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Literature Review

Ethnomathematics in the Jonggan Art of the Dayak Kanayat'n

Rino Sinus Pandanu
Department of Mathematics Education, Faculty of Mathematics and Natural Science Education, Universitas Tanjungpura, Pontianak, Indonesia

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ABSTRACT

This study explores the role and presence of ethnomathematics in jonggan, a traditional art form of the Dayak Kanayat'n community. Jonggan is a social dance involving dancers, musicians, and singers that reflects the community's rich cultural heritage. This study employs a qualitative approach through a literature review to identify mathematical concepts embedded in the patterns, rhythms, and choreography of jonggan. The findings reveal the presence of geometric forms such as triangular and rectangular prisms, circles, and trapezoids, as well as numerical sequences in the dance movements and musical instruments. These elements not only enrich the aesthetic structure of jonggan but also serve as a medium for transmitting cultural knowledge. The study concludes that integrating ethnomathematical elements into mathematics education can create a more engaging and culturally relevant learning experience. By illustrating how mathematics is inherent in Dayak Kanayat'n traditions, this research contributes to a deeper understanding of the intersection between culture and mathematics and supports the development of contextualized learning strategies.

Corresponding Author:

Rino Sinus Pandanu
Faculty of Mathematics and Natural Sciences Education, Universitas Tanjungpura Pontianak
JL. Prof. Dr. H. Hadari Nawawi
Email: rinowarnawarni@gmail.com

1. INTRODUCTION

Math and culture are two inseparable elements in daily life. Culture reflects all of the values and practices that are prevalent in society. However, these aspects are often considered separate and unrelated entities (Hardiarti, 2017). In the context of education, mathematics plays a very important role in developing students' logical, analytical, and problem-solving skills (Pujiono et al., 2024). For a long time, mathematics has been a necessary part of human life. One piece of evidence is the discovery of mathematical artifacts from the Mesopotamian and Ancient Egyptian civilizations. These artifacts reveal that the Mesopotamian people had an impressive understanding of mathematics, even though it was still simple and not as deductively structured as modern mathematics (Chatterjee, 2021; Ernesto et al., 2022; Katz, 2021; Høyrup, 2018; Høyrup, 1996). As an effective tool for analyzing, researching, and verifying the truth, mathematics has become an objective science in a world often characterized by subjectivity, chaos, and uncertainty (Hammond, 2000).

Indonesia, as an archipelagic state, has many different kinds of societies, identities, and traditions that have thrived together in harmony (Farhaeni & Martini, 2023). This cultural diversity is passed down from generation to generation, preserving local wisdom and values (Irmania et al., 2021). One manifestation of this cultural diversity is the variety of tribes, ethnicities, religions, and languages throughout the country. According to the population census conducted by the Central Statistics Agency in 2010, Indonesia is home to 1,340 ethnic groups and approximately 2,500 regional languages (Hardiarti, 2017).

One of the tribes in Indonesia, especially in West Kalimantan (West Borneo), is the Dayak Kanayat'n. One of the cultural riches of the Dayak Kanayat'n is jonggan (M & Muniir, 2022). Jonggan is a folk dance that serves as entertainment and depicts the joy and happiness of the Dayak people. In the Dayak Kanayat'n language, the word "Jonggan" means "Dance", while "Bajonggan" means "Dancing". Jonggan is a social dance that involves dancers, musicians, and singers, and is often performed as part of ancestral traditions to honor and welcome distinguished guests of high status (Turyati, 2015). This art form includes people of all ages and genders, from the elderly to the young, and both men and women, though older participants usually take a more prominent role. During a jonggan performance, pantun (traditional rhymed verses) are presented in groups, and the audience is encouraged to join in the dancing. The atmosphere becomes even more vibrant with the exchange of pantun between the dancers and the audience (Olendo et al., 2023).

The goal of this research is to examine the presence and role of ethnomathematics in the jonggan dance of the Dayak Kanayat'n community. Specifically, it seeks to uncover the mathematical concepts and principles embedded in jonggan's choreography, patterns, and rhythms. Furthermore, the study explores how jonggan illustrates the broader relationship between mathematics and culture in the Dayak Kanayat'n tradition. By analyzing this interplay, the research provides insights into how cultural expressions not only embody mathematical understanding but also serve as a medium for transmitting it.

2. METHOD

This research adopts a qualitative approach through an in-depth literature review (Wright, 1996). By analyzing a range of written sources, including research articles on jonggan art and other relevant documents, this study aims to uncover the rich interplay between mathematics and cultural expression in jonggan. The literature review serves as a foundation for identifying and understanding the mathematical concepts intricately woven into the patterns, choreography, and rhythms of this traditional art form.

By drawing from diverse and credible references, this study delves into the ethnomathematical elements embedded in jonggan, shedding light on how these mathematical principles enhance both its aesthetic and cultural significance. Through a comprehensive analysis, the research provides meaningful insights into the mathematical concepts inherent in jonggan, contributing to a deeper appreciation of its role within the Dayak Kanayat'n community and its potential applications in culturally contextualized mathematics education.

3. RESULTS AND DISCUSSION

3.1. Results

3.1.1. Jonggan Stage

The main preparation for the jonggan performance begins with setting up the stage, designed to resemble a traditional stilt house in a rectangular shape (see Figure 1). The floor is made of neatly arranged wooden planks, and the roof is covered with a tarp to protect against rain or sunlight. Simple decorations with traditional elements enhance the cultural atmosphere.

Figure 1. Jonggan Stage

Source: Screenshot from the article "Pertunjukan Jonggan Dalam Konteks Sosial Kemasyarakatan Suku Dayak Kanayatn". Author: Turyati. Journal: Panggung: Jurnal Seni Budaya. 2015. Image protected under Creative Commons Attribution-NonCommercial 3.0 (CC BY-NC) License

The mathematical concept behind the stage shape is that it forms a rectangular prism, and the stage floor involves the concept of the area of a rectangle (see Figure 2 and Figure 3). Additionally, concepts of multiplication and division are used to determine how many planks will be needed.

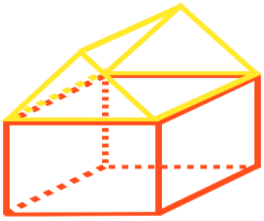

Figure 2. The Combination of a Rectangular Prism with a Triangular Prism
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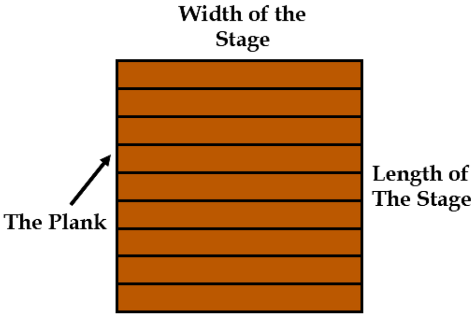

Figure 3. Planks on the Floor of the Jonggan Stage
Source: Private Document

3.1.2. Musical Instrument

In the jonggan performance, many musical instruments are usually used, such as the Dau, Ttuma, Gong, Suling, and Saron. The Dau has two parts, which are the Dau Ino' (Induk) and the Dau Anak (see Figure 4). The Dau musical instrument is played by striking or beating its protruding top part. The player sits cross-legged and faces the Dau, striking it with both hands using wooden mallets that are generally 20cm to 25cm long and have a diameter of around 2 cm to 2.5 cm (Selmen et al., 2021).

Figure 4. Dau Musical Instrument
Source: Screenshot from the article. "Analisis Struktur Musik Iringan Tari Jonggan di Desa Sebente Kecamatan Teriak Kabupaten Bengkayang" Authors: Selmen, Nurmila Sari Djau, and Asfar Munir. Journal: JPPK: Jurnal Pendidikan Pembelajaran Khatulistiwa. 2021. Image protected under Creative Commons Attribution 4.0 (CC BY 4.0) license

In the Dau musical instrument, the concept of circles can be found and can also be used to explain the constant π (pi). When viewed from above, the instrument forms at least three circles of different sizes. We can use it without needing to search for many circular objects, as the Dau already contains three circles of varying sizes (see Figure 5).

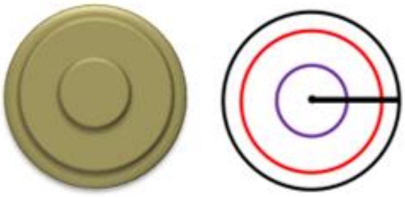

Figure 5. Circle in Dau Musical Instrument
Source: Private Document

Then there is the Gadobong (Ttuma) musical instrument, which is cylindrical with a hole at the bottom. This instrument is played by striking it with the palm of the hand (see Figure 6). The Ttuma is a membranophone instrument, as the sound is produced from its membrane. One of the mathematical concepts found in the Gadobong (Ttuma) is the concept of a solid revolution (see Figure 7).

Figure 6. Ttuma Musical Instrument
Source: Screenshot from the website of Kementerian Pariwisata dan Ekonomi Kreatif / Badan Pariwisata dan Ekonomi Kreatif. Article "Mengenal Berbagai Alat Musik Tradisional Khas Pulau Kalimantan". Image protected by copyright © 2024 Kementerian Pariwisata dan Ekonomi Kreatif / Badan Pariwisata dan Ekonomi Kreatif

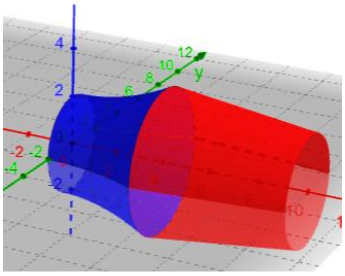

Figure 7. Example for Solid Revolution From Ttuma Musical Instrument
Source: GeoGebra

The next one is the Gong. The Gong is a musical instrument similar to the Ttuma but much larger in size (see Figure 8). To play Gong, the player sits facing the instrument, holding the stick in the right hand, and strikes the raised, circular center of the gong with the stick or Gong mallet (Selmen et al., 2021). The mathematical concept found in the Gong is similar to that in the Ttuma. We can easily explain the value of π (pi) because the gong usually contains three circles of different sizes.

Figure 8. Gong Musical Instrument
Source: Screenshot from the website of Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi Republik Indonesia. Article title "Gong". Image protected by copyright © 2024 Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi Republik Indonesia

After Gong, we have Suling (Solekng). This musical instrument is made of bamboo and is classified as a wind instrument, also known as an aerophone (see Figure 9). In the Jonggan dance music, the Suling plays a crucial role in initiating the music and is essential for the Jonggan music. The most evident mathematical concept in the suling is the concept of a cylinder (see Figure 10).

Figure 9. Suling (Solekng) Musical Instrument
Source: Screenshot from the article "Bentuk Penyajian dan Fungsi Musik Jonggan di Desa Bebatung Kecamatan Mandor Kabupaten Landak." Authors: M. Aristo Ranto M. and Christianly Jeri Silaban. Journal: TACET: Jurnal Ilmiah Pendidikan dan Kajian Seni. 2022. Image protected under Creative Commons Attribution 4.0 International (CC BY 4.0) license

Figure 10. Cylinder
Source: Private Document

The next musical instrument is the Saron. The saron is a traditional musical instrument of the Dayak Kanayat'n, also known as Tengga (see Figure 11) (Adrianty, 2017). The instrument is made of metal and consists of eight rectangular metal bars placed on a wooden frame. The metal bars on the Saron are shaped like isosceles trapezoids. The length of the metal bars increases in a patterned sequence. If we denote the length of the first bar as x, the size of the second bar can be represented as $x + y$, followed by $x + 2y$, $x + 3y$,… (see Figure 12).

Figure 11. Saron Musical Instrument
Source: Screenshot from the article. "Analisis Struktur Musik Iringan Tari Jonggan di Desa Sebente Kecamatan Teriak Kabupaten Bengkayang" Authors: Selmen, Nurmila Sari Djau, and Asfar Munir. Journal: JPPK: Jurnal Pendidikan Pembelajaran Khatulistiwa. 2021. Image protected under Creative Commons Attribution 4.0 (CC BY 4.0) license

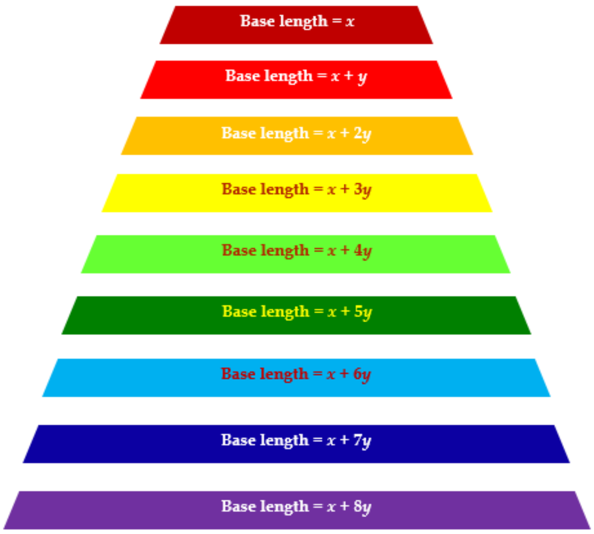

Figure 12. Base Length of Trapezoid
Source: Private Document

3.1.3. Jonggan Dancer

The jonggan dancers arrange themselves in straight lines, typically forming two or three parallel rows (see Figure 13, Figure 14, Figure 15, and Figure 16). Each row usually consists of three dancers. At the beginning of the performance, all dancers face the audience while standing in formation. Positioned behind them are the musicians, singers, and the host, who introduces and manages the jonggan performance from start to finish. This setup ensures that the performer's faces are visible to the audience, which is crucial for establishing the structure of the performance. The choreography is designed to encourage social participation within the show's context. Each dancer is free to interact with their dance partners and other performers on stage. As a social dance within the Dayak Kanayat'n community, jonggan represents the joy and happiness inherent in the social interactions among the young people of the Dayak Kanayat'n Tribe (Turyati, 2015).

Figure 13. Jonggan Dancer Formation
Source: Screenshot from the website of Pontianak Informasi. Article title "Cerita Keberagaman dari Retok Jonggan, Ronggeng, Sepak Bola hingga Tester Halal". Image protected by copyright © 2024 Pontianak Informasi

Figure 14. Jonggan Dancer Formation
Source: Screenshot from the YouTube video by Andrew Borneo Pascalis. Video title "Tarian Jonggan Dayak Kanayant". Image protected by copyright © 2024 Andrew Borneo Pascalis

Figure 15. Jonggan Couple Dance
Source: Screenshot from the article "Pertunjukan Jonggan Dalam Konteks Sosial Kemasyarakatan Suku Dayak Kanayatn". Author: Turyati. Journal: Panggung: Jurnal Seni Budaya. 2015. Image protected under Creative Commons Attribution-NonCommercial 3.0 (CC BY-NC) License

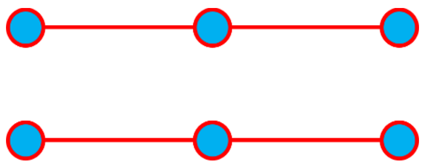

Figure 16. Jonggan Dance Formation
Source: Private Document

In the Jonggan dance formation, the dancers are arranged using the concept of parallel lines. The dance begins with synchronized movements, where the dancers swing their feet in unison with the music while gracefully waving their hands. This movement continues until the rhythm of the music shifts, at which point all the dancers take positions facing each other in rows. During the paired dance segment, male and female dancers assume positions facing one another (Kristova et al., 2014). These paired positions are maintained through several formations without changing partners.

3.2. Discussion

The mathematical concepts present in the jonggan dance are numerous. Among them, this article will discuss about 1) concepts of triangular prisms; 2) rectangular prisms; 3) circles; 4) π (pi); 5) rectangles; 6) division and multiplication; 7) trapezoids; 8) cylinders; 9) sequences and patterns; 10) solid of revolution; 11) parallel lines.

3.2.1. Jonggan Stage

The jonggan stage incorporates several mathematical concepts, including cuboids (see Figure 17 and Figure 18), triangular prisms, rectangles, and the concepts of division and multiplication. The shape of the jonggan stage, which combines cuboids, the rectangular shape of the stage floor, and the method used to determine the number of wood planks required to construct the floor, all reflect the mathematical concepts embedded in the jonggan stage.

The first is a rectangular prism. A rectangular prism is a three-dimensional (3D) shape with six rectangular faces, twelve edges, and eight vertices (corners). The faces meet at right angles, and all pairs of opposite faces are congruent. The prism has two parallel and congruent bases. Rectangular prisms are also known as cuboids (Eklesiawati & Liliana, 2016). The volume of a cuboid is $h \times w \times l$ and the surface area of a cuboid is $2(h.l + w.l + h.w)$.

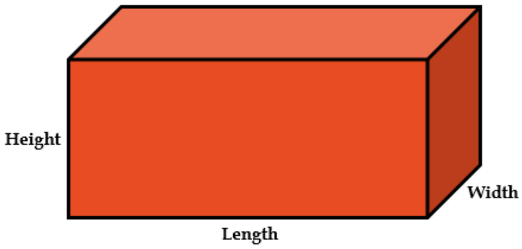

Figure 17. Cuboids
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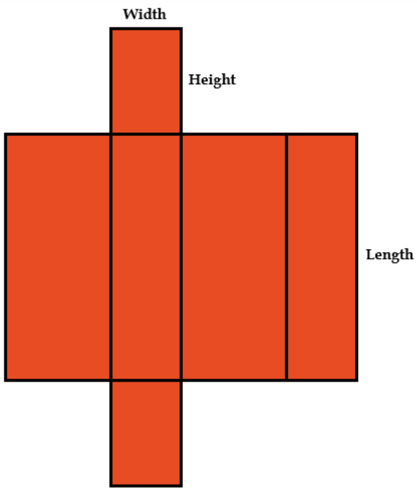

Figure 18. Cuboid Net
Source: Private Document

Next is a triangular prism. A triangular prism is a three-dimensional (3D) shape with two triangular bases and three rectangular faces (see Figure 19). The triangular bases are the top and bottom faces, and the rectangular faces are the lateral faces. A triangular prism is a polyhedron, which is a 3D shape with flat surfaces (see Figure 20). It has five faces, six vertices, and nine edges (Ardiansyah et al., 2022). The volume of the triangular prism is the base area of prism $\times$ length of the prism and the surface area of the triangular prism is $3(\text{lateral face area}) + 2(\text{base area})$.

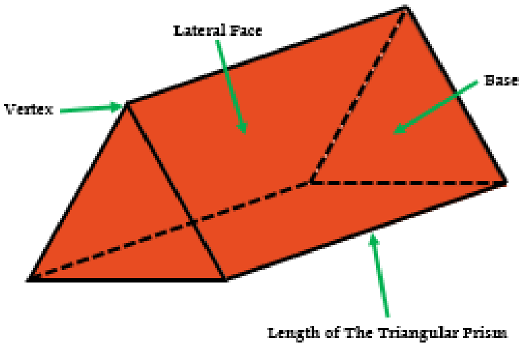

Figure 19. Triangular Prism
Source: Private Document

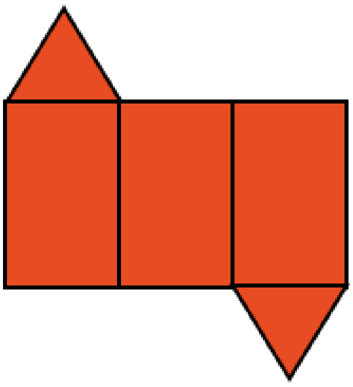

Figure 20. Triangular Prism Net
Source: Private Document

The third is a rectangle. A rectangle is a two-dimensional shape with four sides, four corners, and four right angles (see Figure 21). It is also a parallelogram, which means it has two pairs of opposite sides that are parallel. The opposite sides of a rectangle are the same length, with one pair being longer than the other pair. If all the sides of a rectangle were the same size, it would be known as a square. The area of a rectangle is $w \times l$ and the perimeter of a rectangle is $2w + 2l$.

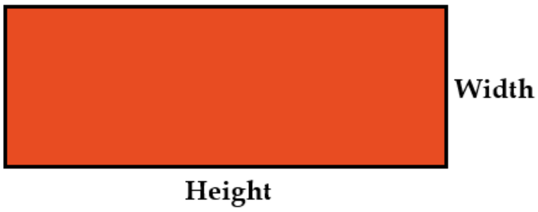

Figure 21. Rectangle
Source: Private Document

The last is multiplication and division. In the arrangement of wooden planks on the jonggan stage, there are concepts of division and multiplication. For example, if we want to construct a jonggan stage with a total length of 12 meters and a total width of 6 meters (Turyati, 2015). The planks are 20cm wide and 4 meters long, as illustrated in Figure 22.

Figure 22. Illustration of the Comparison Between the Area of Wooden Planks and the Area of the Jonggan Stage
Source: Private Document

The illustration depicts the comparison between the area of the wooden planks and the area of the jonggan stage. To find the minimum number of planks needed, follow these steps for calculation: First, divide the total length of the stage by the width of the plank to determine the number of planks required without any cutting.

$$\frac{12\text{m}}{0.2\text{m}} = 60$$

This means that we need 60 wooden planks on the left side, as shown in Figure 23.

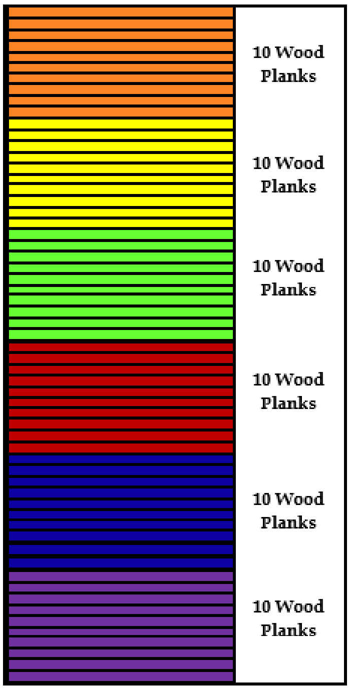

Figure 23. Illustration of the Number of Whole Planks That Do Not Need to Be Cut
Source: Private Document

To find the remaining planks on the right, where wooden planks can be saved by cutting two planks in half, given that the remaining length is 2 meters while the original length of the wooden planks is 4 meters. We need to organize 60 planks with a length of 2 meters. Since the planks can be divided in half, only 30 planks are required.

$$\frac{4\text{m}}{2\text{m}}.(x) = 60$$

$$\frac{\frac{4\text{m}}{2\text{m}}}{\frac{4\text{m}}{2\text{m}}}.(x) = \frac{60}{\frac{4\text{m}}{2\text{m}}}$$

$$x = \frac{60}{2} = 30$$

Based on this assumption, we determine that to build a jonggan stage floor measuring 6 meters by 12 meters, you will need a total of 90 wooden planks. This calculation represents the minimum number of planks required, and the actual quantity may need to be adjusted depending on the specific dimensions of the stage. In practical situations, it is common to purchase approximately 100 planks or more for a stage of the same size.

This practical estimation process can be utilized as a contextual mathematics problem for students. By involving real-life cultural scenarios such as the construction of a Jonggan stage, learners are encouraged to apply mathematical concepts such as area calculation, unit conversion, multiplication, and division in a meaningful context. Moreover, integrating local cultural elements into mathematics education helps bridge the gap between abstract concepts and everyday experiences. This approach aligns with the principles of ethnomathematics, which emphasize that mathematical ideas are deeply embedded within cultural practices. In addition to strengthening students' mathematical thinking, this method also promotes cultural awareness and appreciation for indigenous knowledge systems.

3.2.2. Dau and Gong Musical Instrument

Dau and Gong are musical instruments that have similar shapes but differ in size and usage. The Dau is smaller and arranged in several pieces, from the smallest to the largest, while the Gong is significantly larger and fewer in number (see Figure 24). The sound produced by these instruments also differs. However, due to their similar shapes, Dau and Gong can be used to explain several concepts related to circular geometry, including the circumference of a circle, the area of a circle, and the value of π (pi).

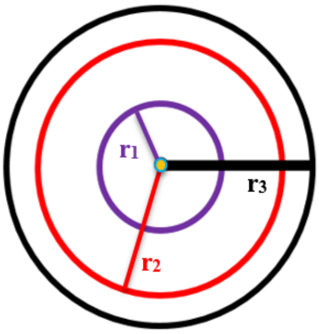

Figure 24. Three Circles From Dau and Gong Musical Instrument
Source: Private Document

A circle is a two-dimensional shape consisting of all points in a plane that are a set distance from a given point called the center. The distance between any point on the circle and the center is called the radius. The area of a circle is calculated using the formula $A = \pi.r^2$, where A is the area, π is a constant, and r is the radius. The circumference of a circle is the length of the circle if it were opened and straightened into a line. The formula for calculating the circumference of a circle is $C = 2.\pi.r$ or $C = \pi.d$, where C is the circumference, r is the radius, and d is the diameter. The value of π (pi) was discovered by dividing the circumference of a circle by its diameter. This ratio, which is approximately equal to 3.14, remains the same even if the diameter or the circumference of a circle changes.

As a continuation of the explanation about circles, it is important to reflect on how our understanding of these concepts influences their application in real life and other fields of knowledge. While the formulas used to calculate the area and circumference of a circle are quite common, many people still struggle to fully understand these concepts, especially in their application. For example, even though π (pi) is a constant, understanding its role in various contexts, such as in measuring areas or in engineering technology, can affect the accuracy of the results obtained. Additionally, while π is commonly approximated as 3.14 in simple calculations, in more complex applications, a more precise value of π, such as 3.14159 or even more decimal places, is necessary to improve the accuracy of the results. Therefore, the challenge in learning this concept lies not only in memorizing formulas but also in gaining a deeper understanding of the meaning and implications of these formulas in various fields.

3.2.3. Ttuma Musical Instrument

The Ttuma musical instrument incorporates the concept of a solid of revolution. This concept, in calculus, is closely related to the topic of functions. A solid of revolution is a shape generated by rotating a planar curve around a straight line, known as the axis of rotation, that lies within the same plane. A function is then rotated about an axis, such as the x, y, or z axis, resulting in the formation of the graph of a solid of revolution (see Figure 25, Figure 26, Figure 27, Figure 28, and Figure 29).

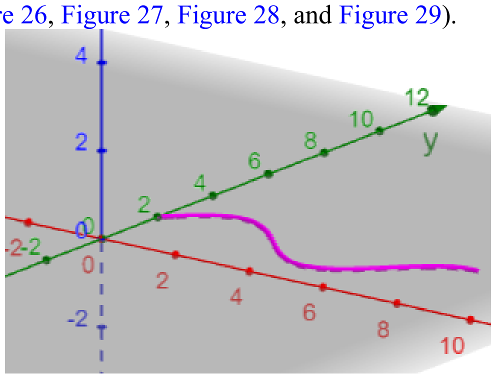

Figure 25. Function Graph of $\sin(x) + 2 \mid 0 \leq x \leq 8$
Source: GeoGebra

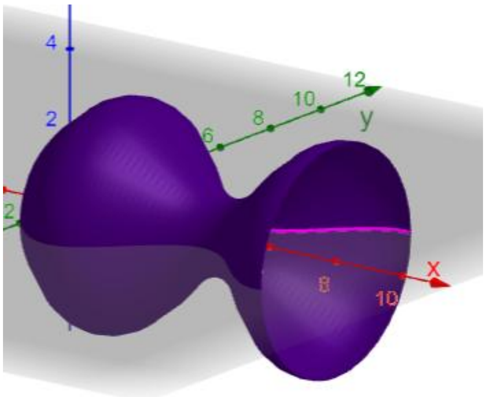

Figure 26. Solid of Revolution for the Function $\sin(x) + 2 \mid 0 \leq x \leq 8$, around the x-Axis
Source: Geogebra

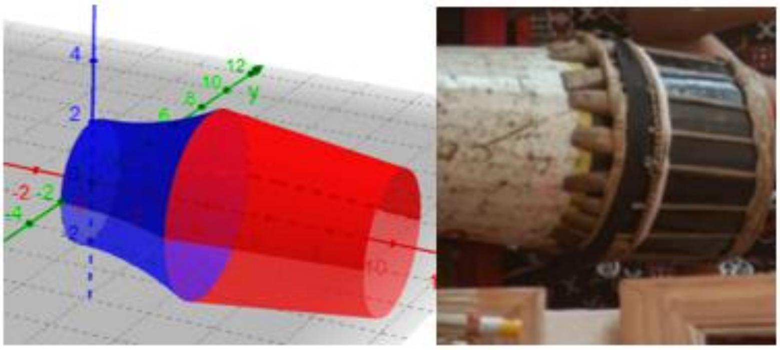

Figure 27. An Example of a Solid of Revolution for the Ttuma Musical Instrument

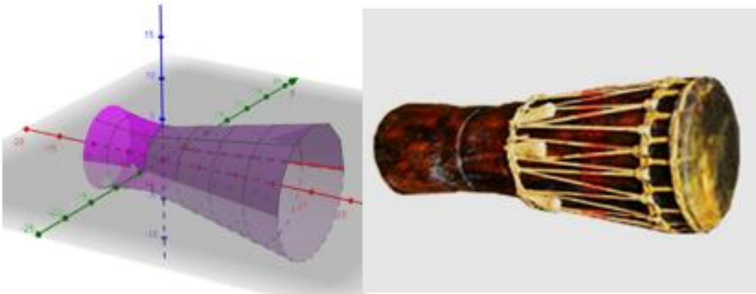

Figure 28. An Example of a Solid of Revolution for the Ttuma Musical Instrument
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Source: Screenshot from the website of Budaya Indonesia. Article title "Tuma". Image protected by copyright © 2024 Budaya Indonesia and GeoGebra

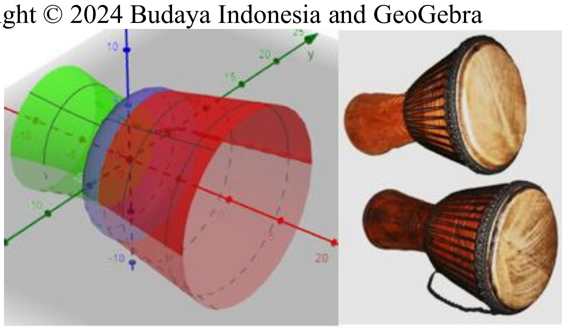

Figure 29. An Example of a Solid of Revolution for the Ttuma Musical Instrument
Source: Screenshot from the website of Khatulistiwa Hits. Article title "Tuma, Merupakan Alat Musik Khas Kalimantan yang Mampu Berkolaborasi Dengan Musik Modern Beranda Budaya". Image protected by copyright © 2023 Khatulistiwa Hits

The concept of a solid of revolution, as demonstrated in the creation of the Ttuma musical instrument, not only illustrates the intersection of mathematics and art but also highlights the ingenuity of traditional craftsmanship. The Ttuma, with its unique shape formed through the rotation of a function around an axis, embodies the practical application of mathematical principles in real-world objects. This blending of mathematics and culture opens up a broader discussion about how mathematical concepts are not just abstract ideas but can manifest in tangible forms that have cultural and functional significance. In the case of the Ttuma, the resulting solid of revolution influences both the acoustics and aesthetics of the instrument, which is an essential aspect of its design. As a traditional musical instrument from Kalimantan, the Ttuma showcases how mathematics can enhance the quality of sound and performance. Furthermore, the use of the solid of revolution in Ttuma's design demonstrates the enduring relevance of mathematical principles in modern and traditional music, inviting a closer examination of how art and science can converge in creative expressions.

3.2.4. Suling (Solekng) Musical Instrument

The most apparent mathematical concept present in the suling musical instrument is the concept of a cylinder. A cylinder is a three-dimensional solid with two parallel circular bases connected by a curved surface (see Figure 30) (Lumbantoruan, 2021). It has several properties: the cylinder features two identical and parallel circular surfaces, one curved surface that wraps around its entire extent, and no vertices. It can stand upright when placed on one of its bases or roll when placed on its side. The cylinder has two main properties: surface area and volume. The formula for calculating the surface area of a cylinder is $A = (2.\pi.r.h) + (2.\pi.r2)$, while the formula for calculating the volume is $V = \pi.r^2.h$.

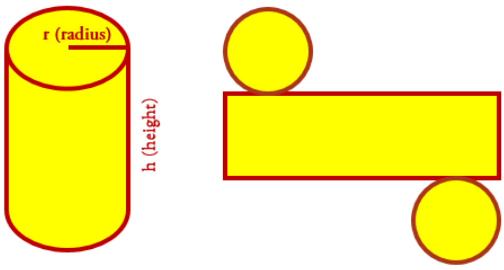

Figure 30. Cylinder and Its Net
Source: Private Document

The presence of the cylinder in the design of the suling musical instrument exemplifies the direct application of mathematical principles in traditional music making. The cylindrical shape of the suling allows for a uniform resonance along its length, which is crucial for producing a consistent sound when air is blown through the instrument. The properties of the cylinder, particularly its surface area and volume, can influence the acoustics of the suling, affecting its pitch and tone. For example, the length and diameter of the cylinder determine the pitch of the sound produced by the suling, with the volume of air inside playing a key role in the resonance. Additionally, the cylindrical design enables the suling to have a smooth and continuous surface, which can be important for both the visual aesthetics and the ease of handling the instrument. The use of a simple geometric shape such as the cylinder in the construction of the suling highlights the harmonious relationship between mathematics and art in creating functional and culturally significant objects.

3.2.5. Saron

The mathematical concepts found in the saron musical instrument are the concept of trapezoidal shapes and number sequences. A trapezoid is a two-dimensional geometric figure with four sides, where two of the sides are parallel but not of equal length, giving it a shape resembling a combination of a triangle and a rectangle (see Figure 31) (Lumbantoruan, 2021). Characteristics of a trapezoid include having a pair of parallel sides called bases, non-parallel sides called legs, a total angle sum of 360 degrees, and four edges and four vertices. The trapezoid also has diagonals of equal length, one rotational symmetry, and one line of symmetry. One type of trapezoid is the right-angled trapezoid, which has one angle measuring 90 degrees. To calculate the area of a trapezoid, you can use the formula $A = \frac{1}{2}.h(\text{Base}_1 + \text{Base}_2)$

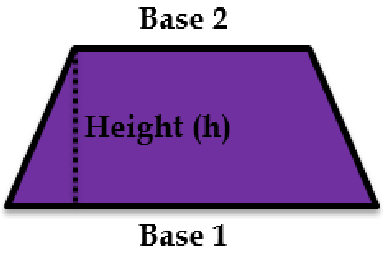

Figure 31. Trapezoid
Source: Private Document

Additionally, there is the concept of number sequences in the lengths of the bases of the trapezoid formed by the saron musical instrument. Referring to the saron in Figure 11, this musical instrument consists of nine metal plates, each producing a different sound when struck. The dimensions used to create these plates are based on the concept of number sequences.

If we denote the length of the base of the leftmost (smallest) metal plate as x, then the length of the subsequent metal plates will be greater than the previous one. Let's denote this increment in length as y. Consequently, the pattern for the lengths of the subsequent metal plates will be $x + y, x + 2y, x + 3y, \ldots$. This pattern can be observed in the illustration in Figure 32).

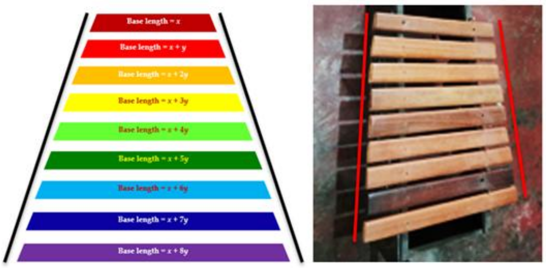

Figure 32. Pattern-Based Length of the Saron Musical Instrument
Source: Screenshot from the website of e-Katalog LKPP. Image protected by copyright © 2022 Lembaga Kebijakan Pengadaan Barang/Jasa Pemerintah (LKPP) and Private Document

3.2.6. Jonggan Formation

In the jonggan formation, dancers will arrange themselves facing the same direction, typically in two rows where they form parallel straight lines. In mathematics, parallel lines are two lines that extend in both directions and never intersect, even if extended indefinitely (Padafing, 2019). Parallel lines have the characteristics of being equidistant from each other, having the same slope, and having no point of intersection (see Figure 16). Parallel lines are denoted by //.

4. CONCLUSION

Based on the results and discussion presented, it can be concluded that in the jonggan art of the Dayak Kanayat'n community, various mathematical concepts are found, including triangular prisms, rectangular prisms, circles, π (pi), rectangles, isosceles triangles, division and multiplication, trapezoids, cylinders, sequences and patterns, rotational solids, and parallel lines. It is highly recommended to use these findings as supplementary materials to enrich knowledge or support mathematics learning in schools as an effort to introduce the culture of the Dayak Kanayat'n community to students. Due to the limitations of the researcher, this study only serves to uncover and present the ethnomathematics found in the jonggan art. The development of teaching materials that incorporate the Dayak Kanayat'n culture, particularly jonggan, will provide a fresh perspective for students and assist in implementing contextual mathematics learning.

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