Where Are We? An Exercise in Translations, Rotations and Reflections

**Purpose:** The purpose of this lab is to translate points on a “treasure” map, and use your translations to determine where to find the next clue. You will also be using your knowledge of translations and reflections to make your own treasure map.

**Outline:** A map of the UNLV campus has been put on a 10x10 coordinate axis. Starting with a given point you will be finding the next point on the map by reflecting or translating for Part A. For Parts B and C you will make your own lessons.

**Topical Objectives:** Using coordinate geometry to demonstrate geometric transformations: rotate/turn, translate/slide, reflect/flip

**Instructions:** Answer the following questions. Provide a cover page (date, project title, names)

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**Part A:**

1. On the attached page you will find a map of the UNLV campus, placed upon a grid. The points and lines on the map will be referenced as follows:
   a. All vertical and horizontal “lines” on the grid will be referenced by the row (or column) name. Vertical lines will be identified by the column heading, and horizontal lines by the row heading. For instance, Maryland Parkway can be most easily identified with LineT.
   b. All “points” on the grid will be referenced with the point of intersection between two lines. For instance, the Thomas and Mack Center (TMC) is located at the intersection of LineI and Line15, so it will be referenced as I15 (since this building is so large, it could also be referenced with J15).
   c. All “axes” will be referenced by the point of origin. For instance, the axes most closely formed by Maryland Parkway and Tropicana Avenue would be identified as AxesT20.

2. Preliminary exercises:
   a. Identify the building located at point J6
   b. Identify the point for the Parking Garage
   c. Beginning at point N11, translate 4 units right. What building is this?
   d. Beginning at point M14, translate 2 units right and 3 units down. What building is this?
   e. Beginning at point M14, rotate 90 degrees clockwise centered at AxesP14
   f. Reflect the point H7 through LineL
   g. Test each other in with points, lines, and axes.
3. Starting with the point $L14$ (CBCB building) find the next point on the map according to the instructions below.

**Treasure Map Instructions**

<table>
<thead>
<tr>
<th>Movement</th>
<th>Finish Point</th>
<th>Building Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reflect 3 units left and 1 unit down</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reflect through $Line_{12}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Translate 1 unit left and 2 units up</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotate 90 degrees clockwise centered at $Axes_{H12}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Translate right 3 units</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotate 90 degrees counterclockwise centered at $Axes_{P10}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Translate 2 left and 1 down</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotate 90 degrees clockwise centered at $Axis_{M11}$, AND then translate left 1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Part B:**
1. Using this map (or one of your own), make your own lesson using from 8 to 10 separate points.
2. You should have at least one translation, rotation and reflection.
3. Write up a handout of sorts (this need not be a formal lesson plan), and indicate where in the curriculum this can be presented.

**Part C:**
1. Take any elementary picture, and place it on a grid. This picture should have at least three pieces to it.
2. Rotate, translate and reflect the individual pieces to “mix” them up.
3. Provide someone with instructions as to how to put the picture back together.
   For example,
   After appropriately translating, reflecting and rotating the red pieces, you arrive at the black picture.

4. Hand this to one of your group-mates to complete. (There should be one Part C for each group member when you turn in your project).
5. They should be able to arrive at your picture. Discuss.