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**Dialogues about the ongoing challenge of combating racism in “people’s” sport:  
critical mathematics education in the classroom**

**Diálogos sobre el reto continuo de combatir el racismo en el deporte “del  
pueblo”: educación matemática crítica en el aula**

**Dialogues sur le défi permanent de la lutte contre le racisme dans le sport «du  
peuple» : l’enseignement critique des mathématiques en classe**

**Diálogos acerca do desafio contínuo do combate ao racismo no esporte “do  
povo”: educação matemática crítica em sala de aula**

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### **Abstract**

The challenges faced by teachers in Mathematics teaching are perceptible, with regard to students’ interest in the subject and students’ understanding of mathematical concepts. The justification for this work is given by the need to think about new possibilities for teaching Mathematics, so that there is the development of critical and democratic thinking by the students. The question posed is: will the contextualization of mathematical concepts through soccer using technological resources contribute to a better understanding of the content being taught? The general aim of this paper is to develop the construction of knowledge of statistics and percentage content through the lens of Critical Mathematics Education, contextualizing the ongoing challenge of combating racism in soccer. Discussing topics such as the history of Brazilian soccer in parallel with the fight against racism in Mathematics classes is of paramount importance so that we can form critical and reflective citizens, thus being able to transform the society in which we live. It is hoped that the activities proposed here will make math teaching more meaningful for students.

**Keywords:** Critical mathematics education, Soccer, Technology, Racism.

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## Resumen

Los retos a los que se enfrentan los profesores en la enseñanza de las Matemáticas son notables, en lo que respecta al interés de los estudiantes por la asignatura y la comprensión de los conceptos matemáticos por los estudiantes. La justificación de este trabajo viene dada por la necesidad de pensar nuevas posibilidades para la enseñanza de las Matemáticas con el fin de que los estudiantes desarrollen un pensamiento crítico y democrático. La pregunta que se plantea es: ¿la contextualización de conceptos matemáticos a través del fútbol con uso de recursos tecnológicos contribuirá a una mejor comprensión de los contenidos impartidos. El propósito general de este artículo es desarrollar la construcción del conocimiento de la Estadística y contenidos porcentuales a partir de un sesgo de Educación Matemática Crítica contextualizar el desafío actual de combatir el racismo en el fútbol. Diálogo sobre temas como la historia del fútbol brasileño paralela a la lucha contra el racismo en las clases de Matemática es de suma importancia para que podamos formar ciudadanos críticos y reflexivos, pudiendo así transformar la sociedad en la que viven. Se espera que, con las actividades aquí propuestas, la enseñanza de las Matemáticas sea más significativa para los estudiantes.

**Palabras clave:** Educación matemática crítica, fútbol, Tecnología, racismo.

## Résumé

Les défis rencontrés par les enseignants dans l'enseignement des mathématiques sont perceptibles, en ce qui concerne l'intérêt des élèves pour la matière et la compréhension des concepts mathématiques par les élèves. La justification de ce travail est donnée par la nécessité de penser à de nouvelles possibilités pour l'enseignement des mathématiques, afin qu'il y ait le développement d'une pensée critique et démocratique de la part des étudiants. La question posée est la suivante : la contextualisation des concepts mathématiques à travers le soccer en utilisant des ressources technologiques contribuera-t-elle à une meilleure compréhension des contenus enseignés ? L'objectif général de cet article est de développer la construction de la connaissance des statistiques et des pourcentages à travers un biais de l'enseignement critique des mathématiques contextualiser le défi permanent de la lutte contre le racisme dans le soccer. Le dialogue sur des sujets tels que l'histoire du soccer brésilien parallèlement à la lutte contre le racisme dans les cours de mathématiques est d'une importance capitale afin que nous puissions former des citoyens critiques et réfléchis, et ainsi pouvoir transformer la société dans laquelle nous vivons. On s'attend à ce que, avec les activités proposées ici, l'enseignement des mathématiques soit plus significatif pour les élèves.

*Mots-clés* : l'enseignement critique des mathématiques, Football, Technologie, Racisme.

### **Resumo**

São perceptíveis os desafios enfrentados pelos professores no ensino de Matemática, no que diz respeito ao interesse dos estudantes pela disciplina e ao entendimento dos conceitos matemáticos por parte dos estudantes. A justificativa deste trabalho se dá através da necessidade de se pensar em novas possibilidades para o ensino de Matemática, a fim de que haja o desenvolvimento de um pensamento crítico e democrático pelos estudantes. A questão colocada é: a contextualização dos conceitos matemáticos através do futebol com uso de recursos tecnológicos contribuirá para um melhor entendimento acerca dos conteúdos lecionados? O objetivo geral deste artigo é desenvolver a construção de conhecimentos de conteúdos de Estatística e porcentagem por um viés da Educação Matemática Crítica contextualizando o desafio contínuo do combate ao racismo no futebol. Dialogar acerca de temáticas como a história do futebol brasileiro em paralelo ao combate ao racismo nas aulas de Matemática é de suma importância para que possamos formar cidadãos críticos e reflexivos, podendo assim transformar a sociedade em que vivemos. Espera-se que, com as atividades aqui propostas, o ensino de Matemática seja mais significativo para os estudantes.

*Palavras-chave:* Educação matemática crítica, Futebol, Tecnologia, Racismo.

## **Dialogues about the ongoing challenge of combating racism in “people’s” sport: critical mathematics education in the classroom**

Traditionally, the teaching of Mathematics has been focused on mechanization and repetition of procedures, in an abstract, decontextualized manner, and distant from students' everyday lives. The justification for the development of this work arose from the need to consider new possibilities for the teaching of Mathematics, aiming for the development of critical and democratic thinking among students.

In addition, normally in classes of this subject, the teacher presents the mathematical techniques, and then the students, after memorizing the content, do the "exercises" selected from textbooks, with little or no dynamism in the classes, being less attractive and with little meaning to the students. The question posed is: Will contextualizing mathematical concepts through soccer, using technological resources, contribute to a better understanding of the taught content?

The general objective of this paper is to develop the construction of knowledge of Statistics and percentages through a Critical Mathematics Education lens, contextualizing the ongoing challenge of combating racism in soccer. In order to achieve the general objective, we have some specific objectives, namely: (1) seek new teaching approaches for Mathematics classes; (2) discuss the fight against racism through Mathematics classes based on a Didactic Sequence that talks about the problem in question; (3) make use of digital technologies such as spreadsheets on *smartphones* to create and better understand statistical graphs. The target audience for this Teaching Sequence proposal are high school students.

This paper is organized as follows: the “Theoretical reference” section provides an overview of the area of Mathematics Education that guides this research: Critical Mathematics Education. Furthermore, this section also discusses a brief historical review of soccer in Brazil and also the origin, concept and implications of racism in society, themes that guided the proposed Teaching Sequence developed. Finally, there was a need to discuss the use of technology in Mathematics classes, highlighting its importance in cyberculture, as a great ally of the education professional in the construction of knowledge by students.

The methodology contains the methodological procedures that guide this research, containing the objectives of this work and the explanation of how it can be used in Mathematics classes in High School, followed by the proposal for the Teaching Sequence.

## Critical mathematics education

Mathematics teaching in Brazil has currently seen considerable progress in carrying out research in the fields of Mathematics Education, with innovative proposals for educational methodologies and practices, in areas such as Critical Mathematics Education, Mathematical Modeling, History of Mathematics and Ethnomathematics.

However, in most schools, classes in this subject have an instructional approach, with repetitive and decontextualized classes, resulting in many students' aversion to the subject.

Sometimes students memorize formulas whose origins they do not know and apply them in exercises that have no connection with their reality, using solving techniques commonly known as algorithms. Therefore, the student does not see meaning in the content taught.

When using students' daily lives, based on social and political issues in the applications of formulas and the construction of mathematical reasoning in their respective contexts, knowledge gains meaning and can be more valued by those who appropriate it.

Muzinatti (2018) focuses on this reality:

Social situations involving economic or political problems are part of this list of evils and seem to depend on a more accurate degree of awareness and reflection; otherwise, they will be nothing more than empty information. Social injustices and inequalities in the economic field, which we can consider to be problems at this level, are more commonly treated by other fields of knowledge. Mathematics is reserved for assertiveness, the set of truths that guarantees us that our world, although imperfect in its changing material manifestations, has an essential logically and geometrically ordered framework (p.188, our translation).

According to Skovsmose et al (2016), Critical Mathematics Education (CME) moves towards social justice, approaching Mathematics critically in all its instances and applications.

It is necessary to know the basis of CME to better understand this approach. Ginglass (2020) highlights that three principles underpin the emergence of Critical Mathematics Education: Critical Theory, Critical Education and Ethnomathematics. The author also highlights that the emergence of Critical Theory began in the 1920s. Pucci (2001 apud Ginglass 2020, p.18) explains that the formulators of this theory focused on philosophical, social, cultural and aesthetic problems originating within the scope of capitalism.

Freire (1979) argues that, regarding practice and research, for education to be critical, it must engage in dialogue about social problems, inequalities, and suppression, striving to become a progressively active social force.

In Critical Education, literacy assumes considerable importance. According to Skovsmose (2001), literacy is a fundamental requirement in society, as it informs people about

their obligations, so that they can be part of essential work processes. The author also highlights that literacy can be used for the purpose of “liberation”, as it helps in organizing and reorganizing the interpretations of social institutions, traditions and proposals for political reforms.

To understand mathematical literacy, it is necessary to understand what reflective knowledge would be. This knowledge is directly related to the ability to reflect on the use of Mathematics and evaluate it. Therefore, mathematical literacy also becomes a necessary condition in society, serving to inform people of their obligations (Skovsmose, 2001).

Finally, it is understood that Ethnomathematics unfolds over the study of the appreciation of Mathematics developed by different groups based on their specificities and needs. Passos (2008 apud Araújo 2009, p.61) states that Ethnomathematics approaches that align with the purposes of CME are approaches related to political issues.

According to D'Ambrosio, the methodology is related to “Ethno (commonly accepted group of myths and compatible values and behaviors) + Techné (manners, arts, techniques) + mathema (explain, understand, learning)” (2018, p.28). Therefore, we understand Ethnomathematics as Mathematics used by certain groups of people based on their needs.

Through Ethnomathematics in the school context, it is possible to establish cultural connections between students' daily lives and the content taught, which makes it fundamental in the development of teaching-learning, as it makes students realize that Mathematics is a significant part of their own cultural identity (ROSA; OREY, 2006).

Ethnomathematics, as an area of Mathematics Education, draws from the source of social and political issues. In this regard, it contributes to the fight against racism, colonialism, imperialism and marginalization of peoples, societies and cultures, as it shows the knowledge of different peoples, as well as establishing mutual respect and reducing the tendency to exploit and discriminate against other cultures. (BARTON, 2002).

Thus, contextualizing mathematical content with social issues, such as soccer, for example, is the starting point for students to see Mathematics in their daily lives, increasing their interest in the subject and allowing the teacher to question and invite them to think.

### **A brief historical review of the “king of sports” in brazil**

According to D'Ambrosio, it is common, when talking about soccer, to hear that “it's just a game”, seen by people as a mere possibility of entertainment. However, the history of the “king of sports” in Brazil is intertwined with the country's own history. Soccer is definitely not a sport that is limited only to the playing fields; it is also related to social and political issues

(Soriano; Vianna, 2023). According to Guterman (2021), there is a relationship between soccer and Brazilian society in the construction of our country's history and, more than that, the “Breton” sport is the biggest national phenomenon in Brazil.

In 1895, soccer, already widespread in Europe, arrived in Brazil through Charles Miller, son of an important English industrialist. Miller discovered soccer during his study period in England and “brought it back” with him, being responsible for introducing the competitive profile of soccer and its rules, which was fundamental for its expansion. The sport quickly spread among the São Paulo elite, becoming yet another space for socializing between the English elite and the coffee industry (Magalhães, 2010).

Guterman (2021) highlights that in Europe, English soccer emerged in a context of growth of the working class, with the feelings of the country's lower classes being expressed on the playing fields. Furthermore, through soccer, workers and students had the chance to earn some money. In Brazil, unlike European countries, the sport initially appeared as an elite activity, with black people and workers in general only being able to practice it on the “várzea” fields or when they became decisive for rich white teams to win titles.

In São Paulo, on April 14 or 15, 1895, the first soccer game played in Brazil took place more or less within the official rules, according to the most accepted records. It is worth mentioning that soccer was a sport practiced by foreigners in Brazil before the aforementioned date, and that it was not entirely within the official rules (Guterman, 2021).

Charles Miller brought together employees from “Companhia do Gás” (The Team of Gaz Company) and São Paulo Railway. The match took place in Várzea do Carmo, on the grounds of Companhia Viação Paulista, an animal-powered transport company. Miller and his colleagues had to expel the donkeys that grazed there in order to hold the first game there (Guterman, 2021).

According to Magalhães (2010), despite the upper classes trying to prevent its popularization, soccer ended up reaching the lower social classes. And something very similar to what happened in England was repeated in Brazil: the advancement of industry and the growth of the working class led to the spread of sport among the working class. Thus, for the elite, soccer was interested in remaining amateur, while for the popular classes, the professionalization of the sport was their greatest desire.

Currently, with the high prices of tickets to attend games in stadiums and the high cost of team uniforms and the Brazilian National Team's kit, we arrive at the following question: has soccer really reached the lower social classes? Or even: don't the upper classes continue trying to prevent the popularization of soccer?

With the professionalization of soccer in Brazil and broadcasts of matches on radio and later on TV, the sport was embraced by the lower social classes, becoming part of the national identity. However, elitism still persists in the sport, which can be seen in the high prices of tickets for matches and sports uniforms, excluding a large part of the population from the full experience of watching a soccer match in the stadium and wearing their team's shirt. From Critical Mathematics Education, it is possible to dialogue with students in the classroom about this social and economic reality (Soriano; Vianna, 2023).

Guterman (2021) highlights that, before the mass of fans joined Brazilian soccer, there was a declared intention of its founders to make the sport an expression of their education and sporting spirit. In other words, *a priori*, there should be a concern with fair play and good education, these factors being decisive for the intrinsic quality of soccer, according to its pioneers.

It is very common nowadays for fans, dissatisfied with their teams' performances, to boo during or at the end of each match. At the beginning of soccer practice in Brazil, booing was synonymous with disrespect for the spectacle and, also, a threat to the very future of the sport in the country.

In the democratization of Brazilian soccer, some teams stood out: Bangu, Vasco da Gama and Corinthians. Bangu Atlético Clube was founded in 1904 by English workers from Companhia Progresso Industrial. However, as it is located in a region far from the center and areas of the upper classes, the solution found was to select factory workers to join the association. The company's interest in investing in soccer was to promote the company itself while the team traveled through the cities (Magalhães, 2010).

Magalhães (2010) highlights that Sport Clube Corinthians Paulista was founded in 1910, by residents of the Bom Retiro neighborhood, aiming to form a club for the masses, with blacks and whites, immigrants and workers, the “people's club”.

Racism was a theme that marked (and still marks) Brazilian soccer, with teams being prohibited from including black people in their roster for a long time. The author also highlights Carlos Alberto, a player from the elitist Fluminense team, who used to apply face powder to disguise his skin color, an unfortunate fact that became a symbol of the Rio de Janeiro team itself.

In 1923, in the first division of the Rio championship, Vasco da Gama was champion with a team made up mostly of workers and black people, most of whom were illiterate. Many years later, only in 1937, after poor participation in the 1934 World Cup (with only amateur



athletes), the Brazilian Sports Confederation recognized the professionalism of soccer (Magalhães, 2010).

Although we previously mentioned situations of discrimination that occurred in the last century, racism, unfortunately, remains present in Brazilian soccer and in world soccer.

A critical look at political and social issues is necessary, so that students, as future citizens, can transform the society in which they live. Racism linked to soccer and society as a whole is a topic that needs to be debated in the classroom, taking into account the social function of the school, in accordance with the Law of Guidelines and Bases of National Education (Law No. 9,394/1996), in its article 205, which establishes that “education, the right of all and the duty of the State and the family, will be promoted and encouraged with the collaboration of society, aiming at the full development of the person, their preparation for the exercise of citizenship and their qualification for work” (Brasil, 1996).

Since arriving in Brazil, the most popular sport in the country has won over millions of Brazilian fans. What many people don't realize is how important Mathematics is in this sporting practice, both in understanding the rules of the sport and in helping athletes, coaching staff and clubs in their efforts to become champions. Furthermore, in the classroom it is possible, through the connection between the subject and sport, to discuss social issues of extreme relevance in our society, such as the fight against racism, for example.

### **Racism: origin, concept and implications in society**

When referring to democratic and critical teaching, we seek a classroom in which students have broad access to information and the most different opinions are heard. It is interesting that teachers, regardless of the subject they teach, help students to increase their level of information on cross-cutting topics such as political, social, cultural and environmental issues.

Therefore, talking about racism in the classroom can be one of the ways to combat this problem in our society, aiming to form critical citizens who seek social justice, thus being able to transform the society to which they belong.

After all, what does “racism” mean? Racism derives from racialism — an ancient doctrine that stated that the biological differences of the human species differentiated races with different psychological, intellectual or character qualities (Brasil, 2009). Racism affirms not only the existence of races, but also the “natural” and hereditary superiority of one race over the other. The formation of social relations based on this idea produced historically new social identities in America: Indians, blacks and mestizos, and redefined others.

And to the extent that the social relations that were being configured were relations of domination, such identities were associated with corresponding hierarchies, places and social roles, with their constituents, and, consequently, with the pattern of domination that was imposed. In other words, race and racial identity were established as instruments for the basic social classification of the population (QUIJANO, 2005, p.117, our translation).

In this way, a supposed structural and biological distinction is used to place individuals in a natural condition of inferiority in relation to others. Therefore, although racism was not a consequence of colonialism, it was reinforced and reproduced by it through various actions, such as, for example, slavery. Quijano (2005) also highlights that, in Latin America, the idea of race was a way of granting legitimacy to relations of domination imposed by colonizers. Almeida (2018, p.22) corroborates this by stating that the classification of human beings would be “one of the technologies of European colonialism for the destruction of peoples in the Americas, Africa, Asia and Oceania”.

According to Kilomba (2019), the due importance that the issue of racism demands has not been given, and this omission is a consequence of the denial of the importance of black people as political, social and individual subjects. The author also highlights that having the status of a subject means having your individual and collective interests recognized, validated and officially represented in society.

This lack of importance highlighted by the author becomes clear when, despite knowing that racism is a crime in Brazil, white people continue to discriminate against black people in the noble areas of the country. It is noticeable that many people do not think about the consequences of their actions and do not want to evolve as human beings.

There are three characteristics present in racism. The first is the construction of difference, in which the person, due to their racial origin, is seen as different. The second characteristic concerns the construction of differences linked to hierarchical values, implying the superiority of whites over blacks. Finally, the third characteristic is related to historical, political, social and economic issues and results in differences in access to education, health, housing, employment and other rights, when comparing the lives and trajectories of black people and white people (Kilomba, 2019).

In the following graph (Figure 1), it is possible to confirm that there are differences in access to education if we compare black people and white people. The illiteracy rate is higher among black people (9.1%) than among white people (3.9%). It is worth noting that these data refer to the year 2018 and concern people aged 15 and over. There is a difference between urban

and rural areas. The illiteracy rate is higher in rural areas, but this does not change the inferior condition of black people in terms of literacy levels.

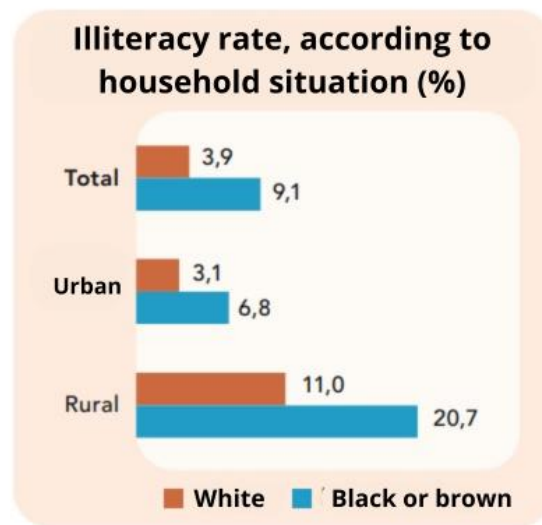


Figure 1.

*Illiteracy rate (%), according to household situation and skin color (IBGE, Continuous National Household Sample Survey, 2018). note: People aged 15 or over) – Our translation*

Kilomba (2019) points out that conceptually there are three types of racism, namely: structural racism, institutional racism and everyday racism. The author highlights that structural racism is related to the way official structures operate, privileging white subjects and creating disproportionality in the occupation of positions of power by black subjects. Regarding institutional racism, white subjects have a clear advantage over other racialized groups in the job market, criminal justice, etc. Finally, everyday racism refers to actions, gestures, speeches, looks and images that personify and repress black subjects and non white people.

On the other hand, Almeida (2018) highlights that racism is always structural, being an element that integrates the economic and political organization of Brazilian society. In short, all other classifications regarding racism, according to this author, are just partial and incomplete ways of conceiving racism, because racism in everyday life, in interpersonal relationships and in the dynamics of institutions is a consequence of something deeper developed in the strange political and economic aspects of our society.

When discussing race, it is necessary to differentiate three terms that are often confused in society, namely: racism, prejudice and racial discrimination. According to Almeida (2018), racism is a form of discrimination that has race as its basis, being manifested consciously or unconsciously, culminating in disadvantages or privileges according to the racial group to which the individual belongs. Prejudice is judgment based on stereotypes, which may or may

not result in discriminatory practices. Finally, racial discrimination is the act of treating members of racially identified groups differently.

Despite understanding that racism is always structural, Almeida (2018) recognizes specific dimensions of racism, namely: individualistic, institutional and structural. Regarding the individualistic dimension, we have an ethical or psychological phenomenon, which, despite being called “individualistic”, can be of an individual or collective nature, also attributed to isolated groups. In this case, racism would be an “irrationality” to be combatted in the judiciary through the application of civil sanctions. The institutional dimension is related to the performance of institutions in a dynamic that grants disadvantages and privileges based on race, albeit indirectly, ensuring the maintenance of the hegemony of the racial power group (ALMEIDA, 2020). As for the third dimension, Almeida (2020) himself maintains:

Racism is a result of the social structure itself, that is, of the “normal” way in which political, economic, legal and even family relationships are constituted, and is not a social pathology or an institutional breakdown. Racism is structural. Individual behaviors and institutional processes are derived from a society whose racism is the rule and not the exception (p.50, our translation).

Still according to Almeida (2018), in the 20th century the socio-anthropological discourse of racial democracy spread, minimizing racial discrimination and highlighting multiculturalism with the aim of demonstrating that racism did not exist. The author also highlights the ability to absorb conflicts in an increasingly efficient way. In short, the idea was: if there is no racism, there is nothing to fight.

No less important is the concept of “white supremacy”, which comes from the times of colonization and imperialism, but which continues today, substantiating the belief that white people are superior to black, Indian and brown people. According to Almeida (2018), this concept attempts to naturalize the fact that whiteness occupies a privileged position with regard to access to material and symbolic resources. Therefore, it is extremely important that white people take a stand against this supposed supremacy, in order to put an end to the problem of racism.

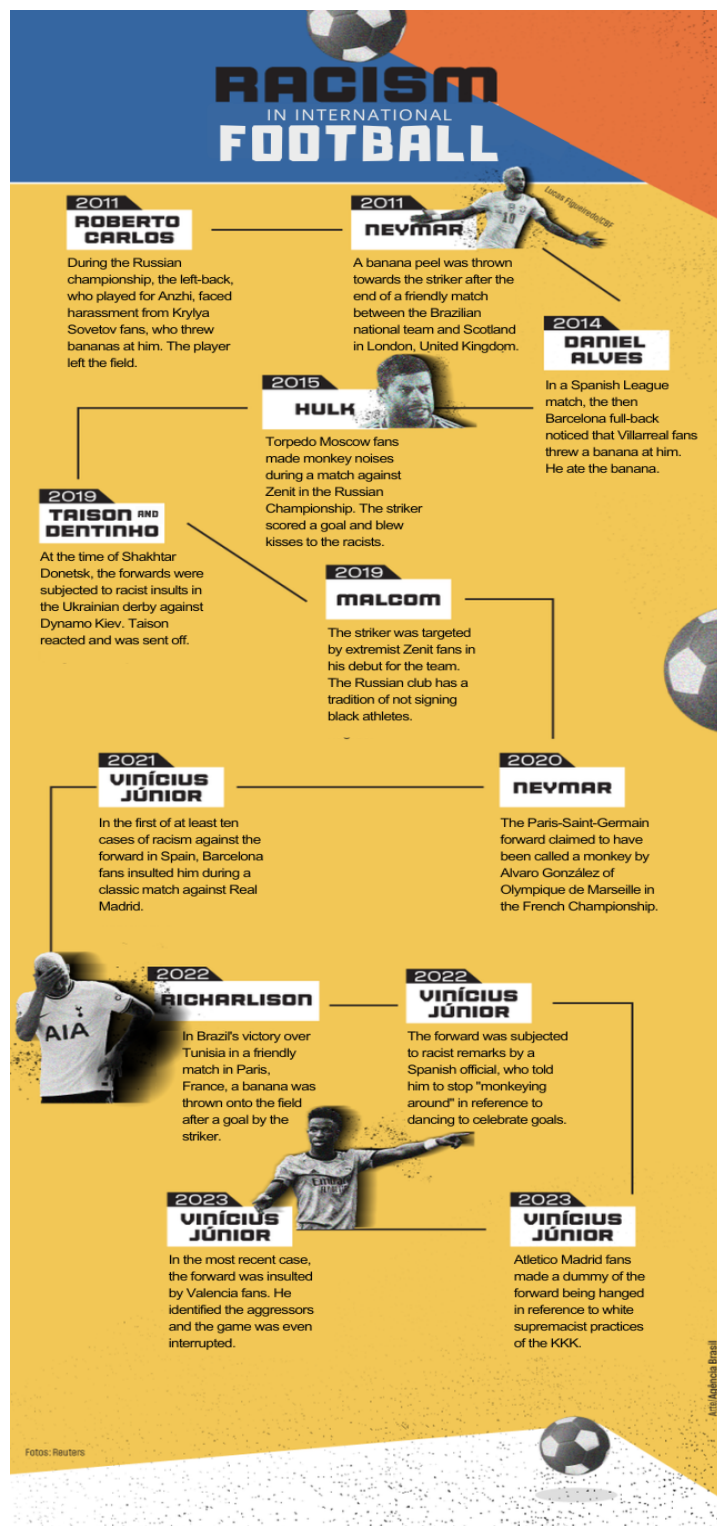


Figure 2.

*Some cases of racism in international soccer involving Brazilian players (Agência Brasil<sup>3</sup>) – Our translation*

<sup>3</sup> <https://agenciabrasil.ebc.com.br/esportes/noticia/2023-05/ofensas-vinicius-junior-fazem-parte-de-historico-de-racismo-no-futebol>

As soccer is not a world apart, the racism that stains society in Brazil and around the world is also present in this sport. In the following table (Figure 2), it is possible to visualize some of the dozens of cases that have occurred in recent years in international soccer involving black Brazilian players.

The timeline shown in the table begins in 2011 with the episode of racism suffered by defender Roberto Carlos and perpetrated by Zenit fans when the player played in the Russian championship. The player left the field after some of the fans threw bananas on the playing field. Still in 2011, in the Brazilian team's friendly match in London, Neymar was hit by a banana peel. In 2014, an episode with bananas on the field occurred again, this time in the Spanish championship. Daniel Alves ate the banana that was thrown towards him.

In 2015, again in the Russian championship, people from the opposing fans imitated monkey sounds referring to striker Hulk, who responded to the insults by scoring a goal and sending kisses to the racists. In 2019, in Ukraine, strikers Taison and Dentinho suffered racism. Taison even reacted to the offenses and, regrettably, was expelled from the game. In the same year, again in Russia, striker Malcom was the target of racist insults. It is worth mentioning that the Russian team Zenit does not usually hire black players.

In the French championship, in 2020, striker Neymar once again suffered racism, this time having been called a monkey by a player from the opposing team. In the year 2022, forward Richarlison is targeted by racism, also in France, during a friendly match of the Brazilian National Team. After scoring a goal, the opposing fans threw a banana onto the playing field.

In the years 2021, 2022 and 2023, striker Vinícius JR suffered several cases of racism in Spain, being discriminated against by opposing fans, even involving children and a Spanish official. In total, according to the player recorded on his social network, there were 19 cases of racism until October 21st, the date of publication of his *post*<sup>4</sup>.

In the latest case of racism suffered by the player in the match between Real Madrid and Sevilla, Sevilla expelled<sup>5</sup> the fan who committed racist acts in the stadium. However, there are still many actions to be taken to combat racism worldwide, especially in Europe.

One of the most impactful cases in the series of discrimination suffered by Vinícius JR occurred in 2023, in which Atlético de Madrid fans made a doll<sup>6</sup> referencing the player being hanged in allusion to the white supremacist practices of the Ku Klux Klan (a supremacist and

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<sup>4</sup> Available at: <https://x.com/vinijr/status/1715851887428214814?s=20>

<sup>5</sup> See more at: <https://agenciabrasil.etc.com.br/esportes/noticia/2023-10/sevilla-expulsa-torcedor-que-cometeu-atos-racistas-em-jogo-contra-real>

<sup>6</sup> See more at: <https://g1.globo.com/mundo/noticia/2023/01/26/boneco-com-camisa-de-vinicius-jr-aappear-enforcado-em-ponte-em-madri-jante-expect-punishment-against-hate-crimes-says-representante.ghtml>

terrorist organization that emerged in the United States in the 19th century, persecuting black people, attacking and murdering them).

Alvim (2023) highlights that, after several cases of racism, in August 2023 LaLiga (National Championship of the 1st division of Spain) admits its mistakes in dealing with cases of racism and inaugurates the information platform “LaLiga versus Racism”, aiming to report cases of discrimination.

It is worth mentioning that racism is also present in Brazilian soccer. GloboEsporte.com<sup>7</sup> developed a study in 2019, during which they spent six months interviewing 163 black athletes and coaches from 60 clubs in Series A, B and C, the research was carried out under the condition of anonymity on the part of those interviewed. The survey showed that 48.1% said they had been victims of racism in soccer.

The study highlights that the historic lack of punishment by entities that organize competitions influences the recurrence of cases of racism, given that only in the 2019 season did FIFA (International Soccer Federation) and CBF (Brazilian Soccer Confederation) create protocols minimally rigid related to discriminatory cases. The following data refers to the study carried out by GloboEsporte.com (Figures 3, 4, 5 and 6).

The data in Figures 3 and 4 are related to the place where racism occurred, and also what the interviewees felt when being discriminated against. The vast majority of cases occur in soccer stadiums (92.4%). However, in the club's concentration and in the hotel there are also cases of racism, showing that not even in their workplaces or in accommodation are individuals respected in their entirety. It is worth highlighting that the Southeast Region (32.5%) is the region with the most cases of racism in this survey, followed by the South Region (31.4%). Regarding feelings towards discriminatory acts, it is surprising that 13.2% of those interviewed felt indifference after being humiliated.

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<sup>7</sup> See more at: <https://ge.globo.com/pe/futebol/noticia/levantamento-inedito-quase-metade-dos-atletas-negros-das-series-abec-sofreu-racismo-no-futebol.ghtml>



Figure 3.

*Where did the racist act occur? (Infografia GloboEsporte.com) – Our translation*

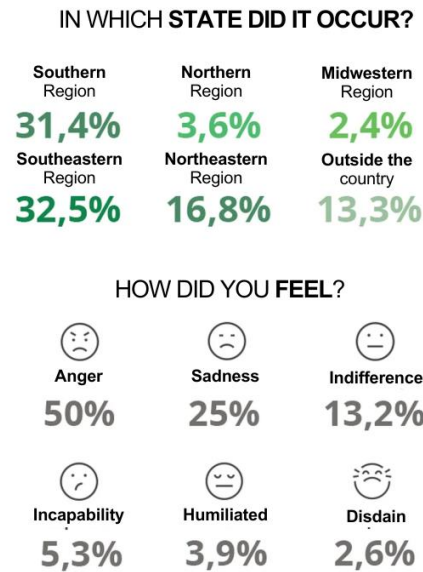


Figure 4.

*In which state did the racist act occur and what the victims felt (Infografia GloboEsporte.com) – Our translation*

Furthermore, interviewees were asked who carried out the racist act (Figure 5). Most of the victims reported having suffered racism from the opposing fans (63.2%), followed by the opposing players (18.4%). What drew the most attention was the fact that black people were not respected either by the fans of the team they represent (9.2%) or by the leadership of their club (5.3%).



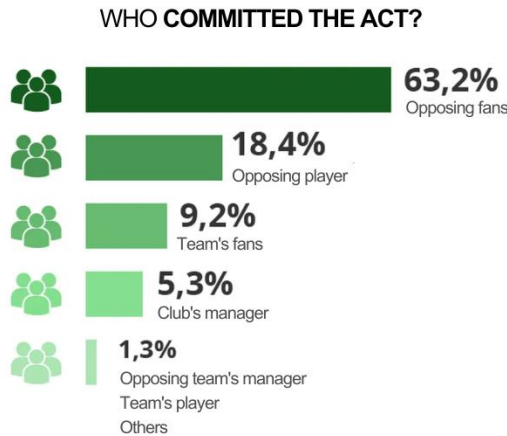


Figure 5.

*Who carried out the racist act? (Infografia GloboEsporte.com) – Our translation*

Finally, we sought to investigate what would need to be done to reduce or end racism in soccer from the perspective of those interviewed (Figure 6). Through the survey, 39% of victims believe that punishment is more effective in combating racism. Educational campaigns are also extremely important, according to respondents (27.7%). These data corroborate one of the objectives of this paper, which is to combat racism through Mathematics classes. Punishment of the clubs and those involved was the response of 19.5% of black subjects, being very numerically relevant as well, perhaps assuming that, by punishing the clubs, they could carry out anti-discrimination campaigns. More information (6.9%), punishment for clubs (4.4%) and stoppage of matches (2.5%) complete the solutions according to respondents.

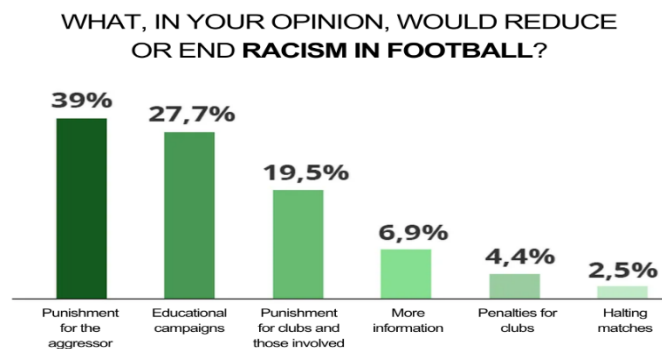


Figure 6.

*What, in your opinion, would reduce or end racism in soccer? (Infografia GloboEsporte.com) – Our translation*

## **The use of technology in mathematics classes**

According to Borba (2022), the technological revolution originated in the late 1960s, with the creation of the internet by the US Department of Defense, with decades later the development and mass use of technological devices, such as personal computers, *smartphones* and tablets, which resulted in changes in communication paradigms globally.

Through technology, people's daily lives have been changed. There are several examples of how technology has changed people's way of life across the globe, and education has not been left out of this. There are several educational applications that make it possible to acquire certain knowledge with a few clicks.

It is extremely important for teachers to know the phenomena of contemporary culture to not only interact with students, but also to establish curricula that are more in tune with current affairs. It is interesting that there is also an articulation between teaching and students' daily practices, including the use of technology in favor of better quality teaching and learning. In addition to access to technological devices and the internet, teachers must be prepared to use digital technologies to their advantage (Santos, 2011).

Continuing training for education professionals is necessary, as, in this way, there may be a link between the exploration of technology, pedagogical action with the use of technology and educational theories.

Using digital network technologies in cyberspace (interfaces, virtual learning environments, internet social networks) and in cities (computer laboratories, infocenters, telecenters, *Cybercafés*, computers and mobile devices in multi-referential spaces – schools, NGOs, companies and universities, among others), we experience contemporary culture, also known as cyberculture (Santos, 2011).

Fernandes and Healy (2020) highlight that the hegemony of the symbolic is common in Mathematics classes, favoring abstraction to the detriment of experimental practices. But it is increasingly clear that technology can be a great ally for teachers, when the objective is to construct knowledge in a practical way.

According to Vianna (2012), *softwares* normally installed on personal computers can be adapted to be used in Mathematics classes, as is the case with the Microsoft Excel spreadsheet. Through this *software*, it is possible to construct and analyze functions and graphs, matrices, determinants and linear systems, in which students develop arguments, seeking meanings for such knowledge (Castro; Frant, 2002, apud Vianna, 2012).

The choice of Excel is justified by the need to construct and analyze statistical graphs in a practical way, articulating the construction of knowledge with students' daily practices and including technology in favor of better-quality teaching and learning.

### **Methodology**

Gil (1994) highlights that applied research aims to generate knowledge for practical application and aimed at solutions to specific problems. This is an applied research, given its purpose of generating new knowledge through the application of a Teaching Sequence that will address the fight against racism, from the perspective of Critical Mathematics Education, in Mathematics classes.

As for the approach, it is qualitative research. Anchored in the perspective that knowledge occurs from a process socially constructed by subjects in their daily interactions, the research is based on the idea that while subjects act in reality, they transform it and are transformed by it. Therefore, with regard to the knowledge acquired in the context of social issues, in the formation of critical citizens, through the application of the Teaching Sequence, students will be able to reflect on the current problems in our society, seeking to rethink their attitudes towards respect for others, transforming society in the fight against racism.

According to Mizukami (1996), in the traditional approach, education is considered as instruction, taking place through the transmission of knowledge. In most schools, Mathematics classes still follow the traditional approach, with repetitive and decontextualized classes, fitting into the “exercise paradigm” (Skovsmose, 2000). According to Cotton (1998), in the exercise paradigm, the mathematics class is divided into two parts: firstly, the teacher presents the mathematical techniques, and then the students, after memorizing the content, perform the selected exercises, with variation in the available time for exercise development.

The justification for this work is the need to think about new possibilities for teaching Mathematics, so that, in addition to the development of critical and democratic thinking on the part of students, there is also the construction of mathematical knowledge in a contextualized way with the students' daily lives, thus achieving significant learning in the classes of this subject.

According to anthropologist Munanga (2023 apud Veloso; Santos; Sales, 2023), structural racism can be combatted through three paths: laws, anti-racist education and affirmative actions. The anthropologist emphasizes that laws affect observable racist practices, however, they are not effective when it comes to the prejudices that are in people's heads, and only education can reach this area.

However, the neutrality of teachers, teaching staff and school management in the fight against racism is common, with no intervention in conflicts and aggressions in these spaces. Sometimes, institutions believe that only “celebrating” the date of Black Consciousness or Indigenous Day is enough for this fight, without promoting the necessary reflections throughout the academic year.

Education professionals frequently advise that harassed children should ignore the discrimination they have suffered, thus increasing the low self-esteem of these children and their suffering, in addition to promoting segregation and poor coexistence among children. (Petronilha, 2018).

However, it is necessary for us, as education professionals, to take a leading role in building the transformation of society with diverse and unique human beings, respected in their power and perspective of life, leaving aside the neutrality that is so criticized by Freire (1979) in the field of education.

Thus, this research has the general objective of building knowledge of Statistics and percentage content through a Critical Mathematics Education bias, contextualizing the ongoing challenge of combating racism in soccer. In order to achieve the general objective, we have some specific objectives, namely: (1) seek new teaching approaches for Mathematics classes; (2) discuss the fight against racism through Mathematics classes based on a Teaching Sequence that dialogues about the problem in question; (3) make use of digital technologies such as spreadsheets on computers to construct and better understand statistical graphs. Furthermore, it is also worth highlighting the materials used to apply the Teaching Sequence, namely: (1) pencil; (2) rubber; (3) *smartphones* and (4) Activity list.

### **Teaching sequence proposal**

The Teaching Sequence proposed in this paper is aimed at high school students, under the justification that we believe that it is interesting for students to have a more advanced level of maturity, thus generating a better debate in the classroom about the issues discussed. The Teaching Sequence was divided into two moments, namely:

- (1) Historical recovery of the origins of soccer in Brazil through the documentary *Brasil Soccer Club: The history of Brazilian soccer*,<sup>8</sup> with production by Pedro Henrique Sassi, João Gollo and Sula Sevilis. The objective is to understand how soccer originated, the

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<sup>8</sup> Available at: <https://youtu.be/mLtRmNtde8Y>

social issues involved, such as elitism and racism, which are parallel to the history of sport in the country;

- (2) List of Activities in which students will answer questions about statistics and percentage content, from a Critical Mathematics Education perspective, related to racism in Brazilian soccer. The ideal scenario for developing the Teaching Sequence in question is for students to have a *smartphone*, given that the Microsoft Excel application will be used.

The List of Activities can be viewed below:

- I. Build a table in the Microsoft Excel application based on the data in Table 1 regarding racist acts that occurred in stadiums, on the internet and in other spaces, following the step by step below:
- II. Create a first column titled “Years” and enter the years from 2014 to 2021 as follows: Year 2014, Year 2015, Year 2016, Year 2017, Year 2018, Year 2019, Year 2020 and Year 2021.
- III. Create a second column entitled “Number of cases of racism in Brazilian soccer” and enter the data shown in Table 1 for each year.
- IV. Select the table completely and after selecting it, click on the “3 dots” in the bottom right corner of the screen.
- V. Click on “Home” and then click on “Insert”. Look for “Graphs” and click. Finally click on “Column”.
- VI. Select the first Column chart template.

Table 1.

*Number of cases of racism in Brazilian soccer between 2014 and 2017 (Observatory of Racial Discrimination in Soccer)*

<b>Number of cases of racism in Brazilian soccer between 2014 and 2021</b>
Year 2014: <b>25</b> ; Year 2015: <b>36</b> ; Year 2016: <b>26</b> ; Year 2017: <b>43</b>
Year 2018: <b>47</b> ; Year 2019: <b>70</b> ; Year 2020: <b>31</b> ; Year 2021: <b>64</b>

- a) In your opinion, how is it possible to better visualize the data about racism in Brazilian soccer: from the chart, the table or the column graph? Justify your answer:

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b) In which year did the greatest number of cases of racism occur in Brazilian soccer between 2014 and 2021?

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c) In your opinion, what could influence the high number of cases of racism in Brazilian soccer over the last few years?

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d) Give, in your opinion, 3 ways to reduce or combat racism in Brazilian soccer. Justify each choice.

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e) Have you ever suffered or know someone who has suffered racism? Report the event.

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f) Observe the table below regarding data on racist acts in soccer by regions in Brazil and do what is asked. It is worth noting that the total (201) does not coincide with data from the previous activity (342), as cases that occurred in national territory were selected (not including cases on the internet or games involving Brazilian teams that played in other countries in international competitions).

Table 1.

*Racist acts by regions in Brazil from 2014 to 2021 (Observatory of Racial Discrimination in Soccer)*

REGION	2014-2021	%
North	14	6.97%
Northeast	32	15.92%
Southeast	60	29.85%
Midwest	20	9.95%
South	75	37.31%

**Total**

201	100%
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a) Analyzing the table above, indicate which region of Brazil has the highest number of cases of racism. In your opinion, what factors influence this region to present a greater number of cases?

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b) Indicate how the calculation of the percentage provided in the third column is mathematically done.

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c) Using the Microsoft Excel application again, transform the data in the third column of the table above into a pie chart following the step by step below:

1. Create a first column titled “Regions of Brazil” and enter the respective regions available in the table.
2. Create a second column entitled “Proportion (%) of cases of racism in soccer in national territory” and enter the data shown in the table.
3. Select the table completely and after selecting it, click on the “3 dots” in the bottom right corner of the screen.
4. Click on “Home” and then click on “Insert”. Look for “Graphs” and click. Finally click on “Pie”.
5. Select the first Pie chart model.
6. Click on “Layouts” and then select the first model.

d) In your opinion, how is it possible to better visualize the data on the Proportion (%) of cases of racism in soccer in the national territory: from the table or the Pie chart? Justify your answer:

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### **Final considerations**

This work addresses a relevant and current discussion on Mathematics Education, more specifically on Critical Mathematics Education, bringing intersectional references, such as the relationship between sport and racism to classes in this subject, through the application of a Teaching Sequence. This approach highlights the importance of considering not only Mathematics itself, but also how it intertwines with other spheres of social, cultural and political

life. By recognizing and exploring these intersections, we are able to develop a more comprehensive and meaningful understanding of Mathematics Education and the underlying social issues.

Regarding technology in Mathematics Education, it is concluded that *software* can contribute to the construction of mathematical knowledge. Activities were proposed about mathematical content such as: statistics and percentages. We can conclude that the Microsoft Excel application, despite not being educational in nature, can be a great ally in the construction and analysis of statistical graphs, highlighting, through numbers, social problems in society, such as, for example, racism.

The numbers and facts related to violence against the black population show that, in fact, racial democracy is a utopia in our society, and in soccer it is no different. Athletes are often targets of racial abuse from fans, players from opposing teams or even players from their own teams.

According to Louro, Felipe and Goellner (2013), the “center” materialized by the figure of the Western, heterosexual, middle-class white man is taken as a reference and the other cultural groups are known as “eccentrics”. Precisely what makes the Western, heterosexual, middle-class white man seen as a reference is the fact that over the years it has been reiterated that being part of the center is the “right” thing to do, the best example to follow.

In past decades, much was said about respect for others. Currently, there is talk about appreciation. Groups considered “eccentric” are not looking for acceptance or integration. According to Louro, Felipe and Goellner (2013), “eccentrics” seek to break with a logic that refers to the central identity, as if the latter were the reference. The “eccentrics” assume the precariousness and risks caused not because of who they are, but rather by a prejudiced and discriminatory society.

It is believed that the general objective of this paper was achieved, given that, through the theoretical references discussed in the work and the development of the Didactic Sequence, the construction of knowledge of statistics and percentage content, contextualized to the fight against racism in soccer, could be carried out in Mathematics classes in a meaningful way.

With regard to possible directions for future investigations, aiming to provide continuity for debate and research in this field, we will seek to apply the Teaching Sequence exposed here, seeking not only to analyze the results, but also to continue putting into practice the fight against racism in our society. According to Davis (2016, s.p.), “in a racist society, it is not enough to not be racist, it is necessary to be anti-racist”.

It is extremely important that we, as educators, in our pedagogical practices, carry out



the deconstruction of the unity, naturalness and universality of the “center”, thus seeking that prejudices and discrimination are excluded from our society. We, authors of this text, believe that the Teaching Sequence proposed here can contribute to this deconstruction.

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