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ETHNOMATHEMATICS: EXPLORATION OF TRIGONOMETRIC TRANSFORMATION FORMS ON JOGET LAMBAK PUCUK PISANG AT THE OPENING OF THE NATIONAL CULTURE WEEK IN 2020

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ABSTRACT

Melayu dance is often performed by students at school events, but they often do not know that there are many mathematical elements in a Melayu dance. This encourages the author to try to find the application of geometry transformation contained in joget lambak dance. Many types of Melayu dances are very famous, one example is kapur sirih which is used to welcome special guests and joget lambak dance which has a special meaning, where the joget lambak dance on this occasion will be matched with the Melayu song "pucuk pisang". Joget lambak is a dance of young people, joget lambak trips are usually full of nuances of joy, nuances of cheerfulness, which when dancing also occur dancing interactions between young people in order to find a partner to release longing. Usually joget lambak dance becomes an intermediary for them to express that feeling. Geometric transformation is a transformation that studies the process of changing a geometric field that includes its own position, size, and shape, which is caused by translation, dilation, matrix-compatible transformation, rotation, reflection, scale change, and composition of two transformations. This research is a type of literature research with a qualitative approach. The data is collected by document study and analyzed by data analysis technique which is doing a documentation. The result of this study is that it turns out that the joget lambak dance is not only about art, but in it we can also use it as one of the lessons on geometry transformation material. There are so many forms of geometry transformation contained in the lambak dance movement pattern.

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INTRODUCTION

Melayu is one of the cultures in Indonesia, which is also the largest culture in Asia. Many types of Melayu dance are very famous, one example is kapur sirih which is used to welcome special guests and joget lambak dance which has a special meaning, where the joget lambak dance on this occasion will be matched with the Melayu song "pucuk pisang". In Indonesia, especially North Sumatra, Melayu culture is very thick in its existence, this can be proven by the many Melayu dances that have been rearranged by young people or teenagers who enjoy Indonesian culture.

Melayu dance is often performed by students at school events but they often do not know that there are many mathematical elements in a Melayu dance. This encourages the author to try to find the application of geometry transformation contained in joget lambak dance.

Young people today must know culture because it is a form of their own identity, from their identity they will emerge a more civilized character or character. And it must be maintained because it is a form of their identity (Dasrikal, A.Md, Sn).

Culture and art is a tool for me to realize my dreams. Joget lambak is a dance of young people, the journey of joget lambak is usually full of nuances of joy, nuances of cheerfulness, which when dancing also occurs dance interaction between young people in order to find a partner to release longing. Usually joget lambak dance becomes an intermediary for them to express that feeling. Basically, joget lambak dance can be

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in mathematics, geometry is one of the fields in mathematics that is considered the most difficult to understand

Geometric transformation is a transformation that studies the process of changing a geometric field that includes its own position, size, and shape, which is caused by translation, dilation, matrix-compatible transformation, rotation, reflection, change of scale, and composition of two transformations.

Transformation Geometry is a mathematical science that studies lines, space, and volume, which are abstract and related to one another. Flat shapes are shapes that only have perimeter and area, (Wulandari, 2017). Some studies show a lack of student interest in learning geometry transformation because in general, the errors made by students occur due to a lack of mastery of the concept of geometry transformation material. There are several causes of students making mistakes in solving geometry transformation problems, namely the way of learning that is not continuous, the lack of effort made in working on the given problem, students lack mastery of mathematical concepts, and students are not careful and hasty in solving the given problem (Journal of Analysis of student errors in solving geometry transformation material problems).

RESEARCH METHOD

This research is a type of literature research with a qualitative approach. First, researchers collected documents about joget lambak culture and traditional Indonesian dances related to geometry transformation material from several articles, journals and related literature, then all the data researchers summarized in draft form and then analyzed with qualitative data analysis techniques. Second, researchers chose to examine the Joget lambak dance performed in 2020 at the National Culture Week held by Muara Takus Temple, Riau. Researchers took pictures based on videos that the author had watched via YouTube, the following link will be listed by the author is https://youtu.be/tC6nYhTu17g?si=q8azeI15HGt3JW8W

According to (Sugiyono, 2019: 291), literature studies are related to theoretical studies through references related to values, culture, and norms that develop in the social situation under study. According to (Sugiyono, 2019: 315) documentation is a record of events that have passed. Documents can take the form of writings, pictures, or monumental works of a person.

RESULTS AND DISCUSSION

Based on the results of data searches on Google Schoolar, the author found and raised 5 journals that have a relationship between dance and geometry. The journals found as the author's literature are as follows

Number	Author/ Year	Research Title	Research Methods	Research Instruments	Research Results
1	Annisa Enistoneisya / 2017	Mathematical Concepts in Jaipong Kembang Tanjung Dance	Literature Review	This research involves the act of collecting data to determine the existence of a relationship between two or more variables. In this case, the variables in question are mathematics and jaipong Kembang Tanjung dance. As well as exploration, namely collecting information relevant to the topic under	The results showed that there are elements of mathematical concepts in the Kembang Tanjung jaipong dance. The mathematical elements in question are transformation geometry, symmetry and number line. Thus, dance can be used as a learning medium, namely Math Dance.

				study, namely the Kembang Tanjung jaipong dance and exploring the mathematical concepts contained therein	
2	Putri Aprilia Eka Rahmani / 2018	Exploration of Ethnomathematics of Seblang Olehsari Ritual on Geometry Concepts	This research uses a qualitative research type and with an exploratory ethnographic approach related to West Sumatra plate dance.	Data obtained from survey, observation and interview there are ethnomathematical activities in Seblang Olehsari ritual in Olehsari village, Banyuwangi sub-district. The ethnomathematical activities include: the activity of designing ritual places, the activity of designing dance costumes, and the activity of dance movements performed by dancers.	The concept of geometry referred to in the Seblang Olehsari ritual includes the concepts of points, lines, angles, flat shapes, congruence, and geometric transformations.
3	Farah Salsabila/ 2023	Exploration of Ethnomathematics in Plate Dance Movements	This research is an exploratory study conducted to analyze and discuss the concept of geometry contained in the Manuk Dadali Dance using an ethnographic approach.	The results of the study showed that several mathematical concepts were found in plate dance movements such as angles, lines, flat shapes, distances, and coordinate points.	The mathematical concepts found can be applied to learning to explain abstract concepts in mathematics and to introduce cultural elements to students.
4	Sharron Angel/2023	Exploration of Ethnomathematics in Manuk Dadali Dance Movement towards the	The method used in this research is literature review and exploration.	Data collection was carried out by means of observation, documentation and interviews.	Based on the research conducted, geometry elements were found in Manuk Dadali dance movements and floor patterns, including angular geometry, two-dimensional geometry,

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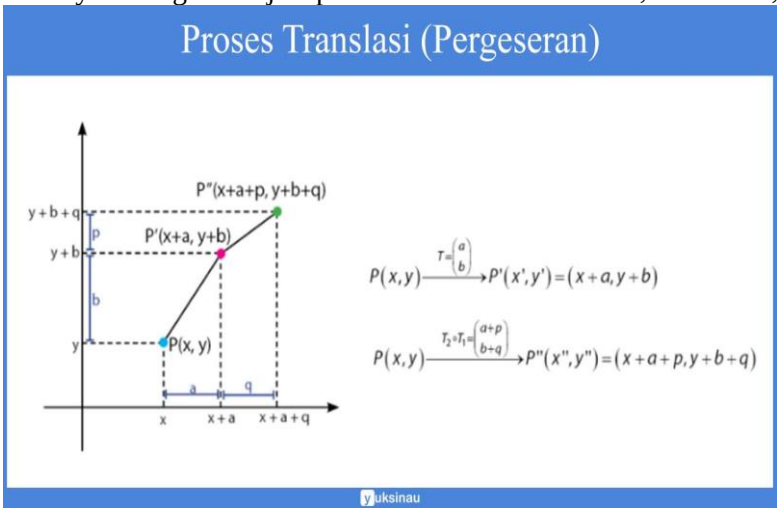
		Concept of Geometry			and transformation geometry.
5	L. Intan Puspa Dewi/ 2019	Ethnomathematics in Balinese Dance in Tinjai from Balinese Dance Classification	The method used in this research is literature review and exploration.	The focus of the research lies on dance movements from the elements of pemeson, pengawak, pengecet, and pekaad.	After the research, a general pattern in each dance and a specific pattern in the classification of Balinese dance (wali dance and balih-balihan dance) were found. When compared to the general pattern of Balinese dance classification, no similar pattern was found, because each dance has different characteristics depending on the creator of the dance. For dance movements, there are elements of reflection (mirroring) in the right and left agem of Pendet dance, right and left agem of Puspanjali dance, right and left ngayab of Rejang Dewa dance, right and left diagonal in Rejang Dewa dance.

Translation in geometry transformation refers to the shifting or moving of an object from one position to another in space. In translation, the shape and size of the object remain unchanged, only its relative position changes. Translations are usually done by moving the object parallel to a coordinate axis, be it the x, y, or z axis.



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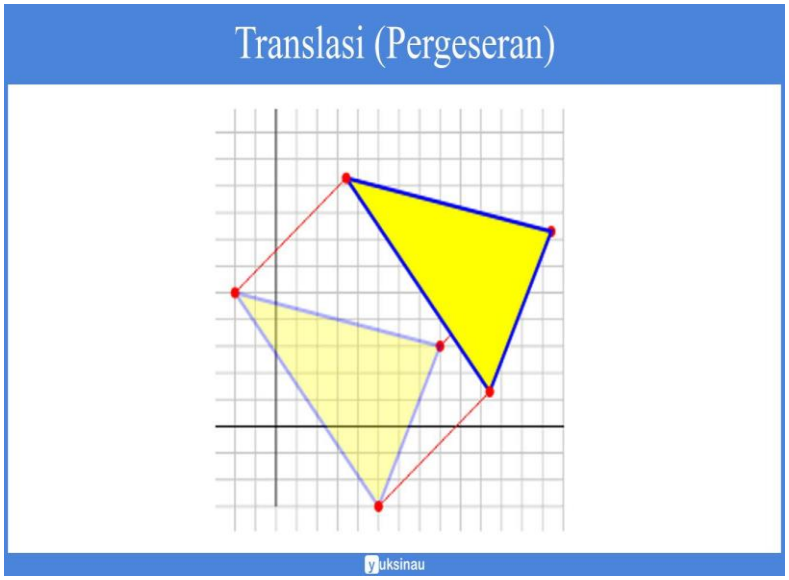

From the picture above, we can know that translations can only be changed in position. The size will remain the same
The formula for translation is :
$(x', y') = (a, b) + (x + y)$
Description:
(x', y') = Shadow point
(a, b) = Translation vector
$(x + y)$ = Starting point

We can see the translation of the joget lambak dance in the pucuk pisang song performed during the 2020 National Arts Week as follows

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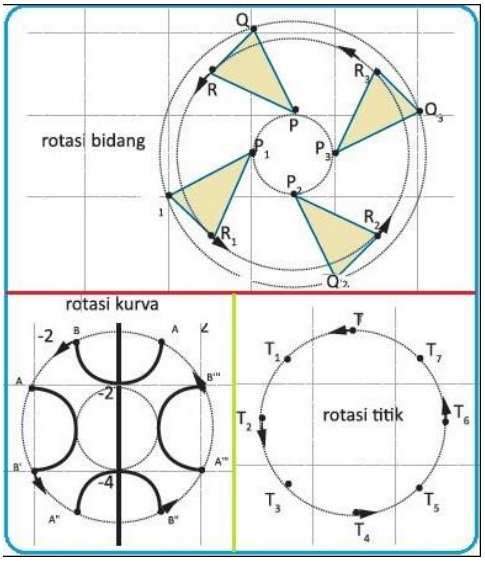
Rotation

Rotation in geometry transformation refers to the turning of an object around a certain point or along an axis. In rotation, the shape and size of the object remain unchanged, only its orientation changes. Rotation is often described using the angle of rotation, which determines how far the object is rotated



There are several Formulas of rotation, namely:

- Rotation of 90 degree with center (a,b): (x,y) $then$ $(-y+a+b, x-a+b)$
- Rotation of 180 degrees with center (a,b): (x,y) $then$ $(-x-2a, -y+2b)$
- Rotation by -90 degrees with centers (a,b): (x,y) $then$ $(y-b+a, -x+a+b)$
- Rotation by 90 degrees with centers $(0,0)$: $(x,y) then$ $(-y,x)$
- Rotation by 180 degrees with center $(0,0)$: $(x,y) then$ $(-x,-y)$
- Rotation by -90 degrees with center $(0,0)$: $(x,y) then$ $(y,-x)$

We can see the rotation in the joget lambak dance in the pucuk pisang song performed during the 2020 National Arts Week as follows

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Reflection

Reflection in geometry transformation refers to the reflection of an object across a specific line. In reflection, the

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shape and size of the object remains unchanged, but its orientation is reversed from the original one. The line used to reflect the object is referred to as the reflection lineThe general formulas of reflection include:

- Reflection about the axis $-x$: $(x, y)\ then\ (x, -y)$
- Reflection about the axis $-y$: $(x, y)\ then\ (-x, y)$
- Reflection about the line $y = x$: $(x, y) then\ (y, x)$
- Reflection about the line $y = -x$: $(x, y) then\ (-y, -x)$
- Reflection on line $x = h$: $(x, y)\ then\ (2h, -x, y)$
- Reflection on line $y = K$: $(x, y) then\ (x, 2k - y)$

We can see the reflection on the joget lambak dance in the pucuk pisang song performed during the 2020 National Arts Week as follows

Dilation

Dilation is a type of geometry transformation that changes the size of an object. This transformation can either enlarge or reduce the object, depending on the scale factor used. Dilation is generally done to a certain center point and done with a certain scale factor.

The general formulas of dilation include:

- Dilation with center (0,0) and scale factor k: $(x, y) then\ (kx, ky)$
- Dilation with center (0,0) and scale factor k: $(x, y) then\ (kx = k(x - a) + a, (k(y - b) + b))$

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CONCLUSION

In this journal, the author will tell you that joget lambak dance is not only about art, but in it we can also use it as one of the lessons on geometry transformation material. There are so many forms of geometry transformation found in the lambak dance movement pattern. Hopefully this research can be implemented as teaching materials or LKPD in school learning

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