Heuristic Results

Match #	Opponent	AB_Improved	AB_Custom	AB_Custom_2	AB_Custom_3
		Won | Lost	Won | Lost	Won | Lost	Won | Lost
1	Random	155 | 45	175 | 25	169 | 31	172 | 28
2	MM_Open	129 | 71	115 | 85	101 | 99	111 | 89
3	MM_Center	146 | 54	152 | 48	132 | 68	149 | 51
4	MM_Improved	116 | 84	103 | 97	108 | 92	96 | 104
5	AB_Open	100 | 100	85 | 115	70 | 130	88 | 112
6	AB_Center	110 | 90	99 | 101	98 | 102	97 | 103
7	AB_Improved	93 | 107	94 | 106	71 | 129	81 | 119
Win Rate		60.6%	58.8%	53.5%	56.7%

In evaluating the different heuristics, the number of matches was set to 100, and the time limit was left at the default value of 150. AB_Improved performed the best, and AB_Custom performed nearly as well as AB_Improved. This isn't surprising, since AB_Improved and AB_Custom are similar in that AB_Improved is the net total of the player's possible moves minus the opponent's possible moves, whereas AB_Custom is the ratio of the number of the player's possible moves compared to the total number of moves on the board. In this way, both heuristics provide an estimate of a value of a game state based on the number of the player's possible moves compared with the rest of the board. With that said, it is unknown whether the difference between these two metrics (or any of the others) is statistically significant.

Unsurprisingly, the difference between AB_Custom_2 and AB_Custom_3 mirrors the difference between the above mentioned heuristics. Both AB_Custom_2 and AB_Custom_3 seek to minimize the opponent's number of available moves. AB_Custom_2 does so by returning the negative value of the ratio of the number of opponents moves compared to the total number of moves on the board (it is the inverse of AB_Custom). AB_Custom_3 minimizes the number of the opponent's moves by returning the negative of the total number of the opponent's moves for a given game state (the inverse of AB_Open).

Based on this data, AB_Improved is the best heuristic to use overall, and among the custom heuristics, AB_Custom is the best. The data above implies that:

1. Maximizing the player's number of available moves is superior to minimizing the opponent's number of available moves.
2. Heuristics that use an absolute value of moves (i.e. total number of the player's moves) are superior to a ratio (i.e. player's moves / total moves)
3. When combining #'s 1 & 2 above, considering the player's number of moves appears to be more consequential than using a ratio. For example, see the performance of AB_Custom, which uses a ratio but seeks to maximize the player's moves, versus AB_Custom_3, which minimizes the total number of the opponent's moves.