(2) (Planetary Voyage) For this voyage, I will assume you have on hand a dime and eight pennies. Instead of coins you can use buttons, checkers, or anything else that will serve as counters. I, your instructor, will now assume the role of magician.

Select any one of the nine cells in the heavenly body matrix below and put the dime on it. This is a completely free choice on your part and obviously I have no way of knowing what choice you made. When you move the dime according to my instructions, you must move it one cell at a time in any horizontal or vertical direction. No diagonal moves are allowed. At each move, spell a letter in the name on the cell where you first put the dime. For example if you start on Mars you spell M-A-R-S, moving the dime one square east, west, north, or south at random, one move for each letter. When you finish spelling the name on the starting square, put a penny on Venus. I am, of course, betting that no matter where you began, or how you moved the dime, it will not have come to rest on Venus.

After the first turn, at each step of your tour of the solar system, move the "space-ship" just seven times, regardless of the name on the cell. You may make these moves randomly, as before, but you are confined to unoccupied cells. The number of these vacant squares will become fewer and fewer as more and more pennies go on the matrix.

<table>
<thead>
<tr>
<th>Mercury</th>
<th>Uranus</th>
<th>Venus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mars</td>
<td>Jupiter</td>
<td>Saturn</td>
</tr>
<tr>
<td>Neptune</td>
<td>Moon</td>
<td>Pluto</td>
</tr>
</tbody>
</table>

After making seven moves, put a penny on Mars.
Move seven times. Put a penny on Mercury. How am I doing? Are all the pennies landing on vacant tiles?
Move seven times. Put a penny on Uranus.
Move seven times. Put a penny on Neptune.
Move seven times. Put a penny on Saturn.
Move seven times. Put a penny on Jupiter.
Move seven times. Put a penny on the Moon.
If you followed instructions correctly, the dime should now be on Pluto!

The basic question here is: How does the trick work?
Questions

(a) Try the procedure with seven moves replaced by spelling the word S-E-V-E-N. Does the trick still work?
(b) See how many variations of the trick you can construct.
(c) Why does the dime not land on Venus on the first move? On what squares can it land?
(d) Write a paragraph describing, as well as you can, how the trick works.
(e) Write a paragraph reflecting on how you gained knowledge about this problem.