AI Heuristic choices

I decided to use three different heuristic that closely resemble each to have a better understanding how they perform. I am fascinated in understanding how two particular heuristics that are very much opposites of each other can be combined to create a more performant heuristic. The first heuristic tried to improve the number of moves a player has available and uses that to optimize the score. This heuristic performed at 56% compared to the baseline of 62.86%. I was not too surprised at this results. Similarly I used a heuristic to calculate the score based on the number of moves an opponent has left (less is better) and got a 61%. I ran the test's a few times and there was some variance but overall the data points that these two heuristics performed worse than the score being used for comparison.

Then I decided to use the heuristic that utilized the following formula:

AvailableMoves – (2 * Opponents moves)) This proved to be a more efficient algorithm, performing at 71%. I used this algorithm since it showcased the simplicity of using two other heuristics in an optimized way. In the future we might be able to create an agent that creates permutations of known heuristics to find more optimal solutions.

```
# Heuristic 1 Optimize for a score that improves players moves
**************************
 Evaluating: ID_Improved
**************************

Playing Matches:
----------
  Match 1: ID_Improved vs   Random      Result: 17 to 3
  Match 2: ID_Improved vs   MM_Null     Result: 16 to 4
  Match 3: ID_Improved vs   MM_Open     Result: 10 to 10
  Match 4: ID_Improved vs MM_Improved   Result: 11 to 9
  Match 5: ID_Improved vs   AB_Null     Result: 15 to 5
```

```
  Match 6: ID_Improved vs   AB_Open     Result: 13 to 7
  Match 7: ID_Improved vs AB_Improved   Result: 11 to 9


Results:
----------
ID_Improved         66.43%

*************************
   Evaluating: Student
*************************

Playing Matches:
----------
  Match 1:   Student   vs   Random      Result: 15 to 5
  Match 2:   Student   vs   MM_Null     Result: 12 to 8
  Match 3:   Student   vs   MM_Open     Result: 8 to 12
  Match 4:   Student   vs MM_Improved   Result: 12 to 8
  Match 5:   Student   vs   AB_Null     Result: 11 to 9
  Match 6:   Student   vs   AB_Open     Result: 13 to 7
  Match 7:   Student   vs AB_Improved   Result: 10 to 10


Results:
----------
Student             57.86%



# Heuristic 2 Optimize for a score that reduced adversarial  moves
*************************
 Evaluating: ID_Improved
*************************

Playing Matches:
----------
  Match 1: ID_Improved vs   Random      Result: 17 to 3
  Match 2: ID_Improved vs   MM_Null     Result: 15 to 5
  Match 3: ID_Improved vs   MM_Open     Result: 13 to 7
  Match 4: ID_Improved vs MM_Improved   Result: 13 to 7
  Match 5: ID_Improved vs   AB_Null     Result: 14 to 6
  Match 6: ID_Improved vs   AB_Open     Result: 14 to 6
  Match 7: ID_Improved vs AB_Improved   Result: 14 to 6


Results:
----------
ID_Improved         71.43%

*************************
   Evaluating: Student
*************************

Playing Matches:
----------
  Match 1:   Student   vs   Random      Result: 16 to 4
  Match 2:   Student   vs   MM_Null     Result: 13 to 7
  Match 3:   Student   vs   MM_Open     Result: 12 to 8
  Match 4:   Student   vs MM_Improved   Result: 10 to 10
  Match 5:   Student   vs   AB_Null     Result: 13 to 7
```

```
  Match 6:   Student   vs   AB_Open     Result: 14 to 6
  Match 7:   Student   vs AB_Improved   Result: 8 to 12


Results:
----------
Student             61.43%



# Third heuristic. (playerMoves – (2 * Opponentmoves))


*************************
 Evaluating: ID_Improved
*************************

Playing Matches:
----------
  Match 1: ID_Improved vs   Random      Result: 16 to 4
  Match 2: ID_Improved vs   MM_Null     Result: 15 to 5
  Match 3: ID_Improved vs   MM_Open     Result: 12 to 8
  Match 4: ID_Improved vs MM_Improved   Result: 12 to 8
  Match 5: ID_Improved vs   AB_Null     Result: 15 to 5
  Match 6: ID_Improved vs   AB_Open     Result: 11 to 9
  Match 7: ID_Improved vs AB_Improved   Result: 7 to 13


Results:
----------
ID_Improved         62.86%

*************************
   Evaluating: Student
*************************

Playing Matches:
----------
  Match 1:   Student   vs   Random      Result: 18 to 2
  Match 2:   Student   vs   MM_Null     Result: 18 to 2
  Match 3:   Student   vs   MM_Open     Result: 15 to 5
  Match 4:   Student   vs MM_Improved   Result: 13 to 7
  Match 5:   Student   vs   AB_Null     Result: 13 to 7
  Match 6:   Student   vs   AB_Open     Result: 11 to 9
  Match 7:   Student   vs AB_Improved   Result: 12 to 8


Results:
----------
Student             71.43%
```