Ethnomathematics exploration in the remote areas

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Abstract. The research objective is to explore ethnomathematic forms in the remote areas. The research was conducted in the Karimunjawa Islands, Jepara Regency. Data were collected using observation and interview methods. The observations were focused on the existing house buildings on Karimunjawa and Kemujan Islands. Data were analyzed descriptively. The results showed that the houses built by the Bugis who live on the island of Kemujan were very ethnomathematical. The structure of the house on stilts contains the concept of symmetry. Window and door accessories contain various concept shapes.

1. Introduction
Karimunjawa Islands is one of the remote areas in Indonesia. Astronomically, Karimunjawa Islands, Jepara Regency is located at 5°40' - 5°57' latitude and 110°4' - 110°40' east longitude. Karimunjawa Islands is a cluster of 27 islands. The land area of the Karimunjawa Islands is about 7,115 hectares, while the water area is 1,072.5 km2. Administratively, the archipelago, which is 45 nautical miles northwest of the city of Jepara, is a sub-district consisting of 3 (three) villages, namely Karimunjawa, Kemujan, and Parang villages. Karimunjawa village covers Karimunjawa and Genting islands; Kemujan village has an area the size of Kemujan Island; while Parang village covers the islands of Parang and Nyamuk.

Several tribes inhabit the islands of the Karimunjawa Islands, with different traditions. This tradition is also related to the shape of the house that is inhabited. For example, the Bugis tribe, the houses that were built were not much different from the houses of the Bugis tribe in South Sulawesi. The house on stilts that is built has a connection with the concept of fractions, as well as various accessories, such as doors and windows, which are related to the concepts of flat shapes. This article is focused on discussing the relationship between mathematical concepts and building forms in the Karimunjawa Islands.

Ethnomathematics is a study that relates mathematical concepts to local culture [1-5]. Ethnomathematical research is very interesting, to answer the question, which one came first, the concept of mathematics or cultural products that are related to mathematical concepts. Research [6] notes that the exploration of the process of weaving cloth in the Baduy community of Banten Province, which uses the competency of measuring, comparing, adding, subtracting, multiplying, and dividing despite the fact that they have never attended formal schools.

The results of research [7] show that the Keraton Kasepuhan Cirebon has used the Aboge calendar in determining holidays. Sundanese people are accustomed to using symbolic mathematical calculations, which involve the basic units: length, width, area, height, weight, group, and time as well as estimating,
pattern-making activities, and constructing geometric patterns [8,9]. Ethnomatematics is applied to batik [10] and games [11], and coastal [12].

Ethnomatematic research is also carried out abroad, such as karara weavers in Maranao [13], carpenters in Cape Town South Africa [14], children in slum cities in Brazil, Kabihugs in the Philippines [15], farmers and fishermen in Mozambique, the Hausas in Nigeria, and the three studies confirm the linkage of mathematical concepts in everyday life.

2. Research Methods
The research is focused on etomathematic objects that are scattered in Karimunjawa and Kemujan Islands. Mathematical objects are in the form of buildings (houses) built on the two islands.

Data were collected using observation techniques, documentation, literature review, and interviews. The data collection instrument developed in this study was related to the data collection techniques carried out at each stage of the study, namely (a) a questionnaire (list of questions) and a check list (check list) used to ask questions and observations to document the object of research. Data were analyzed descriptively qualitatively.

3. Results and Discussion
Karimunjawa Islands are inhabited by various tribes. The Javanese are the majority tribe, which is easily found on various islands. Besides the Javanese, there are the Madurese, Bugis and Wajo tribes. The Bugis mostly live on Kemujan Island. The Bugis community is more easily recognized by the shape of the house building in the form of a Stilt House. Many Bugis live in Dukuh Batu Lawang in Kemujan Village.

When entering the area of the Bugis village, a typical view of the Bugis traditional house can be seen on either side of the road. The houses on stilts built are relatively short, in contrast to the houses on stilts in Bone which are relatively tall, as shown in Figures 1 and 2.

Figure 1. Bugis tribe house at Batu Lawang Karimunjawa
From Figures 1 and 2 it can be said that structurally the house of the Bola Tribe is a Bugis Traditional House which is usually occupied or inhabited by ordinary people. From the two houses, you can find the concept of symmetry, which makes the building stand firm. Types of shapes can be found easily, such as squares, rectangles, and triangles.

The structure of the building consists of three parts, namely the top, middle, and bottom (Figure 3). Figure 3 shows the concept of the fraction one-third, two-thirds and three-thirds; various types of shapes, such as triangles (right angles), and rectangles.

The structure of the Bugis Traditional House building has a siring or under (Figure 4), which has an analogy as a dirty or despicable place because its position is at the very bottom. In ancient times, this
siring or under was often used as a residence for slaves or a place to imprison royal captives. Currently, traditional communities generally make it a place to store tools such as tools for farming, raising livestock, or for fishing. Figure 4 shows a bicycle that is placed under it. Bicycles have wheels that are circular in shape.

In the middle is a house body called Kale Balla (Figure 5) which functions to be occupied by residents. The upper part of the house is called pammakkang (Figure 6), which means a pleasant thing (in Makassar language).

Figure 5. Kale Balla

Kale Balla is a place for residents to do activities such as planning, organizing and managing their own lives. Kale balla is usually divided into several plots according to social class and needs. For example, for the middle class, they can only make three plots in the house, namely for the front room, living room and back room. In the Kale Balla section, the concept of rectangular and square flat shapes is found that function as windows. In line with [16] affirmation, geometric concepts are related to various kinds of traditional house buildings.

The attic part (Figure 6) is generally used by the community for storing crops, or various handicraft tools such as tools for weaving and mats. Ideologically, pammakkang can mean something sacred and has spiritual value because its position is at the highest. In the Bugis language, pammakkang which means something fun.

Seen from the front, pamakkang has a relationship with the shape of an isosceles triangle, which can also be used to teach the concept of parallels. This concept is used to determine which side to look for if the other sides are known.

4. Conclusion

Based on the descriptions above, it can be conclusion can be drawn: ethnomatematic forms in the Karimunjawa Islands can be found in the houses of the Bugis who live on Kemujan Island. Bugis house building is divided into 3 (three) parts, namely pammakkang, kale balla, and siring or under. The Bugis house building contains mathematical concepts, including flat shapes such as squares, rectangles, and triangles; similarity or symmetry.

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