The end goal of Isolation is having at least one legal move left while the opponent does not have any, the heuristic function can focus on three objectives:

1. Maximizing the number of available legal moves for the player
2. Minimizing the number of available legal moves for the opponent
3. Finding the best compromise of first and second objectives.

An intuitive proxy for the available number of moves is vicinity to the board center, specially because only L-shape moves are allowed (i.e., legal moves). Having more legal moves than the opponent is clearly another useful metric. On the other hand, vicinity of two players seems to be an important factors. The custom score functions uses these three simple ideas and combine them in different ways.

The most performant heuristic functions (AB_Custom) combines two players' legal moves difference and their vicinity (euclidean distance). The heuristics simply adds there two quantities up. Note that most likely, there is a better combination of these two factors. The provided heuristic is just to show that combination of them can beat AB_Improved in majority of the cases. Besides, it is very simple and quick to calculate.

```
**************************
    Playing Matches
**************************

Match #   Opponent    AB_Improved   AB_Custom   AB_Custom_2  AB_Custom_3
                      Won | Lost   Won | Lost   Won | Lost   Won | Lost
   1       Random      8  |  2     9  |  1     7  |  3     8  |  2
   2       MM_Open     6  |  4     7  |  3     6  |  4     7  |  3
   3      MM_Center    7  |  3     9  |  1     7  |  3     6  |  4
   4     MM_Improved   6  |  4     4  |  6     8  |  2     7  |  3
   5       AB_Open     4  |  6     6  |  4     5  |  5     7  |  3
   6      AB_Center    8  |  2     6  |  4     2  |  8     6  |  4
   7     AB_Improved   5  |  5     6  |  4     5  |  5     3  |  7
--------------------------------------------------------------------
          Win Rate:      62.9%        67.1%        57.1%        62.9%
```

The other two heuristic functions combines two players' legal moves difference and the difference between their distance to the center (AB_Custom_2 and AB_Custom_3).
As mentioned before, there are numerous ways to combine these intuitive ideas and build heuristic functions. One approach to do so is removing the time constraints on the games and let all the games to finish and meanwhile record the values of these measures/metrics at each step for each game. Once the data collection is done, machine learning, as simple as a linear regression can be used for finding for example coefficient for the optimal way of combining different scores.