



Rock, Paper, Scissors or?

Mathematics Project Competition for Secondary Schools

(2021/22)

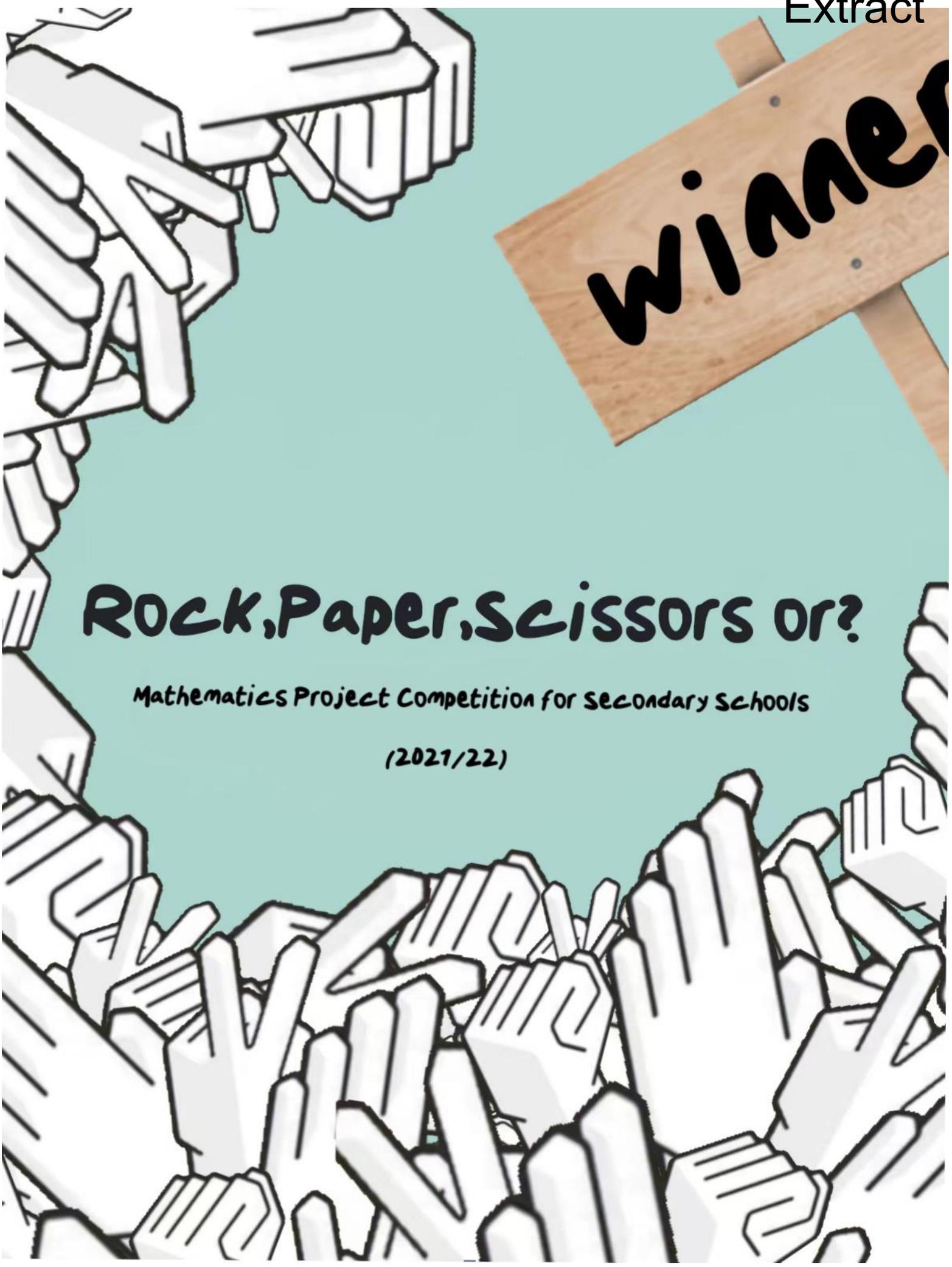


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Introduction

In our daily life, we have to use the game of rock, paper and scissors to randomly choose a winner from a few people. Usually, it is easy to determine who the winner is for 2 to 3 people but is quite time-consuming if the number of player is increased. We would like to find a fair game so that everyone has the same probability to solely win the game while it is less time-consuming.

To find a solution for the above situation, we first tried to use a method called “minority wins” to replace the original game of “Rock, Paper and Scissors” to lower the expected number of rounds to determine the sole winner in the game. Furthermore, we tried to use another game called “Rock, Finger, Scissors, Trident, Folk, Paper, ...” to enumerate the choices of style the players made such that only one round of game is needed to determine who the winner is.

By using combinations, we have shown that the game “Rock, Finger, Scissors, Trident, Folk, Paper, ...” we invented is a fair game for every players such that each player’s choice can affect the result and everyone has the same probability to win. We believe it is a better game than “Rock, Paper and Scissors” if people all around the globe is willing to take a paradigm shift in integrating their mathematical sense to use our game to replace the traditional game.

Chapter 4: Conclusion

		Method 1: Rock, Paper and Scissors	Method 2: Minority wins	Method 3: Rock, Finger, Scissors, Trident,Fork and Paper
		Expected Number of rounds of play		
Number of Players:	2	$1\frac{1}{2}$	1	1
	3	$2\frac{1}{4}$	$1\frac{1}{3}$	1
	4	$3\frac{3}{14}$	2	1
	5	$4\frac{17}{35}$	$1\frac{11}{15}$	1
	6	$5\frac{3719}{4340}$	$2\frac{3}{22}$	1

Refer to the above table, as the number of players increases, the expected number of rounds to play increases by using the method 1 “Rock, Paper and Scissors” or method 2 “Minority wins”. To make the game less time-consuming, we can use method 3 “Rock, Finger, Scissors, Trident, Fork and Paper (number of choices is depending on number of players) as for the number of players being 2 to 6, we have found that the expected number of rounds to be played is 1 to determine a winner. If the number of players is n and n is greater than 6. Using method 3 will also give you the expected number of rounds to 1 if n players can make n choices. (e.g. if hand sign is limited, players can choose a number from 0 to n-1 instead) Therefore, method 3 is more preferred under the condition that we want an efficient way to determine a winner in a fair game where everyone has the same opportunity to win the game.

Chapter 5: Overall Reflection

We've gain so many joy and experience in this project! Also, we learn many new math concept when doing the project, we even don't know what topic we have to investigate! Fortunately, we figured out in a few days after. Also, in the first month we started the project, we work individually whereas we didn't have good communication to share our workings to other members. As a result, our efficiency is extremely low at the beginning. Meanwhile, to investigate something so normal like “rock, paper, scissors”, we were overwhelmed and did not know that we can use some other ways to replace it. In the mathematical sense, we have to catch up about what C_r^n means to help us find the respective probability. Luckily, our teacher Mr. Chau teaches us how to work with others and gives some useful advices to us when we have problems. Thanks to him, our progress gain many experiences in this project. Hope that our next Math project can be better than this time.