Initial state	Goal State	Number of moves to solve	Number of nodes explored using Heuristic A	Number of nodes explored using Heuristic B
1 2 3; 4 5 _; 7 8 6	1 2 3; 4 5 6; 7 8 _	1	4	4
1 2 3; 4 8 _; 7 6 5	1 2 3; 4 5 6; 7 8 _	5	34	16
1 3 8; 4 _ 2; 7 6 5	1 2 3; 4 5 6; 7 8 _	10	995	57
3 4 8; _ 1 2; 7 6 5	1 2 3; 4 5 6; 7 8 _	15	13,518	97

The table above shows the number of nodes explored for both heuristics using the same initial/goal state combinations. The combinations increase in complexity by 5 moves (except for the first to second combination, where the increase is by 4 moves). The initial/goal state columns written in this table follow MATLAB syntax, where a “ “ denotes a new column and “;” denotes a new row. Heuristic A refers to the number of misplaced tiles as the priority function, and Heuristic B refers to the Manhattan Distance as the priority function.

The results show that Heuristic B is a more efficient heuristic than Heuristic A, because for all initial/goal state combinations, the number of nodes explored by Heuristic B were less than or equal to that of the number of nodes explored by Heuristic A.

The following explains why this is the expected result: Both heuristics are admissible, which means that they’re both underestimates of the true cost to reach the goal state from a node in the queue. If a tile is misplaced, Heuristic A adds a value of 1 to the total cost evaluated, while Heuristic B adds a value of at least 1. Thus, for a node in the queue, Heuristic B estimates a cost **H1** greater than or equal to that of Heuristic A’s estimate **H2**. In other words, $\mathbf{H2} \leq \mathbf{H1} \leq \mathbf{H}^{*}$, where $\mathbf{H}^{*}$ is the true cost to reach the goal state from a node. Less nodes are explored using Heuristic B since it’s a better priority function for the cost estimates of each node in the queue. At Heuristic B’s worst case, its cost estimate will be equal to that of Heuristic A. Thus, Heuristic B is expected to do better or as well as Heuristic A for an initial/goal state combination.