COM S 572: Lab 2 Report
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In short, the depth of the agent seemed to make a more significant difference than the evaluation if the evaluation function was a material advantage function. Expanding on this, the evaluation was very difficult to improve past a material advantage function and improvements would only marginally improve performance against other evaluation functions. This is in contrast with depth where a larger increase in the difference of search depth greatly increased agent performance.

Question 6:
The chart below shows the results of varying depth in the alpha-beta pruning for a single agent and a constant depth for another where both use the percentage of total material advantage evaluation function. From this we see that a larger increase in depth typically increases the chances of winning; however, it does not necessarily increase the speed of a win when one does occur.

Depth of Agent1	Depth of Agent2	Winner : NumMoves
0	10	Agent2 : 94
1	10	Agent2 : 60
2	10	Agent2 : 68
3	10	Draw
4	10	Agent2 : 86
5	10	Agent2 : 78
6	10	Draw
7	10	Agent2 : 62
8	10	Draw
9	10	Draw
10	10	Draw

Question 7:
The following table shows two evaluation functions used. From it, we see that the percentage of total material advantage improves marginally over an absolute material advantage. This is because the percentage of material advantage encourages trading while ahead.

Agent1 (Depth) : (Eval)	Agent2 (Depth) : (Eval)	Winner : NumMoves
8 : Absolute	10: Percentage	Agent2 : 106
9 : Absolute	10: Percentage	Draw
10 : Absolute	8 : Percentage	Draw
10 : Absolute	9 : Percentage	Draw
10 : Absolute	10 : Percentage	Agent2 : 88
10 : Percentage	8 : Absolute	Draw
10 : Percentage	9 : Absolute	Draw
8 : Percentage	10 : Absolute	Draw
9 : Percentage	10 : Absolute	Draw
10 : Percentage	10 : Absolute	Draw

It should be noted that numerous other evaluation functions were tested, but all but one showed equal or worse performance than the percentage of material advantage heuristic. The one that did show a favorable outcome was a combination of many heuristics: absolute material advantage, minimizes Manhattan distance to the center of the board, moving out the single-corner piece, retaining the king's row double corner piece, retaining the king's row most-adjacent piece to the single corner, retaining both at the same time, and retaining both double corner pieces.

This heuristic was found to draw with the percentage material advantage heuristic when played as Agent2 and Agent1, respectively. However, when this combination heuristic was played as Agent1, it was able to beat the percentage material advantage heuristic for both algorithms set at depth 10 in 103 moves. This was the first time one of the agents achieved a win as the starting player.

It should also be noted, that depth 10 was the deepest depth test, and shallower depths resulted in draws up until depth 2 where percentage material value won instead.