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ETHNOMATHEMATICS:

SOLUTION TO HAUSA PUZZLES USING MATHEMATICS CONCEPTS FOR TEACHERS AND STUDENTS

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Abstract

This paper explores and discuss the use of ethno-mathematics approach in solving Hausa puzzles through mathematical concepts and its implications for teaching and learning mathematics. The study was motivated by the desire to link school mathematics with students' cultural experiences in order to improve understanding, commitment, interest, achievement and relevance of mathematics. The paper employed a qualitative method. Data were collected using literature review and interviews with students, pre-service teachers, lecturers, and members of the Hausa community in Kano State. The respondents provided examples of Hausa puzzles which were analyzed and solved to identify their underlying mathematical concept and ideas. The findings showed that there are many Hausa puzzles connected to mathematical concepts that mathematics teachers and students can use to improve the teaching and learning of mathematics. In addition, it was found that incorporating these puzzles into classroom teaching and learning can make mathematics more meaningful, reduce psychological stress and promote learners' engagement and motivation. The study established that mathematical ideas and concepts are embedded in Hausa culture, thereby vanishing the misconception that there is no mathematics in Hausa culture, mathematics starts and end only in classroom, mathematics has no relevance to Hausa people. The paper concludes that ethno-mathematics creates a suitable bridge between mathematics learning and culture. It was recommended that mathematics and Hausa language teachers should integrate culturally based puzzles and examples into teaching and learning to enhance learners' understanding, interest and commitment in mathematics.

Keywords: Mathematics, Ethno-mathematics, Hausa culture, Hausa Puzzles



Introduction

Mathematics is fundamental to sciences, technology, social sciences and other disciplines of knowledge, because of its intellectual prowess, mathematics stand-alone without depending on other areas of studies (Sidi, 2025 and Okafor, Balogun, & Abubakar, 2026). Being one of the oldest academic fields and contributing to the development of other courses is one of the main reasons mathematics is so powerful around the world (Ilmaa, & Usodoa, 2024). As a result, several countries around the world, including Nigeria, have made mathematics learning mandatory at both basic and post-basic levels (NPE, 2014).

Unfortunately, a significant percentage of today's mathematics curricula provides little to assist students in acquiring the knowledge and abilities required to succeed in this digital era. The failure rate of mathematics in our higher education institution and at every level of education is proof of this. Nigeria ranked bottom out of eleven other English-speaking West African countries due to the extremely high rate (Shuabu, 20218 and Shuaibu, Sidi & Ahmad, 2020; Sidi, Gurjiya, and Sadoh, 2024).

Majority of researchers in the field of mathematics education in Nigeria agreed with the observations that students at all levels encounter difficulties in learning mathematics. The method of teaching mathematics in Nigeria is totally irrelevant with the background and local environments of the learners, making teaching and learning Mathematics difficult and more abstract (Ilmaa, & Usodoa, 2024). Ahmad, Sidi & Shu'aibu, (2020) found that students have difficulties in understanding the concepts of Mathematics, while teachers find it difficult with teaching and learning. According to Shu'aibu (2018) teachers face difficulties due to the methods they employed when teaching mathematics. Their methods of teaching are totally based on European culture; consequently, students view mathematics as a difficult subject and perceive it as Western knowledge. The method of teaching mathematics is completely out of pace with the students' backgrounds and local environments. It does not encourage students' engagement, active participation and commitment in the classroom. The Nigerian mathematics curriculum is totally foreign-oriented, does not emphasize Nigerian culture, and solely relies on Eurocentric culture.



The seeming lack of basic mathematical ideas is one of the effects of relying on this eurocentric curriculum and teaching strategies, which leads to rote learning and poor student performance (Shuaibu, 2014b and Sani, & Gobir, 2026). One source of this challenges might be in the abstract nature, lack of instructional strategy, the teachers' qualifications, lack of students' interest and other is inherent in the methodology of teaching mathematics. A substitute way of teaching mathematics in relation with students' cultural perspective need to be sought. However, the effect of Hausa puzzles facilitate the development of mathematical reasoning and problem solving (Shuaibu, 2014a). The Hausa community have mathematical idea embedded in their culture, and they practice them through everyday life activities which include puzzles, trading, business, farming, communication, games, and other aspects of life. All these mathematical concepts native in Hausa culture can benefit teachers and students by making the teaching and learning of mathematics simpler and more relevant. Therefore, the researchers are of the opinion that Hausa cultural in their puzzles may have a significant contribution on students' mathematical ability. Hence, this paper explored the concept of Mathematics in Hausa puzzles with implications to teaching and learning of mathematics for students and teachers.

REVIEW OF RELATED LITERATURE

Hausa Culture

Hausa is a language commonly found in the West African Sahel area, largest percentages of the Hausa population are found in Northern Nigeria and southern Niger. A significant number is also found in Saudi Arabia, Central Africa, Niger, Mali, Sudan, Cameroon, Ghana, Cote d'ivoire and Chad (Ahmad, Sidi & Shu'aibu, 2020; Pawlak, 2023; Inuwa-Dutse, 2025 and Sani, & Gobir, 2026). According to Shuaibu (2018), the Niger and Benue Rivers geographically converge to form a 'Y' shape that splits Nigeria into three separate entities. Fortunately this 'Y' shape marks the boundaries of the three major ethnic groups with the Hausa in the North, the Yoruba in the south-west and the Igbo in the south-east. In the present study the culture of the Hausa ethnic group will be addressed as a method of helping students to like and understand mathematics as well as enhancing and promoting the image of Hausa cultural study.



Hausawa are well known in their traditional activities such as: blacksmith, tailoring, rearing, wood carving, weaving, dyeing (shuni), trading (both exporting and importing). The most important aspect of their cultural activities is agriculture, that one they explain with the saying, “Noma na duké tsohon ciniki, kowa ya zo duniya kai ya tarar!” as stated by (Shu’aibu, 2014). These Hausa activities, occupations, and engagements cannot take place without systematic and critical thinking, as well as logical reasoning. One may therefore agree that systematic and logical reasoning are concepts of mathematics. This indicates that the Hausa culture possess ways of acquiring mathematical skills and thinking in one way or another, even without consciously realizing it.

The Hausawa, in their culture, have numerous strategies of teaching and learning, such as storytelling, folktales, puzzles (wasa kwakwalwa), and games. Elders use these approaches to shape the minds of younger generations and develop their cognitive thinking abilities. Hausa people practice mathematics through what they call wasa kwakwalwa (puzzles), which invite the interests of the writers to work on the topic, “Ethno-mathematics: Solving Hausa Puzzles Using Mathematics.” This paper aims to proof that mathematics is not only for Europeans, nor is it an abstract and uninteresting, as perceived by some Hausa students. Rather, mathematics is also found and embedded in Hausa culture, which is referred to as ethno-mathematics, that is, cultural mathematics. This paper reviewed the methods of solving Hausa puzzles using mathematics concepts such as Algebra, Set theory, Matrix, Quadratic Equation, Geometry, Trigonometry, Sequence and others to see if Ethno-mathematics could be assist in enhancing pupils performance and promote their interest in mathematics.

ETHNOMATHEMATICS

Mathematics is very important in our culture and our everyday life in general; allowing us to make sense of the world and to manage our lives. Mathematics enables us to model real life situation and make connections. It equips us with the skills we need to interpret and analyze information, simplifying and solve problems, assessing risk and informed decisions. Mathematics has been described as the queen of science, and cannot be separated from science,



because of its application to physical science. (Ahmad & Aldiabat, 2024 and Ilmaa & Usodoa, 2024; Sudirman, Rodríguez-Nieto, & Bonyah, 2024).

The concept of ethno-mathematics requires a good explanation because it describes concepts that are neither rigid nor singular namely; “ethno” “Mathema” and “tics”. “Ethno”: refers to different cultural groups such as national, tribes, societies, labor groups, children of a certain age groups, professional classes etc. and their specific ways of reasoning and inferring (D’Ambrosio 1987). He further said “Mathema”: means to explain, understand and manage reality specifically by ciphering, counting, measuring, classifying, ordering, inferring and modeling patterns arising in the environment or culture. Again “Tics” here means art or technique.

Therefore, ethno-mathematics can be described as

“The mathematics which is practice among identifiable cultural groups such as national, tribes, societies, labor group, children of certain age bracket and professional classes”, (Nur, Kartono, Zaenuri, Waluya, & Rochmad, 2020; Abah, Atondo, & Kwaghwa, 2020; Rosa, & Orey, 2021).

Pawlak, (2023); Inuwa-Dutse, (2025); Sani, & Gobir, (2026) and Okafor, Balogun, & Abubakar, (2026) pointed out that, the practiced of mathematics by cultural group can be different from its well-known and recognized form, which is called Eurocentric mathematics. That is different from its western European form of mathematics. This paper address Hausa puzzles such as (Two five that dose not make ten. “Biyar biyu bata goma”, Talle was ask to bring out two mangoes from a garden. “An ce da Talle a tsunko mangoro guda biyu a cikin lambu”) in solving mathematics problems for example (Set theory, geometry progression G.P, algebra, trigonometric and quadratic equation etc) that will promote the ideal of ethno-mathematics in Hausa cultural heritage.

Objectives of the Study

1. To determine Hausa puzzles relevant to Mathematics for teachers and students.
2. To determine the concepts of Mathematics from Hausa puzzles that can be used by the teachers and students.

Research Questions

1. What are the Hausa puzzles relevant to Mathematics for teachers and students?
2. Are there a concept of Mathematics from Hausa puzzles for teachers and students?



Statement of the Problem

The method of teaching Mathematics in Hausa culture is confronted with problems like the style in which it is taught. Students experience problems in solving mathematics because of its abstract method of teaching they are complaining that mathematics is not in practice and has no relevance to their Hausa culture. These perceptions might lead to students' poor achievement and negative consequences on the human development (Shu'aibu, 2018; Sadi, 2019; Ahmad et al., 2020b; Pawlak, 2023; Inuwa-Dutse, 2025; Sani, & Gobir, 2026; Okafor, Balogun, & Abubakar, 2026). Hausa puzzles, which embed indigenous mathematical skills, are not used in most classroom teaching (Shu'abu et al., 2020a). Therefore, to promote teaching and learning for both teachers and students, ethno-mathematics need to be explore as a strategy for solving Hausa puzzles. This paper used Ethno-mathematic as a method of solving Hausa puzzles relevant to classroom mathematics for teachers and students.

Methodology

Descriptive survey would help to explore the wide range of Hausa puzzles relevant to classroom mathematics (Shuaibu, 2018). The paper used this technique to explore wide range of coverage of Hausa puzzle and solved them for teachers and students. A qualitative research technique base on oral interview with an elderly Hausa people and other members in the Hausa community was used to gather the data .

Findings: This section, present where the concept of mathematics lies in Hausa puzzles and all the topics that can be explored for teachers and students.

1. The use of Set Theory as a Tool for Analyzing Hausa Puzzle

Two fives that does not make ten. There was a man lives with his wife and their four children. Destiny made it possible for their separation. Each one of them married again with another chosen partner. They luckily bear a child, that is she bears a child with her new husband and he too bears a child with his new wife. In the same vein they started showing that they all have five-five children which are not, because the two fives does not make ten.

Solution: The saying two fives do not make ten can be proved using set theory as:

Let the set of the family be X which can only be expressed as



$X = F \cup M = \{a, b, c, d\}$, is a unique representation of family before separation.

Where U is a union of the set, F is a father, M is a mother, X is a universal set of father and mother. Now, after they separated, X as a unique representation became

$X = F \cup M = \{a, b, c, d, e, f\}$ where e and f are the distinct new children. $F = \{e\}$ and $M = \{f\}$

The combination of F and M before and after the separation $F = \{a, b, c, d, e\}$ and $M = \{a, b, c, d, f\}$

$F \cap M = \{a, b, c, d, e\} \cap \{a, b, c, d, f\} = \{a, b, c, d\}$ which indicates the number of children before separation while the union of F and M is

$F \cup M = \{a, b, c, d, e, f\}$ which indicates the number of children before and after the separation.

Analysis: Thus, theoretically, one common five (in the settings that cannot be shared) belonging to two people doesn't give total of ten (10). But rather the total of five (5) itself.

Hence, two five cannot make ten. (Biyar biyu bata goma)

Observation: This finding revealed that, the Hausa puzzle embodies mathematical concepts like set, universal set, union and intersection of the set, logical thinking, proving, relationship and counting. The finding demonstrates that Hausa puzzles contain mathematical concepts relevant to teachers and students

2. The use of Geometric Progression as a Tool for Analyzing Hausa Puzzles

Talle was asked to bring out two mangoes from a garden. The garden has ten (10) gates with gate man each. Whatever number of mangoes Talle have, it should be divided with each of the gate man. How many mangoes do the Talle have to carry? Shuaibu (2014)

Solution

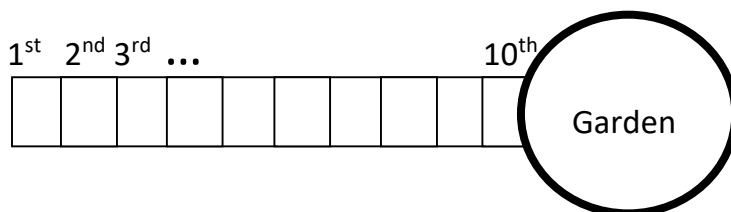


Figure 1: Number of gates to be followed by Talle into the garden

Let Z_1 be the number of mangoes at 1st gate, Z_2 be the number of mangoes at 2nd gate,

Z_3 be the number of mangoes at 3rd gate..., Z_{10} be the number of mangoes at 10th gate,

Therefore we have this sequence, $Z_1, Z_2, Z_3, \dots, Z_{10}$



The goal is to find the total number of mangoes Talle carry at the initial point, since at 1st gate Talle is expected to carry 4 mangoes, 2nd gate 8 mangoes, 3rd gate 16 mangoes and so on. Up to 10th gate. Hence, we can generate the following sequence: 4,8,16,32,64,...

This sequence can be solved using Geometric Progression (GP), $U_n = ar^{n-1}$, $a = 4$, $r = 2$, $n = 10$
 $U_{10} = 4 \times 2^{10-1} = 2048$. Therefore, the number of mangoes Talle needed at the 10th gate is 2048

Analysis

1 st	2 nd	3 rd	4 th	5 th	6 th	7 th	8 th	9 th	10 th
4	8	16	32	64	128	256	512	1024	2048

The findings showed that this Hausa puzzle contain mathematical ideas include series and sequence (geometric progression), problem solving, logical thinking, counting and sharing etc. The finding indicates that Hausa puzzles contain mathematical ideas relevant to teachers and students

3. The use of Quadratic and Simultaneously as a Tool for Analyzing Hausa Puzzles

Malam Talle has pigeons and chickens, but he did not keep record of their numbers. Then his son, Tanko, asked him how many pigeons and chickens he has now. Talle told him that if the number of pigeons and chickens are added together, they make thirteen. But if the number of pigeons is multiplied by the number of chickens, the result is forty.

Solution: Let u be the number of Tattabarau, Let v be the number of Kaji

Let us solve the problem simultaneously

$u + v = 13$(1), $uv = 40$(2), From equation (1)

$v = 13 - u$ From (2) $uv = 40$, $u(13 - u) = 40 \Rightarrow 13u - u^2 = 40 \Rightarrow u^2 - 13u + 40 = 0$... (3)

$(u - 5)(u - 8) = 0 \Rightarrow u = 5$ or $u = 8$, substitute $u = 5$ or $u = 8$ in (a) which is $u + v = 13$

If $u = 5$ then $5 + v = 13$, which implies as $v = 13 - 5 \equiv v = 8$

If $v = 8$ then $8 + v = 13$, which implies as $v = 13 - 8 \equiv v = 5$

Check: $8 + 5 = 13 \Rightarrow 8 \times 5 = 40$, Hence, $(u, v) = (5, 8)$ or $(u, v) = (8, 5)$

Therefore, the number of pigeons are either 8 or 5 also, the number of chickens are either 5 or 8

Alternatively: This Puzzle can also be solved using almighty formula

From; $u^2 - 13u + 40 = 0$ (3), So, $a = 1$, $b = -13$, $c = 40$

$$u = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-(-13) \pm \sqrt{(-13)^2 - 4 \times 1 \times 40}}{2 \times 1} =$$

Therefore, the number of pigeons are either 8 or 5 also, the number of chickens are either 5 or 8



Observation The findings revealed that this Hausa puzzle embodies mathematical concepts like word problem, quadratic equation, factorization, normalization, sharing, counting, ordering, logical thinking and relationships would. The finding demonstrates that Hausa puzzles contain mathematical concepts relevant to teachers and students.

4. The use of Matrix as a Tool for Analyzing Hausa Puzzles

Tanko has onions and tomatoes, and the total number of items he has is 18. Lado asked Tanko, "How many onions and tomatoes do you have? Tanko replied, "The total number of items I have is equal to twice the number of onions, plus three times the number of tomatoes." Then Lado also, asked Musa the same question: "How many onions and tomatoes do you have? And the total number of items he has is 20 " Musa replied, "The total number of items I have is equal to the product of five times the number of onions, times twice the number of tomatoes.

Solution: we can apply the method of solving a system of linear equations using matrices. Particularly, using method of matrix inversion or Cramer's rule.

$AX = B$, therefore we have; $2v + 3u = 18$ and $5v + 2u = 20$

Hence, we can represent these equations into

$$\begin{bmatrix} 2 & 3 \\ 5 & 2 \end{bmatrix} \begin{bmatrix} v \\ u \end{bmatrix} = \begin{bmatrix} 18 \\ 20 \end{bmatrix}$$

$$A^{-1} = \frac{1}{-11} \begin{bmatrix} 2 & -3 \\ -5 & 2 \end{bmatrix} = \begin{bmatrix} -\frac{2}{11} & \frac{3}{11} \\ \frac{5}{11} & -\frac{2}{11} \end{bmatrix}$$

Note, you can multiply the inverse of a given matrix say A^{-1} with the constant vector B ($A^{-1} \times B$) the result will be a vector of values correspond to first row of the inverse is for v , and second row of the inverse is for u

$$\begin{aligned} A^{-1} \times B &= \begin{bmatrix} -\frac{2}{11} & \frac{3}{11} \\ \frac{5}{11} & -\frac{2}{11} \end{bmatrix} \begin{bmatrix} 18 \\ 20 \end{bmatrix} = \begin{bmatrix} -\frac{2}{11} \times 18 & + & \frac{3}{11} \times 20 \\ \frac{5}{11} \times 18 & + & -\frac{2}{11} \times 20 \end{bmatrix} = \begin{bmatrix} -\frac{36}{11} & + & \frac{60}{11} \\ \frac{90}{11} & + & -\frac{40}{11} \end{bmatrix} = \begin{bmatrix} \frac{-36+60}{11} \\ \frac{90-40}{11} \end{bmatrix} \\ &= \begin{bmatrix} \frac{24}{11} \\ \frac{50}{11} \end{bmatrix}, \text{ Recall, the first row is for } v, \text{ and second row is for } u, \text{ Now, } v = \frac{24}{11} \text{ and } u = \frac{50}{11} \end{aligned}$$

$$\begin{aligned} \text{Check; } 2v + 3u &= 18, & 2 \times \frac{24}{11} + 3 \times \frac{50}{11} &= 18, \text{ which implies as } \frac{48}{11} + \frac{150}{11} = 18 \\ 5v + 2u &= 20, & 5 \times \frac{24}{11} + 2 \times \frac{50}{11} &= 20, \text{ which implies as } \frac{100}{11} + \frac{220}{11} = 20 \end{aligned}$$



Observation: The findings revealed that this Hausa puzzle embodies mathematical concepts like matrix, order of the matrix, Cramer's rule, word problem, quadratic equation, factorization, normalization, sharing, counting, ordering, logical thinking and relationships would. The finding demonstrates that Hausa puzzles contain mathematical concepts relevant to teachers and students

5. The use of Trigonometry as a Tool for Analyzing Hausa Puzzles

Muhammad's room's floor is identical to silos shape and that of Arifullahi's look like our school four-corner classes as well. Muhammad ask Arifullahi that by which nature is our room's floor looks like yours?

Solution: Since the floor of silo looks like a circle and that of four corner classes looks like a square or rectangle, then let the floor of silo (circle) be x . Since x is a circle it has 360^0 (Angle at the center of circle). Let the floor of four-corner class be y , has four equal angles of 90^0 each.

Hence, $90^0+90^0+90^0+90^0=360^0$ Or $4 \times 90^0 = 360^0$

Analysis: Therefore, x and y are the same in terms of angle.

Although x and y can be described similar as having 360^0 , when the circular floor room as well as rectangular room is tiled with rectangular tiles, from tessellation theory, the rectangular floor will be more economic than a circular floor room. Because rectangles can cover the place completely without gaps, whereas circular cannot cover the surface completely.

Observation: The findings revealed that this Hausa puzzle involves mathematical concepts such as plane shapes (square, rectangles and circles etc.), solid shapes (cone, sphere and cylinder etc.), angle (angle at the centre of a circle, right angle etc.), arc, sector, segment and chord etc. The finding shows that Hausa puzzles contain mathematical concepts relevant to teachers and students

6. The use of Algebra as a Tool for Analyzing Hausa Puzzle

In one of the Allo (Qur'anic) school, there are students who are paying their weekly fee (Kudi laraba) and also others are not. If one of those who are not paying moves to or joins with those who are paying, those who are paying will be multiple of those who are not paying. And also if one of those paying their weekly fee fails or refuses to pay joined who are not paying, those who are not paying will be equal to those who are paying, how many students are paying and how many are not?



Solution Let the number of students paying be M and students not paying be N

Since, if one of those who are not paying joining who are paying those who are paying will be multiple of those who are not paying.

Then, $N - 1 = M + 1 \Rightarrow 2(N - 1) = M + 1 \Rightarrow 2N - 3 = M \dots\dots\dots(i)$

And, if one paying joins who are not paying. Then, $N + 1 = M - 1 \dots\dots\dots(ii)$

Substitute (ii) in (i) $\Rightarrow N = (2N - 3) - 2 \Rightarrow 2N - 5 \Rightarrow N = 5$. Putting $N = 5$ in equation (i) $\Rightarrow$

$M = 2(5) - 3 \Rightarrow 7 \therefore N = 5$ and $M = 7$. Therefore, 7 students are paying while 5 are not paying

Analysis: From equation (i) $(5 - 1) = 7 + 1 \Rightarrow 4 = 8$ and Equation (ii) $7 - 1 = 5 + 1 \Rightarrow 6 = 6$

This shows that if those who are not paying joins those who are paying, there will be eight students paying and four students who are not paying. Also from (ii) it indicates that those who are paying joins who are not, their numbers will be equal.

Observation: The findings revealed that this Hausa puzzle embodies mathematical concepts like simultaneous equations, word problems leading to linear equation, algebra, multiplication, addition, subtraction. The finding demonstrates that Hausa puzzles contain mathematical concepts relevant to teachers and students

7. The use of Quadratic Equation as a Tool for Analyzing Hausa Puzzle

A mother has some amount of Tofu and beans cake she doesn't know their actual numbers. She asked her daughter to tell her their numbers at hand. The girl says if we added Tofu and beans cake, their number will be seven, but if we multiply them together we will get 10, what is the actual number of Tofu and beans cake?

Solution: This can be solved using factorization. Let x be the number of tofu, y be the number of beans cake, If x is added to y, their number is 7

$\Rightarrow x + y = 7 \dots\dots\dots(i)$ And their multiple will be $xy = 10 \dots\dots\dots(ii)$

by making x subject of the formula in (i) and put it in (ii), we have $x = 7 - y - - - - (iii)$

$\Rightarrow 7y - y^2 = 10 \Rightarrow y^2 - 7y + 10 = 0$, Using factorization method, we have

$y^2 - 5y - 2y + 10 = 0 \Rightarrow y(y - 5) - 2(y - 5) = 0 (y - 2)(y - 5) = 0 \Rightarrow$ Either $(y - 2) = 0$ or

$(y - 5) = 0 \Rightarrow y = 2$ or $y = 5$



Analysis: The result shows $x = 2$ or $y=5$ and $y=2$ or $x=5$, therefore if $x = 2$ or $y=5$, means when Tofu is added to beans cake $x+y=7 \Rightarrow 2+5=7$ and if the number of Tofu multiply with the number of beans cake, we can get $2 \times 5 = 10$.

Observation: The findings revealed that this Hausa puzzle involves mathematical ideas such as quadratic equation (factorization method), change of subject of the formula, word problems leading to quadratic equation, quantity, logical thinking, algebraic equation. The result shows that Hausa puzzles contain mathematical concepts relevant to teachers and students.

8. The use of Arithmetic Progression as a Tool for Analyzing Hausa Puzzle

A man wants his only daughter to gets marriage. After a while, he summoned all the competitive guys that want to marry his daughter. While they gathered, he told them that he has an assignment to anyone who wants to marry his daughter, I need nothing lots from him, what I need mainly to finish everything within a month (30 days). There is also a conversational gift to be paid each and every day throughout the month. The conversational gift to start with in the first day is one (1) Naira but you are to add three (3) Naira of what you gave in the previous day. That is how it will be consecutively till the thirtieth day of the month. What is the total amount to be paid for the whole month, if a person agreed to do that?

Solution: To see the mathematics behind this puzzle we use arithmetic progression.

Let y_1 be the amount of money given to the lady at the 1st day.

We can also have this sequence as $y_1, y_2, y_3, \dots, y_{30}$

since at the 1st day he is expected to give her 1 Naira, at the 2nd day 4 Naira at the 3rd day, 7 Naira, ... i.e. 1,4,7,10,13, ...

Using $T_n = a + (n - 1)d$, $n = 30$, $d=3$, $a=1$, where T_n is the number of the n th term, d is the common difference, a is the first term.

$$T_n = 1 + (30 - 1) \times 3 \Rightarrow 1 + (29) \times 3 \Rightarrow 1 + 87 \Rightarrow \text{N}88$$

Analysis: 1st day = ~~N~~1, 2nd day = ~~N~~4, 3rd day = ~~N~~7, ... , 30th day = ~~N~~88

Observation: The findings revealed that this Hausa puzzle embodies mathematical concepts like series and sequences, time conscious, counting, logical reasoning. These findings demonstrate that Hausa puzzles contain mathematical concepts relevant to teachers and students.

General Observations



So many researches such as Waziri, Saidu & Halliru, (2010); Shuaibu, (2014); Shuaibu, (2018); Ahmad, Sidi & Shu'aibu, (2020); Pawlak, (2023); Inuwa-Dutse, (2025); Sani, & Gobir, (2026) and Okafor, Balogun, & Abubakar, (2026) have been done in an attempt to contradict the believe of some Hausa students about mathematics, that is, starts and ends in the classroom, there was no mathematics in Hausa culture and mathematics has no relevant to Hausa culture but still the state of the situation is critical, those issues are believed to be from different angles, not the government only but also among others are students, parents, teachers, and Non-Governmental Organizations(NGOs). Therefore, the mathematical concepts and skills in puzzles one can improve the students' performance in classroom where the teacher want to teach the universal, union, intersection, complement, element of a set etc. Puzzle two can improve the students' performance in geometric progression, problem solving logical thinking etc. Teacher can use puzzle three to teach the students plane shapes, solid shapes and angles etc. puzzle four can be applicable in teaching simultaneous equation, word problems leading to liner equation and algebra etc. Also puzzle five can improve the students' performance in quadratic equation, change subject of the formula and logical thinking. Finally, the mathematical concept and skills in puzzle six can improve the students' performance in series and sequence (Arithmetic and Geometric Progression), time conscious, counting and logical reasoning.

Conclusion

The paper showed that there are Hausa puzzles relevant to classroom Mathematics for teachers and students. If they are utilized effectively in the pedagogy of mathematics, the learning difficulties Hausa students are facing toward mathematics will become to an end. The paper showed that mathematics does not starts and end in classroom. It is not an abstract subject as perceived by some Hausa students. The paper provides evidence that mathematics was not introduced into Hausa culture as a result of western education or European people.



Recommendations

The paper realized that there is need for mathematics and Hausa teachers to be prepared to face some very important area of ethno-mathematics, there is need for also the following:

- The provision of textbooks that contains the standard translation of those Hausa verbal statement or puzzles (wasa kwakwalwa) to mathematical expressions with their solutions. So that students will increase their intellectual, rational and analytical thinking which are purely mathematics.
- The researchers from different fields such as science and technology education and mathematics among others should put heads together to explore and expand the empirical studies in solving Hausa puzzles using mathematics.
- The paper also recommends classroom mathematics teachers should used the concept of ethno-mathematics, so that students can understand and learn mathematics better.
- NGOs should sponsor professionals from science and technology education and mathematics to collect some of Hausa puzzles which appeared to be mathematical in nature and provide a general method of solving them.
- Parents should try to involve their children in the practice of Hausa culture in relation to mathematics concept so that the children will learn some mathematical concepts in their tradition
- Teacher should provide relevant and many examples of Hausa puzzles at a very early stage of teaching mathematics to enable the students feel relevance, joy and relationship between the mathematics and Hausa cultural views of the contents under study.



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