Coding Theory Game

How to play:

1. **(Create and Encode the Message)** Each student comes up with a word of length at most 10 letters, and encodes it using the Encoder / Decoder given. (each letter of the word will become a point \((a, b)\), where \(a\) and \(b\) are integers. So the encoded word will be a list of points \((a_1, b_1), (a_2, b_2), \ldots\)). They then write the original word and the encoded word on one of their notecards.

2. **(Send the Message Into the Channel)** Each student passes the notecard with their original word and encoded word to the student behind them. Each student verifies that the word was encoded correctly.

3. **(Add Noise)** For each letter of the encoded word, which will be a point \((a, b)\), the student rolls a die twice. The first number determines the amount of noise you may add to the \(y\) coordinate of the encoded letter, according to the below table. The second number determines the amount of noise you may add to the \(x\) coordinate of the encoded letter, again according to the below table. The student writes their resulting “encoded word with noise” on their remaining notecard (be sure to **NOT** write the original codeword).

<table>
<thead>
<tr>
<th>Number on the Die</th>
<th>Noise</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No Noise</td>
</tr>
<tr>
<td>2</td>
<td>Add or subtract 1</td>
</tr>
<tr>
<td>3</td>
<td>Add or subtract 1</td>
</tr>
<tr>
<td>4</td>
<td>Add or subtract 1</td>
</tr>
<tr>
<td>5</td>
<td>Add or subtract 2</td>
</tr>
<tr>
<td>6</td>
<td>Add or subtract 2</td>
</tr>
</tbody>
</table>

4. **(Exit the Channel)** After each student has finished adding noise to the encoded word they received, they pass their notecard with the “encoded word with noise” to the student behind them.

5. **(Decode)** Finally each student decodes the word given to them.
Encoder / Decoder:

V
K
J
X
Q
B
S
O
N
D
P
T
E
A
L
Y
H
I
R
C
G
F
W
M
U