ETHNOMATHEMATICS AT JAVANESE TRADITIONAL FOOD MARKET

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Abstract: This study aims to describe the ethnomathematics of traditional Javanese food or snack in terms of geometry topics. We also study the ethnomathematics profit price sales of typical Javanese snacks for the linear equation systems topic. This research is a qualitative descriptive study. This research was conducted in Medan Sinembah village specified for market snacks. Data were obtained in interviews, observations, and documentation. The results showed that typical Javanese market snacks' mathematical concepts include two-dimensional geometry, three-dimensional geometry, and linear equations. Ethnomathematics activities in typical Javanese market snacks are counting activities, measuring activities, and geometric aspects.

Keywords: *Ethnomathematics, market snacks, geometry, linear equations*

INTRODUCTION

Indonesia has abundant diversity, ranging from culture, language, customs, and the culinary field. The culture results from hereditary inheritance from community groups, generation to generation in an area. Culinary is about staple foods or side dishes and traditional snacks. Traditional snacks are a genetic heritage that has become its strength to make culinary in the archipelago more attractive and superior, especially for Javanese ethnic groups. Like Indonesia's culture and ethnicity, taste, color, and forms of diversity are also varied, exciting, and different.

According to the tradition and culture of the traditional Javanese snacks, traditional snacks have a meaning seen from the philosophical form, one of which is a triangular "lupis". It is very important to be preserved because it has a unique side in terms of its traditional culture, such as the uniqueness in processing the packaging, which has always used leaves shaped to produce a unique and very traditional shape. However, many have shifted from their initial form but still do not leave their traditional value [1-2].

Ethno describes all the things that make up the cultural identity of a group, namely language, codes, values, jargon, beliefs, food and clothing, habits, and physical characteristics. At the same time, mathematics includes a broad view of arithmetic, classifying, sorting, inferring, and modeling. [3-5].

Indonesian uses ethnomathematics in determining big days, traditional ceremonies, and many more uses of ethnomathematics in people's lives[6].

Ethnomathematics serves to express the relationship between culture and mathematics [7]. Thus, ethnomathematics is a science used to understand how mathematics is adapted from a culture, so that people know about everyday activities related to mathematics [8-9].

Ethnomathematics also has a broad concept and is related to various activities, namely counting, classifying, measuring, designing buildings or tools, playing, and so on [10-12].

Mathematics is the basic science of all sciences. Both aspects of reasoning and its application play an important role in efforts to master science, technology, and culture. Mathematics is one of the sciences in education that is often applied in society, but in reality, most of them are not aware of its existence. They assume that mathematics is only arithmetic acquired during learning at school [13].

Mathematics permeates everyday life, sometimes clearly and on a more hidden or implicit level [14-15].

Mathematics and culture can be related to everyday life because mathematics is a source of knowledge and the primary needs of every living being. Overall, humans' ability in society is used to understand the environment of their experiences and guides their behavior [16-17].

Cultures in Indonesia are forgotten because of the times and technology. Therefore, we must protect it as the next generation because the existence and resilience of locals reside at a younger age [18].

Thus, various efforts are needed to maintain and preserve culture. In this case, one of the efforts to maintain and preserve culture is to introduce to the public and the realm of education that the culture found in everyday life can be associated with mathematics. It is easier for people to understand the cultural aspects of life with this.

RESEARCH METHOD

The type of research used in this research is descriptive qualitative research. Qualitative research produces descriptive data in written and spoken words from people and observable behavior. This research intends to

understand the phenomena of what is experienced by the research subjects such as behavior, perception, motivation, action, and description in the form of words and language in a unique natural context [19-20]. In collecting data, this research uses the method of observation, interviews, and documentation. The data that has been collected is then grouped and then analyzed and drawn conclusions.

RESULTS AND DISCUSSION

Cakes are snacks made from various materials that can be made in multiple forms. Some are steamed, fried, and baked. Snack markets are another name for several cakes or foods traded initially in traditional markets. Thus, what is meant by market snacks on this topic are snacks made from various materials, can be made in multiple forms and different processing methods, and are usually traded in traditional markets [21].

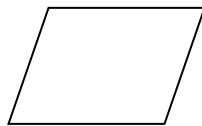Figure 1. Jadah Ketan Goreng (Gemblong)
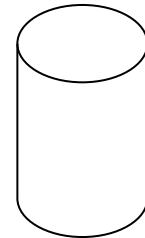

Figure 2. Wajik

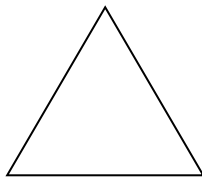Figure 3. Cake Talam Ubi Rambat

Figure 4. Dadar

Figure 5. Lupis

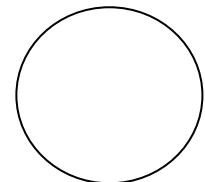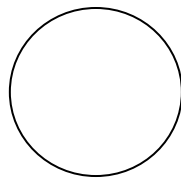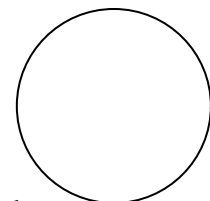Figure 6 Klepon

Figure 7. Lumpang Pandan
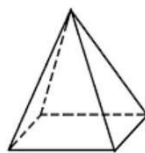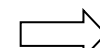

Figure 8. Onde-onde

Figure 9. Mendut

Figure 10. Gethuk

Jadah fried sticky rice (Gemblong) (Fig. 1), this culinary, is a market snack made from sticky rice cooked with grated coconut and after cooking. It is pounded in the barn until smooth after that cut into pieces. The shape resembles a rectangular 2-dimensional space. The size obtained with side = 3 cm, if calculated by the formula for the square area where $s \times s = 3 \times 3 = 9$ cm^2 and has a perimeter of $4 \times s = 12$ cm.

Wajik is a market snack food made from sticky rice cooked with brown sugar (Fig. 2). The shape resembles a 2-dimensional space like a rectangle. The size was obtained with a side of 3 cm. It is calculated by the formula for the area of a square: $s \times s = 3 \times 3 = 9$ cm^2 and has a perimeter of $4 \times s = 12$ cm.

Sweet potato tray cake is a market snack made from yellow Talam Ubi Rambat (Fig. 3), made by steaming. The shape resembles a 2-dimensional parallelogram. The size obtained is a base of 9 cm, a height 6 cm, and the yam cake tray area is $L = a \times t = 54$ cm^2.

Dadar is a market snack filled with grated coconut mixed with brown sugar or palm sugar, the skin of the omelet rolls is usually green, but with the development of age, the colors of this roll of omelet have changed (Fig. 4). The shape resembles a flat 3-dimensional tube. The cylinder has a base area of 6 cm and a height of 10 cm, so the volume of the omelet is $V = r^2 \times t = 1.130.4$ cm^3.

Lupis (Fig. 5) is a market snack that has existed since ancient times. It is made from glutinous rice cooked with banana leaves and then mixed with grated coconut and given a sauce made of brown sugar, which is diluted to make lupis sweetener. The shape resembles a 2-dimensional isosceles triangle and has a base of 8 cm and a height of 12 cm, so the area of lupis is $L = \frac{1}{2} \times$ base $\times$ height $= 48$ cm^2.

Klepon (Fig. 6) is a traditional cake that is included as a market snack made from glutinous rice flour, water, palm sugar, and grated coconut as a filling for klepon mixed with brown sugar by boiling until the klepon floats and then sprinkled with grated coconut. The shape resembles the geometry of a circle, klepon about 4 cm in diameter or 2 cm in radius. Then it can be calculated the surface area of the klepon r^2 with a radius of 2 cm. The result is 12.57 cm^2 while the perimeter is 12.57 cm.

Kue Lumpang pandan (Fig. 7) is a market snack that can be found in any area made from tapioca flour and rice flour with a sprinkle of coconut evenly throughout the cake. The shape of this mortar cake is round like a circle geometry. The diameter of the mortar cake is about 6 cm, or the radius is 3 cm, so the surface area of the mortar cake can be calculated r^2 using the formula with a radius of 3 cm. The result is 28.28 cm^2 while the circumference is 18.85 cm.

Onde-onde (Fig. 8) cake is one of the market snacks made from glutinous rice flour which until now has developed along with the times, for example in the past these onde-onde only contained coconut kernels cooked with brown sugar, but nowadays the variations of onde fillings There are various kinds of dumplings, such as chocolate, green beans and cheese. The shape resembles the geometry of a circle. The diameter of the onde-onde is about 4 cm or a radius of 2 cm. Then it can be calculated the surface area of the onde-onde r^2 with a radius of 2 cm; the result is 12.57 cm^2.

Mendut (Fig. 9) is a traditional snack we often encounter in traditional markets and home products. The main ingredient is glutinous rice flour mixed with coconut milk which has a coconut core filling mixed with brown sugar. The shape resembles the geometry of a rectangular pyramid. The size of the base area is 8 cm and the height is 6 cm, if calculated by the formula $V = \frac{1}{3}$ (L base $\times$ t) $= \frac{1}{3}(8 \times 6) = 16$ cm^2.

Gethuk (Fig. 10) is a typical Javanese market snack made from cassava which is almost difficult to find at home cake traders or in the market. The shape resembles a rectangular geometric shape. The size obtained with sides = 4 cm, if calculated by the formula for the area of a square $s \times s = 4 \times 4 = 16$ cm^2 and has a perimeter of $4 \times s = 16$ cm.

In the sales process, the seller of market snacks has a price difference to consider the profits to be obtained from selling traditional Javanese snacks. If you want to calculate how much profit from the selling price of traditional Javanese snacks, the seller must know how much it costs.

Table 1. The Difference in Selling Prices of Typical Javanese

Market Snacks Name of Market Snacks	Production Costs	Selling Price	Difference
Lupis	1000	1500	500
diamonds	800	900	100
Jadah sticky rice (gemblong)	800	900	100

Based on production costs and selling prices (Table 1), there are examples of linear equations. For example, in research, some sellers sell several types of cakes in one merchandise. Some even have only one type of cake. For example, Halimatu Sa'diah's mother makes lupis and klepon snacks, and in a single day, she is able

to sell 65 lupis and 75 diamonds. If the cost of the materials and the selling price are as shown in table 4.1, then Mrs. Halimatu Sa'diah will get a daily profit of Rp. . .

For example ax : profit of lupis; v: profit of klepon. The form of the equation:

65 ax + 75 v.

65 (500) + 75(100)

32.500 + 7.500

40.000, so the daily profit is Rp. 40.000

Table 2. Difference in Selling Prices of Javanese Traditional Snacks Market

Names	Production Costs	Selling Price	Difference in
Klepon	700	900	200
Lumpang pandan cakes	800	900	100
Onde-onde	800	900	100

There is a linear equation model based on production costs and selling prices (Table 2). For example, in this study, there were sellers who marketed several types of cakes in one merchandise. Some even had only one type of cake. For example, Nurhayati's mother makes klepon and dumplings in one day, she sells 95 klepon and 100 onde-onde. If the costs of materials and selling prices are as shown in table 4.2, then Mrs. Nurhayati will get a daily profit of Rp. ..

For example bx : lupis profit; by : klepon profit. The equation:

95 bx + 100 by

95 (200) + 100(100)

19.000 + 10.000

29.000. then the daily profit is Rp. 29,000

CONCLUSION

After observing and observing typical Javanese market food or snacks, it can be concluded that the mathematical concepts contained in typical Javanese market snacks are two-dimensional and three-dimensional geometry. The shape of traditional Javanese snacks are rectangles, rectangles, tubes, parallelograms, triangles, and quadrilateral pyramids.

Ethnomathematical activities on the typical Javanese food market are: calculating activities contained in the unit price of traditional Javanese snacks, activities of calculating the profits earned per day in the process of selling traditional Javanese snacks, measuring activities contained in the composition of the comparison of materials obtained to make Javanese market snacks,

geometric aspects contained in the form of traditional Javanese snacks.

REFERENCES

[1] Hakiki, NN (2019). Diversification of traditional cakes based on premix flour. *Journal of Catering*, *8*(1).

[2] Mayasari, I., Sugeng, NW, & Ratnaningtyas, H. (2021). The Role of the Marketing Mix on Millennial Generation's Purchasing Decisions: A Study of Traditional Snacks.*At-Tadbir: scientific journal of management*, *5*(2), 135-147.

[3] Marsigit, Condromukti, R., Setiana, DS, & Hardiarti, S. (2018). Development of Ethnomathematical-Based Mathematics Learning. *Proceedings of the National Seminar on Ethnomatnesia Mathematics Education,* 20–38.

[4] Lubis, ANMT, & Yanti, D. (2018). Identification of ethnomathematics of Besurek Bengkulu batik as a media and teaching aid for conveying the concept of congruence and similarity.*Wahana Didactic: Journal of Educational Sciences*,*16*(3), 267-275.

[5] Albanese, V., & Perales Palacios, FJ (2015). Enculturation with ethnomathematical microprojects: From culture to mathematics.

[6] Aditya, DY (2017). Exploration of mathematical elements in Javanese culture. *Formative: Scientific Journal of Mathematics and Natural Sciences Education*, *7*(3).

[7] Ajmain, A., Herna, H., & Masrura, SI (2020). Implementation of the Ethnomathematical Approach in Mathematics Learning.*SIGMA: JOURNAL OF MATHEMATICS EDUCATION*,*12*(1), 45-54.

[8] Sunandar, MA (2017, February). Vocational mathematics learning has an ethnomathematical nuance. In*PRISMA, Proceedings of the National Mathematics Seminar*(pp. 95-105).

[9] Hardiarti, S. (2017). Ethnomathematics: Application to Build a Quadrilateral Flat at Muaro Jambi Temple.*Axiom*,*8*(2), 99-110.

[10] Badrullah. (2020). Ethnomathematical Approach in Improving Basic Competence of Integer Patterns for Elementary School students.*Journal of Sipatokkong BPSDM South Sulawesi*,*1*(1), 123-135.

[11] Sarwoedi, S., Marinka, DO, Febriani, P., & Wirne, IN (2018). The effectiveness of ethnomathematics in improving students' mathematical understanding abilities.*Raflesia Journal of Mathematics Education*,*3*(2), 171-176.

[12] Rakhmawati, R. (2016). Cultural-based mathematical activities in the Lampung community.*Al-Jabar: Journal of Mathematics Education*,*7*(2), 221-230.

[13] Noto, MS, Firmasari, S., & Fatchurrohman, M. (2018). Ethnomathematics on ancient wells in Kaliwadas Village, Cirebon and its relation to mathematics learning in schools. *Journal of Mathematics Education Research*, *5*(2),201–210.

[14] Francois, K., & Kerhove, B. Van (2010). Ethnomathematics and the philosophy of mathematics. *Center For Logic and Philosophy of Science*. October 2009, 121-154.

[15] Choeriyah, L., & Nusantara, T. (2020). Ethnomathematics study on traditional Cilacap food.*AKSIOMA: Journal of Mathematics and Mathematics Education*,*11*(2), 210-218.

[16] Aditya, IPW (2017). Transformation and Development of Stove Technology.*FPIPS Communication Media*,*16*(2), 31-35.

[17] Noah, ZM, & Dardiri, D. (2017). Ethnomathematics in the Numbering System in the Riau Malay Society. *Kutubkhanah*, *19*(2), 220-238.

[18] Nahak, HM. (2019). Efforts to preserve Indonesian culture in the era of globalization. *Journal of Sociology of the Archipelago*, 5(1), 65-76.

[19] Moleong, Lexy J. (2010). *Qualitative Research Methodology. Bandung*: Rosdakarya Youth

[20] Moleong, Lexy J. (2013). *Qualitative Research Methodology.* Bandung: Rosdakarya Youth.

[21] Coelestia, AAG, & Isodarus, PB (2021). Basis for Naming the Pasar Snack Cake at Lempuyangan Market.*Synthesis*,*15*(1), 1-16.