

Code Write-Up:

I stuck heavily with the format of the problem, except I broke the Manhattan Heuristic Function into two, with the mhs function calculating the return values for the specific values, and the MH function would add all the return values, excluding 0.

The cost of 0 was not added to the heuristic as in real life this is just an empty space.

```
1 4 2
0 5 8
3 6 7
```

====BFS====

Path to goal: ['Up', 'Left', 'Left', 'Down', 'Right', 'Down', 'Right']

Cost of path: 7

States expanded: 152

Max frontier size: 90

Total time: 0.003s

====DFS====

Cost of path: 63987

States expanded: 108309

Max frontier size: 42967

Total time: 3.065s

====A* (Misplaced Tiles Heuristic)====

Path to goal: ['Up', 'Left', 'Left', 'Down', 'Right', 'Down', 'Right']

Cost of path: 7

States expanded: 7

Max frontier size: 8

Total time: 0.000s

====A* (Total Manhattan Distance Heuristic)====

Path to goal: ['Up', 'Left', 'Left', 'Down', 'Right', 'Down', 'Right']

Cost of path: 7

States expanded: 7

Max frontier size: 8

Total time: 0.000s

7 2 4
5 0 6
8 3 1

====BFS====

Path to goal: ['Right', 'Down', 'Left', 'Up', 'Left', 'Up', 'Right',
'Right', 'Down', 'Left', 'Left', 'Up', 'Right', 'Right', 'Down',
'Left', 'Left', 'Down', 'Right', 'Right', 'Up', 'Left', 'Left',
'Down', 'Right', 'Right']

Cost of path: 26

States expanded: 170921

Max frontier size: 24983

Total time: 4.375s

====DFS====

Cost of path: 62140

States expanded: 114207

Max frontier size: 42912

Total time: 3.040s

====A* (Misplaced Tiles Heuristic)====

Path to goal: ['Right', 'Down', 'Left', 'Up', 'Left', 'Up', 'Right',
'Right', 'Down', 'Left', 'Left', 'Up', 'Right', 'Right', 'Down',
'Left', 'Left', 'Down', 'Right', 'Right', 'Up', 'Left', 'Left',
'Down', 'Right', 'Right']

Cost of path: 26

States expanded: 32643

Max frontier size: 13927

Total time: 0.829s

====A* (Total Manhattan Distance Heuristic)====

Path to goal: ['Right', 'Down', 'Left', 'Up', 'Left', 'Up', 'Right',
'Right', 'Down', 'Left', 'Left', 'Up', 'Right', 'Right', 'Down',
'Left', 'Left', 'Down', 'Right', 'Right', 'Up', 'Left', 'Left',
'Down', 'Right', 'Right']

Cost of path: 26

States expanded: 1745

Max frontier size: 971

Total time: 0.075s