PROPOSAL

• An introduction of the project
• Brief summary of what has been done in the area of the project and the relationship of different works/articles with your own project
• Objectives of the project
• The intended approach or methodology
• A realistic time frame towards completion of project
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WRITING AN INTRODUCTION

• Keep introduction clear and succinct
• Give sufficient details
• Use diagrams to illustrate basic case if necessary
• Use definitions or theorems from Math dictionaries/books
• Define variables and terminologies
WRITING AN INTRODUCTION - SAMPLES

• Introduction to a Game ...

Euclid Game is a number game played between two players. A position in the game is defined to be a pair of positive integers \((a, b)\), where \(a \leq b\). During each move, the player can move from the current position \((a, b)\) to any one of the new positions, with the rule of \((a, b - ta)\) where \(t \in \mathbb{Z}^+\) and \(b - ta > 0\). In other words, the player can

• Explain briefly how the game is played for e.g. no. of players, how each move is made, how to win etc.
**WRITING AN INTRODUCTION - SAMPLES**

- Use pictures or diagrams to illustrate the Steps/how the game is played

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
<th>Step 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Get a deck of numbered cards (or Poker cards)</td>
<td>Arrange it in ascending order such that the smallest card is on top and the largest card is at the bottom.</td>
<td>Take the first card (top card) and put it on the LEFT side of the table.</td>
<td>Take the next card and put it on the RIGHT side of the table.</td>
</tr>
</tbody>
</table>

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[Image of playing cards being fanned out and held by hands]
A positive integer is a prime if it is not 1 and all its only integer factors are 1 and itself. Given a positive integer with at least two digits one can cyclically rotate its digits or permute its digits. For example, given the number 137 the numbers which arise from it by cyclic rotation are 371 and 713. The numbers which arise from it by permutation are: 137 173 371 317 713 and 731. A number is called permutable prime if all its permutations are primes.
### 1.4 Terminologies

<table>
<thead>
<tr>
<th><strong>Terminology</strong></th>
<th><strong>Definition</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Permutable primes</td>
<td>A prime that permutes its digits and the numbers formed are all primes, also known as absolute primes</td>
</tr>
<tr>
<td>Permutable rotation</td>
<td>An arbitrary rearrangement of a number’s digits</td>
</tr>
<tr>
<td>Cyclic rotation</td>
<td>A rearrangement of a number’s digits by placing the first digit of the number after the last digit</td>
</tr>
<tr>
<td>Repunit</td>
<td>The repunits of integer $n$ ($1 \leq n \leq 9$) refer to numbers of which all digits are equal to $n$</td>
</tr>
<tr>
<td>Mod-index calculation</td>
<td>The calculation of $x$, where $a^r \equiv x \pmod{n}$, particularly referring to the case when $r$ is very large</td>
</tr>
</tbody>
</table>
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Objectives

Through this project, we hope to achieve the following objectives:

- Solve our research questions
- Prove all our solutions to our research questions
- Explore different types of shapes which we can apply the method of efficient cutting on

Firstly, we intended to calculate the probabilities of the different sets occurring in the 13-card hand. This information would be advantageous to any player when considering the risk of a certain combination being beaten by an opponent. Secondly, we wanted to introduce benchmarks for classifying combinations into controls and stragglers, since we could only base our strategies on accurately defined terms.

Thirdly, we identified various main processes in the game that we could analyze.
RESEARCH QUESTIONS

There should be at least 3 research questions

In a nutshell, our research questions we came up with so far are

- Find minimum no. of cuts needed to reduce $a \times b$ rectangle into unit squares.
- Find minimum no. of cuts needed to reduce $a \times b \times c$ cuboid into unit cubes.
- Find minimum no. of cuts needed to reduce side $n$ equilateral triangle into unit side 1 equilateral triangles.

1.2 Research Problems:

In the project, we want to:

1. Develop an efficient algorithm for the search of permutable primes.

2. Find out the existence of permutable primes with $n$ digits for each integer $n$
   a) If permutable primes exist for all $n$, then prove it.
   b) If permutable primes only exist for certain $n$, then find these specific $n$.

3. Check the infinity of permutable primes
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METHODOLOGY

• List the methods which you will be using to solve the 3 research questions mentioned
• Some common methods are:
• (1) Use algebra/number theory etc. to solve ...
• (2) Develop Excel File to model...
• (3) Use GSP/Geogebra Programme to ...
• (4) Develop a computer algorithm to ...
• You may be using different methods to solve different research question
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