LEVEL: Middle School/High School

NUMBER OF TEAMS: One (1) team per school can participate at the MESA Day state competition. Three (3) teams can participate at MESA regional events.

TEAM MEMBERS: Two (2) to Four (4) Students per Team

OBJECTIVE: Students will participate in teams to replicate a drawing. Part of the team will need to code the directions while the other part will follow the directions to recreate a drawing. Students will also solve questions involving cryptography.

MATERIALS: All materials will be provided by MESA.

RESOURCES: The code used for this problem will come from studio.code.org/s/express. The teacher section of http://Cryptoclub.org has resources for the types of cryptography that will be used.

TESTING PARAMETERS:
1. Team members will be broken into 2 groups: Coders and Artists that are kept in separate rooms. They may not communicate in any way except by code written by the Coders
   a. Groups will consist of a maximum of 2 people.
   b. Coders will write the code for the Artists to follow
   c. Artists will follow the code that the Coders write to recreate a drawing
2. Coders will be provided a drawing printed on graph paper, a ruler, and a protractor. They will have at most 1 hour to write the code that the artists will follow.
3. The artist will follow the code exactly as written.
4. Total time to complete the drawing will be recorded and counted as part of the score.
5. All turns, if used, must be in terms of degrees (i.e. 90 degrees, 180 degrees, etc.)

JUDGING:
1. Judges will separate the teams into Coders and Artists
2. Judges will provide coders with the materials. Coders will be allowed to use their Engineering Design Notebook to take notes.
3. Time will start for, at max, a 1 hour coding session. Coders can use only commands from Code.org’s code studio (see example 1).
   a. All coding must start with the “when run” command
   b. User defined commands can only contain two words (i.e. solve puzzle)
   c. User defined commands may identify and set variables (i.e. set timer to 30 seconds)
4. While coders are creating the code, artists will be asked to solve a set of cryptography questions. Questions will ask students to use a Caesar, Additive, Substitution, or Multiplicative cipher to either encode or decode a message.
5. When the Coder has finished or time has expired, they will hand their code to the judge.
6. Judges will then bring the team together and the artists will be given materials to draw including a black sheet of graph paper, a pencil, a ruler, a protractor, and an eraser. The artist will also be given the code created by their team member.
7. If at any point, the artist is confused they may stop and ask the coder a clarifying question. Only yes
or no questions may be asked. The timer will not stop for these pauses.
8. The team will have a maximum of 60 minutes to complete the drawing.
9. The total time will be recorded.

**SCORING CRITERIA:**

1. Coders (see rubric):
   a. Efficiency of code (Use of loops, While statements, etc.)
   b. Accuracy of Code
   c. Readability of Code

2. Artists:
   a. Following the code
   b. Time to complete course drawing
   c. Answers to cryptography questions

3. Total Score will be Total Rubric Score x 1000 / Time in seconds
School: ____________________________

Student Names: ____________________________

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Design Testing:

<table>
<thead>
<tr>
<th>CODE</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code Efficiency (x2)</td>
<td>Team uses complex coding skills (Loops, If-Else statements, etc.) successfully</td>
<td>Team uses complex coding skills (Loops, If-Else statements, etc.) with limited success</td>
<td>Team uses basic coding skills successfully</td>
<td>Team uses basic coding skills with limited success</td>
<td>Code does not work.</td>
</tr>
<tr>
<td>Accuracy</td>
<td>The Artist is able to completely recreate the picture with no errors</td>
<td>The Artist is able to recreate the picture with 1 or 2 small errors</td>
<td>The Artist is able to recreate the picture with at most 5 minor errors</td>
<td>The Artist is able to partially recreate the picture with at most 2 major errors</td>
<td>The Artist is not able to recreate the picture without more than 2 major errors.</td>
</tr>
<tr>
<td>Code Readability (x2)</td>
<td>No unnecessary code is present</td>
<td>Coder uses meaningful variable names and good layout</td>
<td>The code is well laid out</td>
<td>The code is laid out with some spaces that are difficult to read.</td>
<td>Poor quality of code</td>
</tr>
</tbody>
</table>

Number of Cryptography questions correct (x5)

Total Score

Total Time (seconds): ____________________________

Final Score (Rubric score x 1000/Time in seconds) (rounded to nearest hundredth): ____________________________

Lead Judge Signature: ____________________________  Student Signature: ____________________________

Comments/Suggestions:
Example 1

- When Run
  - Repeat 5 Times
  - Do While path ahead do
    - Move forward
    - If at junction
    - Do Turn right
    - Else Turn left

**What it does:**

1. Start Program
2. Let’s computer know it will do this program 5 fives
3. Checks to see if there is a path in front
   a. If yes, continue to step #4
   b. If no, the program stops.
4. Move forward
5. Checks to see if a there is a junction of a 2nd path.
   a. If yes, it will turn right
   b. If no, it will turn left
6. Returns back to step #3 to repeat the cycle