HEURISTIC Analysis

It is important to return a legal move in case there is a timeout and not forfeiting (not returning -1,-1).

My heuristics:

1. `AB_Custom = custom_score()`: (my_moves - opponent_moves) - the same as AB_Improved heuristic function (improved_score)
2. `AB_Custom_2 = custom_score_2()`: my_moves
3. `AB_Custom_3 = custom_score_3()`: (my_moves - opponent_moves x 2)

After playing 20 different matches:

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

 Match #   Opponent    AB_Improved   AB_Custom   AB_Custom_2
AB_Custom_3
                         Won | Lost   Won | Lost   Won | Lost   Won |
Lost
    1       Random       29  |  11    32  |   8    31  |   9    32  |
8
    2       MM_Open      32  |   8    33  |   7    29  |  11    34  |
6
    3      MM_Center     36  |   4    34  |   6    33  |   7    32  |
8
    4     MM_Improved    27  |  13    28  |  12    29  |  11    26  |
14
    5       AB_Open      18  |  22    21  |  19    20  |  20    22  |
18
    6      AB_Center     23  |  17    23  |  17    22  |  18    23  |
17
    7     AB_Improved    18  |  22    20  |  20    14  |  26    21  |
19
--------------------------------------------------------------------
------
           Win Rate:      65.4%        68.2%        63.6%
67.9%
```

There were 48.0 timeouts during the tournament.

In overall, the best result is for the `AB_Custom` function that returns the difference in moves between me and my opponent, giving the best result when I have more moves than my opponent and the least result when my opponent has more moves than me. This is followed by `AB_Custom_3`. This heuristic gives

more weight (exactly x2) to the opponent number of moves. This two metrics improve the result of `AB_Improved`. The second heuristic (`AB_Custom_2`) is good but doesn't improve the baseline because it doesn't take into account the opponent moves to penalize.

I have tried another heuristics based in the location of the moves (scoring better the moves near the center). In the next figure is shown the result of comparing the heuristic based on moves near the center, `AB_Custom_2`, versus `AB_Improved` and `AB_Custom` (moves between me and my opponent).

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

 Match #   Opponent    AB_Improved   AB_Custom   AB_Custom_2
                        Won | Lost   Won | Lost   Won | Lost
    1       Random       9  |   1    10  |   0    10  |   0
    2       MM_Open      6  |   4    10  |   0     9  |   1
    3      MM_Center     9  |   1    10  |   0     9  |   1
    4     MM_Improved    7  |   3     7  |   3     7  |   3
    5       AB_Open      6  |   4     3  |   7     4  |   6
    6      AB_Center     6  |   4     5  |   5     6  |   4
    7     AB_Improved    7  |   3     6  |   4     3  |   7
-------------------------------------------------------------
           Win Rate:      71.4%        72.9%        68.6%
```

But they require more time to calculate and they aren't better compared to the final heuristic metrics. Some of the metrics explained in the course are not better because of the new restriction of the players' movement as knights.