Ziyan Liu

Artificial Intelligence 1

CSC 480

Assignment 1

The presentation link on YouTube:

<https://youtu.be/c6h7-MxEGec>

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Easy** | | | | |
| **Algorithm** | **Length** | **Cost** | **Time** | **Space** |
| **BFS** | 5 | 5 | 42 | 36 |
| **DFS** | 31269 | 31269 | 155276 | 42967 |
| **IDS** | 5 | 5 | 26 | 6 |
| **UCS** | 5 | 38 | 37 | 31 |
| **GBF** | 5 | 38 | 50 | 38 |
| **A\*1** | 5 | 38 | 57 | 47 |
| **A\*2** | 5 | 38 | 34 | 30 |
| **A\*3** | 5 | 38 | 37 | 32 |
|  |  |  |  |  |
| **Medium** | | | | |
| **Algorithm** | **Length** | **Cost** | **Time** | **Space** |
| **BFS** | 9 | 9 | 343 | 218 |
| **DFS** | 25125 | 25125 | 160710 | 42913 |
| **IDS** | 9 | 9 | 1596 | 14 |
| **UCS** | 9 | 68 | 200 | 146 |
| **GBF** | 4578 | 4578 | 4702 | 3651 |
| **A\*1** | 9 | 68 | 306 | 205 |
| **A\*2** | 9 | 68 | 149 | 110 |
| **A\*3** | 9 | 68 | 206 | 146 |
|  |  |  |  |  |
| **Hard** | | | | |
| **Algorithm** | **Length** | **Cost** | **Time** | **Space** |
| **BFS** | 30 | 30 | 181364 | 24983 |
| **DFS** | 4578 | 4578 | 4702 | 3651 |
| **IDS** | 38 | 38 | 42898 | 31 |
| **UCS** | 30 | 225 | 170632 | 24651 |
| **GBF** | 30 | 225 | 181354 | 24592 |
| **A\*1** | 30 | 225 | 173256 | 24653 |
| **A\*2** | 30 | 225 | 150008 | 25919 |
| **A\*3** | 30 | 225 | 164570 | 25270 |

In two of the three difficulty modes (Easy & Medium), BFS search works way better than DFS search. That is because if the current path that DFS search follows doesn't lead to a solution, the algorithm needs to exhaust all possiblities in that path to know the path doesn't work. When the path is very long, it may significantly increase the amount of checking to walk through the enire path. BFS, however, is essentially checking all possible paths one move at a time, if the solution is only a few moves away from the given puzzle, it can be found by BFS in a short time. This conition is reversed in Hard mode. It looks A\*2 works better than A\*3, according to the testing data. Since h1 takes more time and space than h2, it looks like adding a h1 to a h2 overall increase the time and space usage. The order of the directions also matters during the entire searching process.

|  |  |  |  |
| --- | --- | --- | --- |
| Easy | | | |
| BFS | DFS | A\*2 | A\*3 |
| [1, 3, 4]  [8, 0, 2]  [7, 6, 5]  [1, 3, 4]  [8, 6, 2]  [0, 7, 5]  [1, 3, 4]  [8, 6, 2]  [7, 5, 0]  State checked: 1  [1, 0, 4]  [8, 3, 2]  [7, 6, 5]  [1, 3, 4]  [0, 8, 2]  [7, 6, 5]  [1, 3, 4]  [8, 2, 0]  [7, 6, 5]  State checked: 2  [1, 3, 4]  [0, 6, 2]  [8, 7, 5]  State checked: 3  [1, 3, 4]  [8, 6, 0]  [7, 5, 2]  State checked: 4  [0, 1, 4]  [8, 3, 2]  [7, 6, 5]  [1, 4, 0]  [8, 3, 2]  [7, 6, 5]  State checked: 5  [0, 3, 4]  [1, 8, 2]  [7, 6, 5]  [1, 3, 4]  [7, 8, 2]  [0, 6, 5]  State checked: 6  [1, 3, 0]  [8, 2, 4]  [7, 6, 5]  [1, 3, 4]  [8, 2, 5]  [7, 6, 0]  State checked: 7  [0, 3, 4]  [1, 6, 2]  [8, 7, 5]  [1, 3, 4]  [6, 0, 2]  [8, 7, 5]  State checked: 8  [1, 3, 0]  [8, 6, 4]  [7, 5, 2]  [1, 3, 4]  [8, 0, 6]  [7, 5, 2]  State checked: 9  [8, 1, 4]  [0, 3, 2]  [7, 6, 5]  State checked: 10  [1, 4, 2]  [8, 3, 0]  [7, 6, 5]  State checked: 11  [3, 0, 4]  [1, 8, 2]  [7, 6, 5]  State checked: 12  [1, 3, 4]  [7, 8, 2]  [6, 0, 5]  State checked: 13  [1, 0, 3]  [8, 2, 4]  [7, 6, 5]  State checked: 14  [1, 3, 4]  [8, 2, 5]  [7, 0, 6]  State checked: 15  [3, 0, 4]  [1, 6, 2]  [8, 7, 5]  State checked: 16  [1, 0, 4]  [6, 3, 2]  [8, 7, 5]  [1, 3, 4]  [6, 7, 2]  [8, 0, 5]  [1, 3, 4]  [6, 2, 0]  [8, 7, 5]  State checked: 17  [1, 0, 3]  [8, 6, 4]  [7, 5, 2]  State checked: 18  [1, 0, 4]  [8, 3, 6]  [7, 5, 2]  [1, 3, 4]  [8, 5, 6]  [7, 0, 2]  [1, 3, 4]  [0, 8, 6]  [7, 5, 2]  State checked: 19  [8, 1, 4]  [7, 3, 2]  [0, 6, 5]  [8, 1, 4]  [3, 0, 2]  [7, 6, 5]  State checked: 20  [1, 4, 2]  [8, 3, 5]  [7, 6, 0]  [1, 4, 2]  [8, 0, 3]  [7, 6, 5]  State checked: 21  [3, 8, 4]  [1, 0, 2]  [7, 6, 5]  [3, 4, 0]  [1, 8, 2]  [7, 6, 5]  State checked: 22  [1, 3, 4]  [7, 0, 2]  [6, 8, 5]  [1, 3, 4]  [7, 8, 2]  [6, 5, 0]  State checked: 23  [1, 2, 3]  [8, 0, 4]  [7, 6, 5]  [0, 1, 3]  [8, 2, 4]  [7, 6, 5]  State checked: 24  [1, 3, 4]  [8, 0, 5]  [7, 2, 6]  [1, 3, 4]  [8, 2, 5]  [0, 7, 6]  State checked: 25  [3, 6, 4]  [1, 0, 2]  [8, 7, 5]  [3, 4, 0]  [1, 6, 2]  [8, 7, 5]  State checked: 26  [0, 1, 4]  [6, 3, 2]  [8, 7, 5]  [1, 4, 0]  [6, 3, 2]  [8, 7, 5]  State checked: 27  [1, 3, 4]  [6, 7, 2]  [0, 8, 5]  [1, 3, 4]  [6, 7, 2]  [8, 5, 0]  State checked: 28  [1, 3, 0]  [6, 2, 4]  [8, 7, 5]  [1, 3, 4]  [6, 2, 5]  [8, 7, 0]  State checked: 29  [1, 6, 3]  [8, 0, 4]  [7, 5, 2]  [0, 1, 3]  [8, 6, 4]  [7, 5, 2]  State checked: 30  [0, 1, 4]  [8, 3, 6]  [7, 5, 2]  [1, 4, 0]  [8, 3, 6]  [7, 5, 2]  State checked: 31  [1, 3, 4]  [8, 5, 6]  [0, 7, 2]  [1, 3, 4]  [8, 5, 6]  [7, 2, 0]  State checked: 32  [0, 3, 4]  [1, 8, 6]  [7, 5, 2]  [1, 3, 4]  [7, 8, 6]  [0, 5, 2]  State checked: 33  [8, 1, 4]  [7, 3, 2]  [6, 0, 5]  State checked: 34  [8, 0, 4]  [3, 1, 2]  [7, 6, 5]  [8, 1, 4]  [3, 6, 2]  [7, 0, 5]  [8, 1, 4]  [3, 2, 0]  [7, 6, 5]  State checked: 35  [1, 4, 2]  [8, 3, 5]  [7, 0, 6]  State checked: 36  [1, 0, 2]  [8, 4, 3]  [7, 6, 5]  [1, 4, 2]  [8, 6, 3]  [7, 0, 5]  [1, 4, 2]  [0, 8, 3]  [7, 6, 5]  State checked: 37  [3, 8, 4]  [1, 6, 2]  [7, 0, 5]  [3, 8, 4]  [0, 1, 2]  [7, 6, 5]  [3, 8, 4]  [1, 2, 0]  [7, 6, 5]  State checked: 38  [3, 4, 2]  [1, 8, 0]  [7, 6, 5]  State checked: 39  [1, 0, 4]  [7, 3, 2]  [6, 8, 5]  [1, 3, 4]  [0, 7, 2]  [6, 8, 5]  [1, 3, 4]  [7, 2, 0]  [6, 8, 5]  State checked: 40  [1, 3, 4]  [7, 8, 0]  [6, 5, 2]  State checked: 41  Goal State Found!  Lenght: 5  Cost: 5  Time: 42  Space: 36 | State checked:  …  State checked: 155136  State checked: 155137  State checked: 155138  State checked: 155139  State checked: 155140  [1, 7, 2]  [3, 4, 8]  [0, 5, 6]  State checked: 155141  [1, 7, 2]  [0, 4, 8]  [3, 5, 6]  State checked: 155142  [0, 7, 2]  [1, 4, 8]  [3, 5, 6]  State checked: 155143  State checked: 155144  State checked: 155145  State checked: 155146  State checked: 155147  [7, 2, 8]  [0, 1, 6]  [5, 3, 4]  State checked: 155148  [0, 2, 8]  [7, 1, 6]  [5, 3, 4]  [7, 2, 8]  [5, 1, 6]  [0, 3, 4]  State checked: 155149  State checked: 155150  [2, 0, 8]  [7, 1, 6]  [5, 3, 4]  State checked: 155151  State checked: 155152  State checked: 155153  State checked: 155154  State checked: 155155  State checked: 155156  State checked: 155157  State checked: 155158  State checked: 155159  State checked: 155160  State checked: 155161  [2, 8, 6]  [3, 7, 0]  [5, 1, 4]  State checked: 155162  [2, 8, 0]  [3, 7, 6]  [5, 1, 4]  [2, 8, 6]  [3, 7, 4]  [5, 1, 0]  State checked: 155163  State checked: 155164  State checked: 155165  State checked: 155166  [0, 8, 6]  [2, 3, 1]  [5, 4, 7]  State checked: 155167  State checked: 155168  State checked: 155169  State checked: 155170  State checked: 155171  State checked: 155172  State checked: 155173  State checked: 155174  State checked: 155175  State checked: 155176  State checked: 155177  State checked: 155178  State checked: 155179  State checked: 155180  State checked: 155181  State checked: 155182  State checked: 155183  State checked: 155184  State checked: 155185  State checked: 155186  State checked: 155187  State checked: 155188  State checked: 155189  State checked: 155190  [0, 8, 6]  [2, 4, 1]  [3, 5, 7]  State checked: 155191  State checked: 155192  State checked: 155193  State checked: 155194  State checked: 155195  State checked: 155196  State checked: 155197  State checked: 155198  [2, 6, 1]  [8, 3, 4]  [0, 5, 7]  State checked: 155199  State checked: 155200  [2, 6, 1]  [3, 5, 4]  [0, 8, 7]  State checked: 155201  [2, 6, 1]  [0, 5, 4]  [3, 8, 7]  State checked: 155202  [0, 6, 1]  [2, 5, 4]  [3, 8, 7]  State checked: 155203  State checked: 155204  State checked: 155205  State checked: 155206  State checked: 155207  State checked: 155208  State checked: 155209  State checked: 155210  State checked: 155211  State checked: 155212  State checked: 155213  State checked: 155214  [0, 3, 7]  [6, 2, 1]  [4, 8, 5]  State checked: 155215  [6, 3, 7]  [0, 2, 1]  [4, 8, 5]  State checked: 155216  [6, 3, 7]  [4, 2, 1]  [0, 8, 5]  State checked: 155217  State checked: 155218  [2, 0, 7]  [3, 6, 1]  [4, 8, 5]  State checked: 155219  State checked: 155220  State checked: 155221  State checked: 155222  State checked: 155223  State checked: 155224  State checked: 155225  State checked: 155226  State checked: 155227  State checked: 155228  State checked: 155229  State checked: 155230  State checked: 155231  State checked: 155232  State checked: 155233  State checked: 155234  State checked: 155235  State checked: 155236  State checked: 155237  [3, 2, 7]  [1, 4, 5]  [0, 6, 8]  State checked: 155238  [3, 2, 7]  [0, 4, 5]  [1, 6, 8]  State checked: 155239  [0, 2, 7]  [3, 4, 5]  [1, 6, 8]  State checked: 155240  State checked: 155241  State checked: 155242  State checked: 155243  [0, 7, 5]  [2, 3, 1]  [6, 4, 8]  State checked: 155244  State checked: 155245  State checked: 155246  State checked: 155247  State checked: 155248  State checked: 155249  State checked: 155250  State checked: 155251  State checked: 155252  State checked: 155253  State checked: 155254  State checked: 155255  State checked: 155256  [1, 2, 7]  [8, 3, 5]  [0, 4, 6]  State checked: 155257  [1, 2, 7]  [0, 3, 5]  [8, 4, 6]  State checked: 155258  [0, 2, 7]  [1, 3, 5]  [8, 4, 6]  State checked: 155259  State checked: 155260  State checked: 155261  State checked: 155262  State checked: 155263  [8, 1, 2]  [5, 3, 7]  [0, 4, 6]  State checked: 155264  [8, 1, 2]  [0, 3, 7]  [5, 4, 6]  State checked: 155265  [0, 1, 2]  [8, 3, 7]  [5, 4, 6]  State checked: 155266  State checked: 155267  State checked: 155268  State checked: 155269  State checked: 155270  State checked: 155271  State checked: 155272  State checked: 155273  State checked: 155274  State checked: 155275  Goal State Found!  Lenght: 31269  Cost: 31269  Time: 155276  Space: 42967 | [1, 3, 4]  [8, 0, 2]  [7, 6, 5]  [1, 3, 4]  [8, 6, 2]  [0, 7, 5]  [1, 3, 4]  [8, 6, 2]  [7, 5, 0]  State checked: 1  [1, 0, 4]  [8, 3, 2]  [7, 6, 5]  [1, 3, 4]  [0, 8, 2]  [7, 6, 5]  [1, 3, 4]  [8, 2, 0]  [7, 6, 5]  State checked: 2  [0, 1, 4]  [8, 3, 2]  [7, 6, 5]  [1, 4, 0]  [8, 3, 2]  [7, 6, 5]  State checked: 3  [1, 3, 4]  [0, 6, 2]  [8, 7, 5]  State checked: 4  [8, 1, 4]  [0, 3, 2]  [7, 6, 5]  State checked: 5  [1, 3, 4]  [8, 6, 0]  [7, 5, 2]  State checked: 6  [0, 3, 4]  [1, 8, 2]  [7, 6, 5]  [1, 3, 4]  [7, 8, 2]  [0, 6, 5]  State checked: 7  [1, 4, 2]  [8, 3, 0]  [7, 6, 5]  State checked: 8  [0, 3, 4]  [1, 6, 2]  [8, 7, 5]  [1, 3, 4]  [6, 0, 2]  [8, 7, 5]  State checked: 9  [8, 1, 4]  [7, 3, 2]  [0, 6, 5]  [8, 1, 4]  [3, 0, 2]  [7, 6, 5]  State checked: 10  [1, 4, 2]  [8, 3, 5]  [7, 6, 0]  [1, 4, 2]  [8, 0, 3]  [7, 6, 5]  State checked: 11  [1, 3, 0]  [8, 6, 4]  [7, 5, 2]  [1, 3, 4]  [8, 0, 6]  [7, 5, 2]  State checked: 12  [1, 3, 0]  [8, 2, 4]  [7, 6, 5]  [1, 3, 4]  [8, 2, 5]  [7, 6, 0]  State checked: 13  [1, 4, 2]  [8, 3, 5]  [7, 0, 6]  State checked: 14  [1, 0, 3]  [8, 6, 4]  [7, 5, 2]  State checked: 15  [3, 0, 4]  [1, 8, 2]  [7, 6, 5]  State checked: 16  [3, 0, 4]  [1, 6, 2]  [8, 7, 5]  State checked: 17  [1, 0, 3]  [8, 2, 4]  [7, 6, 5]  State checked: 18  [1, 3, 4]  [7, 8, 2]  [6, 0, 5]  State checked: 19  [1, 0, 2]  [8, 4, 3]  [7, 6, 5]  [1, 4, 2]  [8, 6, 3]  [7, 0, 5]  [1, 4, 2]  [0, 8, 3]  [7, 6, 5]  State checked: 20  [1, 3, 4]  [8, 2, 5]  [7, 0, 6]  State checked: 21  [3, 8, 4]  [1, 0, 2]  [7, 6, 5]  [3, 4, 0]  [1, 8, 2]  [7, 6, 5]  State checked: 22  [3, 6, 4]  [1, 0, 2]  [8, 7, 5]  [3, 4, 0]  [1, 6, 2]  [8, 7, 5]  State checked: 23  [0, 1, 2]  [8, 4, 3]  [7, 6, 5]  [1, 2, 0]  [8, 4, 3]  [7, 6, 5]  State checked: 24  [1, 0, 4]  [8, 3, 6]  [7, 5, 2]  [1, 3, 4]  [8, 5, 6]  [7, 0, 2]  [1, 3, 4]  [0, 8, 6]  [7, 5, 2]  State checked: 25  [1, 6, 3]  [8, 0, 4]  [7, 5, 2]  [0, 1, 3]  [8, 6, 4]  [7, 5, 2]  State checked: 26  [3, 8, 4]  [1, 6, 2]  [7, 0, 5]  [3, 8, 4]  [0, 1, 2]  [7, 6, 5]  [3, 8, 4]  [1, 2, 0]  [7, 6, 5]  State checked: 27  [3, 6, 4]  [1, 7, 2]  [8, 0, 5]  [3, 6, 4]  [0, 1, 2]  [8, 7, 5]  [3, 6, 4]  [1, 2, 0]  [8, 7, 5]  State checked: 28  [8, 1, 4]  [7, 3, 2]  [6, 0, 5]  State checked: 29  [1, 2, 3]  [8, 0, 4]  [7, 6, 5]  [0, 1, 3]  [8, 2, 4]  [7, 6, 5]  State checked: 30  [1, 4, 2]  [8, 6, 3]  [0, 7, 5]  [1, 4, 2]  [8, 6, 3]  [7, 5, 0]  State checked: 31  [1, 6, 3]  [8, 5, 4]  [7, 0, 2]  [1, 6, 3]  [0, 8, 4]  [7, 5, 2]  [1, 6, 3]  [8, 4, 0]  [7, 5, 2]  State checked: 32  [1, 0, 4]  [6, 3, 2]  [8, 7, 5]  [1, 3, 4]  [6, 7, 2]  [8, 0, 5]  [1, 3, 4]  [6, 2, 0]  [8, 7, 5]  State checked: 33  Goal State Found!  Lenght: 5  Cost: 38  Time: 34  Space: 30 | [1, 3, 4]  [8, 0, 2]  [7, 6, 5]  [1, 3, 4]  [8, 6, 2]  [0, 7, 5]  [1, 3, 4]  [8, 6, 2]  [7, 5, 0]  State checked: 1  [1, 0, 4]  [8, 3, 2]  [7, 6, 5]  [1, 3, 4]  [0, 8, 2]  [7, 6, 5]  [1, 3, 4]  [8, 2, 0]  [7, 6, 5]  State checked: 2  [1, 3, 4]  [0, 6, 2]  [8, 7, 5]  State checked: 3  [0, 1, 4]  [8, 3, 2]  [7, 6, 5]  [1, 4, 0]  [8, 3, 2]  [7, 6, 5]  State checked: 4  [8, 1, 4]  [0, 3, 2]  [7, 6, 5]  State checked: 5  [1, 3, 4]  [8, 6, 0]  [7, 5, 2]  State checked: 6  [0, 3, 4]  [1, 6, 2]  [8, 7, 5]  [1, 3, 4]  [6, 0, 2]  [8, 7, 5]  State checked: 7  [1, 4, 2]  [8, 3, 0]  [7, 6, 5]  State checked: 8  [8, 1, 4]  [7, 3, 2]  [0, 6, 5]  [8, 1, 4]  [3, 0, 2]  [7, 6, 5]  State checked: 9  [0, 3, 4]  [1, 8, 2]  [7, 6, 5]  [1, 3, 4]  [7, 8, 2]  [0, 6, 5]  State checked: 10  [1, 3, 0]  [8, 6, 4]  [7, 5, 2]  [1, 3, 4]  [8, 0, 6]  [7, 5, 2]  State checked: 11  [1, 4, 2]  [8, 3, 5]  [7, 6, 0]  [1, 4, 2]  [8, 0, 3]  [7, 6, 5]  State checked: 12  [1, 0, 3]  [8, 6, 4]  [7, 5, 2]  State checked: 13  [3, 0, 4]  [1, 6, 2]  [8, 7, 5]  State checked: 14  [1, 4, 2]  [8, 3, 5]  [7, 0, 6]  State checked: 15  [1, 3, 0]  [8, 2, 4]  [7, 6, 5]  [1, 3, 4]  [8, 2, 5]  [7, 6, 0]  State checked: 16  [3, 0, 4]  [1, 8, 2]  [7, 6, 5]  State checked: 17  [3, 6, 4]  [1, 0, 2]  [8, 7, 5]  [3, 4, 0]  [1, 6, 2]  [8, 7, 5]  State checked: 18  [1, 3, 4]  [7, 8, 2]  [6, 0, 5]  State checked: 19  [1, 0, 3]  [8, 2, 4]  [7, 6, 5]  State checked: 20  [3, 8, 4]  [1, 0, 2]  [7, 6, 5]  [3, 4, 0]  [1, 8, 2]  [7, 6, 5]  State checked: 21  [1, 0, 4]  [8, 3, 6]  [7, 5, 2]  [1, 3, 4]  [8, 5, 6]  [7, 0, 2]  [1, 3, 4]  [0, 8, 6]  [7, 5, 2]  State checked: 22  [1, 0, 2]  [8, 4, 3]  [7, 6, 5]  [1, 4, 2]  [8, 6, 3]  [7, 0, 5]  [1, 4, 2]  [0, 8, 3]  [7, 6, 5]  State checked: 23  [3, 6, 4]  [1, 7, 2]  [8, 0, 5]  [3, 6, 4]  [0, 1, 2]  [8, 7, 5]  [3, 6, 4]  [1, 2, 0]  [8, 7, 5]  State checked: 24  [1, 3, 4]  [8, 2, 5]  [7, 0, 6]  State checked: 25  [3, 8, 4]  [1, 6, 2]  [7, 0, 5]  [3, 8, 4]  [0, 1, 2]  [7, 6, 5]  [3, 8, 4]  [1, 2, 0]  [7, 6, 5]  State checked: 26  [1, 6, 3]  [8, 0, 4]  [7, 5, 2]  [0, 1, 3]  [8, 6, 4]  [7, 5, 2]  State checked: 27  [0, 1, 2]  [8, 4, 3]  [7, 6, 5]  [1, 2, 0]  [8, 4, 3]  [7, 6, 5]  State checked: 28  [8, 1, 4]  [7, 3, 2]  [6, 0, 5]  State checked: 29  [1, 0, 4]  [6, 3, 2]  [8, 7, 5]  [1, 3, 4]  [6, 7, 2]  [8, 0, 5]  [1, 3, 4]  [6, 2, 0]  [8, 7, 5]  State checked: 30  [1, 6, 3]  [8, 5, 4]  [7, 0, 2]  [1, 6, 3]  [0, 8, 4]  [7, 5, 2]  [1, 6, 3]  [8, 4, 0]  [7, 5, 2]  State checked: 31  [1, 4, 2]  [8, 0, 5]  [7, 3, 6]  [1, 4, 2]  [8, 3, 5]  [0, 7, 6]  State checked: 32  [1, 2, 3]  [8, 0, 4]  [7, 6, 5]  [0, 1, 3]  [8, 2, 4]  [7, 6, 5]  State checked: 33  [0, 1, 4]  [8, 3, 6]  [7, 5, 2]  [1, 4, 0]  [8, 3, 6]  [7, 5, 2]  State checked: 34  [1, 4, 2]  [8, 6, 3]  [0, 7, 5]  [1, 4, 2]  [8, 6, 3]  [7, 5, 0]  State checked: 35  [3, 4, 2]  [1, 6, 0]  [8, 7, 5]  State checked: 36  Goal State Found!  Lenght: 5  Cost: 38  Time: 37  Space: 32  Process finished with exit code 0 |
| Medium | | | |
| BFS | DFS | A\*2 | A\*3 |
| ...  State checked: 297  [8, 0, 4]  [6, 3, 1]  [2, 7, 5]  State checked: 298  [8, 4, 1]  [6, 3, 5]  [2, 0, 7]  State checked: 299  [8, 6, 4]  [2, 5, 1]  [7, 0, 3]  [8, 6, 4]  [0, 2, 1]  [7, 5, 3]  [8, 6, 4]  [2, 1, 0]  [7, 5, 3]  State checked: 300  [2, 8, 4]  [0, 6, 1]  [7, 5, 3]  State checked: 301  [8, 1, 6]  [2, 4, 0]  [7, 5, 3]  State checked: 302  [8, 4, 1]  [0, 5, 6]  [2, 7, 3]  State checked: 303  State checked: 304  [4, 0, 1]  [8, 2, 6]  [7, 5, 3]  State checked: 305  [8, 4, 1]  [7, 2, 6]  [5, 0, 3]  State checked: 306  [4, 1, 3]  [8, 2, 5]  [7, 0, 6]  State checked: 307  [4, 0, 3]  [8, 1, 2]  [7, 6, 5]  [4, 1, 3]  [8, 6, 2]  [7, 0, 5]  [4, 1, 3]  [0, 8, 2]  [7, 6, 5]  State checked: 308  [7, 8, 1]  [0, 4, 3]  [6, 2, 5]  State checked: 309  [8, 1, 3]  [7, 4, 0]  [6, 2, 5]  State checked: 310  [4, 0, 1]  [8, 7, 3]  [6, 2, 5]  State checked: 311  [8, 0, 4]  [7, 3, 1]  [6, 2, 5]  State checked: 312  [8, 4, 1]  [7, 3, 5]  [6, 0, 2]  State checked: 313  [8, 0, 4]  [7, 2, 1]  [6, 5, 3]  State checked: 314  [8, 0, 1]  [7, 4, 2]  [6, 5, 3]  [8, 4, 1]  [7, 5, 2]  [6, 0, 3]  [8, 4, 1]  [0, 7, 2]  [6, 5, 3]  State checked: 315  [8, 3, 4]  [0, 6, 1]  [2, 7, 5]  State checked: 316  [8, 3, 4]  [2, 6, 0]  [7, 5, 1]  State checked: 317  [3, 0, 4]  [8, 2, 1]  [7, 6, 5]  State checked: 318  [8, 3, 4]  [7, 2, 1]  [6, 0, 5]  State checked: 319  [8, 3, 4]  [2, 1, 5]  [7, 0, 6]  State checked: 320  [2, 8, 4]  [7, 3, 1]  [6, 0, 5]  State checked: 321  [2, 0, 4]  [3, 8, 1]  [7, 6, 5]  [2, 8, 4]  [3, 6, 1]  [7, 0, 5]  [2, 8, 4]  [3, 1, 0]  [7, 6, 5]  State checked: 322  [8, 1, 5]  [2, 4, 0]  [7, 3, 6]  State checked: 323  [4, 0, 1]  [8, 2, 5]  [7, 3, 6]  State checked: 324  [8, 4, 1]  [7, 2, 5]  [3, 0, 6]  State checked: 325  [8, 0, 4]  [2, 5, 1]  [7, 3, 6]  State checked: 326  [4, 0, 1]  [8, 3, 5]  [2, 7, 6]  State checked: 327  [8, 0, 1]  [3, 4, 5]  [2, 7, 6]  [8, 4, 1]  [3, 7, 5]  [2, 0, 6]  [8, 4, 1]  [3, 5, 0]  [2, 7, 6]  State checked: 328  [2, 8, 3]  [0, 1, 5]  [7, 4, 6]  State checked: 329  [8, 3, 5]  [2, 1, 0]  [7, 4, 6]  State checked: 330  [1, 0, 3]  [8, 2, 5]  [7, 4, 6]  State checked: 331  [8, 1, 3]  [7, 2, 5]  [4, 0, 6]  State checked: 332  [8, 0, 1]  [2, 5, 3]  [7, 4, 6]  State checked: 333  [8, 1, 3]  [2, 5, 6]  [7, 0, 4]  State checked: 334  [1, 0, 3]  [8, 4, 5]  [2, 7, 6]  State checked: 335  [8, 0, 3]  [4, 1, 5]  [2, 7, 6]  [8, 1, 3]  [4, 7, 5]  [2, 0, 6]  [8, 1, 3]  [4, 5, 0]  [2, 7, 6]  State checked: 336  [2, 8, 3]  [7, 1, 4]  [6, 0, 5]  State checked: 337  [2, 0, 3]  [1, 8, 4]  [7, 6, 5]  [2, 8, 3]  [1, 6, 4]  [7, 0, 5]  [2, 8, 3]  [1, 4, 0]  [7, 6, 5]  State checked: 338  [1, 0, 3]  [8, 6, 4]  [2, 7, 5]  State checked: 339  [8, 0, 3]  [6, 1, 4]  [2, 7, 5]  [8, 1, 3]  [6, 7, 4]  [2, 0, 5]  State checked: 340  [8, 0, 1]  [2, 6, 3]  [7, 5, 4]  State checked: 341  [8, 0, 3]  [2, 1, 6]  [7, 5, 4]  [8, 1, 3]  [0, 2, 6]  [7, 5, 4]  State checked: 342  Goal State Found!  Lenght: 9  Cost: 9  Time: 343  Space: 218 | ...  State checked: 160577  State checked: 160578  State checked: 160579  State checked: 160580  State checked: 160581  [4, 7, 1]  [2, 5, 8]  [3, 6, 0]  State checked: 160582  [4, 7, 1]  [2, 5, 0]  [3, 6, 8]  State checked: 160583  [4, 7, 0]  [2, 5, 1]  [3, 6, 8]  State checked: 160584  State checked: 160585  State checked: 160586  State checked: 160587  State checked: 160588  State checked: 160589  State checked: 160590  State checked: 160591  State checked: 160592  State checked: 160593  State checked: 160594  State checked: 160595  State checked: 160596  [7, 1, 8]  [5, 4, 0]  [6, 3, 2]  State checked: 160597  [7, 1, 0]  [5, 4, 8]  [6, 3, 2]  [7, 1, 8]  [5, 4, 2]  [6, 3, 0]  State checked: 160598  State checked: 160599  State checked: 160600  State checked: 160601  State checked: 160602  State checked: 160603  State checked: 160604  State checked: 160605  [0, 7, 8]  [2, 1, 3]  [5, 6, 4]  State checked: 160606  [2, 7, 8]  [0, 1, 3]  [5, 6, 4]  State checked: 160607  [2, 7, 8]  [5, 1, 3]  [0, 6, 4]  State checked: 160608  State checked: 160609  State checked: 160610  State checked: 160611  State checked: 160612  State checked: 160613  State checked: 160614  State checked: 160615  State checked: 160616  State checked: 160617  State checked: 160618  [7, 8, 0]  [4, 1, 6]  [3, 2, 5]  State checked: 160619  [7, 8, 6]  [4, 1, 0]  [3, 2, 5]  State checked: 160620  [7, 8, 6]  [4, 1, 5]  [3, 2, 0]  State checked: 160621  State checked: 160622  State checked: 160623  State checked: 160624  State checked: 160625  State checked: 160626  State checked: 160627  State checked: 160628  State checked: 160629  State checked: 160630  State checked: 160631  State checked: 160632  State checked: 160633  [7, 2, 1]  [0, 5, 8]  [6, 4, 3]  State checked: 160634  [0, 2, 1]  [7, 5, 8]  [6, 4, 3]  [7, 2, 1]  [6, 5, 8]  [0, 4, 3]  State checked: 160635  State checked: 160636  [2, 0, 1]  [7, 5, 8]  [6, 4, 3]  State checked: 160637  State checked: 160638  [5, 0, 1]  [6, 7, 8]  [4, 2, 3]  State checked: 160639  State checked: 160640  State checked: 160641  State checked: 160642  State checked: 160643  [5, 0, 7]  [6, 3, 1]  [4, 8, 2]  State checked: 160644  State checked: 160645  State checked: 160646  State checked: 160647  State checked: 160648  State checked: 160649  State checked: 160650  State checked: 160651  State checked: 160652  State checked: 160653  State checked: 160654  State checked: 160655  State checked: 160656  [0, 5, 1]  [8, 7, 4]  [2, 3, 6]  State checked: 160657  State checked: 160658  State checked: 160659  State checked: 160660  State checked: 160661  State checked: 160662  State checked: 160663  State checked: 160664  State checked: 160665  State checked: 160666  State checked: 160667  State checked: 160668  State checked: 160669  State checked: 160670  [7, 1, 2]  [6, 5, 3]  [0, 4, 8]  State checked: 160671  State checked: 160672  [7, 2, 0]  [5, 1, 3]  [6, 4, 8]  State checked: 160673  [7, 2, 3]  [5, 1, 0]  [6, 4, 8]  State checked: 160674  [7, 2, 3]  [5, 1, 8]  [6, 4, 0]  State checked: 160675  State checked: 160676  State checked: 160677  State checked: 160678  State checked: 160679  State checked: 160680  State checked: 160681  [1, 0, 2]  [5, 7, 3]  [6, 8, 4]  State checked: 160682  State checked: 160683  State checked: 160684  State checked: 160685  State checked: 160686  State checked: 160687  State checked: 160688  State checked: 160689  State checked: 160690  State checked: 160691  State checked: 160692  State checked: 160693  State checked: 160694  State checked: 160695  State checked: 160696  State checked: 160697  State checked: 160698  State checked: 160699  State checked: 160700  State checked: 160701  State checked: 160702  State checked: 160703  State checked: 160704  State checked: 160705  State checked: 160706  State checked: 160707  State checked: 160708  State checked: 160709  Goal State Found!  Lenght: 25125  Cost: 25125  Time: 160710  Space: 42913 | ...  State checked: 115  [4, 1, 3]  [8, 2, 5]  [7, 6, 0]  [4, 1, 3]  [8, 0, 2]  [7, 6, 5]  State checked: 116  [0, 1, 3]  [2, 4, 8]  [7, 6, 5]  [2, 1, 3]  [7, 4, 8]  [0, 6, 5]  State checked: 117  [0, 1, 3]  [8, 2, 5]  [7, 4, 6]  [8, 1, 3]  [7, 2, 5]  [0, 4, 6]  State checked: 118  [2, 0, 3]  [7, 1, 8]  [6, 4, 5]  [2, 1, 3]  [7, 4, 8]  [6, 0, 5]  [2, 1, 3]  [0, 7, 8]  [6, 4, 5]  State checked: 119  [2, 4, 8]  [7, 5, 1]  [6, 0, 3]  [2, 4, 8]  [0, 7, 1]  [6, 5, 3]  [2, 4, 8]  [7, 1, 0]  [6, 5, 3]  State checked: 120  [2, 0, 1]  [4, 8, 6]  [7, 5, 3]  [2, 8, 1]  [4, 5, 6]  [7, 0, 3]  [2, 8, 1]  [0, 4, 6]  [7, 5, 3]  State checked: 121  [8, 3, 4]  [2, 1, 5]  [7, 0, 6]  State checked: 122  [2, 3, 8]  [7, 0, 1]  [6, 4, 5]  [0, 2, 8]  [7, 3, 1]  [6, 4, 5]  State checked: 123  [2, 6, 8]  [4, 0, 1]  [7, 5, 3]  [0, 2, 8]  [4, 6, 1]  [7, 5, 3]  State checked: 124  [8, 3, 4]  [0, 6, 1]  [2, 7, 5]  State checked: 125  [8, 6, 4]  [2, 5, 1]  [7, 0, 3]  [8, 6, 4]  [0, 2, 1]  [7, 5, 3]  [8, 6, 4]  [2, 1, 0]  [7, 5, 3]  State checked: 126  [8, 1, 3]  [2, 6, 0]  [7, 5, 4]  State checked: 127  [8, 1, 0]  [2, 5, 3]  [7, 4, 6]  [8, 1, 3]  [2, 5, 6]  [7, 4, 0]  State checked: 128  [0, 3, 8]  [2, 4, 1]  [7, 6, 5]  [2, 3, 8]  [7, 4, 1]  [0, 6, 5]  State checked: 129  [2, 8, 1]  [7, 5, 4]  [0, 6, 3]  [2, 8, 1]  [7, 5, 4]  [6, 3, 0]  State checked: 130  [2, 8, 1]  [0, 3, 5]  [4, 7, 6]  State checked: 131  [8, 0, 1]  [7, 4, 3]  [6, 2, 5]  [8, 4, 1]  [0, 7, 3]  [6, 2, 5]  [8, 4, 1]  [7, 3, 0]  [6, 2, 5]  State checked: 132  [0, 2, 1]  [4, 8, 5]  [7, 3, 6]  [2, 1, 0]  [4, 8, 5]  [7, 3, 6]  State checked: 133  [1, 0, 3]  [8, 2, 5]  [7, 4, 6]  State checked: 134  [8, 3, 4]  [7, 2, 1]  [6, 0, 5]  State checked: 135  [2, 0, 3]  [1, 8, 4]  [7, 6, 5]  [2, 8, 3]  [1, 6, 4]  [7, 0, 5]  [2, 8, 3]  [1, 4, 0]  [7, 6, 5]  State checked: 136  [0, 2, 3]  [1, 8, 4]  [7, 6, 5]  [2, 3, 0]  [1, 8, 4]  [7, 6, 5]  State checked: 137  [4, 1, 3]  [8, 2, 5]  [7, 0, 6]  State checked: 138  [7, 2, 1]  [6, 8, 3]  [4, 0, 5]  State checked: 139  [7, 2, 8]  [0, 4, 1]  [6, 5, 3]  State checked: 140  [0, 1, 3]  [8, 6, 4]  [2, 7, 5]  [8, 1, 3]  [6, 0, 4]  [2, 7, 5]  State checked: 141  [0, 1, 3]  [8, 4, 5]  [2, 7, 6]  [8, 1, 3]  [4, 0, 5]  [2, 7, 6]  State checked: 142  [0, 2, 1]  [6, 8, 3]  [4, 7, 5]  [2, 1, 0]  [6, 8, 3]  [4, 7, 5]  State checked: 143  [8, 6, 1]  [2, 7, 3]  [4, 0, 5]  [8, 6, 1]  [0, 2, 3]  [4, 7, 5]  [8, 6, 1]  [2, 3, 0]  [4, 7, 5]  State checked: 144  [1, 0, 3]  [2, 4, 8]  [7, 6, 5]  State checked: 145  [0, 8, 1]  [7, 4, 3]  [6, 2, 5]  [8, 1, 0]  [7, 4, 3]  [6, 2, 5]  State checked: 146  [4, 6, 1]  [8, 0, 3]  [2, 7, 5]  [4, 1, 0]  [8, 6, 3]  [2, 7, 5]  State checked: 147  [1, 2, 3]  [8, 0, 4]  [7, 6, 5]  [1, 3, 0]  [8, 2, 4]  [7, 6, 5]  State checked: 148  Goal State Found!  Lenght: 9  Cost: 68  Time: 149  Space: 110 | ...  State checked: 167  [2, 3, 8]  [4, 1, 5]  [7, 6, 0]  State checked: 168  [2, 1, 3]  [0, 8, 5]  [4, 7, 6]  State checked: 169  [8, 4, 0]  [2, 5, 1]  [7, 3, 6]  [8, 4, 1]  [2, 5, 6]  [7, 3, 0]  State checked: 170  [8, 3, 5]  [2, 1, 0]  [7, 4, 6]  State checked: 171  [1, 0, 3]  [2, 4, 8]  [7, 6, 5]  State checked: 172  [4, 0, 1]  [8, 3, 5]  [2, 7, 6]  State checked: 173  [0, 2, 3]  [1, 8, 4]  [7, 6, 5]  [2, 3, 0]  [1, 8, 4]  [7, 6, 5]  State checked: 174  [0, 2, 3]  [4, 1, 5]  [7, 8, 6]  [2, 3, 0]  [4, 1, 5]  [7, 8, 6]  State checked: 175  [1, 0, 3]  [8, 6, 4]  [2, 7, 5]  State checked: 176  [8, 3, 4]  [2, 6, 0]  [7, 5, 1]  State checked: 177  [8, 4, 1]  [6, 7, 3]  [0, 2, 5]  [8, 4, 1]  [6, 7, 3]  [2, 5, 0]  State checked: 178  [8, 4, 1]  [2, 5, 6]  [0, 7, 3]  State checked: 179  [2, 8, 3]  [7, 1, 5]  [0, 4, 6]  [2, 8, 3]  [1, 0, 5]  [7, 4, 6]  State checked: 180  [0, 8, 1]  [2, 3, 5]  [4, 7, 6]  [2, 8, 1]  [3, 0, 5]  [4, 7, 6]  State checked: 181  [4, 6, 1]  [8, 7, 3]  [2, 0, 5]  [4, 6, 1]  [0, 8, 3]  [2, 7, 5]  [4, 6, 1]  [8, 3, 0]  [2, 7, 5]  State checked: 182  [7, 2, 8]  [0, 3, 1]  [6, 4, 5]  State checked: 183  [0, 3, 4]  [8, 6, 1]  [2, 7, 5]  [8, 3, 4]  [6, 0, 1]  [2, 7, 5]  State checked: 184  State checked: 185  [2, 3, 8]  [0, 6, 1]  [4, 7, 5]  State checked: 186  State checked: 187  [8, 0, 1]  [2, 5, 3]  [7, 4, 6]  State checked: 188  [0, 2, 4]  [3, 8, 1]  [7, 6, 5]  [2, 4, 0]  [3, 8, 1]  [7, 6, 5]  State checked: 189  [2, 0, 1]  [7, 8, 5]  [6, 3, 4]  [2, 8, 1]  [0, 7, 5]  [6, 3, 4]  [2, 8, 1]  [7, 5, 0]  [6, 3, 4]  State checked: 190  [7, 2, 1]  [0, 8, 4]  [6, 5, 3]  State checked: 191  [8, 4, 1]  [7, 2, 0]  [6, 5, 3]  State checked: 192  [2, 1, 3]  [0, 6, 8]  [4, 7, 5]  State checked: 193  [0, 2, 3]  [7, 1, 8]  [6, 4, 5]  [2, 3, 0]  [7, 1, 8]  [6, 4, 5]  State checked: 194  [4, 2, 3]  [7, 1, 8]  [6, 0, 5]  State checked: 195  [2, 0, 3]  [7, 1, 5]  [6, 8, 4]  [2, 1, 3]  [0, 7, 5]  [6, 8, 4]  [2, 1, 3]  [7, 5, 0]  [6, 8, 4]  State checked: 196  [7, 0, 1]  [8, 2, 3]  [6, 4, 5]  [7, 2, 1]  [8, 4, 3]  [6, 0, 5]  [7, 2, 1]  [8, 3, 0]  [6, 4, 5]  State checked: 197  [1, 2, 3]  [8, 0, 4]  [7, 6, 5]  [1, 3, 0]  [8, 2, 4]  [7, 6, 5]  State checked: 198  [0, 4, 1]  [8, 7, 3]  [6, 2, 5]  State checked: 199  [4, 2, 3]  [0, 1, 5]  [7, 8, 6]  State checked: 200  [0, 4, 8]  [2, 7, 1]  [6, 5, 3]  [2, 4, 8]  [6, 7, 1]  [0, 5, 3]  State checked: 201  [2, 1, 3]  [7, 4, 8]  [6, 5, 0]  State checked: 202  [8, 1, 0]  [2, 6, 3]  [7, 5, 4]  [8, 1, 3]  [2, 0, 6]  [7, 5, 4]  State checked: 203  [8, 3, 5]  [2, 1, 6]  [7, 4, 0]  [8, 3, 5]  [2, 0, 1]  [7, 4, 6]  State checked: 204  [3, 0, 4]  [8, 6, 1]  [2, 7, 5]  State checked: 205  Goal State Found!  Lenght: 9  Cost: 68  Time: 206  Space: 146 |
| Hard | | | |
| BFS | DFS | A\*2 | A\*3 |
| ...  State checked: 181137  State checked: 181138  State checked: 181139  State checked: 181140  [2, 1, 3]  [8, 6, 5]  [7, 4, 0]  State checked: 181141  State checked: 181142  [0, 6, 5]  [8, 7, 4]  [1, 2, 3]  State checked: 181143  [8, 2, 3]  [1, 6, 5]  [7, 4, 0]  State checked: 181144  State checked: 181145  State checked: 181146  [0, 8, 3]  [1, 4, 2]  [7, 6, 5]  State checked: 181147  State checked: 181148  State checked: 181149  State checked: 181150  State checked: 181151  State checked: 181152  State checked: 181153  State checked: 181154  State checked: 181155  State checked: 181156  [7, 4, 0]  [8, 6, 3]  [1, 5, 2]  State checked: 181157  State checked: 181158  State checked: 181159  [7, 4, 3]  [8, 6, 2]  [1, 5, 0]  State checked: 181160  State checked: 181161  State checked: 181162  State checked: 181163  State checked: 181164  State checked: 181165  State checked: 181166  State checked: 181167  State checked: 181168  State checked: 181169  State checked: 181170  State checked: 181171  State checked: 181172  State checked: 181173  State checked: 181174  State checked: 181175  State checked: 181176  State checked: 181177  State checked: 181178  State checked: 181179  State checked: 181180  State checked: 181181  State checked: 181182  State checked: 181183  State checked: 181184  State checked: 181185  State checked: 181186  State checked: 181187  State checked: 181188  State checked: 181189  State checked: 181190  State checked: 181191  State checked: 181192  State checked: 181193  State checked: 181194  State checked: 181195  State checked: 181196  State checked: 181197  State checked: 181198  State checked: 181199  State checked: 181200  [1, 3, 0]  [8, 6, 2]  [7, 4, 5]  State checked: 181201  State checked: 181202  State checked: 181203  State checked: 181204  State checked: 181205  State checked: 181206  State checked: 181207  State checked: 181208  State checked: 181209  State checked: 181210  State checked: 181211  State checked: 181212  State checked: 181213  State checked: 181214  State checked: 181215  State checked: 181216  State checked: 181217  State checked: 181218  State checked: 181219  State checked: 181220  State checked: 181221  State checked: 181222  State checked: 181223  State checked: 181224  State checked: 181225  State checked: 181226  State checked: 181227  State checked: 181228  State checked: 181229  State checked: 181230  State checked: 181231  [0, 1, 3]  [2, 6, 4]  [7, 8, 5]  State checked: 181232  State checked: 181233  State checked: 181234  State checked: 181235  State checked: 181236  State checked: 181237  State checked: 181238  State checked: 181239  State checked: 181240  State checked: 181241  State checked: 181242  State checked: 181243  State checked: 181244  State checked: 181245  State checked: 181246  State checked: 181247  State checked: 181248  State checked: 181249  State checked: 181250  State checked: 181251  State checked: 181252  State checked: 181253  State checked: 181254  State checked: 181255  State checked: 181256  State checked: 181257  State checked: 181258  State checked: 181259  State checked: 181260  State checked: 181261  State checked: 181262  State checked: 181263  State checked: 181264  State checked: 181265  State checked: 181266  State checked: 181267  State checked: 181268  State checked: 181269  State checked: 181270  State checked: 181271  State checked: 181272  State checked: 181273  State checked: 181274  State checked: 181275  State checked: 181276  State checked: 181277  State checked: 181278  State checked: 181279  State checked: 181280  State checked: 181281  State checked: 181282  State checked: 181283  State checked: 181284  State checked: 181285  State checked: 181286  State checked: 181287  State checked: 181288  State checked: 181289  State checked: 181290  State checked: 181291  State checked: 181292  State checked: 181293  State checked: 181294  State checked: 181295  State checked: 181296  State checked: 181297  State checked: 181298  State checked: 181299  State checked: 181300  State checked: 181301  State checked: 181302  State checked: 181303  State checked: 181304  State checked: 181305  State checked: 181306  State checked: 181307  State checked: 181308  State checked: 181309  State checked: 181310  State checked: 181311  State checked: 181312  State checked: 181313  State checked: 181314  State checked: 181315  State checked: 181316  State checked: 181317  State checked: 181318  State checked: 181319  State checked: 181320  State checked: 181321  State checked: 181322  State checked: 181323  State checked: 181324  State checked: 181325  State checked: 181326  State checked: 181327  State checked: 181328  State checked: 181329  State checked: 181330  State checked: 181331  State checked: 181332  State checked: 181333  State checked: 181334  State checked: 181335  State checked: 181336  State checked: 181337  State checked: 181338  State checked: 181339  State checked: 181340  State checked: 181341  State checked: 181342  State checked: 181343  State checked: 181344  State checked: 181345  State checked: 181346  State checked: 181347  State checked: 181348  State checked: 181349  State checked: 181350  State checked: 181351  State checked: 181352  State checked: 181353  State checked: 181354  State checked: 181355  State checked: 181356  State checked: 181357  State checked: 181358  State checked: 181359  State checked: 181360  State checked: 181361  State checked: 181362  State checked: 181363  Goal State Found!  Lenght: 30  Cost: 30  Time: 181364  Space: 24983 | …  State checked: 4635  [1, 3, 2]  [0, 5, 6]  [4, 7, 8]  State checked: 4636  [0, 3, 2]  [1, 5, 6]  [4, 7, 8]  [1, 3, 2]  [5, 0, 6]  [4, 7, 8]  State checked: 4637  [1, 0, 2]  [5, 3, 6]  [4, 7, 8]  [1, 3, 2]  [5, 7, 6]  [4, 0, 8]  [1, 3, 2]  [5, 6, 0]  [4, 7, 8]  State checked: 4638  [1, 3, 0]  [5, 6, 2]  [4, 7, 8]  [1, 3, 2]  [5, 6, 8]  [4, 7, 0]  State checked: 4639  [1, 3, 2]  [5, 6, 8]  [4, 0, 7]  State checked: 4640  [1, 3, 2]  [5, 0, 8]  [4, 6, 7]  [1, 3, 2]  [5, 6, 8]  [0, 4, 7]  State checked: 4641  [1, 3, 2]  [0, 6, 8]  [5, 4, 7]  State checked: 4642  [0, 3, 2]  [1, 6, 8]  [5, 4, 7]  [1, 3, 2]  [6, 0, 8]  [5, 4, 7]  State checked: 4643  [1, 0, 2]  [6, 3, 8]  [5, 4, 7]  [1, 3, 2]  [6, 4, 8]  [5, 0, 7]  [1, 3, 2]  [6, 8, 0]  [5, 4, 7]  State checked: 4644  [1, 3, 0]  [6, 8, 2]  [5, 4, 7]  [1, 3, 2]  [6, 8, 7]  [5, 4, 0]  State checked: 4645  [1, 3, 2]  [6, 8, 7]  [5, 0, 4]  State checked: 4646  [1, 3, 2]  [6, 0, 7]  [5, 8, 4]  State checked: 4647  [1, 0, 2]  [6, 3, 7]  [5, 8, 4]  [1, 3, 2]  [0, 6, 7]  [5, 8, 4]  [1, 3, 2]  [6, 7, 0]  [5, 8, 4]  State checked: 4648  [1, 3, 0]  [6, 7, 2]  [5, 8, 4]  [1, 3, 2]  [6, 7, 4]  [5, 8, 0]  State checked: 4649  [1, 3, 2]  [6, 7, 4]  [5, 0, 8]  State checked: 4650  [1, 3, 2]  [6, 0, 4]  [5, 7, 8]  [1, 3, 2]  [6, 7, 4]  [0, 5, 8]  State checked: 4651  [1, 3, 2]  [0, 7, 4]  [6, 5, 8]  State checked: 4652  [0, 3, 2]  [1, 7, 4]  [6, 5, 8]  [1, 3, 2]  [7, 0, 4]  [6, 5, 8]  State checked: 4653  [1, 0, 2]  [7, 3, 4]  [6, 5, 8]  [1, 3, 2]  [7, 5, 4]  [6, 0, 8]  [1, 3, 2]  [7, 4, 0]  [6, 5, 8]  State checked: 4654  [1, 3, 0]  [7, 4, 2]  [6, 5, 8]  [1, 3, 2]  [7, 4, 8]  [6, 5, 0]  State checked: 4655  [1, 3, 2]  [7, 4, 8]  [6, 0, 5]  State checked: 4656  [1, 3, 2]  [7, 0, 8]  [6, 4, 5]  [1, 3, 2]  [7, 4, 8]  [0, 6, 5]  State checked: 4657  [1, 3, 2]  [0, 4, 8]  [7, 6, 5]  State checked: 4658  [0, 3, 2]  [1, 4, 8]  [7, 6, 5]  [1, 3, 2]  [4, 0, 8]  [7, 6, 5]  State checked: 4659  [1, 0, 2]  [4, 3, 8]  [7, 6, 5]  [1, 3, 2]  [4, 6, 8]  [7, 0, 5]  [1, 3, 2]  [4, 8, 0]  [7, 6, 5]  State checked: 4660  [1, 3, 0]  [4, 8, 2]  [7, 6, 5]  [1, 3, 2]  [4, 8, 5]  [7, 6, 0]  State checked: 4661  State checked: 4662  [1, 0, 3]  [4, 8, 2]  [7, 6, 5]  State checked: 4663  [1, 8, 3]  [4, 0, 2]  [7, 6, 5]  [0, 1, 3]  [4, 8, 2]  [7, 6, 5]  State checked: 4664  [4, 1, 3]  [0, 8, 2]  [7, 6, 5]  State checked: 4665  [4, 1, 3]  [7, 8, 2]  [0, 6, 5]  [4, 1, 3]  [8, 0, 2]  [7, 6, 5]  State checked: 4666  [4, 0, 3]  [8, 1, 2]  [7, 6, 5]  [4, 1, 3]  [8, 6, 2]  [7, 0, 5]  [4, 1, 3]  [8, 2, 0]  [7, 6, 5]  State checked: 4667  [4, 1, 0]  [8, 2, 3]  [7, 6, 5]  [4, 1, 3]  [8, 2, 5]  [7, 6, 0]  State checked: 4668  [4, 1, 3]  [8, 2, 5]  [7, 0, 6]  State checked: 4669  [4, 1, 3]  [8, 0, 5]  [7, 2, 6]  [4, 1, 3]  [8, 2, 5]  [0, 7, 6]  State checked: 4670  [4, 1, 3]  [0, 2, 5]  [8, 7, 6]  State checked: 4671  [0, 1, 3]  [4, 2, 5]  [8, 7, 6]  State checked: 4672  [1, 0, 3]  [4, 2, 5]  [8, 7, 6]  State checked: 4673  [1, 2, 3]  [4, 0, 5]  [8, 7, 6]  [1, 3, 0]  [4, 2, 5]  [8, 7, 6]  State checked: 4674  [1, 3, 5]  [4, 2, 0]  [8, 7, 6]  State checked: 4675  [1, 3, 5]  [4, 2, 6]  [8, 7, 0]  State checked: 4676  State checked: 4677  [1, 2, 3]  [4, 7, 5]  [8, 0, 6]  [1, 2, 3]  [0, 4, 5]  [8, 7, 6]  [1, 2, 3]  [4, 5, 0]  [8, 7, 6]  State checked: 4678  [1, 2, 0]  [4, 5, 3]  [8, 7, 6]  [1, 2, 3]  [4, 5, 6]  [8, 7, 0]  State checked: 4679  [1, 2, 3]  [4, 5, 6]  [8, 0, 7]  State checked: 4680  [1, 2, 3]  [4, 0, 6]  [8, 5, 7]  [1, 2, 3]  [4, 5, 6]  [0, 8, 7]  State checked: 4681  [1, 2, 3]  [0, 5, 6]  [4, 8, 7]  State checked: 4682  [0, 2, 3]  [1, 5, 6]  [4, 8, 7]  [1, 2, 3]  [5, 0, 6]  [4, 8, 7]  State checked: 4683  [1, 0, 3]  [5, 2, 6]  [4, 8, 7]  [1, 2, 3]  [5, 8, 6]  [4, 0, 7]  [1, 2, 3]  [5, 6, 0]  [4, 8, 7]  State checked: 4684  [1, 2, 0]  [5, 6, 3]  [4, 8, 7]  [1, 2, 3]  [5, 6, 7]  [4, 8, 0]  State checked: 4685  [1, 2, 3]  [5, 6, 7]  [4, 0, 8]  State checked: 4686  [1, 2, 3]  [5, 0, 7]  [4, 6, 8]  [1, 2, 3]  [5, 6, 7]  [0, 4, 8]  State checked: 4687  [1, 2, 3]  [0, 6, 7]  [5, 4, 8]  State checked: 4688  [0, 2, 3]  [1, 6, 7]  [5, 4, 8]  [1, 2, 3]  [6, 0, 7]  [5, 4, 8]  State checked: 4689  [1, 0, 3]  [6, 2, 7]  [5, 4, 8]  [1, 2, 3]  [6, 4, 7]  [5, 0, 8]  [1, 2, 3]  [6, 7, 0]  [5, 4, 8]  State checked: 4690  [1, 2, 0]  [6, 7, 3]  [5, 4, 8]  [1, 2, 3]  [6, 7, 8]  [5, 4, 0]  State checked: 4691  [1, 2, 3]  [6, 7, 8]  [5, 0, 4]  State checked: 4692  [1, 2, 3]  [6, 0, 8]  [5, 7, 4]  [1, 2, 3]  [6, 7, 8]  [0, 5, 4]  State checked: 4693  [1, 2, 3]  [0, 7, 8]  [6, 5, 4]  State checked: 4694  [0, 2, 3]  [1, 7, 8]  [6, 5, 4]  [1, 2, 3]  [7, 0, 8]  [6, 5, 4]  State checked: 4695  [1, 0, 3]  [7, 2, 8]  [6, 5, 4]  [1, 2, 3]  [7, 5, 8]  [6, 0, 4]  [1, 2, 3]  [7, 8, 0]  [6, 5, 4]  State checked: 4696  [1, 2, 0]  [7, 8, 3]  [6, 5, 4]  [1, 2, 3]  [7, 8, 4]  [6, 5, 0]  State checked: 4697  [1, 2, 3]  [7, 8, 4]  [6, 0, 5]  State checked: 4698  [1, 2, 3]  [7, 8, 4]  [0, 6, 5]  State checked: 4699  [1, 2, 3]  [0, 8, 4]  [7, 6, 5]  State checked: 4700  [0, 2, 3]  [1, 8, 4]  [7, 6, 5]  [1, 2, 3]  [8, 0, 4]  [7, 6, 5]  State checked: 4701  Goal State Found!  Lenght: 4578  Cost: 4578  Time: 4702  Space: 3651 | …  State checked: 150027  [0, 3, 7]  [8, 2, 4]  [1, 6, 5]  [8, 3, 7]  [2, 0, 4]  [1, 6, 5]  State checked: 150028  State checked: 150029  State checked: 150030  [2, 0, 5]  [8, 6, 4]  [7, 3, 1]  State checked: 150031  [7, 1, 3]  [8, 2, 5]  [0, 6, 4]  State checked: 150032  [1, 6, 0]  [8, 3, 7]  [2, 4, 5]  State checked: 150033  [1, 8, 0]  [2, 6, 3]  [7, 4, 5]  State checked: 150034  [0, 1, 4]  [8, 6, 7]  [2, 3, 5]  [1, 4, 0]  [8, 6, 7]  [2, 3, 5]  State checked: 150035  State checked: 150036  State checked: 150037  State checked: 150038  [7, 0, 6]  [2, 3, 5]  [8, 1, 4]  [7, 3, 6]  [0, 2, 5]  [8, 1, 4]  [7, 3, 6]  [2, 5, 0]  [8, 1, 4]  State checked: 150039  [0, 2, 7]  [8, 1, 4]  [3, 6, 5]  [8, 2, 7]  [1, 0, 4]  [3, 6, 5]  State checked: 150040  State checked: 150041  [1, 7, 0]  [8, 3, 2]  [4, 5, 6]  State checked: 150042  State checked: 150043  State checked: 150044  State checked: 150045  [8, 1, 5]  [0, 2, 4]  [7, 3, 6]  State checked: 150046  State checked: 150047  [4, 3, 6]  [8, 7, 0]  [1, 2, 5]  State checked: 150048  State checked: 150049  [2, 6, 4]  [3, 0, 5]  [7, 8, 1]  [2, 6, 4]  [3, 8, 5]  [7, 1, 0]  State checked: 150050  [3, 1, 4]  [8, 0, 2]  [7, 5, 6]  [0, 3, 4]  [8, 1, 2]  [7, 5, 6]  State checked: 150051  [8, 0, 2]  [3, 1, 5]  [7, 6, 4]  State checked: 150052  [0, 3, 6]  [7, 4, 2]  [5, 8, 1]  State checked: 150053  [8, 3, 4]  [6, 0, 2]  [5, 7, 1]  [0, 8, 4]  [6, 3, 2]  [5, 7, 1]  State checked: 150054  State checked: 150055  State checked: 150056  State checked: 150057  State checked: 150058  State checked: 150059  [6, 0, 2]  [7, 5, 3]  [1, 8, 4]  State checked: 150060  [8, 0, 5]  [6, 3, 7]  [1, 4, 2]  State checked: 150061  State checked: 150062  State checked: 150063  [0, 4, 5]  [7, 1, 2]  [8, 6, 3]  [4, 5, 0]  [7, 1, 2]  [8, 6, 3]  State checked: 150064  [0, 4, 2]  [7, 6, 1]  [8, 3, 5]  State checked: 150065  [0, 6, 1]  [7, 2, 3]  [8, 4, 5]  [6, 1, 0]  [7, 2, 3]  [8, 4, 5]  State checked: 150066  State checked: 150067  State checked: 150068  [8, 3, 2]  [7, 5, 6]  [4, 1, 0]  State checked: 150069  [4, 0, 2]  [5, 3, 1]  [6, 7, 8]  State checked: 150070  [8, 7, 4]  [3, 1, 6]  [5, 0, 2]  State checked: 150071  [8, 6, 5]  [1, 2, 4]  [3, 7, 0]  State checked: 150072  [6, 5, 0]  [1, 8, 4]  [2, 3, 7]  State checked: 150073  [8, 0, 3]  [2, 5, 4]  [1, 6, 7]  State checked: 150074  [7, 0, 5]  [6, 3, 2]  [8, 1, 4]  State checked: 150075  [6, 0, 1]  [7, 5, 8]  [2, 3, 4]  State checked: 150076  [8, 4, 5]  [1, 2, 3]  [6, 7, 0]  State checked: 150077  [3, 7, 6]  [4, 2, 1]  [8, 0, 5]  State checked: 150078  State checked: 150079  State checked: 150080  [4, 0, 3]  [8, 2, 1]  [5, 6, 7]  [4, 2, 3]  [0, 8, 1]  [5, 6, 7]  [4, 2, 3]  [8, 1, 0]  [5, 6, 7]  State checked: 150081  State checked: 150082  State checked: 150083  [6, 5, 3]  [2, 8, 4]  [0, 7, 1]  [6, 5, 3]  [8, 0, 4]  [2, 7, 1]  State checked: 150084  [0, 2, 6]  [8, 7, 4]  [1, 5, 3]  [8, 2, 6]  [7, 0, 4]  [1, 5, 3]  State checked: 150085  [3, 0, 2]  [8, 6, 5]  [7, 1, 4]  [3, 6, 2]  [0, 8, 5]  [7, 1, 4]  [3, 6, 2]  [8, 5, 0]  [7, 1, 4]  State checked: 150086  State checked: 150087  State checked: 150088  Goal State Found!  Lenght: 30  Cost: 225  Time: 150089  Space: 25919  Process finished with exit code 0 | State checked: 164523  [6, 0, 3]  [1, 8, 4]  [7, 5, 2]  State checked: 164524  [0, 2, 3]  [7, 6, 5]  [8, 1, 4]  [7, 2, 3]  [8, 6, 5]  [0, 1, 4]  State checked: 164525  State checked: 164526  State checked: 164527  State checked: 164528  [8, 1, 6]  [2, 3, 5]  [7, 4, 0]  State checked: 164529  State checked: 164530  State checked: 164531  State checked: 164532  State checked: 164533  State checked: 164534  [3, 0, 6]  [7, 2, 4]  [8, 5, 1]  State checked: 164535  State checked: 164536  State checked: 164537  State checked: 164538  State checked: 164539  [0, 5, 4]  [8, 7, 2]  [6, 1, 3]  [8, 5, 4]  [6, 7, 2]  [0, 1, 3]  State checked: 164540  State checked: 164541  State checked: 164542  [4, 7, 6]  [8, 5, 3]  [1, 2, 0]  [4, 7, 6]  [8, 0, 5]  [1, 2, 3]  State checked: 164543  State checked: 164544  [1, 7, 3]  [8, 6, 5]  [2, 4, 0]  [1, 7, 3]  [8, 0, 6]  [2, 4, 5]  State checked: 164545  [8, 4, 1]  [6, 5, 0]  [7, 2, 3]  State checked: 164546  [8, 3, 2]  [6, 7, 4]  [1, 5, 0]  State checked: 164547  [8, 3, 4]  [0, 5, 6]  [7, 1, 2]  [8, 3, 4]  [5, 6, 0]  [7, 1, 2]  State checked: 164548  [6, 0, 5]  [2, 4, 3]  [7, 8, 1]  [6, 4, 5]  [0, 2, 3]  [7, 8, 1]  State checked: 164549  [8, 7, 3]  [4, 1, 2]  [5, 0, 6]  State checked: 164550  [2, 5, 0]  [3, 4, 1]  [7, 6, 8]  State checked: 164551  State checked: 164552  State checked: 164553  [0, 2, 4]  [7, 6, 8]  [1, 3, 5]  State checked: 164554  [1, 6, 2]  [7, 3, 5]  [8, 0, 4]  State checked: 164555  State checked: 164556  [1, 8, 0]  [3, 4, 7]  [6, 2, 5]  State checked: 164557  State checked: 164558  State checked: 164559  State checked: 164560  State checked: 164561  [8, 2, 4]  [1, 5, 6]  [7, 3, 0]  State checked: 164562  [1, 8, 4]  [5, 6, 2]  [7, 0, 3]  State checked: 164563  State checked: 164564  State checked: 164565  State checked: 164566  State checked: 164567  State checked: 164568  [5, 0, 2]  [8, 6, 4]  [7, 1, 3]  [5, 6, 2]  [8, 4, 0]  [7, 1, 3]  State checked: 164569  Goal State Found!  Lenght: 30  Cost: 225  Time: 164570  Space: 25270  Process finished with exit code 0 |