and heel.
Astrid	Jadi bentuk alas dan hak itu bisa berbeda-beda bu?
Mrs. Eet	Mrs. Eet Yes, the shape of the base and the right itself can be different because usually the motifs that will be made are adjusted to the shape of the right and everyone likes short heels or high heels. We also have our own design or pattern to determine the right motif and size so that they are the same.
Astrid	For the manufacture of the upper or the face or the top of the Kelom Geulis, what materials are needed and are there certain conditions?
Mrs. Eet	The material of the upper or face or the top of Kelom Geulis is made of cloth, leather, mica and others. For the provisions, either from the shape or color itself, it adjusts to the motif.
Astrid	How to attach the front or top to the base and heel of the Kelom Geulis?

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Mrs. Eet	Installation of the front using a prosthetic leg or commonly known as LIS so that it is neat and fits on the leg and of course there is a size.
Astrid	At the stage of painting or painting the base of Kelom Geulis, what materials are needed and what motifs are taken into consideration?
Mrs. Eet	For painting materials, using wood paint and the motifs drawn usually follow the times, but mostly flowers for now.

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After the interviews were conducted, the next step was to observe the craft of kelom geulis by looking directly at the factories and shops of making kelom geulis at the factory and shop owned by Mrs. Eet named Ayunna Kelom Geulis. Based on observations, we can find out how to make and also various forms of kelom geulis both the shape of the base, rights and also the motifs on the kelom geulis itself.



**Figure 1.** Half-finished columns



**Figure 2.** Columns already painted



**Figure 3.** Column has been given rights and engraving



**Figure 4.** Clumps are ready

The picture above shows the steps for making geulis clogs, starting with the semi-finished column shape, which is the shape produced from logs that have been cut with a pattern, shaved and dried in the sun to form a clog base with a predetermined size. Next, the clogs are painted in brown and black. After finishing painting, the clogs are installed with the right and given carvings or motifs according to the wishes or provisions. Then, the kelom geulis will be fitted with an upper which is usually made of leather or cloth. Kelom geulis is ready to use. Here are some collections of Ibu Eet's kelom geulis.



**Figure 5.** Channel columns



**Figure 6.** Circle right column



**Figure 7.** Column of rights with "Tasik" written on it



**Figure 8.** Right Triangle Column



**Figure 9.** Flower Motif Columns

Figures 5, 6, 7, 8 and 9 are some of the collections of Ibu Eet's kelom geulis. In the pictures, there are several types of kelom geulis, ranging from motifs made of cloth, the shape of the right begins to vary and the motifs in various forms as well. The results of interviews and observations obtained from Mrs. Eet are complete, starting from the explanation of the kelom geulis, how to make it, to the various forms of the kelom geulis. The following are the results of the documentation during interviews and observations with Mrs. Eet.





**Figure 10.** Interview with Mrs. Eet



**Figure 11.** Touring the Factory with Mrs. Eet

## 4.2. Discussion

The result of the research is a picture of the geulis group containing mathematical values, especially flat shapes. If the form of rights and motifs of the kelom geulis are carefully examined, it can be found that there are several mathematical concepts contained therein. The mathematical concept contained is the concept of flat shapes including rectangles, circles, and triangles. Not only can we pay attention to the shape of the right and the motif, but this mathematical concept can also be seen indirectly in the way of making geulis such as determining the size. The following is a description of the mathematical concepts in the form of rights and the motif of the geulis group.

### 1. The concept of a flat rectangle

The rectangular flat shape in question is at the upper part or the top of the geulis group. If you pay close attention, the upper part of this geulis group when stretched will form a flat rectangular shape.



**Figure 12.** Flat Rectangles in Geulis Clusters

### 2. Flat Circle Concept

Bangun Flat The circle in question is in the shape of the right of the geulis group. If you pay close attention, the shape of the geulis clump right forms a circle in which there is a lightning shape so that it can provide more aesthetic value when used.



**Figure 13.** Construct a Flat Square Circle on the Geulis Group

### 3. The Concept of Constructing a Flat Triangle

The shape of the triangular flat in question is in the form of the right of the geulis group. If you pay close attention, the shape of this geulis clump right forms a stacked triangle.



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Berikut adalah ringkasan mengenai ... **bel 2.**

**Tabel 2.** Ukuran Kelom Geulis

Ukuran	Panjang Kaki
36	23 cm
37	23,5 cm
38	24 cm
39	24,5 cm
40	25 cm

Based on Table 2 for each size of 1 there is an additional foot length of 0.5 cm. The relationship between leg length and the size of the geulis group is directly proportional. Mathematical models or equations that can be made based on the data in Table 2 are:

$$y = 2x - 10 \quad x = 23, 23.5, 24, 24.5, 25.$$

where x represents the length of the foot and y represents the size of the geulis group.

The relationship between the length of the legs and the size of the geulis group produces a linear equation with a positive gradient, namely 2. The graph of the function in the linear equation (1) is a straight line that goes up.

## 5. Conclusions And Suggestions

### 5.1. Conclusion

Based on the results and discussion, it can be concluded that there are ethnomathematics in the geulis group in the discussion of flat shapes, including rectangles, circles and triangles both in the form of the base and the right shape of the geulis group and can also be seen from the motifs contained in the geulis group. In addition, without realizing the mathematical concept of calculation is also found in the process of making geulis clusters such as in determining the size of geulis clusters. From the data obtained, it turns out that the determination of the size of the geulis group uses a linear equation as a function of the leg length.

### 5.2. Suggestions

In future research, it is better to be able to look for ethnomathematics in geulis groups in a broader discussion so that it is not only in the concept of flat shapes.

## References

- Afonso N. E. (2013). Rethinking the History of Inclusion of IKS in School Curricula: Endeavoring to Legitimate the Subject. *International Journal of Science & Mathematics Education*, 11(1).
- Arikunto, S. (2013). *Research Procedure A Practical Approach*. Jakarta: Rineka Cipta.
- Barton, P. B., & Toulmin, P. (1966). Phase relations involving sphalerite in the Fe-Zn-S system. *Economic Geology*, 61(5), 815-849.
- Bugin, B. (2012). *Qualitative Research*. Jakarta: Kencana Prenada.
- D'Ambrosio. (1995). Ethnomatematics and its in the History and Pedagogy of Mathematics for the Learning of Mathematics. 5(1): 44-47.
- Prabowo, A. Sukono, Mamat, M., Wahyudin, and Budiono, R. (2020). Ethnomodelling: Aboge Cikakak Calendar Conversion into Gregorian Calendar using Brute Force Algorithm. *International Journal of Advanced Science and Technology*, 29(7): 1633 – 1646.
- Prabowo, A. Sukono, Mamat, M., Wahyudin, and Budiono, R. (2020). Mathematical Model for Commemoration of Death in Javanese Tradition. *International Journal of Advanced Science and Technology*, 29(5): 162 – 168.
- Purwadi. (2004). Orises Formation of Adolescent Self-Identity. *Humanity*. 2(1): 43-52.
- Rudhito, M. A. (Ed.). (2019). *Mathematics in Culture: A Collection of Ethnomathematical Studies*. Garudhawaca.
- Sirate, S.F. (2011). Qualitative Study on Ethnomathematical Activities in Tolaki Community Life. *Journal of Education Lantern*, 14(2).
- Siregar, S. (2018). *Quantitative Research Methods Equipped with Comparison of Manual & SPSS Calculations*. Jakarta: Prenadamedia Group.
- Sugiyono. (2005). *Qualitative Quantitative Research Methods and R&D*. Bandung: Alfabeta.
- Wiranata, I. G. A., & SH, M. (2011). *Cultural Antropology*. Citra Aditya Bakti.