# Analysis of the Heuristics

Following heuristics were chosen and implemented

* **H1** (AB\_Custom): *# of player’s moves – 2 x # of opponent’s moves*
* **H2** (AB\_Custom\_2): *# of player’s moves - # of opponent’s moves*
* **H3** (AB\_Custom\_3): Center score of the player (Square of the distance of the player’s location from the center of the board.

The results of the tournament with these heuristics are as follows:

Table Results of the Tournament

                        \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

                             Playing Matches

                        \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

 Match #   Opponent    AB\_Improved   AB\_Custom   AB\_Custom\_2  AB\_Custom\_3

                        Won | Lost   Won | Lost   Won | Lost   Won | Lost

    1       Random       9  |   1    10  |   0    10  |   0     8  |   2

    2       MM\_Open     10  |   0    10  |   0    10  |   0    10  |   0

    3      MM\_Center    10  |   0    10  |   0    10  |   0     9  |   1

    4     MM\_Improved   10  |   0    10  |   0    10  |   0    10  |   0

    5       AB\_Open      4  |   6     6  |   4     2  |   8     6  |   4

    6      AB\_Center     5  |   5     9  |   1     6  |   4     6  |   4

    7     AB\_Improved    4  |   6     6  |   4     8  |   2     2  |   8

--------------------------------------------------------------------------

           Win Rate:      74.3%        87.1%        80.0%        72.9%

As it can be seen **H1** performed quite well, as it aggressively tries to minimize opponent’s available moves (hence the factor 2). **H2** is trying to do something similar but player’s and opponent’s available moves are equally important. Hence the win-rate is somewhat lower. One can observe that **H1** performs satisfactorily against even AB\_Improved.

Table 1 shows **H3** does not perform well against AB\_Improved, which Alpha-Beta with iterative deepening. As it is same with AB\_Center, the expectation would have been 50%-50% with AB\_Center. Although they are close, **H3** is slightly better.

Overall, **H1** seems to be the best heuristic, as it is trying to maximize the available moves for player 1 and aggressively minimize (x2) the available moves of the opponent.