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Ethnomathematics on traditional games: *Porok* from Penaga Village

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Abstract

Ethnomathematics is a science that studies the existence of mathematical concepts in social culture. One of the cultures in Indonesia is traditional games, which are a reflection of local wisdom. Traditional games can be linked to mathematics learning through an ethnomathematics approach. One example is the game of *porok*. The *Porok* game is among the most popular traditional games in Penaga Village, Bintan Bay and the Riau Islands. This game can potentially be explored regarding its use in mathematics learning. Thus, this research aims to dig deeper into the mathematical concepts and activities of the *porok* game as a form of ethnomathematics. This research uses a qualitative approach with an ethnographic design. The data source for this research is the head of the Dang Merdu studio in Penaga Village, Bintan Regency. Data collection was carried out through observation, interviews and documentation. The data analysis technique is carried out through 4 stages of analysis: domain analysis, taxonomic analysis, componential analysis, and cultural theme analysis. The research found basic activities and mathematical concepts in this game. The mathematical activities obtained are counting, measuring, explaining, playing and planning. Apart from that, this game has mathematical concepts, namely, value comparison, addition, geometric figures and probability, arithmetic sequences and series, probability and rotation.

Keywords: ethnomathematics; traditional *porok* game; mathematical mathematical activity; mathematical concept

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I. Introduction

As an archipelagic country, Indonesia is blessed with natural wealth in the form of abundant agricultural and marine products. Apart from that, Indonesia is also rich in various ethnicities and cultures (Marina & Izzati, 2019). Dicky said that as the Unitary State of the Republic of Indonesia, there are at least 1,340 ethnic groups (Aflah & Andhany, 2022). Every ethnic group in Indonesia also has its customs, traditional houses, dance, crafts and traditional arts. Thus, it can be said that Indonesia is truly rich in ethnic diversity and regional culture spread across various regions of the archipelago.

This ethnic and cultural diversity has a high aesthetic value from its artistic content. This

aligns with the opinion (Dewita et al., 2019) that cultural diversity in the country represents the richness of ideas and thoughts held by various ethnic groups in Indonesia. Culture is a people's way or outlook on life that has patterns and is inherited (Febrian & Astuti, 2022). Meanwhile, the overall results of this culture are called culture. Culture is inherent in human life (Astriandini & Kristanto, 2021).

These ideas often give birth to various mathematical conceptions. As stated by (Andriyani & Kuntarto, 2017), mathematical concepts are a form of abstraction from daily human activities that should be easy to understand and learn. Thus, the close relationship between mathematics and culture becomes clear in the dynamics of people's lives.

Despite this, many still view mathematics and culture as two separate things. However, according to Ubayanti et al. (Noto et al., 2018), Mathematics is part of the culture because learning makes Mathematics universal. Where, according to (Ramadhina et al., 2021). Mathematics plays a unique role as a foundation or basis for many other branches of knowledge, making it a fundamental and integral aspect of developing other sciences.

Apart from that, this view is reinforced by the opinion (Hardiarti, 2017) that culture is an entity that is inherent in people's daily lives, while mathematics is used to overcome various problems. Then obey (Pratiwi & Pujiastuti, 2020). Many activities in culture involve mathematical concepts and functions even without realizing it.

According to Wahyuni (Sulistyani et al., 2019), ethnomathematics bridges the relationship between mathematics and culture. Ethnomathematics is mathematics found in a culture. Through ethnomathematics studies, understanding of one's own culture and other cultures around it can be deepened. Indonesia is rich in culture and diversity. One form of Indonesian culture is traditional games.

Pratiwi & Pujiastuti (2020) Believes that traditional games are recreational activities carried out with or without simple tools, passed down from generation to generation. Next, according to Paramisuari and Purwani (2019), A game ranging from game rules playing areas to game tools can contain mathematical concepts.

There are various traditional games in Indonesia, one of which is *porok* game, which comes from the village of Penaga. Penaga village is one of the villages in the Bintan regency of the Riau Islands province. It has a cultural diversity with its special characteristics, such as malemang dance, games, *porok*, and bridal martial arts, which have become an art icon in Penaga village. Into *porok* game first played in 1882. Then, in 2003, the *porok* game went to China and got an award. This is a traditional game that royal mothers previously played in the Bintan kingdom in the 12th century. The local community stated that *porok* was used as an entertainment medium to entertain royal mothers. This game almost became extinct but has been preserved by emphasizing cultural and ethnological elements, including mathematical elements.

Previous studies have also discussed mathematical elements or concepts in other traditional games with different names and areas. Research conducted by (Astuti et al., 2023), who examined canang games in the Riau Islands, aimed to describe the mathematical elements contained in traditional games. From the results of the research carried out, it was discovered that there were mathematical concepts of addition and counting, comparison, measuring length, addition, displacement, and distance. Other research was conducted by (Pratiwi and Pujiastuti, 2020), who examined the marble game to identify and describe mathematical objects found in the traditional game of marbles and how they were used in mathematics learning. From the results of this research, there are geometric concepts such as circles, balls, triangles, and the concept of distance.

Furthermore, the researcher saw that research had yet to study the game of *porok* or anything similar. Seeing this potential, researchers feel it is necessary to study ethnomathematics in the traditional *porok* game.

Therefore, researchers consider it necessary to study "Ethnomathematics on Traditional Game: *Porok* from Penaga Village ", which is important to explore fundamental mathematical activities and mathematical concepts in traditional *porok* games. Based on the background described previously, the researcher can formulate the research question: "What fundamental mathematical activities and mathematical concepts are found in the ethnomathematics of traditional *porok* game in Penaga village, Bintan district?". Based on the research questions formulated, the researcher aims to describe how ethnomathematics works in *porok* game in Penaga Village, Bintan Regency.

II. Research methods

Based on the research that has been conducted, this research uses a qualitative type with an ethnographic approach. According to Nasution, qualitative research is realism research, where in this research, the researcher is the main instrument which looks directly into the field to obtain data using observation and interviews without being manipulated (Sulistyani et al., 2019).

The research was carried out in November 2023 in Penaga Village, Bintan, Riau Islands, which is the place where the game *Porok* was born. The subjects or informants of this research are traditional leaders from Penaga Village, Teluk Bintan, Bintan Regency, and the Riau Islands. Researchers examine games' pork, ranging from game tools, game techniques, calculations and ethnomathematical concepts found in games' *porok*.

The main instruments for collecting data in this research were observation sheets and interview guidelines designed based on the research grid. The data collection techniques used are observation, interviews and documentation.

This research began by compiling instruments such as interview sheet grids and observation sheets. Next, validate the lecturer teaching the ethnomathematics course. After validating the instrument, the researcher immediately went into the field to make observations.

The data analysis technique was carried out in 4 stages: domain analysis, taxonomic analysis, componential analysis and cultural theme analysis. The goal is to understand the mathematical aspects and cultural values of the game *porok*.

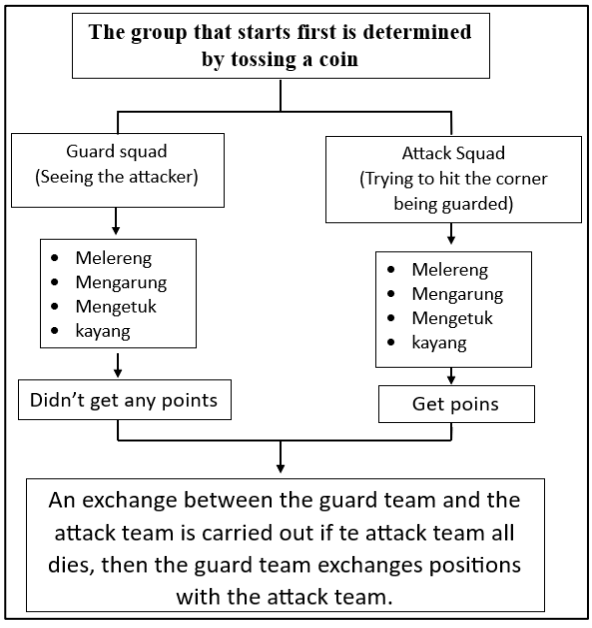
Table 1. Overview of ethnographic games studies *porok*

Guiding Questions	Initial Response	Analysis Steps	Point of View	Activity
Where to start observing?	In manufacturing activities, *porok* is based on traditional figures in Penaga Village, Bintan Regency and the game *porok* by players *porok* where there is potential for mathematical practice.	Domain	Culture	Conduct observations and interviews with players, *porok*, and traditional leaders in Penaga village, Bintan Regency.
How to view creation *porok* and how to play *porok*?	See aspects or details of creation and play *porok* in Penaga Village, where there is potential for mathematical practice in it.	Taxonomy	Think alternatively	Determine what ideas, methods, or potential techniques traditional leaders in Penaga Village and Bintan Regency use in making decisions related to mathematics practices or activities.

Guiding Questions	Initial Response	Analysis Steps	Point of View	Activity
What is the proof of the *porok* game has mathematical concepts?	Proof (Mathematical activity or concept as a result of alternative thinking)	Componential	Mathematics and mathematical philosophy	Recognize and differentiate the potential of certain characteristics in game activities *porok* related to mathematics.
What is its meaning?	Cultural values learned	Cultural Theme	Anthropology	Describe ethnomathematics in *porok* game by focusing on the relationship between activities and mathematical ideas or concepts.

III. Results and Discussion

The *porok* game is a traditional game, especially in Penaga Village, Bintan, and the Riau Islands, which are the places where the game is played. *Porok* was born. In the past, girls in Penaga Village often played this game. Besides the game, *porok* has also spread throughout the Riau Islands, one of which is in the Sting Island area. This research only focuses on Penaga Village, Bintan, and the Riau Islands' traditional game, the *porok*. The sequence of the game can be seen in the following diagram:



Picture 1. *Porok* game play sequence

Tools and materials

In the *porok* game, the tool used is a hollowed-out coconut shell. The perforated shell is called *porok*. One coconut shell will make two pieces. This tool is the main tool in the game and must be owned by every player. Therefore, the more players who play, the more coconut shells or *porok* are needed. From this activity, a mathematical concept regarding value comparison emerged.


Picture 2. *Porok*

Next, the shaft must be shaped in such a way that it is strong and does not harm the player. The shape of the *porok* used is half a ball. Designing the shape of the *porok* gave rise to the mathematical concept of geometric shapes with curved sides, where the shape in question is a sphere.

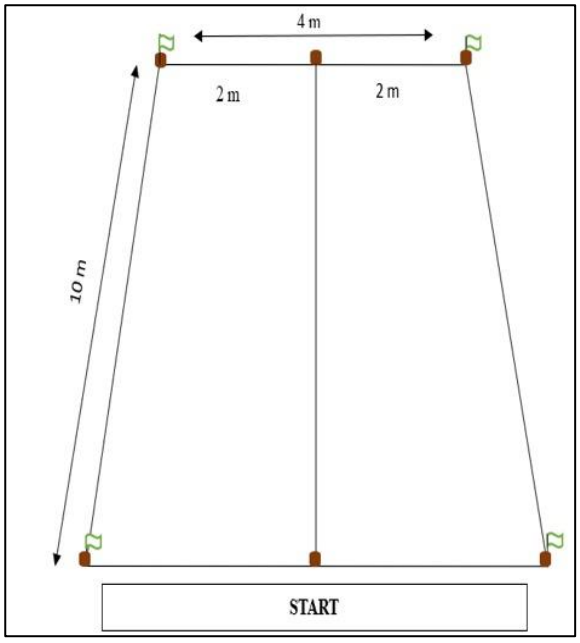
However, not only that, but the *porok* also needs to be designed with a central hole as seen in figure 2. In the half circle of the coconut shell, it is necessary to make a hole, provided that the shape is a circle, a flat shape in geometric mathematics. After measuring mathematically, the diameter of the hole formed is around 1:3 of the diameter of the shaft.

Play Ground

In the *porok* game, the playing field is rectangular. The width of the field is measured depending on the number of players who will play. If there are a large number of players, the field needed is larger than if there are a small number of players. So, when determining the size of a rectangular field, a mathematical concept is

formed in the form of flat geometric shapes and equivalent ratios.

Furthermore, the size is consistent when determining the position distance between players. Where each position distance between players is 2 meters. With this consistent distance, it is by mathematical concepts, namely sequences and arithmetic series. The mathematical size of the field can be seen in picture 3 if there are 3 players per team.



Picture 3. *Porok* playground

Analysis of Mathematical Activities and Mathematical Concepts in *Porok* Game

This *porok* game is usually played as a team, where two teams are playing the *porok* game namely the playing team and the guard team. The number of players between teams can vary, but there is a limit on the number of players ranging from 3-8 for each team. Team members are required to play well and be sportsmanlike in this game. For your information, each team has prepared its team members to play, so there is no determination of the members of each team.

The two existing teams then choose a leader to toss a coin to determine which team will play first and which will stand guard, as shown in Picture 4. After determining which team will play first, it will continue directly with playing traditional *porok*. Playing *porok* has no order of players, where the game is played immediately for all team members. Metal coins have two different sides, namely pictures and numbers. The probability that an image or number will appear when a coin is thrown is the same, namely ½ or 0.5. Players must do mathematical reasoning so that these two possibilities have the same chance of appearing. Understanding these odds is important so players can estimate which team has a greater chance of playing first in each game round. Predicting opportunities is also useful for decision-making and subsequent game strategies. So, it can be concluded that in determining which team will play first, namely by using a coin toss, an activity explains the probability or probability that appears.

Picture 4. Coin toss

In the first stage, the playing teams start at the starting line with *porok* prepared for each team member, and the guard team is on guard *porok* which has been prepared at the finish line. First, the playing team performs activities, as shown in picture 5.

Picture 5. Activity *Melereng*

Melereng is the beginning of running the game shell with the big toe. Demonstratively, it can be done by turning the body, hitting with the heel, and so on.

Each guard team member carries out this activity together, within limits, *melereng* is 3 times for each player. The distance between players, the guard and the playing teams is 2 meters. The playing field is 10 meters long, with

the width determined by the number of players. For example, if the number of players is 3, then the width of the field is 4 meters because the distance between each player is 2 meters.

The playing teams must carry out activities *melereng* well with marked with *porok* the *melereng* ones must touch *porok* which is guarded at the finish line by a team of guards. When the *porok* is tilted to touch the *porok* guarded by the guard team, the playing team will get points called the board.

Successful players *melereng* to *porok* to touch *porok* others at the finish line will get 1 board. For example, for a team of 3 people playing, and all three are successful, *melereng* to *porok* so that it touches another person, and then the playing team will get 3 boards. So, the *melereng* activity involves mathematical concepts in geometric transformations, namely rotation or rotation of the axle to roll it forward. Players need precision and motor skills to make turns and direct the shaft so that it hits the opponent's shaft. Thus, even though it looks simple, the m*elereng* activity in the traditional *porok* game trains an understanding of geometric transformation, especially rotation

After doing the activity *melereng*, The playing team returns to carry out the second activity in the *porok* game namely activity *mengarung* as in Picture 6. Meanwhile, the guard team continues to carry out its duties, namely guarding *Porok*, who is at the finish line.

Picture 6. Activity *Mengarung*

Mengarung means the shell is clamped with the right thumb and then kicked towards the opponent's shell. This activity is also carried out without sequence; in other words, it is carried out jointly by all playing team members. Throwing is only done once for each member of the playing team, which is for throwing *porok* must be face down, but if the player's throw is not face down, in other words on his back, a kick will be taken with a limit of 2 kicks to touch *porok* team playing with *porok* who is guarded at the finish line.

For each vertex that touches another vertex at the finish line, you will get points called boards. Every player who successfully touches their corner to another corner at the finish line will get a point, namely 1 board. Therefore, in *mengarung* activities, mathematical concepts emerge, such as probability and geometric transformations. The concept of chance can be shown by a team of players having the same probability of getting points because the chance of each hitting a corner is the same, namely 0.5. This shows that each player has an equal chance of getting points. Where when a player successfully touches his butt, the player will get a point, namely 1 board. Apart from the concept of chance, this *mengarung* activity gives rise to another mathematical concept, namely geometric transformation, more precisely the concept of rotation. As seen in Picture 6, a player shows *mengarung* activities.

After doing the activity *melereng* and *mengarung*, the playing team returns to carry out the next activity, namely *mengetuk* as in picture 7. *Mengetuk* means to knock the opponent when finished wide. If it fails, the bearer is considered *dead and gets no game points.*

Picture 7. Activity *Mengetuk*

This activity begins with walking with the head raised, which is done by every player who can play. The walking distance with the head raised is 10 meters according to the length of the playing field.

After each player arrived at the finish line with their heads still looking up, each player, *mengetuk* hit the corner on the finish line. If the *mengetuk* process is successful, each player

who plays will get a point, namely 1 board. However, if this process is unsuccessful, the player's team gets no points or sanctions. Therefore, in the *mengetuk* activity, mathematical concepts such as probability emerge. The concept of chance can be shown by a team of players having the same probability of getting points because the chance of each hitting a corner is the same, namely 0.5. This shows that each player has an equal chance of getting points. Where when a player successfully touches his butt, the player will get a point, namely 1 board.

After doing the activity *mengetuk*, the playing team returns to continue the next activity as a sequence in the game *porok* namely activity *kayang* as in picture 8. *Kayang* must be done well to get maximum points where there are 3 times *kayang*. *Kayang* is done at 1 foot from the player *porok* at the finish line.

Picture 8. Activity *kayang*

When the *kayang* is done perfectly, it is marked by the dowel touching another dot on the finish line. The second *kayang* is done with the distance between the player and the *porok* being 2 soles of the player's feet. Likewise with the third *kayang*, but in this third *kayang*, the distance between the player and the *porok* at the finish line is 3 soles of the player's feet. *Kayang* is a bouncy body activity carried out by each player from the playing team. The calculation of points in this *kayang* activity is the same as the three previous activities. The goal of the *kayang* is to make the thrown throw touch the opponent's bottom at the finish line. If the player succeeds in doing so, they will get 1 board. Where in the game of *porok*, 1 point is equal to one board. Therefore, *kayang* activities in the *porok* game involve mathematical concepts, namely geometric transformations, especially rotation or turns. This can be seen in Picture 8. The player must rotate or bend his body appropriately to direct the throw to hit the target accurately. Turning the body on the *kayang* requires flexibility and body coordination. This activity trains motor skills, flexibility, and understanding of geometric transformations. Even though it looks like just playing and moving freely, this activity contains a deep mathematical concept: geometric transformations.

Table 2. Ethnomathematics identified from the *porok* game

Domain	**Ideas, Methods, Mathematical Techniques**	**Math activities in *porok* game**	**Emerging mathematical concepts**
Count	Determines the number of game tools in the *porok* game	Counting the number of tools in the game, *Porok* is adjusted to the number of players. The more players there are, the more tools will be needed in terms of the number of tools in the *porok* game, determined based on the number of players.	Worth comparison
	Determines the total score in the game *porok* which is obtained from the term "knock on the board".	The player's score can be seen from the team that completes the knock on all the opponent's boards. In the *porok* game there is a term "knock on the board". So, if you have tapped all the shells guarded by the opposing team in the game, it is called having captured all the opponent's shells, which means all the shells have been taken, and the points can be counted as 8 boards.	Addition

	Determine the number of materials needed in the *porok* game	The number of coconut shells required in the game *Porok* is adjusted to the number of players. If the team consists of 4 players, you need 2 whole coconut shells, each cut into 2 parts to make 4 pieces of *porok*.	Worth comparison
Measure	Determines the size of the field in the *porok* game use standard units	Field measurements are carried out by determining the shape of the field. Once it is known that the shape of the field is rectangular, the next process is to measure the length and width of the field. The width is determined by the more players, the wider the field size in the game of *porok*.	Flat shape geometry and worth comparison
	Determine the position distance between players using standard units.	You can measure the distance between players using a meter where the field's length is consistently 10 meters, while the width depends on the number of players. However, the distance between players is 2 meters. It has become a rule and regulation. This distance between players also brings up mathematical concepts. The concept of an arithmetic sequence is precise because measuring the distance between players gives the idea that the value of each term is obtained from the previous term by adding a number. Apart from that, in this measurement, the difference between the values of adjacent terms is always the same, namely 2 m. Therefore, it measures the distance between players in the *porok* game gave rise to mathematical concepts, namely arithmetic sequences.	Arithmetic sequences and series
Explain	Determine the attacking and guarding teams using a coin toss.	Determining the attacking team and the guard team uses a coin toss up. Where both teams choose who is the number and who is the picture.	Probability
Play	Do activities *melereng* by using the big toe on the *porok* game.	On the *porok* game, one main activity must be present, namely carrying out activities *melereng*. This activity is the beginning of running the game shell with the thumb. So, this activity gives rise to a mathematical concept, namely geometric transformation, or more precisely, rotation.	Rotation
	Carrying out activities aimed at *mengetuk* opponent's shell when finished *wade* on the *porok* game.	On the *porok* gamethere is activatable. Where activityable involves movementable, which includes the concept of rotation with the angle and speed of the body when bending the body backwards.	
Designing	Design basic shapes *porok* by dividing two coconut shells into a half-shape shape	The spherical coconut shell is split into two equal parts so that the shell that has been divided is half-spherical in shape.	Geometry of curved sided shapes
	Design a hole on the top surface *porok* includes flat shapes	During creation *porok*, it is necessary to design a circular hole on the coconut shell's top surface, which has previously been divided into half balls. Selecting the shape's centre point and then making a hole using the tools provided.	Flat shape geometry

Based on the research results, there are several mathematical activities and concepts in traditional games. This game is part of Indonesian culture. Culture is a system of values and ideas that a group of people lives in a certain living environment and a certain period (Kusumaningsih, 2019). These mathematical activities and concepts include counting, measuring, explaining, playing and designing.

The first activity is counting. The *porok* game has a fundamental mathematical activity: counting the number of tools needed. The game's

tools are adjusted to the number of players. The more players there are, the more tools will be needed. In addition, the player's score can be seen from the team that successfully taps all of the opponent's boards. In the *porok* game there is a term "knock on the board". So if, in the game, you have knocked on all the shells guarded by the opposing team, then that team is said to have captured all of the opponent's shells. This means all the shells have been successfully taken, and the points can be counted for 8 boards. The number of coconut shells required in the *porok* game also adjusted to the number of players. For example, if the team consists of 4 players, you need 2 whole coconut shells, each cut into 2 parts so that there are 4 pieces *porok*.

Thus, equivalent comparisons and additions are used to calculate the mathematical concepts that appear in these activities. According to Hamidah et al., (2017), a comparison is a relationship or relationship between two certain quantities, while a comparison of worth is a statement about two equal ratios. Meanwhile, addition combines groups of numbers or more to produce a number, the sum of the numbers minus their reciprocals (Taus et al., 2022).

Another mathematical activity that we can find is measuring activities. According to (Febrian and Astuti, 2022), measuring is an activity that includes quantifying quality for comparison and measurement purposes, using objects as measuring tools with associated units or "measure-words". There are measuring activities contained in the *porok* game, namely, field measurements, which are carried out by determining the shape of the field first. Once it is known that the shape of the field is rectangular, the length and width of the field are measured. The more players determine the width, the larger the field size in the game of porok. Therefore, the mathematical concepts in this activity are the geometry of flat shapes and equivalent comparisons.

Furthermore, measuring the distance between players is also carried out using a meter, provided that the field's length is 10 meters and the width depends on the number of players. The distance between players is 2 meters. This distance between players also brings up mathematical concepts. The concept of an arithmetic sequence is precise because measuring the distance between players gives the idea that the value of each term is obtained from the previous term by adding a number. Apart from that, in this measurement, the difference between the values of adjacent terms is always the same, namely 2 m. Therefore, it measures the distance between players in the game, which gave rise to mathematical concepts, namely arithmetic sequences. An arithmetic sequence has the characteristic that each successive term has the same difference or difference (Ismail, 2015).

Apart from counting and measuring activities, there is another fundamental mathematical activity in traditional games: explaining. Explaining activities include finding ways to account for phenomena, whether religious, animist, or scientific (Febrian & Astuti, 2022). Probability material has many applications in everyday life, especially in estimating the possibility of an event, as stated by Riana 2020 (Sari et al., 2022). On the *porok* game, the concept of probability arises when the activity determines the turn to play, the team that will play first is determined by tossing a coin. Players must use mathematical explanations and reasoning to determine the probability of a certain image appearing on a coin toss. They need to explain that a coin thrown has two possible outcomes, namely a picture or a number, so the probability of a picture appearing is 1/2 or 0.5. A mathematical explanation process like this is needed so players can understand the fundamental concept of chance. It can be applied when determining their turn to play *porok* using coins. Understanding the odds will help players predict which team will likely play first in each game round. The simple activity of tossing a coin determines your turn to play *porok*, which contains activities explaining in-depth mathematical concepts.

Next, in the game *porok* the players perform various movements such as mooring and

kayang. This activity is included in the fundamental activities of mathematics. Play is an activity that includes designing and engaging in games and entertainment, playing by rules with more or less formal rules that all players must adhere to. (Febrian & Astuti, 2022), Because players must understand and follow the applicable rules of the game. Specifically, on *porok* game, one main activity must be present, namely carrying out activities melereng. This is the beginning of running the game shell with the thumb.

Besides, on the *porok* game there are also activities called *kayang*. This activity involves a flexible twisting of the body backwards. Thus, these two activities give rise to the mathematical concept of geometric transformation, specifically rotation. Rotation is a type of geometric transformation that rotates a flat shape around a central rotation point at a certain angle (Loma et al., 2023).

In traditional *porok* game, there is a fundamental mathematical activity in designing. Design activities include creating shapes or designs for an object or part of one's spatial environment (Febrian & Astuti, 2022). Examples of design activities in *porok* game is making game equipment *porok* itself. Starting from the ball-shaped coconut shell is split into two equal-sized parts until it is split into a half-ball shape. Then, a spiral-shaped hole is made on the top surface of the half-ball coconut shell. The hole is made by determining the centre point on the surface of the half-sphere, then punched using the tool that has been prepared. Thus, making to spook involves design activities by applying geometric concepts. According to Iswati and Putra on (Muslimin & Rahim, 2021), Geometry discusses everyday life problems in the form of natural phenomena, shapes of objects and activities carried out, most of which are the result of geometry.

Pane figure is a material that is closely related to everyday life. We find many items around us that have shapes similar to or even the same as flat shapes, such as rectangular doors, circular plates, kites and others (Kuswidi et al., 2021).

Meanwhile, a geometric shape is a regular three-dimensional shape with sides, edges and corner points (Subagyo et al., 2015). Spatial shapes are formed from several flat areas, such as squares, rectangles, triangles or circles.

Traditional games can be a means for children to learn basic mathematical concepts while playing and having fun. Traditional games also contain elements of mathematics learning that can be explored and used as mathematics learning media, making it easier for teachers to convey material about flat shapes that Maulida will present (Taskiyah & Widyastuti, 2021).

IV. Conclusion

Based on the results of research that has been carried out, there are mathematical activities and mathematical concepts in the *porok* game. This *porok* game has mathematical activities in the form of counting, measuring, explaining, playing, and designing. Mathematical concepts are also found in *porok* game activities. The existing mathematical concepts are the concepts of equal comparison, addition, the geometry of plane figures and probability, arithmetic sequences and series, probability, and rotation. The mathematical activities in this *porok* game provide the experience that mathematics learning is carried out at school and in everyday activities such as playing.

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