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Local Wisdom of Mathematics in Building Calculations Ponorogo Traditional House

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Abstract. This article aims to reveal the logical relationship between the folklore of the Ponorogo community in the tradition of building a house with a mathematical calculation pattern. It is important to know how people overcome the problems of living wisely through mathematical calculations. Therefore, this research focuses on how the integration of local wisdom in the folklor for mathematical calculations in determining good days (dragon days) according to the beliefs of the Ponorogo community. This research uses descriptive method by describing the pattern of mathematical calculation in the tradition of building a house so that it can be known about natural phenomena or human engineering.

1. Introduction

Ponorogo is an area in East Java that has various cultures. in ethnology, people in Ponorogo consist of various kinds such as customs, folklore, arts, kinship structures, and belief systems. Among the cultural diversity that until now has survived is a belief system in primbon numerology in building traditional houses. The Ponorogo community built a house still holds the ancestral tradition of numerology. This tradition is inherited from generation to generation. Numerology in building a house to determine a good day so that the house to be built brings security and prosperity to its inhabitants.

Primitive numerology in the eyes of mathematics is part of ethnatics. Ethnomatematics is perceived as a lens for viewing and understanding mathematics as a cultural product (Puspa Dewi and Ngurah Nila Putra, 2014). Culture-based mathematical activities in the Ponorogo community are practiced in building houses with mathematical concepts that combine with a belief system in carrying out life activities. Primbon calculation in building a house cannot be separated from the pattern of mathematical calculations. Mathematics has several calculation patterns, including rows and series. The concept of sequences and series will always be related to these numbers. Likewise with the calculation of the primbon that uses numbers and associates with the properties of nature.

This method is considered by the Ponorogo community as local wisdom to anticipate unwanted problems in the future. Meanwhile, previous research on ethnomatatics that can be reached by the author includes (Eti Rohaeti, 2011; Astri Wahyuni, 2013; Rosida Rakhmawati, 2016; Hasanudin, 2017; David Setiadi, 2017; Linda Indiyarti, 2017; Abdusakir, 2017; Apit Supriatna, 2017 ; Zaenuri and Nurkarohmah



2018) but in their research no one has studied ethnomatematics activities in building traditional houses of the Ponorogo community. Based on previous research, the newness in this study lies in the local wisdom of mathematics in the calculation of building a traditional house of the Ponorogo community.

1.1 Theoretical

1.1.1 Traditional Calculation Science

Calculation is a very careful consideration, utilizing clear reason with certain behavior. Calculations are based on the nature of the day, date, month, prey, and time. The calculation is a sub system of religion. The belief system contains the concept of the relationship of various elements such as aspects of the universe, the social and spiritual environment of humans. People view primbon as their identity so that it is difficult to get rid of in their minds and always take into account the pace of life so that they are safe and get protection from the Almighty. Traditional calculations use Saka years. The year Saka comes from the name of the King Sariwahana Aji Saka, a king from Mataram who created the Javanese or Dentawiyana (Ha Na Ca Ra Ka) calendar starting in 78 AD.

In the Islamic government the Javanese calendar was called the Sultan Agung calendar which followed the Komariah system, namely the moon journey around the earth such as the Javanese calendar as follows: *Sura, Sapar, Mulud, Bakda Mulud, Jumadil Awal, Jumadil Akhir, Rejeb, Ruwah, Pasa, Syawal, Dulkangidah* and *Besar*. The seven days in Javanese calculation are called *dina pitu* and the five markets are called *market five*, or often abbreviated as *dina five dina pitu*. Keduana will determine the amount of protein (Life of the day and market). The markets in question include *Pon* (7), *Wage* (4), *Kliwon* (8), *Legi* (5) and *Pahing* (9) while the day is like ordinary Monday to Saturday. By determining the calculation between the day and the market then it will get an answer or forecast from various things as desired. (Suwardi, 2010: 103)

1.1.2 Mathematical Calculation Pattern

The remaining *teorima* is often used in determining the yield for many tribes. This is also used in traditional calculations of Ponorogo people in determining good days when building houses. This is based on ancestral beliefs to anticipate something that is not desired by the homeowner.

1.1.3 Ethnomatematics

Ethnomatematics was introduced by D'Ambrasi, a Brazilian mathematician in 1977. The definition of ethno-mathematics according to D'Ambrasio is: The prefix *ethno* is today accepted as a very broad term that refers to the socialcultural context and therefore includes language, jargon, and codes of behaviour, myths, and symbols. The derivation of *mathema* is difficult, but tends to mean to explain to know, to understand, and to do activities such as deciphering, measuring, classifying, inferring, and modeling. The suffix *tics* is derived from *techne*, and has the same root as *technique* (Rosa and Orey, 2011) more broadly, if viewed from a research standpoint, ethnomatematics is defined as cultural anthropology (mathematical cultural anthropology of mathematics and mathematics education (D'Ambrasio, 2006: 1)

The term *etnomatematics* continues to grow dynamically and very quickly. As new facts as phenomena, situations and problems require *ethnomatematics*, then *ethnomatematics* will always be there. Currently *ethnomatematics* is seen as part of the history of mathematics, and mathematics education has a close relationship with *atropology* and *cognitive cognitive science* (D'Ambrasio, 2006) as a result and development of different cultures, mathematics allows to have a different form and in accordance with the development needs of the user community. In general, *ethnomatematics* is a widely used mathematical concept. Whether in activity, building design, or playing equipment, determining location etc [2].

2. Research Methods

This study uses a qualitative descriptive approach using field research as a direct data source. Field research reveals the facts of people's social life by describing the phenomenon that exists about the pattern of calculating *weton* good day in building houses according to the tradition of the people of Javanese Ponorogo. Sources of data were obtained from community leaders who were referred to as

gatekeepers by conducting interviews and documentation to obtain data on various matters relating to the pattern of weton calculation in the tradition of building houses.

3. Results And Discussion

3.1 Calculation Pattern for Good Days Building Houses in the Tradition of Ponorogo Society

Primbon is a note about the predictions of human actions based on traditional symbols related to behavior, wishful thinking, and dreams. *Primbon* there are several uses including counting in looking for a good day when going to get married, to build a house, move house, or to determine circumcision time for someone who is *balig*. *Primbon* calculations based on weton can be known from the day of birth as well as the number of markets commonly recorded by ancestors. The number of weton to know good days and avoid bad things.

Weton implementation is used by some Ponorogo people in building houses. Community tradition explains that when a person will build a house must pay attention to everything for the safety of family members and property. So when going to implement the builder, the best time must be chosen in determining the date of implementation, most people based on 7 days until the day and the market there are 5 Every day and the market has their own number pattern which states the value of the day and market. The values of the day and market are as follows:

Table 1. Values of the day

No	Hari	Nilai	No	Pasaran	Nilai
1	Senin	4	1	Legi	5
2	Selasa	3	2	Pahing	9
3	Rabu	7	3	Pon	7
4	Kamis	8	4	Wage	4
5	Jum'at	6	5	Kliwon	8
6	Sabtu	9			
7	Ahad	5			

The results of calculations are carried out by combining both day value and market value. Suppose someone will build a house on Tuesday Kliwon. Tuesday's value is 3 and the legi market value is 8 so that $3 + 8 = 11$ is then calculated in the following way:

1. *Kerta*
2. *Jasa*
3. *Candi*
4. *Rogoh*
5. *Sempoyongan*
6. *Kerta*
7. *Jasa*
8. *Candi*
9. *Rogoh*
10. *Sempoyongan*
11. *Kerta*

The calculation above is 11 so the calculation is only up to 11, which is falling on the paper as well as the next according to the number of numbers of each person. This calculation is to avoid the meaning of *rogoh* which means bad for homeowners. The meaning of the meaning of the day's character is as follows:

1. *Kerta* means getting a lot of sustenance
2. *Jasa* means strong santosa
3. *Candi* means to be happy
4. *Rogoh* means it is often entered by thieves
5. *Semoyongan* means that it often moves, falls and does not last long to live.

After the process of determining the day is good, the next step is the process of *mbedah bumi* or *ndudok ris* in modern terms now known as the laying of the first stone by holding *selamatan* inviting relatives and *tonggo teparo* to run the hajj and prayer together to make a circular formation in the place of the house to be built like a *pager* with The purpose of the house to be built is to avoid danger through prayer pagers in a circle sitting cross-legged in the middle of *uborampe* in the form of Javan chicken, plantain, *jenang sengkolo*, money and eggs.

3.2 Mathematical Number Pattern Calculation of Good Days

Calculation of good days in building houses according to the Javanese tradition in Ponorogo can be related to number patterns or mathematical formulas. Based on information from sources, it can be concluded that the formula in calculating good days in the tradition of building houses in Ponorogo is as follows:

$$X = \frac{a+b}{5}, \text{ sisa } 1 \text{ or } 2$$

$a = \text{netu hari}$

$b = \text{netu pasaran}$

$x = \text{hasil bagi}$

To determine the day and market a and b a number is chosen so that when summed and divided by 4 it will produce 1 or 2 remaining, because 1 is a symbol and 2 is a symbol of service.

4. Conclusion

Based on the explanation of the results, this study can be concluded that the calculation of good days in the tradition of building a house in Ponorogo using two references. The two references include the schedule for Monday to Sunday and the calculation of five market value (*legi, pahing, pon, wage, kliwon*). Each reference calculation has a number pattern that states the value. In addition, in this study also revealed the logical relationship of traditional calculations with mathematical calculation patterns. The mathematical patterns used in Javanese tradition *weton* calculations use the following residual theorem:

$$X = \frac{a+b}{5}, \text{ sisa } 1 \text{ or } 2$$

$a = \text{netu hari}$

$b = \text{netu pasaran}$

$x = \text{hasil bagi}$

5. References

- [1] David Setiadi dan Aritsya Imswatama. 2017. Pola Bilangan Perhitungan Weton dalam Tradisi Jawa dan Sunda. *Jurnal Adihum*, Vol.VII No.2 Juli 2017 pp 75-85
- [2] Hasanudin.2017. Etnomatematika Melayu: Pertautan antara Matematika dan Budaya Pada Masyarakat Melayu Riau. *Jurnal Sosial Budaya*, Vol 14 No 2 Desember 2017 pp 136-149
- [3] Linda Indiyarti. 2017.Eksplorasi Etnomatematika Kesenian Rebana Sebagai Sumber Belajar Matematika Pada Jenjang MI. *Jurnal Ilmiah Pendidikan Dasar*, Vol IV No 11 Januari 2017. Pp 21-31
- [4] Rosida Rakhmawati. 2016. Aktivitas Matematika Berbasis Budaya pada Masyarakat Lampung. *Al Jabar: Jurnal Pendidikan Matematika*, Vo 7, No 2, 2016 pp 221-230
- [5] Zaenuri dan Nurkaromah Dwidayati, 2018.Menggali Etnomatematika sebagai Produk Budaya. *Journal Unnes Prisma* Vol 1 2018 pp 471-476