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# Ethnomathematics Study: Geometrical Concept in Kudus Market Snacks

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## Abstract

Most students consider mathematics difficult, because it is abstract. To respond to this, teachers can use ethnomathematics in learning mathematics so that mathematics is easy to understand. One of the ethnomathematics objects that can be used is market snacks. Market snacks are traditional foods often sold in crowded places like. This study aims to analyze the geometrical concepts that exist in various forms of market snacks in Kudus. This research uses a type of qualitative research with an ethnographic approach. Data collection used semi-structural interviews with 3 market snack sellers, literature studies, and documentation. The results of the study found that there are geometric concepts in market snacks. Triangular, rectangular, and circular shapes are found, while for spatial shapes, rectangular pyramids, blocks, spheres, triangular prisms, and tubes are found. The research results can be used as an alternative source of learning mathematics, especially in geometry material.

**Keywords:** ethnomathematics, geometry, mathematics learning, market snacks

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## 1. Introduction

Mathematics is very much needed in education because mathematics is the basis for many other sciences. Many branches of science, such as physics, chemistry, biology and economics, were developed based on mathematical concepts and principles of cylinder (Ramdani, 2006). For example, integral and differential material in mathematics can be used to build theories in physics. Apart from that, mathematics can also be applied in daily activities. By studying mathematics, a person can improve the ability to think critically, logically, carefully, and become accustomed to solving problems (Wulandari & Supriyono, 2014).

Mathematics has many branches, one of which is geometry. Geometry has a very important position and must be taught to students from elementary school to university level (Wahdah, Haqiqi, & Malasari, 2021). According to Walle, geometry is important to study for reasons: (1) geometry can develop a person's ability to solve problems. (2) geometry plays a major role in other branches of mathematics. (3) Geometry can be applied in daily activities and geometry has many fun puzzles (Rahimah & Asy'ari, 2017).

Most students consider mathematics difficult; this is because mathematics has an abstract nature (Prasetyawan, 2016). Apart from that, most teachers delivering the material seem monotonous

and rigid, where students are taught procedurally using mathematical formulas only. In fact, if a teacher uses inappropriate methods in teaching and learning procedures, it can cause students to have difficulty and be less able to apply their knowledge of mathematics when encountering problems related to mathematics (Auliya, 2018).

One solution is to use an ethnomathematics approach. The ethnomathematics approach is a learning program that focuses on the relationship between mathematics and culture. According to research by Sa'adah, Haqiqi, and Malasari (2021), Ethnomathematics can help connect mathematical concepts with societal culture. The concept of ethnomathematics became known in 1997 by a Brazilian mathematician named Ubiratan D'Ambrosio. Ethnomathematics consists of three words, namely "ethno", "mathema", and "tics". The word "ethno" has a broad meaning and is related to social and cultural aspects. The word "mathema" refers to understanding, knowledge, explanation, and mathematical activities such as classification, measurement, coding, and modeling. The word "tics" refers to a technique or method. Thus, it can be concluded that ethnomathematics is the anthropology of mathematics education and mathematics culture (D'Ambrosio, 1985). Prahmana (2022) The study of mathematics within specific cultural groups—such as labor groups, ethnic communities, age groups of children, professional classes, and so forth—is known as ethnomathematics.

By applying an ethnomathematics approach, mathematics learning can be adapted to everyday life and the cultural context of society, so that it becomes more relevant. This allows students to understand mathematical concepts through real-life experiences in their own culture. Thus, ethnomathematics can be an effective solution to overcome problems in mathematics learning by considering cultural aspects and social context. One of the objects of ethnomathematics is market snacks. Snacks refer to drinks and food offered and sold along the streets or in busy places such as markets (Febrianti & Indrawati, 2021). The shape of the market snacks has geometric elements in them. These geometric elements include triangles, squares, rectangles, circles, cubes, blocks, balls, tubes, and other geometric shapes. So ethnomathematics in market snacks can be used as an alternative source of learning mathematics, especially in geometry material.

This research is based on previous studies. According to research conducted by Pathuddin and Raehana (2019), it was found that typical Bugis food has geometric elements, both in the form of flat shapes and spatial shapes. Febrianti and Indrawati's (2021) research also shows that traditional snacks in Lamongan contain geometric concepts, including flat shapes and spatial shapes. Apart from that, research carried out by Huda (2018) in the Yogyakarta area revealed that market snacks have elements of ethnomathematics, such as plane geometry, space geometry, and linear equations related to the sale of market snacks. Research by Simanjuntak and Sihombing (2020) also shows that typical Batak cakes, such as cimpa, nipak, lapet, and so on, contain ethnomathematics elements in the form of spatial geometry. Thus, this research continues previous research which has shown a relationship between typical foods or traditional snacks and geometric concepts. This shows that the application of ethnomathematics in studying traditional food or snacks can be a relevant and useful approach to learning mathematics.

The main difference between this research and the previous studies mentioned is that this research aims to analyze the geometric concepts that exist in various forms of market snacks in the city of Kudus. Researchers conducted research on the market snacks *koci*, *ketan salak*, *cucur*, *onde-onde*, *bekuan*, *tahu susur*, *gethuk lindri*, *pokes*, *arem-arem mie*, and *wingko*. This research has its own uniqueness, because there are currently only a few ethnomathematics studies on market snacks in the city of Kudus.

## 2. Methods

Researchers use descriptive qualitative research, which is a research method that uses descriptive data consisting of written or spoken words from perpetrators who can be observed (Creswell, 2014). The research method used in this research is ethnography. The ethnographic approach aims to provide a full description of a particular culture, considering the cultural aspects observed (Darmawan, 2008).

In this research, there are three subjects who are the focus, namely three market snack sellers operating in Kudus Regency. The object of this research is the concept of geometric shapes related to market snacks. To collect data regarding market snacks, literature study techniques (written), semi-structural interviews (oral) and documentation (images) were used. The first is an oral source obtained directly from the results of semi-structural interviews with three market snack sellers in Kudus Regency. Second, written sources in the form of books and scientific articles relevant to market snacks and ethnomathematics. And finally, the source of documentation is pictures or photos related to the research object, namely market snacks. After that, the researcher carried out the data analysis process and presented the analysis results in detail.

## 3. Result

Based on the results of observations and interviews, the research obtained several types of market snacks in Kudus. After analyzing the market snacks, the researcher discovered the concept of ethnomathematics, namely the geometric concepts of plane shapes and spatial shapes. The following is an explanation of the concept of ethnomathematics in market snacks in Kudus as follows:

### 3.1. *Koci*

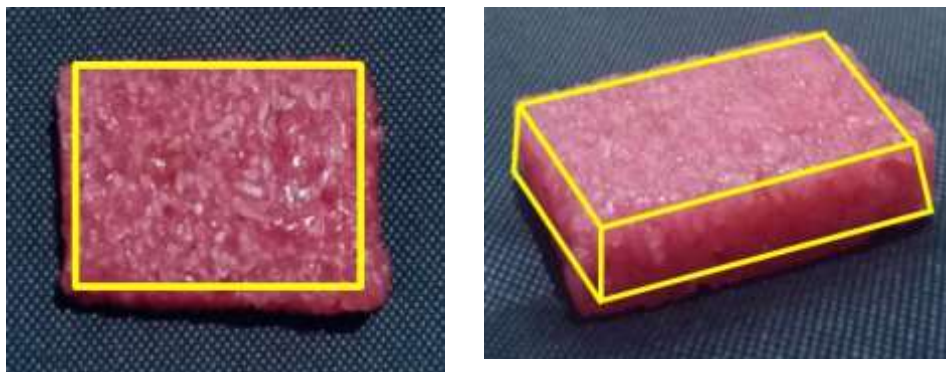
Figure 1. *Koci* (source: Personal documentation)



*Koci* is a market snack made from sticky rice flour, filled with young coconut mixed with palm sugar. The *koci* is wrapped in banana leaves and then steamed. In the *koci* snacks, researchers found elements of spatial geometry, namely rectangular pyramids. A rectangular pyramid is a geometric shape that has 5 vertices, 8 edges, and 5 sides consisting of 1 base side which is in the form of a rectangle, and 4 upright sides which are in the form of a triangle.

### 3.2. *Ketan Salak*

Figure 2. *Ketan salak* from above and from the side (source: Personal documentation)



*Ketan salak* is a market snack made from sticky rice, sugar, and coconut milk. In *ketan salak* snacks, researchers found geometric elements of flat shapes and spatial shapes. When viewed from the front there are geometric elements of a flat shape, namely a rectangle. A rectangle is a flat shape that has 4 right-angled corners, has 4 sides, and the parallel sides are the same length. When viewed from the side there are elements of spatial geometry, namely rectangular blocks or prisms. A rectangular beam or prism is a geometric shape with 12 edges, 8 vertices, and 6 sides of 3 pairs of rectangular sides of different sizes.

### 3.3. *Cucur*

Figure 3. *Cucur* (source: Personal documentation)



*Cucur* is a market snack made from wheat flour, coconut milk, and brown sugar. In the cucur snacks, researchers found elements of geometry and found elements of flat shapes, namely circles. A circle is a flat shape that has infinite lines of symmetry and rotational symmetry, has 1 center point, and has the same distance from the center point to the edge of the circle.

### 3.4. *Onde-Onde*

Figure 4. *Onde-Onde* (source: Personal documentation)



*Onde-Onde* is a snack made from wheat flour and covered in sesame. *Onde-onde* has green bean filling inside. In *onde-onde* snacks, researchers discovered the concept of spatial geometry, namely balls. A ball is a shape that has curved sides and no corners or edges.

### 3.5. *Bekuan*

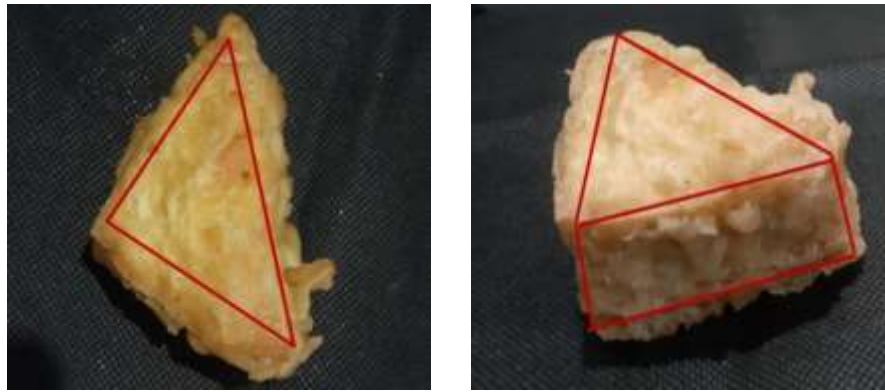
Figure 5. *Bekuan* (source: Personal documentation)



*Bekuan* is a market snack made from rice flour, which contains banana as a filling. The *bekuan* is wrapped in banana leaves and steamed. In *bekuan* snacks, there are geometric elements of flat shapes, namely rectangles. A rectangle is a flat shape that has 4 sides, opposite sides are the same length and have 4 right angles.

### 3.6. *Tahu Susur*

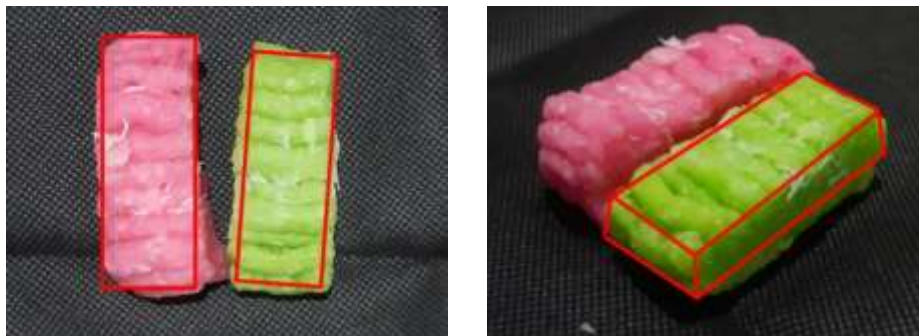
Figure 6. *Tahu Susur* from above and from the side (source: Personal documentation)



*Tahu susur* is a snack made from tofu and coated with flour dough. *Tahu susur* has vegetable fillings in it, such as carrots, cabbage, and sprouts. In the *tahu susur* snacks, researchers found geometric elements of flat shapes and spatial shapes. When viewed from the front, there are elements of flat geometric shapes, namely triangles. A triangle is a flat shape that has 3 sides and 3 vertices. When viewed from the side, there are geometric elements of geometric shapes, namely triangular prisms. A triangular prism is a geometric shape that has 6 vertices, 9 edges, and 5 sides, has a triangular base and top, and has rectangular vertical sides.

### 3.7. *Gethuk Lindri*

Figure 7. *Gethuk Lindri* from above and from the side (source: Personal documentation)



*Gethuk lindri* is a market snack made from cassava, coconut, and sugar. This snack has elements of geometry in both spatial and flat shapes. If analyzed from the front, there are geometric elements of flat shapes in the form of rectangles. A rectangle is a flat shape that has four vertices that form right angles and has four sides that are parallel and the same length. However, if analyzed from the side, there are geometric elements of geometric shapes in the form of blocks or rectangular prisms. A rectangular beam or prism is a geometric shape with 12 edges, 8 vertices, and 6 side of three pairs of rectangular sides of different sizes. Thus, *gethuk lindri* as a market snack shows the presence of geometric elements both in the form of flat rectangular shapes and rectangular blocks or prisms. *Gethuk lindri* is a market snack made from cassava, coconut, and sugar. This snack has elements of geometry in both spatial and flat shapes. If analyzed from the front, there are geometric elements of flat shapes in the form of rectangles. A rectangle is a flat shape that has four vertices that form right angles and

has four sides that are parallel and the same length. However, if analyzed from the side, there are geometric elements of geometric shapes in the form of blocks or rectangular prisms. A rectangular beam or prism is a geometric shape with 12 edges, 8 vertices, and 6 sides of three pairs of rectangular sides of different sizes. Thus, *gethuk lindri* as a market snack shows the presence of geometric elements both in the form of flat rectangular shapes and rectangular blocks or prisms.

### 3.8. Pokes

Figure 8. *Pokes* (source: Personal documentation)



*Pokes* or in Indonesian called *pukis* are market snacks made from wheat flour. In *pokes* snacks, there is a flat shape element, namely a half circle. A half circle is a flat shape formed by dividing a circle into two parts. A semicircle has angles measuring  $180^{\circ}$ .

### 3.9. Arem-Arem Mie

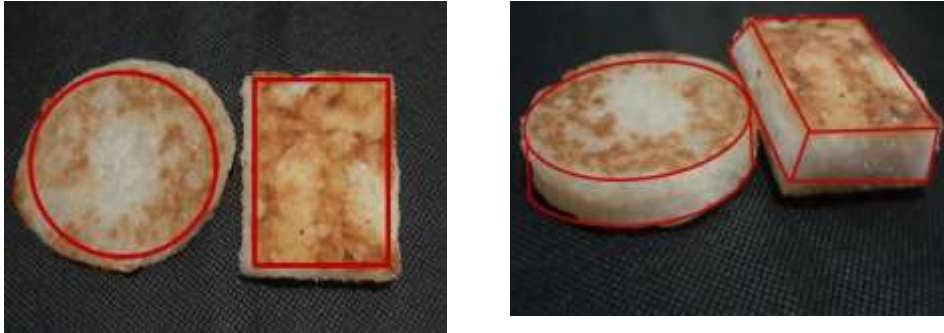
Figure 9. *Arem-Arem Mie* (source: Personal documentation)



*Arem-arem mie* is a market snack made from noodles, filled with fried tofu and potato chili sauce, then wrapped in banana leaves. In the *arem-arem mie* snack, there are elements of spatial geometry, namely tubes or cylinders. A tube or cylinder is a geometric shape that has 2 circular sides that are the same and parallel and has a rectangular blanket that surrounds the two circles.

### 3.10. Wingko

Figure 10. *Wingko* from above and from the side (source: Personal documentation)



*Wingko* is a food made from sticky rice flour, sugar, and coconut. This snack contains geometric elements both in the form of flat shapes and spatial shapes. If analyzed from the front, there are geometric elements of flat shapes in the form of rectangles and circles. A rectangle is a flat shape that has four vertices forming right angles and has four sides that are parallel and the same length. A circle is a flat shape that has infinite lines of symmetry and rotational symmetry, has one center point, and is the same distance from the center point to the edge of the circle.

Meanwhile, if analyzed from the side, there are geometric elements of geometric shapes in the form of rectangular blocks or prisms and tubes or cylinders. A rectangular beam or prism is a geometric shape with 12 edges, 8 vertices, and 6 sides of three pairs of rectangular sides of different sizes. A tube or cylinder is a geometric shape that has two circular sides that are the same and parallel and has one side of a rectangular blanket that goes around the two circles. Thus, *wingko* as a market snack shows the presence of geometric elements in the form of rectangular and circular flat shapes, as well as rectangular blocks or prisms and tubes or cylinders.

#### 4. Discussion

*Koci* market snacks have elements of the geometric shape of a rectangular pyramid. In accordance with the results of research conducted by Simajuntak and Shiombing (2020) show that the typical Batak cake, namely the lapet cake, also contains geometric elements of rectangular pyramid shapes. In the market snacks of *ketan salak* and *gethuk lindri*, there are geometric elements of rectangular blocks or prisms. In accordance with the results of the analysis carried out by Huda (2018) which shows that in market snacks in the Yogyakarta area, namely *jadah manten*, *sawut*, and *krasikan*, there are geometric elements of block or rectangular prism shapes.

The *cucur* and *wingko* market snacks have geometric elements of flat, circular shapes. In line with the results of a study conducted by Huda (2018) which shows that market snacks in the Yogyakarta area, namely *putu ayu* and *serabi solo*, contain geometric elements of flat circular shapes. In the *onde-onde* market snack, there are geometric elements of spherical shapes. In accordance with the results of research conducted by Simajuntak and Shiombing (2020) which shows that typical Batak cakes, namely *gadong cake*, *ombus-ombus*, and *dolung-dolung*, contain geometric elements of spherical shapes.



In the market snacks *bekuan*, *wingko*, *ketan salak*, and *gethuk lindri* there are geometric elements, namely rectangular flat shapes. In line with the results of research conducted by Anggaraini, Rusmana, and Ritariandalas (2022), it is shown that in traditional Betawi snacks, namely pepe cakes, there are geometric elements of rectangular flat shapes. The market snack *tahu susur* has elements of flat triangular geometric shapes and triangular prism geometric shapes. In accordance with the results of research conducted by Febrianti and Indrawati (2021), it shows that the traditional snack Lamongan pences has geometric elements of flat triangular shapes, and the traditional market snack Lamongan bongko has geometric elements of triangular prism shapes.

In the *pokes* market snacks, there are geometric elements of flat, semi-circular shapes. In accordance with the results of research conducted by Coelestia and Isodarus (2021), shows that in the market snacks in Lempuyangan Yogyakarta, namely pastels, there are geometric elements of semi-circular flat shapes. In the *arem-arem mie* market snacks there are geometric elements of tube or cylinder shapes. In line with the results of research conducted by Febrianti and Indrawati (2021), it shows that in the traditional Lamongan snack, namely lemper, there are geometric elements of tube or cylinder shapes.

In the *wingko* market snacks, there are geometric elements of rectangular blocks or prisms and tubes or cylinders. In accordance with the results of research conducted by Simajuntak and Shiombing (2020) show that in the typical Batak cakes *cimpa pour* and *cimpa bohan* there are geometric elements of tubular or cylindrical shapes and in the typical Batak Labar cake there are geometric elements of geometric shapes of blocks or rectangular prisms. This is also in accordance with research conducted by Febrianti and Indrawati (2021) which shows that in the traditional Lamongan snack, namely corn klebet, there are geometric elements of rectangular blocks or prisms. This research only examines geometric elements in market snacks. Suggestions for further research, include examining other mathematical concepts in Kudus's market snacks.

## 5. Conclusion

Based on the results of the explanation above, researchers can draw some conclusions that there are geometric concepts found in Kudus's market snacks. *Koci* market snacks contain geometric elements of spatial shapes, namely rectangular pyramids, market snacks of *salak sticky rice* contain elements of flat geometric shapes, namely rectangles, and spatial geometric elements, namely rectangular blocks or prisms. Apart from that, the *cucur* market snacks have elements of flat geometric shapes, namely circles, the *onde-onde* market snacks have elements of geometric shapes, namely spheres, *bekuan* market snacks have elements of flat geometric shapes, namely rectangles, *tahu susur* market snacks have elements of flat geometric shapes, namely triangles and geometric shapes, namely triangular prisms. In the *gethuk lindri* market snacks there are geometric elements of flat shapes, namely rectangles, and spatial geometric elements, namely blocks or rectangular prisms, the *pokes* market snacks have elements of flat geometric shapes, namely half circles, the *arem-arem mie* market snacks contain geometric elements of spatial shapes, namely tubes or cylinders, *wingko* market snacks contain elements of flat geometric shapes, namely rectangles and circles, as well as spatial geometric elements, namely rectangular blocks or prisms and tubes or cylinders. This research only examines

geometric elements in market snacks. The research results can be used as an alternative mathematics learning resource, especially in geometry material.

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