Ethnomathematics in Javanese Death Commemoration

Nurul Husnah Mustika Sari 1,2*, Ahmad Faridh Ricky Fahmy 1,2

1,2 Tadris Matematika, IAIN Pekalongan

* Corresponding Author. E-mail: nurul.husnah.ms@iainpekalongan.ac.id

Article History
Received: February 10th, 2022
Revised: April 12th, 2022
Accepted: April 14th, 2022

ABSTRACT

In Java, there is a tradition called death commemoration. In Javanese society, death commemoration consists of geblag (commemoration after funeral), commemoration at 3rd day of the death, 40th day of the death, 100th day of the death, 1 year, 2 years, and 1000th day of the death. This research is a descriptive research. It used ethnography method. The data was collected by interview, observation, and literature study. The result said that to decide the day and pasaran of death commemoration, it is need to use modulo concept. We used modulo 7 to decide the day, because there are seven days in a week and to decide the pasaran we used modulo 5 because there are five pasarans. It means that death commemoration tradition in Javanese society applied mathematical concept. Then, death commemoration tradition in Javanese is a part of ethnomathematics.

Keywords: ethnomathematics, death commemoration, modulo, arithmetica

INTRODUCTION

Indonesia is a nation that is rich in culture. It is because Indonesia consists of various ethnic groups. One of the ethnic groups in Indonesia is the Javanese. What is meant by “Javanese” are: 1) People who speak Javanese, who are still rooted in the culture and way of thinking as found in the interior of Java, from the west of Yogyakarta to the Kediri area to the east; and 2) which at the same time does not explicitly seek to live on the basis of the Islamic religion[1]. Javanese society is a living unit of Javanese people who interact according to a system of customs, norms, and Javanese cultural systems that are continuous, and which are bound by a shared identity, namely the Javanese[2].

Javanese society is rich in various kinds of culture. One form of Javanese culture is the death commemoration tradition. This tradition has been mixed with Islamic values and called this tradition as tahliilan. The Javanese calendar uses the day and also pasaran. Pasaran is a Javanese day which consists of only 5 days, namely kliwon, legi, pahing, pon, and wage. The term used is pasaran (market) because each of these names is used as a name to determine the opening of the market[3]. Death commemoration time uses days and pasaran. Determination of the day and pasaran for the death commemoration event is using arithmetic concepts.

The description shows that culture has a relationship with mathematics. The relationship between mathematics and culture is referred to as ethnomathematics. Ethnomathematics was introduced by D'Ambrosio, a Brazilian mathematician in 1977[4]. Ethnomathematics is mathematics that is practiced by certain identifiable cultural groups, such as ethnic groups, labor groups, children of certain age groups and professional classes[5]. Furthermore, D'Ambrosio stated that the aim of ethnomathematics is to recognize that there are different ways of doing mathematics taking into account academic mathematics developed by different walks of life and taking into account the different steps in which different cultures negotiate their mathematical practice (how to classify, counting, measuring, designing buildings or other play equipment). Determination of the day and the market for the death commemoration event by using mathematical concepts is an example of ethnomathematics. Therefore, it is necessary to discuss how to calculate the day and market determination for the death commemoration by using mathematical concepts.
METHOD

The method used in this research is an ethnographic method. This study uses an ethnographic method because this research is related to a certain culture, namely the culture of the Javanese people. Ethnographic research methods are considered capable of digging in-depth information with broad sources. Data was collected by interview and literature study. Observation and interviews were conducted with the people of Sumurjomblangbogo in Pekalongan Regency. Interviews were conducted in depth. Based on Alangui, there are four generic questions in ethnomathematical research. They are where to look, how to look, what it is, and what it means. The framework is presented in Table 1.

| Generic questions       | Initial Answers                                                                 | Critical Construct | Specific Activity                                                                 |
|-------------------------|--------------------------------------------------------------------------------|--------------------|----------------------------------------------------------------------------------|
| Where to look            | Cultural practices in determining the days dan pasaran for death commemoration | Culture            | Analysis of document and conduct interviews with elders                          |
| How to look             | Investigating qualitative and relational aspects of the determining the days and pasaran for death commemoration | Alternative thinking | Determine what ideas are contained in determining the days dan pasaran for death commemoration |
| What it is              | Proof of alternative concept                                                   | Philosophical mathematics | Identifying criteria to justify the rules of determining the days and pasaran for death commemoration |
| What it means           | Important for culture and mathematics                                          | Anthropology        | Describing the relationship between mathematics and culture by writing mathematical model of the day and pasaran |

RESULTS AND DISCUSSION

One form of Javanese culture is the tradition of death commemoration. Tradition is the process of inheriting or passing on norms, customs, rules, assets[6]. The passing can be changed, lifted, rejected and combined with a variety of human actions. The tradition of commemoration is carried out every time someone dies and is carried out by the bereaved family.

According to Sholikhin[7], the tradition of commemorating death in Java comes from the socio-religious tradition of the Muslim Campa people (inhabiting the South Vietnam area until they were expelled around 1446 and 1471 AD). Bratawdjaja stated that broadly speaking, the death commemoration process consists of eight activities, namely (1) geblag or commemoration after burial, (2) nelung dina or 3rd day death commemoration, (3) mitung dina or 7th day death commemoration, (4) matang puluh or 40th day death commemoration, (5) nyatus dina or 100th day death commemoration, (6) mendak sepisan or commemoration after one year of death, (7) mendhak pindho or commemoration after two years of death, and (8) nyewu or 1000th day death commemoration[8].

The calculation of the day of commemoration starts from the moment the deceased dies, not from the time he is buried. Therefore, the seven-day salvation is carried out on the seventh day of death or six days after the day of death, the 40-day salvation is carried out 39 days after the day of death, the 100-day salvation is carried out 99 days after the death day, the 1000-day salvation is carried out 999 days after the death day.

Based on the results of an interview with one of the people in the village of Sumurjomblangbogo, the death celebration is usually filled with reading prayers and verses from the Koran which is commonly referred to tahlian. The funeral ceremony began with the bereaved family inviting neighbors and relatives to attend the funeral. Neighbors and relatives who were invited to take part in the commemoration event were male. Meanwhile, female neighbors or relatives can help in the kitchen. The event ended with the distribution of blessings (food) for the invitees who took part in the salvation event.

Discussion

In the Javanese calendar, pasaran consists of legi, pahing, pon, wage, and kliwon. Meanwhile, in a week there are seven days, namely Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday. In mathematics, there is a concept namely modulo. If a and b are integers, then $a \equiv b \pmod{m}$ if and only if there is an integer k such that $a = b + km[9]$. In division algorithm, we called b as remainder with $0 \leq b < m$. There are five pasaran,
so modulo 5 is used to determine the pasaran. Therefore, to determine the day of commemoration, modulo 7, is used. The order of the day and pasaran must be considered. The order is always the same and rotates according to the order. The form of the calendar that contains the day as well as the pasaran can be seen in Figure 1.

The 7\(^{th}\) day of the death
The 7\(^{th}\) day death commemoration is held on the seventh day of death or on the 6th day after death. Therefore, the determination of the 7\(^{th}\) day of death commemoration is \(6=6(mod\ 7)=-1(mod\ 7)\). This result means that the 7\(^{th}\) day death commemoration falls on 6 days after the day of death or on one day before the day of death. Meanwhile, the determination of the 7\(^{th}\) day in pasaran is \(6=1\times5+1(mod\ 5)=1(mod\ 5)\). The 7-day salvation falls on 1 pasaran after the pasaran at the time of death. For example, if someone dies on pahing Thursday, the 7\(^{th}\) day death commemoration will be held 1 day before Thursday, namely Wednesday and on 1 pasaran after pahing, namely pon. So, if someone dies on pahing Thursday then the 7\(^{th}\) day death commemoration will be carried out on pon Wednesday.

The 40\(^{th}\) day of the death
The 40\(^{th}\) day death commemoration is held on 39 days after death. Days and pasaran for 40\(^{th}\) day death commemoration consecutively are \(39=7\times5+4(mod\ 7)=4(mod\ 7)\) and \(39=5\times7+4(mod\ 5)=4(mod\ 5)=-1(mod\ 5)\). This means that the 40\(^{th}\) day death commemoration will fall on 4 days after the day of death and 4 pasaran after the death pasaran or 1 pasaran before the death pasaran. For example, if someone dies on pon Monday then the 40\(^{th}\) day death commemoration will be held on Friday, which is 4 days after Monday and on the pahing, which is 1 pasaran before the death pasaran.

Nyatus (The 100\(^{th}\) day of the death)
The 100\(^{th}\) day death commemoration is held on 99 days after death. The determination of the day and pasaran of nyatus respectively are \(99=7\times14+1(mod\ 7)=1(mod\ 7)\) and \(99=5\times19+4(mod\ 5)=4(mod\ 5)=-1(mod\ 5)\). These mean that the commemoration will fall on one day after the day of death and on one pasaran before the pasaran death. For example, if someone dies on kliwon Thursday then nyatus will be held on Friday, which is one day after Thursday and on the wage, which is one pasaran before the kliwon.

Mendak pisan (one year after death)
In the Javanese calendar, one year consists of 354 days or 355 days. Therefore, the determination of the day in mendak pisan is \(353=7\times50+3(mod\ 7)=3(mod\ 7)\) or \(354=7\times50+4(mod\ 7)=4(mod\ 7)\). Meanwhile, the pasaran determination for mendak pisan is \(353=5\times70+3(mod\ 5)=3(mod\ 5)=-2(mod\ 5)\) or \(354=4\times71+4(mod\ 5)=4(mod\ 5)=-1(mod\ 5)\). These results mean that mendak pisan will fall on 3 days after the day of death or 4 days after the day of death and in three pasaran after the death pasaran or in one pasaran before the death pasaran. For example, if someone dies on pahing Thursday then mendak pisan will be held three days after Thursday, that is Sunday and on three pasaran after pahing, that is kliwon. If in that year there are 355 days, then mendak pisan will be held on four
days after Thursday, that is monday and on one pasaran before pahing, that is legi. So if someone dies on pahing Thursday mendak pisan will be carried out on kliwon Sunday or legi monday.

**Mendak pindho** (two years after death)
Since one year in javanese calendar consists of 354 or 355 days, then mendak pindho commemoration is carried out on 707 days of death or 708 days of death if it passes a leap year. The determination of the day for mendak pindho commemoration is $707=7\times101 (mod \ 7)=0 (mod \ 7)$ or $708=7\times101+1 (mod \ 7)=1 (mod \ 7)$. Meanwhile, the pasaran determination for mendak pindho commemoration is $707=5\times141+2 (mod \ 5)=2 (mod \ 5)$ or $708=5\times141+3 (mod \ 5)=3 (mod \ 5)=2 (mod \ 5)$. These results mean that the salvation mendak pindho will fall on the same day as the day of the death or one day after the day of death and on two pasarans after the pasaran death or on three pasarans after the pasaran death. For example, if someone dies on kliwon Thursday then mendak pindho will be held on Thursday because it is the same day as the death day and on two pasarans after kliwon that is pahing, then mendak pindho will be held on pahing Thursday. If it passes a year that have 355 days, then mendak pindho will be held on Friday because it is one day after the death day and on three pasarans after kliwon that is pon, then mendak pindho will be held on pon Friday.

**Nyewu** (The 1000th day of the death)
Determination of the day and pasaran for the nyewu salvation respectively are $999=7\times142+5 (mod \ 7)=5 (mod \ 7)=2 (mod \ 5)$ and $999=5\times199+4 (mod \ 5)=4 (mod \ 5)=1 (mod \ 5)$. Based on these results, nyewu will be held on 5 days after the day of death or on two days before the day of death and on four pasarans after the death pasaran or one pasaran before the death pasaran. For example, if someone dies on legi Wednesday, nyewu will be held on Monday, which is two days before Wednesday and at the kliwon, which is one pasaran before legi.

The following is an example of determining the day and pasaran for each death commemoration if someone dies on kliwon Friday.

| Table 2. Example of Determining the Day of Commemoration |
|----------------------------------------------------------|
| **Type** | **Commemoration day** |
| The 7th day of the death | **Legi** Thursday |
| The 40th day of the death | **Wage** Tuesday |
| The 100th day of the death | **Wage** Saturday |
| Mendhak pisan | **Pon** Monday or **wage** Tuesday |
| Mendhak pindho | **Pahing** Friday or **pon** Saturday |
| **Nyewu** | **Wage** Wednesday |
In summary, the formula for the day of death commemoration can be seen in Table 3.

| Type               | Calculation                          | Commemoration day |
|--------------------|--------------------------------------|-------------------|
| The 7th day of the death | 6=6(mod 7)=1(mod 7) or 6=1(mod 7)=6(mod 7) | Day=1=day+6       |
| The 40th day of the death | 39=7×5+4(mod 7)=1(mod 7) or 39=7×4+5(mod 7)=1(mod 7) | Day=4             |
| The 100th day of the death | 99=7×14+1(mod 7)=1(mod 7) | Day+1             |
| Mendhak pisan      | 353=7×50+3(mod 7)=3(mod 7) or 353=7×50+3(mod 7)=3(mod 7) | Day=3 or Day=4   |
| Mendhak pindho     | 707=7×101(mod 7)=0(mod 7) or 707=7×101(mod 7)=0(mod 7) | Day or Day=4     |
| Nyewu              | 999=7×142+5(mod 7)=5(mod 7)=2(mod 7) | Day+5=Day-2      |

Meanwhile, the formula for pasaran of death commemoration can be seen in Table 4.

| Type               | Calculation                          | Commemoration Pasaran |
|--------------------|--------------------------------------|-----------------------|
| The 7th day of the death | 6=1×5+1(mod 5)=1(mod 5) | Pasaran+1             |
| The 40th day of the death | 39=5×7+4(mod 5)=4(mod 5)=1(mod 5) | Pasaran-1             |
| The 100th day of the death | 99=5×19+4(mod 5)=4(mod 5)=1(mod 5) | Pasaran-1             |
| Mendhak pisan      | 353=5×70+3(mod 5)=3(mod 5) or 353=5×70+3(mod 5)=3(mod 5) | Pasaran+3 or Pasaran-4|
| Mendhak pindho     | 707=5×141+2(mod 5)=2(mod 5) or 707=5×141+2(mod 5)=2(mod 5) | Pasaran+2 or Pasaran-3|
| Nyewu              | 999=5×199+4(mod 5)=4(mod 5)=1(mod 5) | Pasaran-1             |

CONCLUSION
The tradition of death commemoration in Java consists of (1) geblag or commemoration after burial, (2) nelung dina or commemoration of three days of death, (3) mitung dina or commemoration of seven days of death, (4) matangpuluh dina or commemoration of 40 days of death, (5) nyatus dina or commemoration for 100 days of death, (6) mendak pisan or commemoration for one year of death, (7) mendhak pindho or commemoration for two years of death, and (8) nyewu or salvation for 1000 days of death. The Javanese calendar uses the day and also pasaran. Pasaran is a Javanese day which consists of only 5 days, namely kliwon, legi, pahing, pon, and wage. The order of the day and pasaran is always the same and it rotates according to the order. So, to determine the day and pasaran for death salvation, modulo 7 and modulo 5 are used, respectively. Modulo 7 is used to determine the day of death. Meanwhile, modulo 5 is used to determine the death pasaran.

The 7th day of death (mitung dina) falls on 1 day before the day of death and 1 pasaran after the pasaran of the death. The 40th days of death falls on 4 days after the day of death and 1 pasaran before the pasaran of death. The 100th day of the death falls on 1 day after the day of death and 1 pasaran before the death pasaran. Mendak pisan (one year death commemoration) falls on three days after the death day and three pasarans after the death pasaran or on four days after the death day and one pasaran before the death pasaran. Mendak pindho (two years death commemoration) falls on the same day as the death day and two pasarans after the death pasaran or on one day after the death day and three pasarans after the death pasaran. While nyewu falls on 2 days before the death day and 1 pasaran before the death pasaran.

Suggestion
The existence of Javanese culture in the form of a death salvation tradition which is a form of ethnomathematics can be used by teachers in schools as an example of the application of mathematics in life and used to organize fun mathematics learning.
REFERENCES

[1] F. Magnis-Suseno, *Etika Jawa: Sebuah Analisa Falsafi Tentang Kebijaksanaan Hidup Jawa*. Jakarta: Gramedia, 1988.

[2] D. Siswanto, “Pengaruh Pandangan hidup Masyarakat Jawa terhadap Model Kepemimpinan,” *Jurnal Filsafat*, vol. 20, no. 3, pp. 198–214, 2010.

[3] F. Rizaluddin, S. S. Alifah, and M. I. Khakim, “Konsep Perhitungan Weton dalam Pernikahan Perspektif Hukum Islam,” vol. 12, no. 1, 2021, [Online]. Available: https://journal.iainkudus.ac.id/index.php/Yudisia/index

[4] M. Zayyadi and H. Durroh, *Enomatematika Budaya Madura (Budaya Madura dan Matematika)*. Pemekasan: Pemekasan: Duta Media Publishing, 2019.

[5] U. D’Ambrosio, “Ethnomathematics and its place in the history and pedagogy of mathematics,” *For the Learning of Mathematics*, vol. 5, no. 1, pp. 44–48, 1985.

[6] C. A. van Paursen, *Strategi Kebudayaan*. Yogyakarta: Yogyakarta: Kanisius, 1988.

[7] M. Sholikhin, *Ritual dan Tradisi Islam Jawa*. Yogyakarta: Yogyakarta: Narasi, 2010.

[8] A. A. Aufa, “Memaknai Kematian dalam Upacara Kematian di Jawa,” *An-Nas; jurnal humaniora*, vol. 1, no. 1, pp. 1–11, 2017.

[9] Kenneth H. Rosen, *Elementary Number Theory & Its Application*, 6th ed. Boston, MA: Pearson, 2011.