ETHNOMATHEMATICS IN WEDDING TRADITIONS:
Numerical Analysis of Bugis Makassar Wedding Days

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Abstract. The cultural practice of "A'pa'tantu allo baji," determining auspicious wedding days, intricately involves calculations rooted in Islamic lunar months or the Hijri calendar. This study deeply explores the symbiotic relationship between cultural traditions and mathematical concepts, centering on numerical considerations within Bugis Bugis Makassar tribe wedding ceremonies. Employing rigorous ethnographic methods, the research investigates the nexus between wedding date selection and mathematical principles, with mathematics playing a pivotal role in determining suitable wedding dates in the Pannyangkalang village, employing the Hijri year/Islamic Calendar. The global adherence to the Islamic Calendar among Muslims hinges on lunar phases, marked by the new moon sighting, serving as future event estimations contingent on factors like weather. The fusion of culture and the calculation of auspicious wedding dates in Makassar stems from distinctive palm patterns, resulting in natural number dates, underpinned by intricate mathematical formulas. The research findings reveal diverse mathematical approaches: (1) Some communities employ 3 points on the hand—wrist to palm to fingertips—for calculations, repeating a sequence from 1 at the wrist (auspicious day), 2 at the palm (auspicious day), to 3 at the fingertips (inauspicious day) monthly. (2) Others use 4 points—wrist to palm to middle finger to back of the hand—repeating the pattern from 1 at the wrist (auspicious day), 2 at the palm (auspicious day), 3 at the fingertips (auspicious day), to 4 at the back of the hand (inauspicious day) monthly. (3) Certain communities combine 3 and 4 points, selecting intersecting days, creating a distinctive set of favorable dates. The utilization of numerical concepts in determining wedding dates involves intricate calculations represented as

$$(x \bmod 3 = a)$$

and

$$(x \bmod 4 = a)$$

with communities combining both methods represented as

$$((x \bmod 3)(x \bmod 4) = a)$$

If $a = 0$ then x indicates inauspicious wedding days.

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This study sheds light on the profound cultural and mathematical intricacies entwined within Bugis Bugis Makassar tribe wedding traditions, emphasizing the interplay of culture, numeracy, and the Islamic Calendar.

Keywords: Culture, Bugis Bugis Makassar tribe, Wedding Traditions, Ethnomathematics, auspicious wedding days

1 Introduction

Indonesia's diverse cultural tapestry, highlighted by vibrant traditions and numerous ethnicities, is centered around the Bugis Makassar tribe's steadfast commitment to preserving enduring traditions, especially in Sulawesi's wedding customs. The Bugis Makassar people serve as custodians, safeguarding their cultural heritage amidst dynamic changes. Central to their identity is the timeless institution of marriage, celebrated through customs symbolizing dedication to heritage. A notable practice is A'pa'tantu allo baji, involving meticulous calculations based on the Islamic lunar months. This cultural odyssey connects Bugis Makassar with religious and social roots during marriage. The determination of auspicious wedding dates follows the Hijri calendar, incorporating lunar phases globally and reflecting celestial guidance.

The relationship between mathematics and culture is symbiotic, as evidenced by the work of scholars such as Freudenthal (2002), Romberg (2004), and Mukhopadhyay and Greer (2011), who highlight the ubiquity of mathematics in human activities. Mathematics is viewed as a fundamental human activity, permeating daily existence and inseparable from the broader human culture, humanities, and social sciences.

Recognizing mathematics as a cultural phenomenon, scholars like Bishop (1988) and Dowling (1988) emphasize its status as a pan-human activity, contributing to the creation of distinct mathematical ideas across different cultures. The concept of "other mathematics" suggests that diverse cultures shape unique mathematical concepts.

Gerdes (1997) and Dowling (1998) further emphasize that mathematics exists in every culture, embodied as "frozen mathematics" in the cultural fabric. Milroy (1992) and Dominikus (2014) assert that cultures develop their own mathematical forms, resulting in different expressions across diverse societies.

The term ethnomathematics, introduced by D'Ambrosio in the early 1980s, has evolved to encompass the relationship between mathematics and culture. Ethnomathematics explores mathematical forms within various cultural activities, extending beyond ethnic communities to encompass diverse groups. Scholars like Milroy (1992) and Presmeg (2007) emphasize that ethnomathematics relates to cultural knowledge, including mathematical jargon, symbols, myths, and specific ways people engage in mathematical activities.

Presently, ethnomathematics has become a dedicated research field, exploring the relationship between mathematics and culture, as well as its impact on formal mathematics education. Ethnomathematics enriches formal mathematics education by offering insights into the cultural dimensions of mathematics (D'Ambrosio, 2001; Horsthemke, 2006).

Emerging in response to the dominance of Western mathematics, ethnomathematics aims to counterbalance its influence, recognizing its entanglement with political, hierarchical domination, ideology, and religion (D'Ambrosio, 2016). Ethnomathematical studies, spanning various mathematical concepts, have been actively pursued since 1976, reflecting a comprehensive exploration of fundamental mathematical ideas (D'Ambrosio, 2016; Rosa & Shirley, 2016; Syarif, 2018; Yanuarto, 2017; Zhang & Zhang, 2010).

Ethnomathematics delves into how diverse cultures worldwide employ mathematics in their daily lives, investigating how tribes mathematize problems to find practical solutions. Unlike Western mathematical concepts, traditional mathematical ideas are deeply connected to the environment, methods of reasoning, cultural traditions, myths, codes, symbols, and religions. This field extends beyond traditional concepts, incorporating philosophy, linguistics, pedagogy, anthropology, and history, with educational implications for understanding diverse sociocultural environments (Rosa & Shirley, 2016).

A key aspect of ethnomathematics is its emphasis on understanding different methods of performing and comprehending mathematics based on cultural values, traditional ideas, ethnic environmental contexts, and various sociocultural factors (Rosa & Shirley, 2016). D'Ambrosio (1985) defined ethnomathematics as the amalgamation of "ethno" (pertaining to sociocultural contexts such as language, jargon, code of behavior, myths, and symbols) and "mathema" (defined as knowing, understanding, explaining, and performing activities related to ciphering, measuring, classifying, ordering, inferring, and modeling), with the suffix "tics" sharing its root with art and technique.

2 Methodology

This qualitative descriptive study intricately explores the correlations between wedding date selection and mathematical principles, emphasizing a detailed examination of the cultural and mathematical dimensions involved. The primary objective is to unveil the interconnectedness between wedding date selection practices and mathematical principles, focusing on the utilization of the Hijri year/Islamic Calendar. Adopting an ethnographic approach, the research aims to gain a profound understanding of cultural practices and the mathematical foundations underlying wedding date selection, particularly in the culturally significant village of Pannyangkalang. Participants over 50 years are purposefully chosen for their expertise, contributing to the depth of research findings through unstructured interviews and documentation methods. The Miles and Huberman (1994) interactive data analysis method is employed, focusing on ethnomathematics dimensions to explore cultural objects, existing mathematics, conceptual aspects, and methods utilized in mathematical principles for wedding date selection. (Chen & Ja'faruddin, 2021; Ja'faruddin, 2022).

3 Result and discussion

The determination of wedding dates in the village of Pannyangkalang follows the Islamic calendar, also known as the Hijri calendar. The Hijri calendar is widely used by Muslims (Islam) worldwide and relies on the lunar cycle. The beginning of each month is marked by the sighting of the new moon for the first time. The visibility of the new moon depends on various factors such as weather conditions; thus, the Islamic calendar serves as an estimation for upcoming Islamic events.

The close connection between culture and the calculation of significant dates, especially in Makassar's marriage customs, is rooted in the use of a specific pattern on the hand to derive dates that hold cultural significance. Additionally, the determination of these dates can be achieved through mathematical formulas.

The village of Pannyangkalang, like many other communities in Bugis Makassar tribe, embraces the Hijri calendar for the scheduling of important events, particularly marriages. The Islamic calendar, distinct for its lunar-based system, holds great significance for Muslims globally. Its reliance on the sighting of the new moon reflects the traditional and celestial elements embedded in Islamic culture.

The lunar cycle, a key component of the Hijri calendar, plays a pivotal role in the determination of auspicious occasions such as weddings. The sighting of the new moon marks the commencement of each month, and this process involves a careful observation of the celestial phenomena. Factors like weather conditions impact the visibility of the new moon, making the Islamic calendar an approximation for planning Islamic events in the future.

The interplay between culture and the calculation of dates is particularly pronounced in the context of Makassar's marriage customs. The use of a specific pattern on the hand serves as a unique method for deriving dates, adding a cultural layer to the process. This traditional practice reflects the fusion of ancient customs with practical considerations, creating a distinctive approach to determining significant dates.

Moreover, mathematical formulas are employed to pinpoint specific dates, adding a systematic dimension to the cultural practices. The integration of mathematics into the process showcases a blend of tradition and analytical reasoning, highlighting the dynamic nature of cultural practices.

3.1 The Role of Mathematics in Determining Auspicious Wedding Dates

In various communities in Bugis Makassar tribe, the calculation of auspicious wedding dates involves a unique integration of mathematical concepts, specifically through the interpretation of points on the hand. This practice is prevalent among different societal groups, each employing distinct methods to derive meaningful dates for marriage ceremonies.

One such group employs a system of three points on the hand—starting from the wrist, moving to the palm, and then extending to the fingertips. The calculation begins with assigning the value of 1 to the wrist for the first day of the month, 2 to the palm for the second day, and 3 to the fingertips for the third day. This sequence repeats until the end of the month, providing a methodical approach to identifying propitious days for weddings.

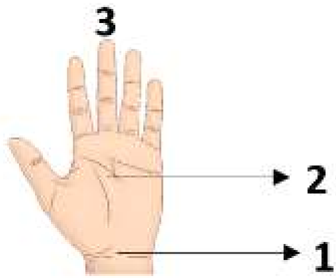

Fig. 1. a system of three points on the hand

On the above pattern, the good and bad dates are as follows:

Good dates: 1, 2, 4, 5, 7, 8, 10, 11, 13, 14, 16, 17, 19, 20, 22, 23, 25, 26, 28, 29

Bad dates: 3, 6, 9, 12, 15, 18, 21, 24, 27, 30

Another group utilizes a more intricate system involving four points on the hand—spanning from the wrist to the palm, then to the middle finger, and finally to the back of the hand, as depicted in an accompanying illustration. Similar to the previous method, the calculation begins with assigning the value of 1 to the wrist for the first day, 2 to the palm for the second day, 3 to the fingertips, and 4 to the back of the hand, symbolizing an inauspicious day for marriage. This process repeats cyclically until the end of the month.

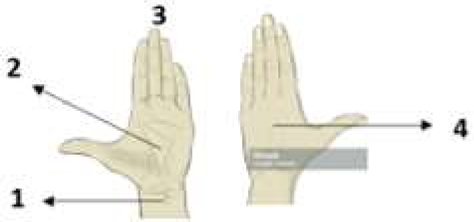

Fig. 2. a system of four points on the hand

From the above pattern, the good and bad dates are as follows:
Good dates: 1, 2,3, 5, 6,7, 9, 10, 11, 13, 14, 15, 17, 18, 19, 21, 22,23, 25, 26,27, 29, 30
Bad dates: 4, 8, 12, 16, 20, 24, 28

Interestingly, there is also a group that combines both the three-point and four-point systems in their calculations. This hybrid approach merges the criteria from both methods, adding a layer of complexity to the determination of auspicious wedding dates. The coexistence of these systems reflects the diversity of cultural practices and the flexibility within communities to adapt and blend different methodologies to suit their beliefs and preferences.

From the above pattern, the good and bad dates are as follows:
Good dates: 1, 2, 5, 6, 9, 10, 13, 14, 17, 18, 21, 22, 25, 26, 29, 30
Bad dates: 3, 4, 7, 8, 11, 12, 15, 16, 19, 20, 23, 24, 27, 28

The utilization of mathematical formulas in these practices goes beyond mere enumeration; it involves a symbolic interpretation of points on the hand to derive meaningful values associated with each day. The interplay between numerical assignments and cultural significance highlights the intricate relationship between mathematics and traditional customs.

3.2 Utilizing Numerical Concepts in Determining Wedding Dates

The application of numerical concepts in the determination of auspicious wedding dates is a fascinating intersection of cultural practices and mathematical principles. Various societal groups have developed distinct methods, often involving points on the hand, to calculate and assign values to different days, shaping the choices for significant life events such as marriages.

One group within these communities employs a three-point system, marking positions from the wrist to the palm and extending to the fingertips. The calculation begins with assigning the value of 1 to the wrist for the first day of the month, deemed auspicious for weddings. Similarly, the palm is assigned a value of 2 for the second day, also considered favorable for marriage. However, the third day, associated with the fingertips and assigned a value of 3, is regarded as inauspicious for weddings. This sequence then repeats cyclically until the end of the month, offering a systematic approach to identifying propitious wedding dates based on the numerical significance attached to each part of the hand.

Another group employs a more complex four-point system, considering positions from the wrist to the palm, then to the middle finger, and finally to the back of the hand, as illustrated. The numerical assignments in this method are similar to the three-point system, with the wrist assigned 1, the palm assigned 2, and the fingertips assigned 3, all representing favorable days for weddings. However, a distinct element is introduced with the assignment of 4 to the back of the hand, symbolizing an inauspicious day for marriage. This method, too, repeats cyclically throughout the month.

A unique approach is taken by a group that combines both the three-point and four-point systems. In this hybrid method, an intersection is created, resulting in a subset of favorable days that align with the criteria from both systems. This combination adds a layer of complexity to the determination of auspicious wedding dates, illustrating the adaptability of cultural practices and the incorporation of diverse numerical concepts.

The utilization of mathematical concepts in these practices goes beyond mere enumeration; it involves a symbolic interpretation of points on the hand to derive meaningful values associated with each day. The systematic calculations provide a structured approach to identifying favorable wedding dates, emphasizing the intricate relationship between mathematics and cultural traditions.

3.3 The Relationship Between Determining Wedding Dates and Mathematical Concepts of Numbers

The intriguing connection between the determination of auspicious wedding dates and mathematical concepts, specifically those related to numbers, reveals a fascinating interplay between cultural traditions and mathematical principles. Various societal groups have developed distinct methods, often involving points on the hand, to calculate and assign values to different days, establishing a unique relationship between the selection of wedding dates and mathematical expressions.

In one group, the calculation of favorable wedding days is associated with three points on the hand. This can be translated into a mathematical expression as

$$x \bmod 3 = a,$$

where x represents the day in question.
If a equals 0, then x denotes a day deemed unfavorable for wedding ceremonies.

This mathematical formulation adds a systematic dimension to the traditional practice, creating a numerical criterion that guides the selection of auspicious dates.

Similarly, another group employs a four-point system on the hand to determine propitious wedding days. This can be expressed mathematically as

$$x \bmod 4 = a,$$

where x represents the day,and a is the remainder when x is divided by 4.
If a equals 0, it signifies that x is an unfavorable day for weddings.

This mathematical representation adds a layer of precision to the cultural practice, transforming the determination of auspicious dates into a mathematical formula.

A more intricate approach is taken by a group that combines both three and four points in their calculations, signifying the intersection of favorable days. This combination can be formulated mathematically as

$$(x \bmod 3)(x \bmod 4) = a,$$

where x is the day in question,and a represents the remainder of the product when x mod 3 *is multiplied by x mod* 4.

If a equals 0, it indicates that x is considered an inauspicious day for wedding events. This synthesis of two distinct numerical criteria showcases the adaptability of cultural practices, integrating mathematical concepts into the determination of wedding dates.

The application of mathematical expressions in these cultural practices extends beyond mere enumeration; it involves a symbolic interpretation of points on the hand to derive meaningful values associated with each day. The systematic calculations provide a structured and quantifiable approach to identifying favorable wedding dates, emphasizing the intricate relationship between mathematics and cultural traditions

4 Conclusion

The determination of wedding dates within the Bugis Makassar tribe represents a captivating fusion of cultural traditions, celestial influences, and mathematical precision. Diverse groups within the Bugis Makassar tribe employ distinct mathematical methodologies, such as three and four-point systems, to identify auspicious wedding dates. The coexistence of these practices demonstrates cultural flexibility and a harmonious blend of methodologies. The use of mathematical formulas to symbolically interpret hand points underscores the intricate relationship between mathematics and cultural traditions, showcasing the emergence of ethnomathematics within the wedding traditions of the Bugis Makassar tribe.

The incorporation of numerical concepts in determining wedding dates encompasses complex calculations expressed as

$$(x \; mod \; 3 = a)$$

and

$$(x \; mod \; 4 = a)$$

with communities combining both methods represented as

$$((x \; mod \; 3)(x \; mod \; 4) = a)$$

If $a = 0$ then x indicates inauspicious wedding days.

It signifies inauspicious wedding days. This study illuminates the intricate cultural and mathematical aspects within Bugis Bugis Makassar tribe wedding traditions, emphasizing the interplay of culture, numeracy, and the Islamic Calendar.

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