Introduction

Today I will be testing your knowledge of the topics that we have covered over the past few months in Math Circles. We will be playing a game of Jeopardy which will have questions varying in difficulty that cover each of the topics that were taught in class. The game is broken into 6 categories with five questions each ranging from easiest ($100) to hardest ($500).

Mental Math

$100$ What is $86 \times 11$?

$200$ Is $1,771,561$ divisible by $11$?

$300$ What is $516.38 \div 5$?

$400$ Evaluate $988^2$

$500$ Calculate $[(185 \times 15) \div 5] \times 9$

Circuits

$100$ In a string of lights, if one burns out and the rest stay on, what type of circuit are the lights connected in?

$200$ If you have several lights connected in a series circuit and you add one more light to the circuit, what will happen to the overall brightness of the lights?

$300$ In a parallel circuit there is a 20 volt battery with 2 light bulbs that each have 5 amps of current running through them. What is the total resistance in the circuit?
$400$ A series circuit with two light bulbs has a total current of 4 amps. If light one has 12 volts and light two has a resistance of 9 ohms, what is the total voltage in the circuit?

$500$ Fill out the missing information from the table below:

![Series Circuit Diagram]

<table>
<thead>
<tr>
<th></th>
<th>$V_1$ = 6V</th>
<th>$V_2$ = 6V</th>
<th>$V_3$ = 15V</th>
<th>$V_4$ = 3V</th>
<th>$V_5$ = 3V</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{total}$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$I_{total}$ = 15A</td>
<td>$I_1$ = 7A</td>
<td>$I_2$ =</td>
<td>$I_3$ =</td>
<td>$I_4$ = 8A</td>
<td>$I_5$ =</td>
</tr>
<tr>
<td>$R_{total}$ =</td>
<td>$R_1$ =</td>
<td>$R_2$ =</td>
<td>$R_3$ =</td>
<td>$R_4$ =</td>
<td>$R_5$ =</td>
</tr>
</tbody>
</table>

3D Geometry

$100$ Find the volume of a cube that has a side length of 7 cm.

$200$ What is the formula for the volume of a cylinder?

$300$ Find the surface area of a rectangular prism with $l = 6 m$, $w = 4 m$, and $h = 8 m$

$400$ What is the slant height of the following rectangular pyramid along the 4 cm side?
$500$ Find the volume of the regular octagonal pyramid below.

![Pyramid Diagram]

**Math of Voting**

$100$ Who wins the following election using the plurality method and with how many votes?

<table>
<thead>
<tr>
<th>Number of voters</th>
<th>17</th>
<th>3</th>
<th>14</th>
<th>5</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Ronaldo</td>
<td>Ronaldo</td>
<td>Neymar</td>
<td>Neymar</td>
<td>Messi</td>
<td>Messi</td>
</tr>
<tr>
<td>2nd</td>
<td>Neymar</td>
<td>Messi</td>
<td>Ronaldo</td>
<td>Messi</td>
<td>Ronaldo</td>
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<tr>
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<td>Messi</td>
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<td>Neymar</td>
<td>Ronaldo</td>
</tr>
</tbody>
</table>

$200$ Who wins the following election using the borda count method and with how many points?

<table>
<thead>
<tr>
<th>Number of voters</th>
<th>3</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st (15 pts)</td>
<td>C</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>2nd (10 pts)</td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>3rd (5 pts)</td>
<td>B</td>
<td>C</td>
<td>A</td>
</tr>
</tbody>
</table>
$300$ Who wins the following election using the plurality with elimination method and with how many votes?

<table>
<thead>
<tr>
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<th>17</th>
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<tr>
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<td>Messi</td>
<td>Neymar</td>
<td>Messi</td>
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<td>Neymar</td>
<td>Ronaldo</td>
</tr>
</tbody>
</table>

$400$ Who wins the following election using the pairwise comparison method and with how many points?

<table>
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<th>Number of voters</th>
<th>3</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st (15 pts)</td>
<td>C</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>2nd (10 pts)</td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>3rd (5 pts)</td>
<td>B</td>
<td>C</td>
<td>A</td>
</tr>
</tbody>
</table>

$500$ Which of the fairness criteria are violated using the plurality with elimination method?

**Types of Numbers**

$100$ Which sets of numbers does \( \pi \) belong to?

$200$ What is \( \sqrt{-49} \) in terms of \( i \)?

$300$ What complex number is represented by the following line?

$400$ Evaluate \((4 - 4i) - (-4 + 4i)\).

$500$ Evaluate \((-4 + 2i) \times (7 - 3i)\).

**Word Problems**
$100$ Ahmed is going to the store. One quarter of the way to the store, he stops to talk with 
Kee. He then continues for 12 km and reaches the store. How many kilometres does 
he travel altogether?

$200$ The Summer Olympics are held once every 4 years. During an 18 year period, what is 
the largest number of Summer Olympics that could be held?

$300$ Three consecutive numbers add to 90. What is the largest number?

$400$ At Mathie High School, a total of 36 students are on either the baseball team, the 
hockey team, or both. If there are 25 students on the baseball team and 19 students 
on the hockey team, how many students play both sports?

$500$ Greg, Charlize and Azarah run at different but constant speeds. Each pair ran a race 
on a track that measured 100 m from start to finish. In the first race, when Azarah 
crossed the finish line, Charlize was 20 m behind. In the second race, when Charlize 
crossed the finish line, Greg was 10 m behind. In the third race, when Azarah crossed 
the finish line, how many metres was Greg behind?
Final Jeopardy
Successfully perform a mathematical card trick learned in class.