Al – Programming Assignment 1

Overview

Programming1.py is my implementation of greedy best first search as well as A* search for solving the 8-puzzle problem and the 15-puzzle problem. The 8 and 15 problems are implemented as classes that contain a goal test, heuristic, and transition model functions (actions). There are three heuristics to evaluate the "correctness" of each state.

- 1. Heuristic 1 (h1 in the program) is the number of tiles misplaced.
- 2. Heuristic 2 (h2) is the total Manhattan distance of each tile from its goal location
- 3. Heuristic 3 (h3) is the average of h1 and h2

I used the same starting state for each heuristic on both the best first and A* search to give the comparisons meaning. I am going to discuss the results before showing the solutions because the solutions take up 12 pages. For the best first search, H1, H2, and H3 found solutions with average path length of 77, 73, and 66.2 respectively. For A* search, all heuristics found the optimal solution with an average path length of 24.2. There were some variations in performance though. H1 consistently took the greatest number of steps to find the solution in A* searches, followed by H3, where H2 was the fastest. For the best first search, which heuristic performed best was greatly determined by the starting state.

I also implemented the 15-puzzle solver which usually found solution with the best first search. H1, H2, and H3 found solutions with an average of 538.2, 258.6, and 246.2 steps respectively.

The A* solution for the 15-puzzle problem would occasionally find a solution, but only with H2. Most of the time, however, it would not find a solution within the generous 4 million iteration limit I specified. When it did find a solution, it was an average of 53 steps long.

8-Puzzle Best First Search Results

Start state	H1	Path	H2	Path	Н3	Path
[['8' '2' '6']	94	[8, 2, 6, 7, 5, 1, 'b', 4, 3]	54	[8, 2, 6, 7, 5, 1, 'b', 4, 3]	46	[8, 2, 6, 7, 5, 1, 'b', 4, 3]
['7' '5' '1']		[8, 2, 6, 'b', 5, 1, 7, 4, 3]		[8, 2, 6, 7, 5, 1, 4, 'b', 3]		[8, 2, 6, 'b', 5, 1, 7, 4, 3]
['b' '4' '3']]		[8, 2, 6, 5, 'b', 1, 7, 4, 3]		[8, 2, 6, 7, 'b', 1, 4, 5, 3]		[8, 2, 6, 5, 'b', 1, 7, 4, 3]
		[8, 2, 6, 5, 1, 'b', 7, 4, 3]		[8, 2, 6, 7, 1, 'b', 4, 5, 3]		[8, 2, 6, 5, 1, 'b', 7, 4, 3]
		[8, 2, 'b', 5, 1, 6, 7, 4, 3]		[8, 2, 'b', 7, 1, 6, 4, 5, 3]		[8, 2, 'b', 5, 1, 6, 7, 4, 3]
		[8, 'b', 2, 5, 1, 6, 7, 4, 3]		[8, 'b', 2, 7, 1, 6, 4, 5, 3]		[8, 'b', 2, 5, 1, 6, 7, 4, 3]
		[8, 1, 2, 5, 'b', 6, 7, 4, 3]		[8, 1, 2, 7, 'b', 6, 4, 5, 3]		[8, 1, 2, 5, 'b', 6, 7, 4, 3]
		[8, 1, 2, 'b', 5, 6, 7, 4, 3]		[8, 1, 2, 7, 5, 6, 4, 'b', 3]		[8, 1, 2, 'b', 5, 6, 7, 4, 3]
		['b', 1, 2, 8, 5, 6, 7, 4, 3]		[8, 1, 2, 7, 5, 6, 'b', 4, 3]		['b', 1, 2, 8, 5, 6, 7, 4, 3]
		[1, 'b', 2, 8, 5, 6, 7, 4, 3]		[8, 1, 2, 'b', 5, 6, 7, 4, 3]		[1, 'b', 2, 8, 5, 6, 7, 4, 3]
		[1, 2, 'b', 8, 5, 6, 7, 4, 3]		['b', 1, 2, 8, 5, 6, 7, 4, 3]		[1, 5, 2, 8, 'b', 6, 7, 4, 3]
		[1, 2, 6, 8, 5, 'b', 7, 4, 3]		[1, 'b', 2, 8, 5, 6, 7, 4, 3]		[1, 5, 2, 'b', 8, 6, 7, 4, 3]
		[1, 2, 6, 8, 5, 3, 7, 4, 'b']		[1, 5, 2, 8, 'b', 6, 7, 4, 3]		[1, 5, 2, 7, 8, 6, 'b', 4, 3]
		[1, 2, 6, 8, 5, 3, 7, 'b', 4]		[1, 5, 2, 'b', 8, 6, 7, 4, 3]		[1, 5, 2, 7, 8, 6, 4, 'b', 3]
		[1, 2, 6, 8, 'b', 3, 7, 5, 4]		[1, 5, 2, 7, 8, 6, 'b', 4, 3]		[1, 5, 2, 7, 'b', 6, 4, 8, 3]

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	[1, 2, 'b', 8, 3, 6, 7, 5, 4]	[1, 5, 2, 7, 'b', 6, 4, 8, 3]	[1, 2, 'b', 7, 5, 6, 4, 8, 3]
	[1, 'b', 2, 8, 3, 6, 7, 5, 4]	[1, 'b', 2, 7, 5, 6, 4, 8, 3]	[1, 2, 6, 7, 5, 'b', 4, 8, 3]
	[1, 3, 2, 8, 'b', 6, 7, 5, 4]	[1, 2, 'b', 7, 5, 6, 4, 8, 3]	[1, 2, 6, 7, 5, 3, 4, 8, 'b']
	[1, 3, 2, 8, 5, 6, 7, 'b', 4]	[1, 2, 6, 7, 5, 'b', 4, 8, 3]	[1, 2, 6, 7, 5, 3, 4, 'b', 8]
	[1, 3, 2, 8, 5, 6, 7, 4, 'b']	[1, 2, 6, 7, 5, 3, 4, 8, 'b']	[1, 2, 6, 7, 5, 3, 'b', 4, 8]
	[1, 3, 2, 8, 5, 'b', 7, 4, 6]	[1, 2, 6, 7, 5, 3, 4, 'b', 8]	[1, 2, 6, 'b', 5, 3, 7, 4, 8]
	[1, 3, 'b', 8, 5, 2, 7, 4, 6]	[1, 2, 6, 7, 'b', 3, 4, 5, 8]	[1, 2, 6, 5, 'b', 3, 7, 4, 8]
	[1, 'b', 3, 8, 5, 2, 7, 4, 6]	[1, 2, 6, 7, 3, 'b', 4, 5, 8]	[1, 2, 6, 5, 3, 'b', 7, 4, 8]
	[1, 5, 3, 8, 'b', 2, 7, 4, 6]	[1, 2, 'b', 7, 3, 6, 4, 5, 8]	[1, 2, 'b', 5, 3, 6, 7, 4, 8]
	[1, 5, 3, 8, 2, 'b', 7, 4, 6]	[1, 'b', 2, 7, 3, 6, 4, 5, 8]	[1, 'b', 2, 5, 3, 6, 7, 4, 8]
	[1, 5, 3, 8, 2, 6, 7, 4, 'b']	[1, 3, 2, 7, 'b', 6, 4, 5, 8]	[1, 3, 2, 5, 'b', 6, 7, 4, 8]
	[1, 5, 3, 8, 2, 6, 7, 'b', 4]	[1, 3, 2, 7, 5, 6, 4, 'b', 8]	[1, 3, 2, 5, 4, 6, 7, 'b', 8]
	[1, 5, 3, 8, 2, 6, 'b', 7, 4]	[1, 3, 2, 7, 5, 6, 4, 8, 'b']	[1, 3, 2, 5, 4, 6, 7, 8, 'b']
	[1, 5, 3, 'b', 2, 6, 8, 7, 4]	[1, 3, 2, 7, 5, 'b', 4, 8, 6]	[1, 3, 2, 5, 4, 'b', 7, 8, 6]
	[1, 5, 3, 2, 'b', 6, 8, 7, 4]	[1, 3, 'b', 7, 5, 2, 4, 8, 6]	[1, 3, 2, 5, 'b', 4, 7, 8, 6]
	[1, 'b', 3, 2, 5, 6, 8, 7, 4]	[1, 'b', 3, 7, 5, 2, 4, 8, 6]	[1, 'b', 2, 5, 3, 4, 7, 8, 6]
	['b', 1, 3, 2, 5, 6, 8, 7, 4]	[1, 5, 3, 7, 'b', 2, 4, 8, 6]	[1, 2, 'b', 5, 3, 4, 7, 8, 6]
	[2, 1, 3, 'b', 5, 6, 8, 7, 4]	[1, 5, 3, 7, 2, 'b', 4, 8, 6]	[1, 2, 4, 5, 3, 'b', 7, 8, 6]
	[2, 1, 3, 8, 5, 6, 'b', 7, 4]	[1, 5, 3, 7, 2, 6, 4, 8, 'b']	[1, 2, 4, 5, 'b', 3, 7, 8, 6]
	[2, 1, 3, 8, 5, 6, 7, 'b', 4]	[1, 5, 3, 7, 2, 6, 4, 'b', 8]	[1, 2, 4, 'b', 5, 3, 7, 8, 6]
	[2, 1, 3, 8, 'b', 6, 7, 5, 4]	[1, 5, 3, 7, 2, 6, 'b', 4, 8]	['b', 2, 4, 1, 5, 3, 7, 8, 6]
	[2, 1, 3, 'b', 8, 6, 7, 5, 4]	[1, 5, 3, 'b', 2, 6, 7, 4, 8]	[2, 'b', 4, 1, 5, 3, 7, 8, 6]
	['b', 1, 3, 2, 8, 6, 7, 5, 4]	[1, 5, 3, 2, 'b', 6, 7, 4, 8]	[2, 4, 'b', 1, 5, 3, 7, 8, 6]
	[1, 'b', 3, 2, 8, 6, 7, 5, 4]	[1, 5, 3, 2, 4, 6, 7, 'b', 8]	[2, 4, 3, 1, 5, 'b', 7, 8, 6]
	[1, 8, 3, 2, 'b', 6, 7, 5, 4]	[1, 5, 3, 2, 4, 6, 'b', 7, 8]	[2, 4, 3, 1, 'b', 5, 7, 8, 6]
	[1, 8, 3, 2, 5, 6, 7, 'b', 4]	[1, 5, 3, 'b', 4, 6, 2, 7, 8]	[2, 'b', 3, 1, 4, 5, 7, 8, 6]
	[1, 8, 3, 2, 5, 6, 'b', 7, 4]	[1, 5, 3, 4, 'b', 6, 2, 7, 8]	['b', 2, 3, 1, 4, 5, 7, 8, 6]
	[1, 8, 3, 'b', 5, 6, 2, 7, 4]	[1, 'b', 3, 4, 5, 6, 2, 7, 8]	[1, 2, 3, 'b', 4, 5, 7, 8, 6]
	[1, 8, 3, 5, 'b', 6, 2, 7, 4]	['b', 1, 3, 4, 5, 6, 2, 7, 8]	[1, 2, 3, 4, 'b', 5, 7, 8, 6]
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	['b', 1, 3, 5, 8, 6, 2, 7, 4]	[4, 1, 3, 2, 5, 6, 'b', 7, 8]	[1, 2, 3, 4, 5, 6, 7, 8, 'b']
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		[1, 2, 3, 5, 6, 6, 4, 7, 8] [1, 2, 3, 'b', 5, 6, 4, 7, 8] [1, 2, 3, 4, 5, 6, 'b', 7, 8] [1, 2, 3, 4, 5, 6, 7, 'b', 8] [1, 2, 3, 4, 5, 6, 7, 8, 'b']				
[['8' '4' '6'] ['7' '3' '5'] ['b' '1' '2']]	106	Omitted because of length > 100	80	[8, 4, 6, 7, 3, 5, 'b', 1, 2] [8, 4, 6, 'b', 3, 5, 7, 1, 2] ['b', 4, 6, 8, 3, 5, 7, 1, 2] [4, 'b', 6, 8, 3, 5, 7, 1, 2] [4, 3, 6, 8, 'b', 5, 7, 1, 2] [4, 3, 6, 8, 5, 'b', 7, 1, 2] [4, 3, 'b', 8, 5, 6, 7, 1, 2] [4, 5, 3, 8, 'b', 6, 7, 1, 2] [4, 5, 3, 8, 'b', 6, 7, 1, 2] [4, 5, 3, 7, 8, 6, 'b', 1, 2] [4, 5, 3, 7, 8, 6, 1, 'b', 2] [4, 5, 3, 7, 8, 6, 1, 'b', 2] [4, 5, 3, 7, b', 6, 1, 8, 2] [4, 5, 3, 'b', 7, 6, 1, 8, 2]	62	[8, 4, 6, 7, 3, 5, 'b', 1, 2] [8, 4, 6, 'b', 3, 5, 7, 1, 2] ['b', 4, 6, 8, 3, 5, 7, 1, 2] [4, 'b', 6, 8, 3, 5, 7, 1, 2] [4, 3, 6, 8, 'b', 5, 7, 1, 2] [4, 3, 6, 8, 5, 'b', 7, 1, 2] [4, 3, 'b', 8, 5, 6, 7, 1, 2] [4, 5, 3, 8, 'b', 6, 7, 1, 2] [4, 5, 3, 8, 1, 6, 7, 'b', 2] [4, 5, 3, 8, 1, 6, 'b', 7, 2] [4, 5, 3, 8, 1, 6, 'b', 7, 2] [4, 5, 3, 1, 5, 6, 8, 7, 2] [4, 5, 3, 1, 5, 6, 8, 7, 2]

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		['b', 4, 3, 1, 5, 6, 8, 7, 2]	[1, 4, 3, 8, 'b', 6, 7, 5, 2]
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		[2, 1, 3, 4, 5, 6, 8, 7, 'b']	[1, 5, 3, 4, 'b', 2, 7, 6, 8]
		[2, 1, 3, 4, 5, 6, 8, 'b', 7]	[1, 'b', 3, 4, 5, 2, 7, 6, 8]
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		[2, 1, 3, 'b', 5, 6, 4, 8, 7]	[1, 3, 2, 4, 5, 'b', 7, 6, 8]
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		[1, 5, 3, 4, 2, 6, 8, 'b', 7]	[1, 'b', 2, 4, 3, 6, 7, 8, 5]
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		[1, 5, 3, 4, 2, 6, 8, 7, 6]	[1, 2, 6, 4, 3, 5, 7, 8, 'b']
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		[1, 3, 'b', 4, 5, 2, 8, 7, 6]	[1, 2, 6, 4, 'b', 5, 7, 3, 8]
		[1, 3, 2, 4, 5, 'b', 8, 7, 6]	[1, 2, 6, 4, 5, 'b', 7, 3, 8]
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		[1, 3, 2, 4, 7, 5, 8, 'b', 6]	[1, 'b', 2, 4, 5, 6, 7, 3, 8]
		[1, 3, 2, 4, 7, 5, 'b', 8, 6]	[1, 5, 2, 4, 'b', 6, 7, 3, 8]
		[1, 3, 2, 'b', 7, 5, 4, 8, 6]	[1, 5, 2, 4, 3, 6, 7, 'b', 8]
		[1, 3, 2, 7, 'b', 5, 4, 8, 6]	[1, 5, 2, 4, 3, 6, 7, 8, 'b']
		[1, 3, 2, 7, 5, 'b', 4, 8, 6]	[1, 5, 2, 4, 3, 'b', 7, 8, 6]
		[1, 3, 'b', 7, 5, 2, 4, 8, 6]	[1, 5, 2, 4, 'b', 3, 7, 8, 6]
		[1, 'b', 3, 7, 5, 2, 4, 8, 6]	[1, 'b', 2, 4, 5, 3, 7, 8, 6]
		[1, 5, 3, 7, 'b', 2, 4, 8, 6]	[1, 2, 'b', 4, 5, 3, 7, 8, 6]
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				[1, 5, 3, 7, 2, 6, 4, 'b', 8]		
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				[1, 5, 3, 'b', 2, 6, 7, 4, 8]		
				['b', 5, 3, 1, 2, 6, 7, 4, 8]		
				[5, 'b', 3, 1, 2, 6, 7, 4, 8]		
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				[5, 2, 3, 1, 4, 'b', 7, 8, 6]		
				[5, 2, 'b', 1, 4, 3, 7, 8, 6]		
				[5, 'b', 2, 1, 4, 3, 7, 8, 6]		
				['b', 5, 2, 1, 4, 3, 7, 8, 6]		
				[1, 5, 2, 'b', 4, 3, 7, 8, 6]		
				[1, 5, 2, 4, 'b', 3, 7, 8, 6]		
				[1, 'b', 2, 4, 5, 3, 7, 8, 6]		
				[1, 2, 'b', 4, 5, 3, 7, 8, 6]		
				[1, 2, 3, 4, 5, 'b', 7, 8, 6]		
				[1, 2, 3, 4, 5, 6, 7, 8, 'b']		
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['6' '7' '4']		[2, 8, 5, 'b', 7, 4, 6, 1, 3]		[2, 8, 5, 6, 7, 4, 1, 'b', 3]		[2, 8, 5, 6, 7, 4, 1, 'b', 3]
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		[2, 8, 5, 7, 1, 4, 6, 'b', 3]		[2, 8, 5, 'b', 6, 4, 1, 7, 3]		[2, 8, 5, 'b', 6, 4, 1, 7, 3]
		[2, 8, 5, 7, 1, 4, 'b', 6, 3]		[2, 8, 5, 1, 6, 4, 'b', 7, 3]		[2, 8, 5, 1, 6, 4, 'b', 7, 3]
		[2, 8, 5, 'b', 1, 4, 7, 6, 3]		[2, 8, 5, 1, 6, 4, 7, 'b', 3]		[2, 8, 5, 1, 6, 4, 7, 'b', 3]
		[2, 8, 5, 1, 'b', 4, 7, 6, 3]		[2, 8, 5, 1, 'b', 4, 7, 6, 3]		[2, 8, 5, 1, 'b', 4, 7, 6, 3]
		[2, 'b', 5, 1, 8, 4, 7, 6, 3]		[2, 8, 5, 1, 4, 'b', 7, 6, 3]		[2, 8, 5, 1, 4, 'b', 7, 6, 3]
		['b', 2, 5, 1, 8, 4, 7, 6, 3]		[2, 8, 5, 1, 4, 3, 7, 6, 'b']		[2, 8, 5, 1, 4, 3, 7, 6, 'b']
		[1, 2, 5, 'b', 8, 4, 7, 6, 3]		[2, 8, 5, 1, 4, 3, 7, 'b', 6]		[2, 8, 5, 1, 4, 3, 7, 'b', 6]
		[1, 2, 5, 8, 'b', 4, 7, 6, 3]		[2, 8, 5, 1, 'b', 3, 7, 4, 6]		[2, 8, 5, 1, 'b', 3, 7, 4, 6]
		[1, 2, 5, 8, 4, 'b', 7, 6, 3]		[2, 'b', 5, 1, 8, 3, 7, 4, 6]		[2, 'b', 5, 1, 8, 3, 7, 4, 6]
		• • • • • • • • •				
		[1, 2, 5, 8, 4, 3, 7, 6, 'b']		[2, 5, 'b', 1, 8, 3, 7, 4, 6]		['b', 2, 5, 1, 8, 3, 7, 4, 6]
		[1, 2, 5, 8, 4, 3, 7, 'b', 6]		[2, 5, 3, 1, 8, 'b', 7, 4, 6]		[1, 2, 5, 'b', 8, 3, 7, 4, 6]
		[1, 2, 5, 8, 'b', 3, 7, 4, 6]		[2, 5, 3, 1, 8, 6, 7, 4, 'b']		[1, 2, 5, 7, 8, 3, 'b', 4, 6]
		[1, 'b', 5, 8, 2, 3, 7, 4, 6]		[2, 5, 3, 1, 8, 6, 7, 'b', 4]		[1, 2, 5, 7, 8, 3, 4, 'b', 6]
		[1, 5, 'b', 8, 2, 3, 7, 4, 6]		[2, 5, 3, 1, 'b', 6, 7, 8, 4]		[1, 2, 5, 7, 'b', 3, 4, 8, 6]
		[1, 5, 3, 8, 2, 'b', 7, 4, 6]		[2, 'b', 3, 1, 5, 6, 7, 8, 4]		[1, 2, 5, 'b', 7, 3, 4, 8, 6]
				• • • • • • • • •		
		[1, 5, 3, 8, 'b', 2, 7, 4, 6]		['b', 2, 3, 1, 5, 6, 7, 8, 4]		[1, 2, 5, 4, 7, 3, 'b', 8, 6]
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		[1, 5, 3, 7, 2, 'b', 4, 8, 6]		[1, 2, 3, 7, 5, 'b', 8, 4, 6]		[1, 5, 3, 4, 2, 'b', 8, 7, 6]
		[1, 5, 3, 7, 2, 6, 4, 8, 'b']		[1, 2, 3, 7, 'b', 5, 8, 4, 6]		[1, 5, 3, 4, 'b', 2, 8, 7, 6]
		[1, 5, 3, 7, 2, 6, 4, 'b', 8]		[1, 2, 3, 7, 4, 5, 8, 'b', 6]		[1, 'b', 3, 4, 5, 2, 8, 7, 6]
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Programi	ming 1 Report		
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	[1, 5, 3, 2, 4, 6, 7, 'b', 8]	[1, 2, 3, 4, 5, 'b', 7, 8, 6]	[1, 3, 2, 4, 5, 6, 8, 'b', 7]
	[1, 5, 3, 2, 4, 6, 'b', 7, 8]	[1, 2, 3, 4, 5, 6, 7, 8, 'b']	[1, 3, 2, 4, 5, 6, 'b', 8, 7]
	[1, 5, 3, 'b', 4, 6, 2, 7, 8]		[1, 3, 2, 'b', 5, 6, 4, 8, 7]
	[1, 5, 3, 4, 'b', 6, 2, 7, 8]		[1, 3, 2, 5, 'b', 6, 4, 8, 7]
	[1, 'b', 3, 4, 5, 6, 2, 7, 8]		[1, 'b', 2, 5, 3, 6, 4, 8, 7]
	['b', 1, 3, 4, 5, 6, 2, 7, 8]		[1, 2, 'b', 5, 3, 6, 4, 8, 7]
	[4, 1, 3, 'b', 5, 6, 2, 7, 8]		[1, 2, 6, 5, 3, 'b', 4, 8, 7]
	[4, 1, 3, 2, 5, 6, 'b', 7, 8]		[1, 2, 6, 5, 'b', 3, 4, 8, 7]
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	[4, 1, 3, 2, 5, 'b', 7, 8, 6]		[1, 2, 6, 4, 5, 3, 8, 'b', 7]
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			[1, 2, 4, 5, 'b', 3, 7, 8, 6]
			[1, 2, 4, 'b', 5, 3, 7, 8, 6]
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			[2, 'b', 4, 1, 5, 3, 7, 8, 6]
LL			[-, -, -, -, -, -, -, -, -, -, -, -, -, -

Prog	rammır	ng 1 Report				
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						[2, 4, 3, 1, 5, 'b', 7, 8, 6]
						[2, 4, 3, 1, 'b', 5, 7, 8, 6]
						[2, 'b', 3, 1, 4, 5, 7, 8, 6]
						['b', 2, 3, 1, 4, 5, 7, 8, 6]
						[1, 2, 3, 'b', 4, 5, 7, 8, 6]
						[1, 2, 3, 4, 'b', 5, 7, 8, 6]
						[1, 2, 3, 4, 5, 'b', 7, 8, 6]
						[1, 2, 3, 4, 5, 6, 7, 8, 'b']
[['1' 'b' '8']	75	[1, 'b', 8, 5, 2, 4, 3, 6, 7]	103	Omitted because of	51	[1, 'b', 8, 5, 2, 4, 3, 6, 7]
['5' '2' '4']	, ,	[1, 2, 8, 5, 'b', 4, 3, 6, 7]	103	solution > 100		[1, 2, 8, 5, 'b', 4, 3, 6, 7]
['3' '6' '7']]		[1, 2, 8, 'b', 5, 4, 3, 6, 7]		301411011 > 100		[1, 2, 8, 5, 6, 4, 3, 'b', 7]
[3 0 7]]		[1, 2, 8, 3, 5, 4, 'b', 6, 7]				[1, 2, 8, 5, 6, 4, 3, 7, 'b']
		[1, 2, 8, 3, 5, 4, 6, 'b', 7]				[1, 2, 8, 5, 6, 'b', 3, 7, 4]
		[1, 2, 8, 3, 5, 4, 6, 7, 'b']				[1, 2, 8, 5, 'b', 6, 3, 7, 4]
		[1, 2, 8, 3, 5, 'b', 6, 7, 4]				[1, 2, 8, 'b', 5, 6, 3, 7, 4]
		[1, 2, 8, 3, 'b', 5, 6, 7, 4]				[1, 2, 8, 3, 5, 6, 'b', 7, 4]
		[1, 2, 8, 3, 7, 5, 6, 'b', 4]				[1, 2, 8, 3, 5, 6, 7, 'b', 4]
		[1, 2, 8, 3, 7, 5, 'b', 6, 4]				[1, 2, 8, 3, 5, 6, 7, 4, 'b']
		[1, 2, 8, 'b', 7, 5, 3, 6, 4]				[1, 2, 8, 3, 5, 'b', 7, 4, 6]
		[1, 2, 8, 7, 'b', 5, 3, 6, 4]				[1, 2, 8, 3, 'b', 5, 7, 4, 6]
		[1, 2, 8, 7, 5, 'b', 3, 6, 4]				[1, 2, 8, 'b', 3, 5, 7, 4, 6]
		[1, 2, 8, 7, 5, 4, 3, 6, 'b']				[1, 2, 8, 7, 3, 5, 'b', 4, 6]
		[1, 2, 8, 7, 5, 4, 3, 'b', 6]				[1, 2, 8, 7, 3, 5, 4, 'b', 6]
		[1, 2, 8, 7, 5, 4, 'b', 3, 6]				[1, 2, 8, 7, 'b', 5, 4, 3, 6]
		[1, 2, 8, 'b', 5, 4, 7, 3, 6]				[1, 2, 8, 7, 5, 'b', 4, 3, 6]
		[1, 2, 8, 5, 'b', 4, 7, 3, 6]				[1, 2, 8, 7, 5, 6, 4, 3, 'b']
		[1, 2, 8, 5, 4, 'b', 7, 3, 6]				[1, 2, 8, 7, 5, 6, 4, 'b', 3]
		[1, 2, 8, 5, 4, 6, 7, 3, 'b']				[1, 2, 8, 7, 'b', 6, 4, 5, 3]
		[1, 2, 8, 5, 4, 6, 7, 'b', 3]				[1, 2, 8, 'b', 7, 6, 4, 5, 3]
		[1, 2, 8, 5, 4, 6, 'b', 7, 3]				[1, 2, 8, 4, 7, 6, 'b', 5, 3]
		[1, 2, 8, 'b', 4, 6, 5, 7, 3]				[1, 2, 8, 4, 7, 6, 5, 'b', 3]
		[1, 2, 8, 4, 'b', 6, 5, 7, 3]				[1, 2, 8, 4, 'b', 6, 5, 7, 3]
		[1, 2, 8, 4, 6, 'b', 5, 7, 3]				[1, 2, 8, 4, 6, 'b', 5, 7, 3]
		[1, 2, 8, 4, 6, 3, 5, 7, 'b']				[1, 2, 'b', 4, 6, 8, 5, 7, 3]
		[1, 2, 8, 4, 6, 3, 5, 'b', 7]				[1, 2, 6, 4, 6, 8, 5, 7, 3] [1, 'b', 2, 4, 6, 8, 5, 7, 3]
		[1, 2, 8, 4, 'b', 3, 5, 6, 7]				[1, 6, 2, 4, 'b', 8, 5, 7, 3]
		• • • • • • • • •				
		[1, 'b', 8, 4, 2, 3, 5, 6, 7]				[1, 6, 2, 4, 8, 'b', 5, 7, 3]
		[1, 8, 'b', 4, 2, 3, 5, 6, 7]				[1, 6, 2, 4, 8, 3, 5, 7, 'b']
		[1, 8, 3, 4, 2, 'b', 5, 6, 7]				[1, 6, 2, 4, 8, 3, 5, 'b', 7]
		[1, 8, 3, 4, 'b', 2, 5, 6, 7]				[1, 6, 2, 4, 'b', 3, 5, 8, 7]
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		[1, 8, 3, 4, 6, 2, 5, 7, 'b']				[1, 2, 'b', 4, 6, 3, 5, 8, 7]
		[1, 8, 3, 4, 6, 'b', 5, 7, 2]				[1, 2, 3, 4, 6, 'b', 5, 8, 7]
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		[1, 8, 3, 4, 7, 6, 'b', 5, 2]				[1, 2, 3, 5, 4, 6, 'b', 8, 7]
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Prog	rammir	ng 1 Report				
		[1, 8, 3, 'b', 7, 6, 4, 5, 2]				[1, 2, 3, 5, 4, 6, 8, 'b', 7]
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		[1, 8, 3, 7, 5, 6, 4, 'b', 2]				[1, 2, 3, 'b', 5, 6, 8, 4, 7]
		[1, 8, 3, 7, 5, 6, 'b', 4, 2]				[1, 2, 3, 8, 5, 6, 'b', 4, 7]
		[1, 8, 3, 'b', 5, 6, 7, 4, 2]				[1, 2, 3, 8, 5, 6, 4, 'b', 7]
		[1, 8, 3, 5, 'b', 6, 7, 4, 2]				[1, 2, 3, 8, 5, 6, 4, 7, 'b']
		[1, 8, 3, 5, 4, 6, 7, 'b', 2]				[1, 2, 3, 8, 5, 'b', 4, 7, 6]
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		[1, 8, 3, 5, 'b', 4, 7, 2, 6]				[1, 2, 3, 4, 8, 5, 'b', 7, 6]
		[1, 8, 3, 5, 2, 4, 7, 'b', 6]				[1, 2, 3, 4, 8, 5, 7, 'b', 6]
		[1, 8, 3, 5, 2, 4, 7, 6, 'b']				[1, 2, 3, 4, 'b', 5, 7, 8, 6]
		[1, 8, 3, 5, 2, 'b', 7, 6, 4]				[1, 2, 3, 4, 5, 'b', 7, 8, 6]
		[1, 8, 3, 5, 'b', 2, 7, 6, 4]				[1, 2, 3, 4, 5, 6, 7, 8, 'b']
		[1, 'b', 3, 5, 8, 2, 7, 6, 4]				
		[1, 3, 'b', 5, 8, 2, 7, 6, 4]				
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		[2, 'b', 4, 1, 5, 3, 7, 8, 6]				
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		[2, 4, 3, 1, 5, 'b', 7, 8, 6]				
		[2, 4, 3, 1, 5, 6, 7, 8, 'b']				
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		[2, 'b', 3, 1, 4, 6, 7, 5, 8]				
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		[1, 2, 3, 4, 'b', 6, 7, 5, 8]				
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		[1, 2, 3, 4, 5, 6, 7, 8, 'b']				
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		[8, 5, 3, 'b', 7, 6, 2, 4, 1]		[7, 8, 3, 'b', 5, 6, 2, 4, 1]		[7, 8, 3, 'b', 5, 6, 2, 4, 1]
		[8, 5, 3, 2, 7, 6, 'b', 4, 1]		[7, 8, 3, 2, 5, 6, 'b', 4, 1]		[7, 8, 3, 2, 5, 6, 'b', 4, 1]
		[8, 5, 3, 2, 7, 6, 4, 'b', 1]		[7, 8, 3, 2, 5, 6, 4, 'b', 1]		[7, 8, 3, 2, 5, 6, 4, 'b', 1]
		[8, 5, 3, 2, 'b', 6, 4, 7, 1]		[7, 8, 3, 2, 'b', 6, 4, 5, 1]		[7, 8, 3, 2, 'b', 6, 4, 5, 1]
		[8, 'b', 3, 2, 5, 6, 4, 7, 1]		[7, 8, 3, 'b', 2, 6, 4, 5, 1]		[7, 8, 3, 'b', 2, 6, 4, 5, 1]
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	[2, 8, 3, 4, 5, 6, 'b', 7, 1]	[8, 2, 3, 7, 'b', 6, 4, 5, 1]	[8, 2, 3, 7, 'b', 6, 4, 5, 1]
	[2, 8, 3, 4, 5, 6, 7, 'b', 1]	[8, 2, 3, 7, 5, 6, 4, 'b', 1]	[8, 2, 3, 7, 5, 6, 4, 'b', 1]
	[2, 8, 3, 4, 'b', 6, 7, 5, 1]	[8, 2, 3, 7, 5, 6, 'b', 4, 1]	[8, 2, 3, 7, 5, 6, 4, 1, 'b']
	[2, 8, 3, 4, 6, 'b', 7, 5, 1]	[8, 2, 3, 'b', 5, 6, 7, 4, 1]	[8, 2, 3, 7, 5, 'b', 4, 1, 6]
	[2, 8, 3, 4, 6, 1, 7, 5, 'b']	[8, 2, 3, 5, 'b', 6, 7, 4, 1]	[8, 2, 3, 7, 'b', 5, 4, 1, 6]
	[2, 8, 3, 4, 6, 1, 7, 'b', 5]	[8, 2, 3, 5, 4, 6, 7, 'b', 1]	[8, 2, 3, 7, 1, 5, 4, 'b', 6]
	[2, 8, 3, 4, 'b', 1, 7, 6, 5]	[8, 2, 3, 5, 4, 6, 7, 1, 'b']	[8, 2, 3, 7, 1, 5, 'b', 4, 6]
	[2, 'b', 3, 4, 8, 1, 7, 6, 5]	[8, 2, 3, 5, 4, 'b', 7, 1, 6]	[8, 2, 3, 'b', 1, 5, 7, 4, 6]
	['b', 2, 3, 4, 8, 1, 7, 6, 5]	[8, 2, 3, 5, 'b', 4, 7, 1, 6]	[8, 2, 3, 1, 'b', 5, 7, 4, 6]
	[4, 2, 3, 'b', 8, 1, 7, 6, 5]	[8, 2, 3, 'b', 5, 4, 7, 1, 6]	[8, 2, 3, 1, 5, 'b', 7, 4, 6]
	[4, 2, 3, 7, 8, 1, 'b', 6, 5]	['b', 2, 3, 8, 5, 4, 7, 1, 6]	[8, 2, 3, 1, 5, 6, 7, 4, 'b']
	[4, 2, 3, 7, 8, 1, 6, 'b', 5]	[2, 'b', 3, 8, 5, 4, 7, 1, 6]	[8, 2, 3, 1, 5, 6, 7, 'b', 4]
	[4, 2, 3, 7, 'b', 1, 6, 8, 5]	[2, 5, 3, 8, 'b', 4, 7, 1, 6]	[8, 2, 3, 1, 'b', 6, 7, 5, 4]
	[4, 2, 3, 7, 1, 'b', 6, 8, 5]	[2, 5, 3, 8, 4, 'b', 7, 1, 6]	[8, 'b', 3, 1, 2, 6, 7, 5, 4]
	[4, 2, 3, 7, 1, 5, 6, 8, 'b']	[2, 5, 3, 8, 4, 6, 7, 1, 'b']	['b', 8, 3, 1, 2, 6, 7, 5, 4]
	[4, 2, 3, 7, 1, 5, 6, 'b', 8]	[2, 5, 3, 8, 4, 6, 7, 'b', 1]	[1, 8, 3, 'b', 2, 6, 7, 5, 4]
	[4, 2, 3, 7, 1, 5, 'b', 6, 8]	[2, 5, 3, 8, 4, 6, 'b', 7, 1]	[1, 8, 3, 2, 'b', 6, 7, 5, 4]
	[4, 2, 3, 'b', 1, 5, 7, 6, 8]	[2, 5, 3, 'b', 4, 6, 8, 7, 1]	[1, 'b', 3, 2, 8, 6, 7, 5, 4]
	[4, 2, 3, 1, 'b', 5, 7, 6, 8]	[2, 5, 3, 4, 'b', 6, 8, 7, 1]	['b', 1, 3, 2, 8, 6, 7, 5, 4]
	[4, 2, 3, 1, 6, 5, 7, 'b', 8]	[2, 'b', 3, 4, 5, 6, 8, 7, 1]	[2, 1, 3, 'b', 8, 6, 7, 5, 4]
	[4, 2, 3, 1, 6, 5, 7, 8, 'b']	['b', 2, 3, 4, 5, 6, 8, 7, 1]	[2, 1, 3, 8, 'b', 6, 7, 5, 4]
	[4, 2, 3, 1, 6, 'b', 7, 8, 5]	[4, 2, 3, 'b', 5, 6, 8, 7, 1]	[2, 1, 3, 8, 5, 6, 7, 'b', 4]
	[4, 2, 3, 1, 'b', 6, 7, 8, 5]	[4, 2, 3, 8, 5, 6, 'b', 7, 1]	[2, 1, 3, 8, 5, 6, 'b', 7, 4]
	[4, 2, 3, 'b', 1, 6, 7, 8, 5]	[4, 2, 3, 8, 5, 6, 7, 'b', 1]	[2, 1, 3, 6, 5, 6, 8, 7, 4]
	[4, 2, 3, 7, 1, 6, 'b', 8, 5]	[4, 2, 3, 8, 5, 6, 7, 1, 'b']	['b', 1, 3, 2, 5, 6, 8, 7, 4]
	[4, 2, 3, 7, 1, 6, 8, 'b', 5]	[4, 2, 3, 8, 5, 'b', 7, 1, 6]	[1, 'b', 3, 2, 5, 6, 8, 7, 4]
	[4, 2, 3, 7, 1, 0, 8, 1, 5]	[4, 2, 3, 8, 5, 6, 7, 1, 6]	[1, 5, 3, 2, 5, 6, 8, 7, 4] [1, 5, 3, 2, 'b', 6, 8, 7, 4]
	[4, 2, 3, 7, 6, 8, 1, 5]	[4, 2, 3, 8, b, 3, 7, 1, 6]	[1, 5, 3, 2, b, 6, 8, 7, 4] [1, 5, 3, 'b', 2, 6, 8, 7, 4]
	['b', 2, 3, 4, 7, 6, 8, 1, 5]	[4, 2, 3, 7, 8, 5, 'b', 1, 6]	[1, 5, 3, 8, 2, 6, 'b', 7, 4]
	[2, 'b', 3, 4, 7, 6, 8, 1, 5]	[4, 2, 3, 7, 8, 5, 1, 'b', 6]	
	[2, 0, 3, 4, 7, 6, 8, 1, 5]		[1, 5, 3, 8, 2, 6, 7, 'b', 4]
	[2, 7, 3, 4, 0, 6, 8, 1, 5]	[4, 2, 3, 7, 'b', 5, 1, 8, 6]	[1, 5, 3, 8, 2, 6, 7, 4, 'b'] [1, 5, 3, 8, 2, 'b', 7, 4, 6]
	[2, 7, 3, 4, 1, 6, 8, 0, 5]	[4, 2, 3, 'b', 7, 5, 1, 8, 6] [4, 2, 3, 1, 7, 5, 'b', 8, 6]	[1, 5, 3, 8, 2, 0, 7, 4, 6] [1, 5, 3, 8, 'b', 2, 7, 4, 6]
	[2, 7, 3, 4, 1, 6, 6, 8, 5]		
		[4, 2, 3, 1, 7, 5, 8, 'b', 6]	[1, 'b', 3, 8, 5, 2, 7, 4, 6]
	[2, 7, 3, 1, 'b', 6, 4, 8, 5]	[4, 2, 3, 1, 'b', 5, 8, 7, 6]	[1, 3, 'b', 8, 5, 2, 7, 4, 6]
	[2, 'b', 3, 1, 7, 6, 4, 8, 5]	[4, 2, 3, 1, 5, 'b', 8, 7, 6]	[1, 3, 2, 8, 5, 'b', 7, 4, 6]
	['b', 2, 3, 1, 7, 6, 4, 8, 5]	[4, 2, 3, 1, 5, 6, 8, 7, 'b']	[1, 3, 2, 8, 5, 6, 7, 4, 'b']
	[1, 2, 3, 'b', 7, 6, 4, 8, 5]	[4, 2, 3, 1, 5, 6, 8, 'b', 7]	[1, 3, 2, 8, 5, 6, 7, 'b', 4]
	[1, 2, 3, 4, 7, 6, 'b', 8, 5]	[4, 2, 3, 1, 'b', 6, 8, 5, 7]	[1, 3, 2, 8, 'b', 6, 7, 5, 4]
	[1, 2, 3, 4, 7, 6, 8, 'b', 5]	[4, 2, 3, 'b', 1, 6, 8, 5, 7]	[1, 'b', 2, 8, 3, 6, 7, 5, 4]
	[1, 2, 3, 4, 7, 6, 8, 5, 'b']	['b', 2, 3, 4, 1, 6, 8, 5, 7]	[1, 2, 'b', 8, 3, 6, 7, 5, 4]
	[1, 2, 3, 4, 7, 'b', 8, 5, 6]	[2, 'b', 3, 4, 1, 6, 8, 5, 7]	[1, 2, 6, 8, 3, 'b', 7, 5, 4]
	[1, 2, 3, 4, 'b', 7, 8, 5, 6]	[2, 1, 3, 4, 'b', 6, 8, 5, 7]	[1, 2, 6, 8, 'b', 3, 7, 5, 4]
	[1, 2, 3, 4, 5, 7, 8, 'b', 6]	[2, 1, 3, 4, 5, 6, 8, 'b', 7]	[1, 2, 6, 8, 5, 3, 7, 'b', 4]
	[1, 2, 3, 4, 5, 7, 'b', 8, 6]	[2, 1, 3, 4, 5, 6, 'b', 8, 7]	[1, 2, 6, 8, 5, 3, 7, 4, 'b']
	[1, 2, 3, 'b', 5, 7, 4, 8, 6]	[2, 1, 3, 'b', 5, 6, 4, 8, 7]	[1, 2, 6, 8, 5, 'b', 7, 4, 3]

Programming 1 Report

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		[1, 2, 3, 5, 'b', 7, 4, 8, 6]		['b', 1, 3, 2, 5, 6, 4, 8, 7]		[1, 2, 6, 8, 'b', 5, 7, 4, 3]
		[1, 2, 3, 5, 7, 'b', 4, 8, 6]		[1, 'b', 3, 2, 5, 6, 4, 8, 7]		[1, 2, 6, 'b', 8, 5, 7, 4, 3]
		[1, 2, 3, 5, 7, 6, 4, 8, 'b']		[1, 5, 3, 2, 'b', 6, 4, 8, 7]		[1, 2, 6, 7, 8, 5, 'b', 4, 3]
		[1, 2, 3, 5, 7, 6, 4, 'b', 8]		[1, 5, 3, 'b', 2, 6, 4, 8, 7]		[1, 2, 6, 7, 8, 5, 4, 'b', 3]
		[1, 2, 3, 5, 'b', 6, 4, 7, 8]		[1, 5, 3, 4, 2, 6, 'b', 8, 7]		[1, 2, 6, 7, 'b', 5, 4, 8, 3]
		[1, 2, 3, 'b', 5, 6, 4, 7, 8]		[1, 5, 3, 4, 2, 6, 8, 'b', 7]		[1, 2, 6, 7, 5, 'b', 4, 8, 3]
		[1, 2, 3, 4, 5, 6, 'b', 7, 8]		[1, 5, 3, 4, 2, 6, 8, 7, 'b']		[1, 2, 6, 7, 5, 3, 4, 8, 'b']
		[1, 2, 3, 4, 5, 6, 7, 'b', 8]		[1, 5, 3, 4, 2, 'b', 8, 7, 6]		[1, 2, 6, 7, 5, 3, 4, 'b', 8]
		[1, 2, 3, 4, 5, 6, 7, 8, 'b']		[1, 5, 3, 4, 'b', 2, 8, 7, 6]		[1, 2, 6, 7, 5, 3, 'b', 4, 8]
				[1, 'b', 3, 4, 5, 2, 8, 7, 6]		[1, 2, 6, 'b', 5, 3, 7, 4, 8]
				[1, 3, 'b', 4, 5, 2, 8, 7, 6]		[1, 2, 6, 5, 'b', 3, 7, 4, 8]
				[1, 3, 2, 4, 5, 'b', 8, 7, 6]		[1, 2, 6, 5, 3, 'b', 7, 4, 8]
				[1, 3, 2, 4, 'b', 5, 8, 7, 6]		[1, 2, 'b', 5, 3, 6, 7, 4, 8]
				[1, 3, 2, 4, 7, 5, 8, 'b', 6]		[1, 'b', 2, 5, 3, 6, 7, 4, 8]
				[1, 3, 2, 4, 7, 5, 'b', 8, 6]		[1, 3, 2, 5, 'b', 6, 7, 4, 8]
				[1, 3, 2, 'b', 7, 5, 4, 8, 6]		[1, 3, 2, 5, 4, 6, 7, 'b', 8]
				[1, 3, 2, 7, 'b', 5, 4, 8, 6]		[1, 3, 2, 5, 4, 6, 7, 8, 'b']
				[1, 3, 2, 7, 5, 'b', 4, 8, 6]		[1, 3, 2, 5, 4, 'b', 7, 8, 6]
				[1, 3, 2, 7, 5, 6, 4, 8, 'b']		[1, 3, 2, 5, 'b', 4, 7, 8, 6]
				[1, 3, 2, 7, 5, 6, 4, 'b', 8]		[1, 'b', 2, 5, 3, 4, 7, 8, 6]
				[1, 3, 2, 7, 5, 6, 'b', 4, 8]		[1, 2, 'b', 5, 3, 4, 7, 8, 6]
				[1, 3, 2, 'b', 5, 6, 7, 4, 8]		[1, 2, 4, 5, 3, 'b', 7, 8, 6]
				[1, 3, 2, 5, 'b', 6, 7, 4, 8]		[1, 2, 4, 5, 'b', 3, 7, 8, 6]
				[1, 3, 2, 5, 4, 6, 7, 'b', 8]		[1, 2, 4, 'b', 5, 3, 7, 8, 6]
				[1, 3, 2, 5, 4, 6, 7, 8, 'b']		['b', 2, 4, 1, 5, 3, 7, 8, 6]
				[1, 3, 2, 5, 4, 'b', 7, 8, 6]		[2, 'b', 4, 1, 5, 3, 7, 8, 6]
				[1, 3, 2, 5, 'b', 4, 7, 8, 6]		[2, 4, 'b', 1, 5, 3, 7, 8, 6]
				[1, 'b', 2, 5, 3, 4, 7, 8, 6]		[2, 4, 3, 1, 5, 'b', 7, 8, 6]
				[1, 2, 'b', 5, 3, 4, 7, 8, 6]		[2, 4, 3, 1, 'b', 5, 7, 8, 6]
				[1, 2, 4, 5, 3, 'b', 7, 8, 6]		[2, 'b', 3, 1, 4, 5, 7, 8, 6]
				[1, 2, 4, 5, 'b', 3, 7, 8, 6]		['b', 2, 3, 1, 4, 5, 7, 8, 6]
				[1, 2, 4, 'b', 5, 3, 7, 8, 6]		[1, 2, 3, 'b', 4, 5, 7, 8, 6]
				['b', 2, 4, 1, 5, 3, 7, 8, 6]		[1, 2, 3, 4, 'b', 5, 7, 8, 6]
				[2, 'b', 4, 1, 5, 3, 7, 8, 6]		[1, 2, 3, 4, 5, 'b', 7, 8, 6]
				[2, 4, 'b', 1, 5, 3, 7, 8, 6]		[1, 2, 3, 4, 5, 6, 7, 8, 'b']
				[2, 4, 3, 1, 5, 'b', 7, 8, 6]		
				[2, 4, 3, 1, 'b', 5, 7, 8, 6]		
				[2, 4, 3, 1, 6, 5, 7, 8, 6]		
				['b', 2, 3, 1, 4, 5, 7, 8, 6]		
				[1, 2, 3, 'b', 4, 5, 7, 8, 6]		
				[1, 2, 3, 4, 'b', 5, 7, 8, 6]		
				[1, 2, 3, 4, 5, 'b', 7, 8, 6]		
				[1, 2, 3, 4, 5, 6, 7, 8, 'b']		
Average	77		73		66.2	
		<u> </u>				·

Thomas Pollard CS – 441 Artificial intelligence, Winter 2021 Programming 1 Report

8-Puzzle A* Search Results

Start state	H1	Path	H2	Path	Н3	Path
[['8' '2' '6']	24	[8, 2, 6, 7, 5, 1, 'b', 4, 3]	24	[8, 2, 6, 7, 5, 1, 'b', 4, 3]	24	[8, 2, 6, 7, 5, 1, 'b', 4, 3]
['7' '5' '1']		[8, 2, 6, 7, 5, 1, 4, 'b', 3]		[8, 2, 6, 7, 5, 1, 4, 'b', 3]		[8, 2, 6, 7, 5, 1, 4, 'b', 3]
['b' '4' '3']]		[8, 2, 6, 7, 'b', 1, 4, 5, 3]		[8, 2, 6, 7, 'b', 1, 4, 5, 3]		[8, 2, 6, 7, 'b', 1, 4, 5, 3]
		[8, 2, 6, 7, 1, 'b', 4, 5, 3]		[8, 2, 6, 7, 1, 'b', 4, 5, 3]		[8, 2, 6, 7, 1, 'b', 4, 5, 3]
		[8, 2, 'b', 7, 1, 6, 4, 5, 3]		[8, 2, 'b', 7, 1, 6, 4, 5, 3]		[8, 2, 'b', 7, 1, 6, 4, 5, 3]
		[8, 'b', 2, 7, 1, 6, 4, 5, 3]		[8, 'b', 2, 7, 1, 6, 4, 5, 3]		[8, 'b', 2, 7, 1, 6, 4, 5, 3]
		[8, 1, 2, 7, 'b', 6, 4, 5, 3]		[8, 1, 2, 7, 'b', 6, 4, 5, 3]		[8, 1, 2, 7, 'b', 6, 4, 5, 3]
		[8, 1, 2, 7, 6, 'b', 4, 5, 3]		[8, 1, 2, 7, 6, 'b', 4, 5, 3]		[8, 1, 2, 7, 6, 'b', 4, 5, 3]
		[8, 1, 2, 7, 6, 3, 4, 5, 'b']		[8, 1, 2, 7, 6, 3, 4, 5, 'b']		[8, 1, 2, 7, 6, 3, 4, 5, 'b']
		[8, 1, 2, 7, 6, 3, 4, 'b', 5]		[8, 1, 2, 7, 6, 3, 4, 'b', 5]		[8, 1, 2, 7, 6, 3, 4, 'b', 5]
		[8, 1, 2, 7, 'b', 3, 4, 6, 5]		[8, 1, 2, 7, 'b', 3, 4, 6, 5]		[8, 1, 2, 7, 'b', 3, 4, 6, 5]
		[8, 1, 2, 'b', 7, 3, 4, 6, 5]		[8, 1, 2, 'b', 7, 3, 4, 6, 5]		[8, 1, 2, 'b', 7, 3, 4, 6, 5]
		['b', 1, 2, 8, 7, 3, 4, 6, 5]		['b', 1, 2, 8, 7, 3, 4, 6, 5]		['b', 1, 2, 8, 7, 3, 4, 6, 5]
		[1, 'b', 2, 8, 7, 3, 4, 6, 5]		[1, 'b', 2, 8, 7, 3, 4, 6, 5]		[1, 'b', 2, 8, 7, 3, 4, 6, 5]
		[1, 2, 'b', 8, 7, 3, 4, 6, 5]		[1, 2, 'b', 8, 7, 3, 4, 6, 5]		[1, 2, 'b', 8, 7, 3, 4, 6, 5]
		[1, 2, 3, 8, 7, 'b', 4, 6, 5]		[1, 2, 3, 8, 7, 'b', 4, 6, 5]		[1, 2, 3, 8, 7, 'b', 4, 6, 5]
		[1, 2, 3, 8, 7, 5, 4, 6, 'b']		[1, 2, 3, 8, 7, 5, 4, 6, 'b']		[1, 2, 3, 8, 7, 5, 4, 6, 'b']
		[1, 2, 3, 8, 7, 5, 4, 'b', 6]		[1, 2, 3, 8, 7, 5, 4, 'b', 6]		[1, 2, 3, 8, 7, 5, 4, 'b', 6]
		[1, 2, 3, 8, 'b', 5, 4, 7, 6]		[1, 2, 3, 8, 'b', 5, 4, 7, 6]		[1, 2, 3, 8, 'b', 5, 4, 7, 6]
		[1, 2, 3, 'b', 8, 5, 4, 7, 6]		[1, 2, 3, 'b', 8, 5, 4, 7, 6]		[1, 2, 3, 'b', 8, 5, 4, 7, 6]
		[1, 2, 3, 4, 8, 5, 'b', 7, 6]		[1, 2, 3, 4, 8, 5, 'b', 7, 6]		[1, 2, 3, 4, 8, 5, 'b', 7, 6]
		[1, 2, 3, 4, 8, 5, 7, 'b', 6]		[1, 2, 3, 4, 8, 5, 7, 'b', 6]		[1, 2, 3, 4, 8, 5, 7, 'b', 6]
		[1, 2, 3, 4, 'b', 5, 7, 8, 6]		[1, 2, 3, 4, 'b', 5, 7, 8, 6]		[1, 2, 3, 4, 'b', 5, 7, 8, 6]
		[1, 2, 3, 4, 5, 'b', 7, 8, 6]		[1, 2, 3, 4, 5, 'b', 7, 8, 6]		[1, 2, 3, 4, 5, 'b', 7, 8, 6]
		[1, 2, 3, 4, 5, 6, 7, 8, 'b']		[1, 2, 3, 4, 5, 6, 7, 8, 'b']		[1, 2, 3, 4, 5, 6, 7, 8, 'b']
[['8' '4' '6']	24	[8, 4, 6, 7, 3, 5, 'b', 1, 2]	24	[8, 4, 6, 7, 3, 5, 'b', 1, 2]	24	[8, 4, 6, 7, 3, 5, 'b', 1, 2]
['7' '3' '5']		[8, 4, 6, 'b', 3, 5, 7, 1, 2]		[8, 4, 6, 'b', 3, 5, 7, 1, 2]		[8, 4, 6, 'b', 3, 5, 7, 1, 2]
['b' '1' '2']]		['b', 4, 6, 8, 3, 5, 7, 1, 2]		['b', 4, 6, 8, 3, 5, 7, 1, 2]		['b', 4, 6, 8, 3, 5, 7, 1, 2]
		[4, 'b', 6, 8, 3, 5, 7, 1, 2]		[4, 'b', 6, 8, 3, 5, 7, 1, 2]		[4, 'b', 6, 8, 3, 5, 7, 1, 2]
		[4, 3, 6, 8, 'b', 5, 7, 1, 2]		[4, 3, 6, 8, 'b', 5, 7, 1, 2]		[4, 3, 6, 8, 'b', 5, 7, 1, 2]
		[4, 3, 6, 8, 1, 5, 7, 'b', 2]		[4, 3, 6, 8, 1, 5, 7, 'b', 2]		[4, 3, 6, 8, 1, 5, 7, 'b', 2]
		[4, 3, 6, 8, 1, 5, 7, 2, 'b']		[4, 3, 6, 8, 1, 5, 7, 2, 'b']		[4, 3, 6, 8, 1, 5, 7, 2, 'b']
		[4, 3, 6, 8, 1, 'b', 7, 2, 5]		[4, 3, 6, 8, 1, 'b', 7, 2, 5]		[4, 3, 6, 8, 1, 'b', 7, 2, 5]
		[4, 3, 'b', 8, 1, 6, 7, 2, 5]		[4, 3, 'b', 8, 1, 6, 7, 2, 5]		[4, 3, 'b', 8, 1, 6, 7, 2, 5]
		[4, 'b', 3, 8, 1, 6, 7, 2, 5]		[4, 'b', 3, 8, 1, 6, 7, 2, 5]		[4, 'b', 3, 8, 1, 6, 7, 2, 5]
		[4, 1, 3, 8, 'b', 6, 7, 2, 5]		[4, 1, 3, 8, 'b', 6, 7, 2, 5]		[4, 1, 3, 8, 'b', 6, 7, 2, 5]
		[4, 1, 3, 'b', 8, 6, 7, 2, 5]		[4, 1, 3, 'b', 8, 6, 7, 2, 5]		[4, 1, 3, 'b', 8, 6, 7, 2, 5]
		['b', 1, 3, 4, 8, 6, 7, 2, 5]		['b', 1, 3, 4, 8, 6, 7, 2, 5]		['b', 1, 3, 4, 8, 6, 7, 2, 5]
		[1, 'b', 3, 4, 8, 6, 7, 2, 5]		[1, 'b', 3, 4, 8, 6, 7, 2, 5]		[1, 'b', 3, 4, 8, 6, 7, 2, 5]
		[1, 3, 'b', 4, 8, 6, 7, 2, 5]		[1, 3, 'b', 4, 8, 6, 7, 2, 5]		[1, 3, 'b', 4, 8, 6, 7, 2, 5]
		[1, 3, 6, 4, 8, 'b', 7, 2, 5] [1, 3, 6, 4, 'b', 8, 7, 2, 5]		[1, 3, 6, 4, 8, 'b', 7, 2, 5] [1, 3, 6, 4, 'b', 8, 7, 2, 5]		[1, 3, 6, 4, 8, 'b', 7, 2, 5] [1, 3, 6, 4, 'b', 8, 7, 2, 5]
		[1, 3, 6, 4, 0, 8, 7, 2, 5] [1, 3, 6, 4, 2, 8, 7, 'b', 5]		[1, 3, 6, 4, 0, 8, 7, 2, 5] [1, 3, 6, 4, 2, 8, 7, 'b', 5]		[1, 3, 6, 4, 0, 8, 7, 2, 5] [1, 3, 6, 4, 2, 8, 7, 'b', 5]
		[1, 3, 6, 4, 2, 8, 7, 6, 5] [1, 3, 6, 4, 2, 8, 7, 5, 'b']		[1, 3, 6, 4, 2, 8, 7, 6, 5] [1, 3, 6, 4, 2, 8, 7, 5, 'b']		[1, 3, 6, 4, 2, 8, 7, 0, 5] [1, 3, 6, 4, 2, 8, 7, 5, 'b']
		[1, 3, 6, 4, 2, 'b', 7, 5, 8]		[1, 3, 6, 4, 2, 'b', 7, 5, 8]		[1, 3, 6, 4, 2, 'b', 7, 5, 8]

Thomas Pollard CS – 441 Artificial intelligence, Winter 2021

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		[1, 3, 'b', 4, 2, 6, 7, 5, 8]		[1, 3, 'b', 4, 2, 6, 7, 5, 8]		[1, 3, 'b', 4, 2, 6, 7, 5, 8]
		[1, 'b', 3, 4, 2, 6, 7, 5, 8]		[1, 'b', 3, 4, 2, 6, 7, 5, 8]		[1, 'b', 3, 4, 2, 6, 7, 5, 8]
		[1, 2, 3, 4, 'b', 6, 7, 5, 8]		[1, 2, 3, 4, 'b', 6, 7, 5, 8]		[1, 2, 3, 4, 'b', 6, 7, 5, 8]
		[1, 2, 3, 4, 5, 6, 7, 'b', 8]		[1, 2, 3, 4, 5, 6, 7, 'b', 8]		[1, 2, 3, 4, 5, 6, 7, 'b', 8]
				• •		
		[1, 2, 3, 4, 5, 6, 7, 8, 'b']		[1, 2, 3, 4, 5, 6, 7, 8, 'b']		[1, 2, 3, 4, 5, 6, 7, 8, 'b']
[['2' '8' '5']	22	[2, 8, 5, 6, 7, 4, 'b', 1, 3]	22	[2, 8, 5, 6, 7, 4, 'b', 1, 3]	22	[2, 8, 5, 6, 7, 4, 'b', 1, 3]
['6' '7' '4']		[2, 8, 5, 6, 7, 4, 1, 'b', 3]		[2, 8, 5, 6, 7, 4, 1, 'b', 3]		[2, 8, 5, 6, 7, 4, 1, 'b', 3]
['b' '1' '3']]		[2, 8, 5, 6, 'b', 4, 1, 7, 3]		[2, 8, 5, 6, 'b', 4, 1, 7, 3]		[2, 8, 5, 6, 'b', 4, 1, 7, 3]
		[2, 8, 5, 6, 4, 'b', 1, 7, 3]		[2, 8, 5, 6, 4, 'b', 1, 7, 3]		[2, 8, 5, 6, 4, 'b', 1, 7, 3]
		[2, 8, 5, 6, 4, 3, 1, 7, 'b']		[2, 8, 5, 6, 4, 3, 1, 7, 'b']		[2, 8, 5, 6, 4, 3, 1, 7, 'b']
		[2, 8, 5, 6, 4, 3, 1, 'b', 7]		[2, 8, 5, 6, 4, 3, 1, 'b', 7]		[2, 8, 5, 6, 4, 3, 1, 'b', 7]
		[2, 8, 5, 6, 'b', 3, 1, 4, 7]		[2, 8, 5, 6, 'b', 3, 1, 4, 7]		[2, 8, 5, 6, 'b', 3, 1, 4, 7]
		[2, 'b', 5, 6, 8, 3, 1, 4, 7]		[2, 'b', 5, 6, 8, 3, 1, 4, 7]		[2, 'b', 5, 6, 8, 3, 1, 4, 7]
		[2, 5, 'b', 6, 8, 3, 1, 4, 7]		[2, 5, 'b', 6, 8, 3, 1, 4, 7]		[2, 5, 'b', 6, 8, 3, 1, 4, 7]
		[2, 5, 3, 6, 8, 'b', 1, 4, 7]		[2, 5, 3, 6, 8, 'b', 1, 4, 7]		[2, 5, 3, 6, 8, 'b', 1, 4, 7]
		[2, 5, 3, 6, 'b', 8, 1, 4, 7]		[2, 5, 3, 6, 'b', 8, 1, 4, 7]		[2, 5, 3, 6, 'b', 8, 1, 4, 7]
		[2, 5, 3, 'b', 6, 8, 1, 4, 7]		[2, 5, 3, 'b', 6, 8, 1, 4, 7]		[2, 5, 3, 'b', 6, 8, 1, 4, 7]
		[2, 5, 3, 1, 6, 8, 'b', 4, 7]		[2, 5, 3, 1, 6, 8, 'b', 4, 7]		[2, 5, 3, 1, 6, 8, 'b', 4, 7]
		[2, 5, 3, 1, 6, 8, 4, 'b', 7]		[2, 5, 3, 1, 6, 8, 4, 'b', 7]		[2, 5, 3, 1, 6, 8, 4, 'b', 7]
		[2, 5, 3, 1, 6, 8, 4, 7, 'b']		[2, 5, 3, 1, 6, 8, 4, 7, 'b']		[2, 5, 3, 1, 6, 8, 4, 7, 'b']
		[2, 5, 3, 1, 6, 'b', 4, 7, 8]		[2, 5, 3, 1, 6, 'b', 4, 7, 8]		[2, 5, 3, 1, 6, 'b', 4, 7, 8]
		[2, 5, 3, 1, 'b', 6, 4, 7, 8]		[2, 5, 3, 1, 'b', 6, 4, 7, 8]		[2, 5, 3, 1, 'b', 6, 4, 7, 8]
		[2, 'b', 3, 1, 5, 6, 4, 7, 8]		[2, 'b', 3, 1, 5, 6, 4, 7, 8]		[2, 'b', 3, 1, 5, 6, 4, 7, 8]
		['b', 2, 3, 1, 5, 6, 4, 7, 8]		['b', 2, 3, 1, 5, 6, 4, 7, 8]		['b', 2, 3, 1, 5, 6, 4, 7, 8]
		[1, 2, 3, 'b', 5, 6, 4, 7, 8]		[1, 2, 3, 'b', 5, 6, 4, 7, 8]		[1, 2, 3, 'b', 5, 6, 4, 7, 8]
		[1, 2, 3, 4, 5, 6, 'b', 7, 8]		[1, 2, 3, 4, 5, 6, 'b', 7, 8]		[1, 2, 3, 4, 5, 6, 'b', 7, 8]
		[1, 2, 3, 4, 5, 6, 7, 'b', 8]		[1, 2, 3, 4, 5, 6, 7, 'b', 8]		[1, 2, 3, 4, 5, 6, 7, 'b', 8]
		[1, 2, 3, 4, 5, 6, 7, 8, 'b']		[1, 2, 3, 4, 5, 6, 7, 8, 'b']		[1, 2, 3, 4, 5, 6, 7, 8, 'b']
[['1' 'b' '8']	25	[1, 'b', 8, 5, 2, 4, 3, 6, 7]	25	[1, 'b', 8, 5, 2, 4, 3, 6, 7]	25	[1, 'b', 8, 5, 2, 4, 3, 6, 7]
['5' '2' '4']		[1, 2, 8, 5, 'b', 4, 3, 6, 7]		[1, 2, 8, 5, 'b', 4, 3, 6, 7]		[1, 2, 8, 5, 'b', 4, 3, 6, 7]
['3' '6' '7']]		[1, 2, 8, 5, 6, 4, 3, 'b', 7]		[1, 2, 8, 5, 6, 4, 3, 'b', 7]		[1, 2, 8, 5, 6, 4, 3, 'b', 7]
[3 0 7]]				• • • • • • • •		
		[1, 2, 8, 5, 6, 4, 3, 7, 'b']		[1, 2, 8, 5, 6, 4, 3, 7, 'b']		[1, 2, 8, 5, 6, 4, 3, 7, 'b']
		[1, 2, 8, 5, 6, 'b', 3, 7, 4]		[1, 2, 8, 5, 6, 'b', 3, 7, 4]		[1, 2, 8, 5, 6, 'b', 3, 7, 4]
		[1, 2, 'b', 5, 6, 8, 3, 7, 4]		[1, 2, 'b', 5, 6, 8, 3, 7, 4]		[1, 2, 'b', 5, 6, 8, 3, 7, 4]
		[1, 'b', 2, 5, 6, 8, 3, 7, 4]		[1, 'b', 2, 5, 6, 8, 3, 7, 4]		[1, 'b', 2, 5, 6, 8, 3, 7, 4]
		[1, 6, 2, 5, 'b', 8, 3, 7, 4]		[1, 6, 2, 5, 'b', 8, 3, 7, 4]		[1, 6, 2, 5, 'b', 8, 3, 7, 4]
		[1, 6, 2, 5, 7, 8, 3, 'b', 4]		[1, 6, 2, 5, 7, 8, 3, 'b', 4]		[1, 6, 2, 5, 7, 8, 3, 'b', 4]
		[1, 6, 2, 5, 7, 8, 'b', 3, 4]		[1, 6, 2, 5, 7, 8, 'b', 3, 4]		[1, 6, 2, 5, 7, 8, 'b', 3, 4]
		[1, 6, 2, 'b', 7, 8, 5, 3, 4]		• • • • • • • •		
		• • • • • • • • •		[1, 6, 2, 'b', 7, 8, 5, 3, 4]		[1, 6, 2, 'b', 7, 8, 5, 3, 4]
		[1, 6, 2, 7, 'b', 8, 5, 3, 4]		[1, 6, 2, 7, 'b', 8, 5, 3, 4]		[1, 6, 2, 7, 'b', 8, 5, 3, 4]
		[1, 6, 2, 7, 3, 8, 5, 'b', 4]		[1, 6, 2, 7, 3, 8, 5, 'b', 4]		[1, 6, 2, 7, 3, 8, 5, 'b', 4]
		[1, 6, 2, 7, 3, 8, 5, 4, 'b']		[1, 6, 2, 7, 3, 8, 5, 4, 'b']		[1, 6, 2, 7, 3, 8, 5, 4, 'b']
		[1, 6, 2, 7, 3, 'b', 5, 4, 8]		[1, 6, 2, 7, 3, 'b', 5, 4, 8]		[1, 6, 2, 7, 3, 'b', 5, 4, 8]
		[1, 6, 2, 7, 'b', 3, 5, 4, 8]		[1, 6, 2, 7, 'b', 3, 5, 4, 8]		[1, 6, 2, 7, 'b', 3, 5, 4, 8]
		[1, 6, 2, 7, 4, 3, 5, 'b', 8]		[1, 6, 2, 7, 4, 3, 5, 'b', 8]		[1, 6, 2, 7, 4, 3, 5, 'b', 8]
	Ì	[L=, O, E, , , ¬, O, O, O, O]	1	[-, 0, 2, ,, -, 0, 0, 0, 0]	1	
		[1 6 2 7 1 2 14 5 0]		[1 6 7 7 1 7 1 1 5 0]		[1 6 2 7 / 2 'h' E 0]
		[1, 6, 2, 7, 4, 3, 'b', 5, 8] [1, 6, 2, 'b', 4, 3, 7, 5, 8]		[1, 6, 2, 7, 4, 3, 'b', 5, 8] [1, 6, 2, 'b', 4, 3, 7, 5, 8]		[1, 6, 2, 7, 4, 3, 'b', 5, 8] [1, 6, 2, 'b', 4, 3, 7, 5, 8]

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		[1 6 2 4 'b' 2 7 5 0]		[1 6 2 4 16 2 7 5 0]		[1 6 2 4 16 2 7 5 0]
		[1, 6, 2, 4, 'b', 3, 7, 5, 8]		[1, 6, 2, 4, 'b', 3, 7, 5, 8]		[1, 6, 2, 4, 'b', 3, 7, 5, 8]
		[1, 'b', 2, 4, 6, 3, 7, 5, 8]		[1, 'b', 2, 4, 6, 3, 7, 5, 8]		[1, 'b', 2, 4, 6, 3, 7, 5, 8]
		[1, 2, 'b', 4, 6, 3, 7, 5, 8]		[1, 2, 'b', 4, 6, 3, 7, 5, 8]		[1, 2, 'b', 4, 6, 3, 7, 5, 8]
		[1, 2, 3, 4, 6, 'b', 7, 5, 8]		[1, 2, 3, 4, 6, 'b', 7, 5, 8]		[1, 2, 3, 4, 6, 'b', 7, 5, 8]
		[1, 2, 3, 4, 'b', 6, 7, 5, 8]		[1, 2, 3, 4, 'b', 6, 7, 5, 8]		[1, 2, 3, 4, 'b', 6, 7, 5, 8]
		[1, 2, 3, 4, 5, 6, 7, 'b', 8]		[1, 2, 3, 4, 5, 6, 7, 'b', 8]		[1, 2, 3, 4, 5, 6, 7, 'b', 8]
		[1, 2, 3, 4, 5, 6, 7, 8, 'b']		[1, 2, 3, 4, 5, 6, 7, 8, 'b']		[1, 2, 3, 4, 5, 6, 7, 8, 'b']
[['8' '3' 'b']	26	[8, 3, 'b', 7, 5, 6, 2, 4, 1]	26	[8, 3, 'b', 7, 5, 6, 2, 4, 1]	26	[8, 3, 'b', 7, 5, 6, 2, 4, 1]
['7' '5' '6']		[8, 'b', 3, 7, 5, 6, 2, 4, 1]		[8, 'b', 3, 7, 5, 6, 2, 4, 1]		[8, 'b', 3, 7, 5, 6, 2, 4, 1]
['2' '4' '1']]		['b', 8, 3, 7, 5, 6, 2, 4, 1]		['b', 8, 3, 7, 5, 6, 2, 4, 1]		['b', 8, 3, 7, 5, 6, 2, 4, 1]
		[7, 8, 3, 'b', 5, 6, 2, 4, 1]		[7, 8, 3, 'b', 5, 6, 2, 4, 1]		[7, 8, 3, 'b', 5, 6, 2, 4, 1]
		[7, 8, 3, 2, 5, 6, 'b', 4, 1]		[7, 8, 3, 2, 5, 6, 'b', 4, 1]		[7, 8, 3, 2, 5, 6, 'b', 4, 1]
		[7, 8, 3, 2, 5, 6, 4, 'b', 1]		[7, 8, 3, 2, 5, 6, 4, 'b', 1]		[7, 8, 3, 2, 5, 6, 4, 'b', 1]
		[7, 8, 3, 2, 5, 6, 4, 1, 'b']		[7, 8, 3, 2, 5, 6, 4, 1, 'b']		[7, 8, 3, 2, 5, 6, 4, 1, 'b']
		[7, 8, 3, 2, 5, 'b', 4, 1, 6]		[7, 8, 3, 2, 5, 'b', 4, 1, 6]		[7, 8, 3, 2, 5, 'b', 4, 1, 6]
		[7, 8, 3, 2, 'b', 5, 4, 1, 6]		[7, 8, 3, 2, 'b', 5, 4, 1, 6]		[7, 8, 3, 2, 'b', 5, 4, 1, 6]
		[7, 'b', 3, 2, 8, 5, 4, 1, 6]		[7, 'b', 3, 2, 8, 5, 4, 1, 6]		[7, 'b', 3, 2, 8, 5, 4, 1, 6]
		['b', 7, 3, 2, 8, 5, 4, 1, 6]		['b', 7, 3, 2, 8, 5, 4, 1, 6]		['b', 7, 3, 2, 8, 5, 4, 1, 6]
		[2, 7, 3, 'b', 8, 5, 4, 1, 6]		[2, 7, 3, 'b', 8, 5, 4, 1, 6]		[2, 7, 3, 'b', 8, 5, 4, 1, 6]
		[2, 7, 3, 8, 'b', 5, 4, 1, 6]		[2, 7, 3, 8, 'b', 5, 4, 1, 6]		[2, 7, 3, 8, 'b', 5, 4, 1, 6]
		[2, 7, 3, 8, 1, 5, 4, 'b', 6]		[2, 7, 3, 8, 1, 5, 4, 'b', 6]		[2, 7, 3, 8, 1, 5, 4, 'b', 6]
		[2, 7, 3, 8, 1, 5, 'b', 4, 6]		[2, 7, 3, 8, 1, 5, 'b', 4, 6]		[2, 7, 3, 8, 1, 5, 'b', 4, 6]
		[2, 7, 3, 'b', 1, 5, 8, 4, 6]		[2, 7, 3, 'b', 1, 5, 8, 4, 6]		[2, 7, 3, 'b', 1, 5, 8, 4, 6]
		[2, 7, 3, 1, 'b', 5, 8, 4, 6]		[2, 7, 3, 1, 'b', 5, 8, 4, 6]		[2, 7, 3, 1, 'b', 5, 8, 4, 6]
		[2, 'b', 3, 1, 7, 5, 8, 4, 6]		[2, 'b', 3, 1, 7, 5, 8, 4, 6]		[2, 'b', 3, 1, 7, 5, 8, 4, 6]
		['b', 2, 3, 1, 7, 5, 8, 4, 6]		['b', 2, 3, 1, 7, 5, 8, 4, 6]		['b', 2, 3, 1, 7, 5, 8, 4, 6]
		[1, 2, 3, 'b', 7, 5, 8, 4, 6]		[1, 2, 3, 'b', 7, 5, 8, 4, 6]		[1, 2, 3, 'b', 7, 5, 8, 4, 6]
		[1, 2, 3, 7, 'b', 5, 8, 4, 6]		[1, 2, 3, 7, 'b', 5, 8, 4, 6]		[1, 2, 3, 7, 'b', 5, 8, 4, 6]
		[1, 2, 3, 7, 4, 5, 8, 'b', 6]		[1, 2, 3, 7, 4, 5, 8, 'b', 6]		[1, 2, 3, 7, 4, 5, 8, 'b', 6]
		[1, 2, 3, 7, 4, 5, 'b', 8, 6]		[1, 2, 3, 7, 4, 5, 'b', 8, 6]		[1, 2, 3, 7, 4, 5, 'b', 8, 6]
		[1, 2, 3, 'b', 4, 5, 7, 8, 6]		[1, 2, 3, 'b', 4, 5, 7, 8, 6]		[1, 2, 3, 'b', 4, 5, 7, 8, 6]
		[1, 2, 3, 4, 'b', 5, 7, 8, 6]		[1, 2, 3, 4, 'b', 5, 7, 8, 6]		[1, 2, 3, 4, 'b', 5, 7, 8, 6]
		[1, 2, 3, 4, 5, 'b', 7, 8, 6]		[1, 2, 3, 4, 5, 'b', 7, 8, 6]		[1, 2, 3, 4, 5, 'b', 7, 8, 6]
		[1, 2, 3, 4, 5, 6, 7, 8, 'b']		[1, 2, 3, 4, 5, 6, 7, 8, 'b']		[1, 2, 3, 4, 5, 6, 7, 8, 'b']
Average	24.2		24.2		24.2	

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15 Puzzle Best First Search

Start State	H1	H2	H3
[['9' '12' '4' '10']	422	314	238
['14' '3' '1' 'b']			
['7' '11' '6' '13']			
['8' '2' '15' '5']]			
[['10' '7' 'b' '2']	386	336	270
['1' '13' '3' '15']			
['4' '14' '11' '9']			
['5' '6' '8' '12']]			
[['b' '9' '10' '11']	550	212	204
['4' '1' '15' '5']			
['8' '3' '12' '14']			
['6' '7' '13' '2']]			
[['10' '6' '5' '13']	892	254	232
['12' '15' '1' '11']			
['9' '8' '4' '2']			
['3' 'b' '14' '7']]			
[['4' 'b' '9' '10']	441	177	287
['11' '13' '7' '3']			
['15' '2' '5' '8']			
['12' '1' '14' '6']]			
Average	538.2	258.6	246.2

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15 Puzzle A* Search Results

Start State	H1	H2	Н3
[['9' '12' '4' '10']	Did not find solution in	54	Did not find solution in
['14' '3' '1' 'b']	within iteration limit		within iteration limit
['7' '11' '6' '13']			
['8' '2' '15' '5']]			
[['10' '7' 'b' '2']	Did not find solution in	Did not find solution in	Did not find solution in
['1' '13' '3' '15']	within iteration limit	within iteration limit	within iteration limit
['4' '14' '11' '9']			
['5' '6' '8' '12']]			
[['b' '9' '10' '11']	Did not find solution in	52	Did not find solution in
['4' '1' '15' '5']	within iteration limit		within iteration limit
['8' '3' '12' '14']			
['6' '7' '13' '2']]			
[['10' '6' '5' '13']	Did not find solution in	Did not find solution in	Did not find solution in
['12' '15' '1' '11']	within iteration limit	within iteration limit	within iteration limit
['9' '8' '4' '2']			
['3' 'b' '14' '7']]			
[['4' 'b' '9' '10']	Did not find solution in	53	Did not find solution in
['11' '13' '7' '3']	within iteration limit		within iteration limit
['15' '2' '5' '8']			
['12' '1' '14' '6']]			
Average		53	