

CS 440: CSPS AND GAMES

PART 1: CONSTRAINT SATISFACTION PROBLEMS

1.1 Word Puzzles

In this problem, we were tasked with finding solutions to the given word puzzles. In order to do so, we set up an infrastructure that would be helpful in both letter-based assignment and in the word-based assignment. Here is a quick list of the infrastructure decisions that we made to enable us to effectively solve this problem.

- Maintained a dictionary that maps a given category (string) to the list of possible words for that category (strings).
- Maintained a dictionary that maps a given category (string) to the indices of that category's slots in the solution (integers).
 - For example, in Puzzle 1, the category ‘emotion’ would be mapped to the integers 4, 5, 7
- Maintained a dictionary that maps a category (string) to its category id (integer)
- For each index of the solution, we maintained a list of category ids (integers) that could place a letter at that location.
- Maintained the number of categories that were being used for the given puzzle
- Maintained a list that would ultimately hold the solution.
 - Elements of this list are initially assigned to hold the integer 0, and as letters or words get assigned, the elements of this list become characters. When this array contains a solution, it is formatted and printed.

As you may notice above, categories are sometimes referred to as a string or by their category id (integer). We chose to do this as strings are easy to read from the user end, but manipulating

integers is much easier than manipulating strings. To ensure consistency between category id (integer) and the category (string) itself, we ensured that we maintained a dictionary that defined this mapping scheme.

NOTE: Search trace data for each example and each formulation is appended at the very end of this file. See Appendix A.

For the letter-based assignment:

- **Variables:** Indices of the solution array
- **Domains:** All letters for a given index (See section on inference detection)
- **Constraints:** Each category has 3 indices in the solution array. The letters of these three indices (taken in ascending order) MUST make up a word from that category. This must hold true for every category. (See section on constraint checking)
- **Inference Detection:** We implemented inference detection when generating the domain for an index. The naïve solution would merely use all 26 letters as the domain for each index of the array. In order to reduce the search trace, we chose our domain more carefully. Here is our methodology for generating the domain for a given index. We looked at each category that maps to the index. For each category, we determined which letter (1st, 2nd, or 3rd) of the word corresponded to the index. We then made a list of every letter that exists at the given position for that category. After generating these lists for every single category, we then took the intersection of the lists to generate the domain for the given index. This was done for each index of the solution array. This proved to be very effective. It limited the possible values for each index to only be letters that could exist in the solution rather than all letters. Our domains ended up being very small in comparison to having domains of all letters.
- **Constraint Checking:** The constraint checking here determines if assigning a given letter to a specific location would make the solution array inconsistent. This goes through and checks all the categories that could store letters to that given index, and ensures that the assignment is consistent against all categories that can map to the given index.

- **An Important Note About Our Search Iterations (for bonus points):** We originally did not implement strong constraint checking when doing our letter based implementation. We tested our code to determine how efficient it was before implementing constraint checking, and then we also tested it to see how efficient it was after implementing constraint checking. The differences are unbelievable. Here are some details on this data.

	Inference Without Constraint Checking	Inference With Constraint Checking
Puzzle 1	Iterations: 1993916	Iterations: 1328
Puzzle 2	Iterations: 81639369	Iterations: 523
Puzzle 3	Iterations: 7768957	Iterations: 475
Puzzle 4	Iterations: 4912501	Iterations: 254
Puzzle 5	Iterations: 232585	Iterations: 6215

This reveals to us that constraint checking drastically cuts down the search tree. It is incredibly more efficient when using constraint checking. If inference and constraint checking were both not implemented, the search iterations would all be incredibly high. As it is, puzzle 2 with inference and without constraint checking took almost 3 minutes on our machines. It would have been much longer had inference not been implemented. Another thing we realized when implementing constraint checking is that the number search iterations are not only dependent on the complexity of the problem, but also the structure of the problem as well. For example, Puzzle 1 without inference checking has close to 2 million search iterations, and is reduced to 1328. However, Puzzle 2 is cut down from 81 million iterations do a mere 523. This truly shows that the structure of the problem does determine how many iterations are necessary. It also reinforces the necessity for forward checking and inference. This is for bonus points.

Our letter-based assignment found the following solutions.

Puzzle 1 - Letter

(Found result: NNEMANDYE)
(Found result: NNESAYDYE)
(Found result: NWEMANDYE)
(Found result: NWESAYDYE)

Puzzle 2 - Letter

(Found result: HSIAIWNC)
(Found result: HSIAIWNPS)
(Found result: HSIOIWNDS)
(Found result: HSIOIWNYS)

Puzzle 3 - Letter

(Found result: ASULPEA)
(Found result: ASULPIE)

Puzzle 4 - Letter

(Found result: HEDITYRE)
(Found result: HELITYRE)
(Found result: HETITYRE)

Puzzle 5 - Letter

(Found result: IHTTNOIEN)
(Found result: IHTTYOIEN)
(Found result: THTTNOIEN)
(Found result: THHTYOIEN)

For the word-based assignment:

- **Variables:** The categories
- **Domains:** All words for a given category (See section on inference detection)
- **Constraints:** Each category has 3 indices in the solution array. You must pick a word for each category, and assign the letters of that word to the the 3 indices (in ascending order) for the given category. You must ensure that each category has a word in the solution array at that category's given indices. (See section on constraint checking)
- **Inference Detection:** We implemented inference detection when generating the domain for a given category. The naïve solution would set the domain for each category to be all possible words. As a result, the domain of a given category would contain words that were not even in that category. The domains of each category would be homogenous. We chose to implement inference detection for the domains. The domain of a given category would only be the words in that category. This drastically reduces the size of your domain for each category.
- **Constraint Checking:** We chose to implement constraint checking here to minimize the size of our search trace. Before expanding a potential word, we implemented our forward checking. Using one of our mapping schemes, we would look up the category that word belonged to and would find the indices that the given category could place values in. Then, we looked at each index of the solution array that a category could place a letter in. For this problem, we would always look at three indices since a category could only place letters at three indices. If a letter had already been assigned to that index and the current word would change the letter at that index, our constraint checking would tell the backtracking search to not expand that word. If a letter had not been assigned to that index yet or if assigning the given word would not change the letter at that index, then the index was consistent. If all three indices were consistent, then the constraint checking would tell the backtracking search to continue; the backtracking search would then assign the word and continue on the search path.

Our word-based assignment found the following solutions:

Puzzle 1 - Word

(Found result: NNEMANDYE)
(Found result: NWEMANDYE)
(Found result: NNESAYDYE)
(Found result: NWESAYDYE)

Puzzle 2 - Word

(Found result: HSIAIWNC)
(Found result: HSIAIWNPS)
(Found result: HSIOIWND)
(Found result: HSIOIWNYS)

Puzzle 3 - Word

(Found result: ASULPEA)
(Found result: ASULPIE)

Puzzle 4 - Word

(Found result: HEDITYRE)
(Found result: HELITYRE)
(Found result: HETITYRE)

Puzzle 5 - Word

(Found result: IHTTNOIEN)
(Found result: THTTNOIEN)
(Found result: IHHTYOIEN)
(Found result: THHTYOIEN)

An interesting design decision we made with this portion of the problem is that we did not tie the code down to each category being mapped to three letters and only three letters. Given the way we designed our solution, categories need not be symmetric in how many letters they assign. We could easily support words with more than three letters, given that we calculate lengths, rather than assigning them as three up front. Though this proves to be more work for the programmer, it increases the versatility of our code. Our code could even be run with a single puzzle where each category assigned a different number of letters. For example, the puzzle

could have one category that assigned four letters, another category that assigned six, and a third category that only assigned two letters. Our code would still work on puzzles like that. This is for bonus points. ☺

NOTE: Search trace data for each example and each formulation is appended at the very end of this file. See Appendix A.

1.2 Map Coloring (For Bonus Points)

Though we are three unit students, we chose to implement the Map Coloring problem for bonus points.

First, we implemented this without forward checking and did not have a heuristic that determines which variable to assign, and which value to assign to that variable. With this method, the search space will become increasingly large as the number of nodes in the graph increases. This implementation did, however, generate a solution to the problem. The solution is listed below.

After implementing the most basic backtracking search, we chose to implement forward checking. When assigning a color to a node, we would check if any of the adjacent nodes had already been assigned the same color. If that was the case, we would not assign that color.

Here are the graphs that we tested, and the solutions that accompanied them.

Graph 1 – The Australia Problem

Node 0 (WA) is red
Node 1 (NT) is yellow
Node 2 (SA) is green
Node 3 (Q) is red
Node 4 (NSW) is yellow
Node 5 (V) is red
Node 6 (T) is red

T -> {}
WA -> {NT, SA}
NT -> {WA, Q, SA}
SA -> {WA, NT, Q, NSW, V}
Q -> {NT, SA, NSW}
NSW -> {Q, SA, V}
V -> {SA, NSW}

Graph 2

Node 0 is red
Node 1 is yellow
Node 2 is yellow
Node 3 is red
Node 4 is green
Node 5 is green
Node 6 is blue

0 -> {1, 4, 2, 5}
1 -> {0, 4, 6, 5}
2 -> {0, 4, 3, 6, 5}
3 -> {2, 4, 6}
4 -> {0, 1, 6, 3, 2}
5 -> {2, 6, 1, 0}
6 -> {2, 3, 4, 1, 5}

Graph 3

Node 0 is red
Node 1 is yellow
Node 2 is red
Node 3 is red
Node 4 is yellow
Node 5 is yellow
Node 6 is red
Node 7 is red
Node 8 is yellow
Node 9 is yellow
Node 10 is red
Node 11 is green

```
0 -> {1, 4, 5}  
1 -> {0, 3}  
2 -> {}  
3 -> {1}  
4 -> {0}  
5 -> {0,6,11}  
6 -> {5}  
7 -> {8,9,11}  
8 -> {7}  
9 -> {7,10}  
10 -> {9}  
11 -> {5,7}
```

PART 2: WAR GAME

2.1 Minimax and Alpha-Beta Agents

For this portion of the project, we needed a strong infrastructure to support the problem. We defined a matrix that will hold the board as it is read in. This matrix essentially holds the score values for each position. We then create another matrix that indicates which player holds which position. If no player holds a specific position, the at that position is merely ‘-1.’ Otherwise it is labelled as a ‘1’ or a ‘2’ for Player 1 and Player 2 respectively. We maintained some fields to help us keep track of nodes expanded, time elapsed, and total number of moves made.

We also set up a method that will calculate the score at a given position. This method merely goes to every index of the board matrix, and adds to the correct player’s score. This assists in calculating the final score at the end of the game.

We first read in the text file, and then we populate the board and scores matrices, which will represent the state of the game at any given time. After completing set up, which includes determining which player will perform use which algorithm (*minimax/alpha-beta*), we actually begin gameplay.

In game play, we will check who’s turn it is, and then call the respective algorithm for the player who’s turn it is. After *minimax* or *alpha-beta* returns an action, that action is applied, and the state of the board is updated. This continues until there are no more moves left.

Minimax and *alpha-beta* were implemented similarly to the pseudo-code in the textbook. Rather than managing utility values, we chose to manage tuples that held utility values as well as the x and y coordinates. This made picking the actions easier; we could merely select an x and y coordinate.

Note: All Results for the War Game are shown below in the Results section.

For Bonus Points

We also built in functionality that allows a user to play against the AI. When running the code, rather than specifying that 2 for '*alpha-beta*' or 1 for '*minimax*,' you can simply specify 0 for '*human*,' and the code will allow the user to input coordinates for moves. For the user's convenience, the state of the board is printed before the user is asked to make a decision. The user is then prompted to enter an X and a Y coordinate on the board. If no move is possible, nothing occurs, and it becomes the turn of the next player. If a Blitz is possible at that point, the blitz automatically occurs. If a blitz is not possible, a Paradrop will occur. Against the AI, we don't do very well. The AI wins with both *minimax* and *alpha-beta* against both of us. At lower depths, we can compete well against the AI, but if the depth of the search tree for the AI is made larger, then the AI is incredibly effective against a human. This is for bonus points.

Minimax by default plays to depth 3, and *alpha-beta* performs to depth 4 by default. *Alpha-beta* regularly outperforms *minimax* at this depth, and when both algorithms are at depth 3. Attached in the Results section is one board where both *minimax* and *alpha-beta* played to depth 3. It is labelled as 'Both at Depth 3,' and is the last result in the list of results. Our structure makes it easy to modify the depth of each algorithm as one chooses. For bonus points.

We also wanted our program itself to be sustainable without the report. This means that upon termination of the game, the program will always report the statistics on nodes expanded, average time per move, and average nodes expanded. It will also always output the final score and winner. In addition, for ease of use when running multiple boards, we also output our results to a formatted HTML page. This will show colors when opened in a web browser and makes it easy to tell who has captured which square.

Our boards were constructed such that they were not dependent on being of size 6x6. They read in the file, and then store the size of one edge of the grid to represent the size of the board. This allows us to expand the functionality of the board to include larger boards. When we run our program on larger boards, both search algorithms did slow down. However, *minimax* was noticeably slower than *alpha-beta*. We ran our program on a few larger boards, and the results

for those programs are shown in the results section as well. The larger boards are titled *WeesterplatteLarge*, *KerenLarge*, *Random*, and *NarvikLarge*. This is also for bonus points.

Note: All Results for the War Game are shown below in the Results section.

Results

Keren minimax vs minimax

Green wins

Blue score: 15 Green score: 21
Blue moves: 18 Green moves: 18
Blue Average Nodes/Move: 12097 Green Average Nodes/Move: 10819
Blue Average Time/Move: 0.236915495661 Green Average Time/Move: 0.236915495661

B	G	B	G	B	G		1	1	1	1	1	1
G	B	G	B	G	B		1	1	1	1	1	1
B	G	G	G	G	G		1	1	1	1	1	1
G	G	B	G	G	G		1	1	1	1	1	1
G	B	G	G	G	B		1	1	1	1	1	1
B	G	B	B	B	B		1	1	1	1	1	1

Keren alpha-beta vs alpha-beta

Tie game

Blue score: 18 Green score: 18
Blue moves: 18 Green moves: 18
Blue Average Nodes/Move: 1832 Green Average Nodes/Move: 1552
Blue Average Time/Move: 0.0341397391425 Green Average Time/Move: 0.0341397391425

B	G	B	G	B	G		1	1	1	1	1	1
G	B	G	B	G	B		1	1	1	1	1	1
B	G	B	G	B	G		1	1	1	1	1	1
G	B	G	B	G	B		1	1	1	1	1	1
B	G	B	G	B	G		1	1	1	1	1	1
G	B	G	B	G	B		1	1	1	1	1	1

Keren minimax vs alpha-beta -- minimax goes first
Green wins

Blue score: 14 Green score: 22
Blue moves: 18 Green moves: 18
Blue Average Nodes/Move: 12097 Green Average Nodes/Move: 1692
Blue Average Time/Move: 0.239449010955 Green Average Time/Move: 0.239449010955

B	G	B	G	G	B		1	1	1	1	1	1
G	B	G	G	B	B		1	1	1	1	1	1
B	G	G	B	G	G		1	1	1	1	1	1
B	B	B	G	G	G		1	1	1	1	1	1
B	B	G	G	G	G		1	1	1	1	1	1
B	G	G	G	G	G		1	1	1	1	1	1

Keren alpha-beta vs minimax -- alpha-beta goes first
Tie game

Blue score: 18 Green score: 18
Blue moves: 18 Green moves: 18
Blue Average Nodes/Move: 1832 Green Average Nodes/Move: 10819
Blue Average Time/Move: 0.0345835023456 Green Average Time/Move: 0.0345835023456

B	G	B	G	B	G		1	1	1	1	1	1
G	B	G	B	G	B		1	1	1	1	1	1
B	G	B	G	B	G		1	1	1	1	1	1
G	B	G	B	G	B		1	1	1	1	1	1
B	G	B	G	B	G		1	1	1	1	1	1
G	B	G	B	G	B		1	1	1	1	1	1

Narvik minimax vs minimax

Green wins

Blue score: 704 Green score: 1096
Blue moves: 18 Green moves: 18
Blue Average Nodes/Move: 12097 Green Average Nodes/Move: 10819
Blue Average Time/Move: 0.24100973871 Green Average Time/Move: 0.24100973871

B	B	B	G	G	B	99	1	99	1	99	1
B	B	B	G	G	G	1	99	1	99	1	99
B	B	G	G	G	B	99	1	99	1	99	1
B	B	G	G	G	G	1	99	1	99	1	99
B	B	G	G	G	B	99	1	99	1	99	1
G	B	B	G	B	G	1	99	1	99	1	99

Narvik alpha-beta vs alpha-beta

Tie game

Blue score: 900 Green score: 900
Blue moves: 18 Green moves: 18
Blue Average Nodes/Move: 3833 Green Average Nodes/Move: 4325
Blue Average Time/Move: 0.0737025605308 Green Average Time/Move: 0.0737025605308

B	B	B	G	G	B	99	1	99	1	99	1
G	B	B	G	G	G	1	99	1	99	1	99
B	B	G	G	G	B	99	1	99	1	99	1
B	B	G	G	G	G	1	99	1	99	1	99
B	B	B	G	G	B	99	1	99	1	99	1
G	B	B	B	G	G	1	99	1	99	1	99

Narvik minimax vs alpha-beta -- minimax goes first

Green wins

Blue score: 899 Green score: 901
Blue moves: 18 Green moves: 18
Blue Average Nodes/Move: 12097 Green Average Nodes/Move: 4188
Blue Average Time/Move: 0.240755558014 Green Average Time/Move: 0.240755558014

B	B	B	G	G	G	99	1	99	1	99	1
B	B	B	G	G	G	1	99	1	99	1	99
B	B	G	G	G	G	99	1	99	1	99	1
B	B	G	G	B	G	1	99	1	99	1	99
B	B	B	G	G	G	99	1	99	1	99	1
G	B	B	B	G	G	1	99	1	99	1	99

Narvik alpha-beta vs minimax -- alpha-beta goes first

Blue wins

Blue score: 1097 Green score: 703
Blue moves: 18 Green moves: 18
Blue Average Nodes/Move: 3747 Green Average Nodes/Move: 10819
Blue Average Time/Move: 0.0719197326236 Green Average Time/Move: 0.0719197326236

B	B	B	G	G	G	99	1	99	1	99	1
G	B	B	G	G	G	1	99	1	99	1	99
B	B	G	G	G	G	99	1	99	1	99	1
B	B	G	G	B	G	1	99	1	99	1	99
B	G	B	B	B	B	99	1	99	1	99	1
B	B	G	B	G	B	1	99	1	99	1	99

Sevastopol minimax vs minimax

Blue wins

Blue score: 226 Green score: 152
Blue moves: 18 Green moves: 18
Blue Average Nodes/Move: 12097 Green Average Nodes/Move: 10819
Blue Average Time/Move: 0.274690932698 Green Average Time/Move: 0.274690932698

B	B	B	B	B	B		1	1	1	1	1	1
B	B	B	B	B	B		2	2	2	2	2	2
B	B	B	B	B	B		4	4	4	4	4	4
G	B	B	B	B	B		8	8	8	8	8	8
G	G	B	B	G	B		16	16	16	16	16	16
G	B	B	G	B	G		32	32	32	32	32	32

Sevastopol alpha-beta vs alpha-beta

Tie game

Blue score: 189 Green score: 189
Blue moves: 18 Green moves: 18
Blue Average Nodes/Move: 209698 Green Average Nodes/Move: 189228
Blue Average Time/Move: 4.31608384185 Green Average Time/Move: 4.31608384185

G	B	G	B	G	B		1	1	1	1	1	1
B	G	B	G	B	G		2	2	2	2	2	2
G	B	G	B	G	B		4	4	4	4	4	4
B	G	B	G	B	G		8	8	8	8	8	8
G	B	G	B	G	B		16	16	16	16	16	16
B	G	B	G	B	G		32	32	32	32	32	32

Sevastopol minimax vs alpha-beta -- minimax goes first

Green wins

Blue score: 148 Green score: 230
Blue moves: 18 Green moves: 18
Blue Average Nodes/Move: 12097 Green Average Nodes/Move: 169882
Blue Average Time/Move: 0.240881681442 Green Average Time/Move: 0.240881681442

G	B	B	G	G	G		1	1	1	1	1	1
B	B	B	G	G	G		2	2	2	2	2	2
B	B	B	G	G	G		4	4	4	4	4	4
G	B	B	G	G	G		8	8	8	8	8	8
G	B	G	G	G	G		16	16	16	16	16	16
B	G	B	G	B	G		32	32	32	32	32	32

Sevastopol alpha-beta vs minimax -- alpha-beta goes first

Blue wins

Blue score: 219 Green score: 159
Blue moves: 18 Green moves: 18
Blue Average Nodes/Move: 223074 Green Average Nodes/Move: 10819
Blue Average Time/Move: 4.44181817108 Green Average Time/Move: 4.44181817108

B	B	B	G	G	G		1	1	1	1	1	1
B	B	B	B	G	G		2	2	2	2	2	2
G	B	B	B	B	G		4	4	4	4	4	4
G	G	B	B	B	B		8	8	8	8	8	8
G	B	G	B	B	B		16	16	16	16	16	16
B	G	B	G	B	G		32	32	32	32	32	32

Smolensk minimax vs minimax

Green wins

Blue score: 535 Green score: 1118
Blue moves: 18 Green moves: 18
Blue Average Nodes/Move: 12097 Green Average Nodes/Move: 10819
Blue Average Time/Move: 0.241235507859 Green Average Time/Move: 0.241235507859

B	G	G	G	G	G	66	76	28	66	11	9
G	G	B	G	G	G	31	39	50	8	33	14
G	G	B	B	G	G	80	76	39	59	2	48
G	G	B	G	B	G	50	73	43	3	13	3
G	G	G	G	G	B	99	45	72	87	49	4
B	G	B	B	B	G	80	63	92	28	61	53

Smolensk alpha-beta vs alpha-beta

Blue wins

Blue score: 890 Green score: 763
Blue moves: 18 Green moves: 18
Blue Average Nodes/Move: 15420 Green Average Nodes/Move: 20423
Blue Average Time/Move: 0.300557666355 Green Average Time/Move: 0.300557666355

B	B	B	B	G	G	66	76	28	66	11	9
B	B	B	G	G	G	31	39	50	8	33	14
B	B	B	G	G	G	80	76	39	59	2	48
G	B	B	B	G	G	50	73	43	3	13	3
B	G	B	G	B	G	99	45	72	87	49	4
G	G	G	G	G	G	80	63	92	28	61	53

Smolensk minimax vs alpha-beta -- minimax goes first
Green wins

Blue score: 645 Green score: 1008
Blue moves: 18 Green moves: 18
Blue Average Nodes/Move: 12097 Green Average Nodes/Move: 45551
Blue Average Time/Move: 0.241369989183 Green Average Time/Move: 0.241369989183

B	B	G	G	B	G		66	76	28	66	11	9
B	G	G	B	G	G		31	39	50	8	33	14
G	B	G	B	G	G		80	76	39	59	2	48
B	G	G	B	B	G		50	73	43	3	13	3
B	G	B	G	B	B		99	45	72	87	49	4
G	G	G	B	G	G		80	63	92	28	61	53

Smolensk alpha-beta vs minimax -- alpha-beta goes first
Blue wins

Blue score: 983 Green score: 670
Blue moves: 18 Green moves: 18
Blue Average Nodes/Move: 12995 Green Average Nodes/Move: 10819
Blue Average Time/Move: 0.253681871626 Green Average Time/Move: 0.253681871626

B	B	G	B	B	G		66	76	28	66	11	9
B	B	B	B	B	B		31	39	50	8	33	14
B	B	B	B	G	G		80	76	39	59	2	48
G	B	G	G	G	G		50	73	43	3	13	3
B	G	B	G	G	G		99	45	72	87	49	4
G	B	G	B	G	G		80	63	92	28	61	53

Westerplatte minimax vs minimax

Green wins

Blue score: 31 Green score: 41
Blue moves: 18 Green moves: 18
Blue Average Nodes/Move: 12097 Green Average Nodes/Move: 10819
Blue Average Time/Move: 0.250323745939 Green Average Time/Move: 0.250323745939

B	B	B	G	G	B		1	1	1	1	1	1
B	B	B	G	G	G		1	3	4	4	3	1
G	B	B	B	G	B		1	4	2	2	4	1
G	G	B	B	G	B		1	4	2	2	4	1
G	G	B	G	G	G		1	3	4	4	3	1
G	G	G	B	G	G		1	1	1	1	1	1

Westerplatte alpha-beta vs alpha-beta

Green wins

Blue score: 33 Green score: 39
Blue moves: 18 Green moves: 18
Blue Average Nodes/Move: 16351 Green Average Nodes/Move: 9814
Blue Average Time/Move: 0.328170471721 Green Average Time/Move: 0.328170471721

G	G	G	G	G	G		1	1	1	1	1	1
B	G	B	G	G	G		1	3	4	4	3	1
B	B	G	G	G	G		1	4	2	2	4	1
B	B	B	G	G	B		1	4	2	2	4	1
G	B	B	G	B	B		1	3	4	4	3	1
B	B	G	B	B	G		1	1	1	1	1	1

Westerplatte minimax vs alpha-beta -- minimax goes first

Green wins

Blue score: 33 Green score: 39
Blue moves: 18 Green moves: 18
Blue Average Nodes/Move: 12097 Green Average Nodes/Move: 14221
Blue Average Time/Move: 0.245308703846 Green Average Time/Move: 0.245308703846

B	B	B	G	G	G	1	1	1	1	1	1
B	B	B	G	G	G	1	3	4	4	3	1
B	B	G	G	G	G	1	4	2	2	4	1
G	B	B	G	G	B	1	4	2	2	4	1
B	G	B	G	B	G	1	3	4	4	3	1
G	B	G	B	G	G	1	1	1	1	1	1

Westerplatte alpha-beta vs minimax -- alpha-beta goes first

Green wins

Blue score: 34 Green score: 38
Blue moves: 18 Green moves: 18
Blue Average Nodes/Move: 18234 Green Average Nodes/Move: 10819
Blue Average Time/Move: 0.378133389685 Green Average Time/Move: 0.378133389685

B	B	G	B	G	G	1	1	1	1	1	1
B	B	B	G	G	G	1	3	4	4	3	1
B	B	G	B	G	G	1	4	2	2	4	1
B	B	B	G	G	G	1	4	2	2	4	1
G	B	G	B	G	G	1	3	4	4	3	1
B	G	B	G	G	G	1	1	1	1	1	1

KerenLarge minimax vs alpha-beta -- minimax goes first

Green wins

Blue score: 29 Green score: 35

Blue moves: 32 Green moves: 32

Blue Average Nodes/Move: 66903 Green Average Nodes/Move: 5319

Blue Average Time/Move: 2.2232837975 Green Average Time/Move: 2.2232837975

KerenLarge alpha-beta vs minimax -- alpha-beta goes first

Tie game

Blue score: 32 Green score: 32

Blue moves: 32 Green moves: 32

Blue Average Nodes/Move: 5678 Green Average Nodes/Move: 62839

Blue Average Time/Move: 0.168849423528 Green Average Time/Move: 0.168849423528

NarvikLarge minimax vs minimax

Green wins

Blue score: 1501 Green score: 1699
Blue moves: 32 Green moves: 32
Blue Average Nodes/Move: 66903 Green Average Nodes/Move: 62839
Blue Average Time/Move: 2.14590658993 Green Average Time/Move: 2.14590658993

B	B	B	G	G	B	G	B		99	1	99	1	99	1	99	1
B	B	B	G	G	G	G	G		1	99	1	99	1	99	1	99
B	B	B	G	G	G	G	G		99	1	99	1	99	1	99	1
B	B	G	B	G	G	B	G		1	99	1	99	1	99	1	99
B	G	B	B	B	B	B	G		99	1	99	1	99	1	99	1
B	G	G	B	B	B	G	G		1	99	1	99	1	99	1	99
B	B	G	G	G	G	B		99	1	99	1	99	1	99	1	
B	B	G	G	G	B	G		1	99	1	99	1	99	1	99	

NarvikLarge alpha-beta vs alpha-beta

Green wins

Blue score: 1599 Green score: 1601
Blue moves: 32 Green moves: 32
Blue Average Nodes/Move: 30350 Green Average Nodes/Move: 32141
Blue Average Time/Move: 0.982285968959 Green Average Time/Move: 0.982285968959

B	B	B	G	G	B	G	G		99	1	99	1	99	1	99	1
B	B	B	G	G	G	G	G		1	99	1	99	1	99	1	99
B	B	B	G	G	B	G	G		99	1	99	1	99	1	99	1
B	B	B	B	G	G	G	G		1	99	1	99	1	99	1	99
B	B	B	B	B	B	G	G	G	99	1	99	1	99	1	99	1
B	B	G	B	B	G	G	G		1	99	1	99	1	99	1	99
B	B	B	B	G	G	G	G		99	1	99	1	99	1	99	1
G	B	B	B	B	G	G	G		1	99	1	99	1	99	1	99

NarvikLarge minimax vs alpha-beta -- minimax goes first
Green wins
Blue score: 1501 Green score: 1699
Blue moves: 32 Green moves: 32
Blue Average Nodes/Move: 66903 Green Average Nodes/Move: 30225
Blue Average Time/Move: 2.44638354331 Green Average Time/Move: 2.44638354331

B	B	B	G	G	B	G	B	99	1	99	1	99	1	99	1
B	B	B	G	G	G	G	G	1	99	1	99	1	99	1	99
B	B	B	G	G	B	G	G	99	1	99	1	99	1	99	1
B	B	B	B	G	G	G	G	1	99	1	99	1	99	1	99
B	B	B	B	B	G	G	G	99	1	99	1	99	1	99	1
B	B	B	B	B	G	G	G	1	99	1	99	1	99	1	99
B	G	B	G	G	B	G	G	99	1	99	1	99	1	99	1
B	B	G	G	G	G	G	G	1	99	1	99	1	99	1	99

NarvikLarge alpha-beta vs minimax -- alpha-beta goes first
Blue wins
Blue score: 1601 Green score: 1599
Blue moves: 32 Green moves: 32
Blue Average Nodes/Move: 30585 Green Average Nodes/Move: 62839
Blue Average Time/Move: 1.04095428437 Green Average Time/Move: 1.04095428437

B	B	B	G	G	B	G	G	99	1	99	1	99	1	99	1
B	B	B	G	G	G	G	G	1	99	1	99	1	99	1	99
B	B	B	G	G	B	G	G	99	1	99	1	99	1	99	1
B	B	B	B	G	G	G	G	1	99	1	99	1	99	1	99
B	B	B	B	B	G	G	G	99	1	99	1	99	1	99	1
B	B	G	B	B	G	G	G	1	99	1	99	1	99	1	99
B	B	B	B	G	G	G	B	99	1	99	1	99	1	99	1
G	B	B	B	B	G	G	B	1	99	1	99	1	99	1	99

WesterplatteLarge minimax vs minimax

Green wins

Blue score: 48

Green score: 57

Blue moves: 25

Green moves: 24

Blue Average Nodes/Move: 29610

Green Average Nodes/Move: 28417

Blue Average Time/Move: 0.842619781494

Green Average Time/Move: 0.842619781494

B	G	B	G	G	G	G		1	1	1	1	1	1	1
G	B	G	B	G	G	G		1	3	4	5	4	3	1
B	G	B	G	G	G	G		1	4	2	5	2	4	1
B	B	G	B	G	B	G		1	4	2	5	2	4	1
G	B	B	G	B	B	B		1	3	4	5	4	3	1
G	G	G	G	B	G	B		1	1	1	5	1	1	1
G	B	G	B	G	B	B		1	1	1	1	1	1	1

WesterplatteLarge alpha-beta vs alpha-beta

Blue wins

Blue score: 55

Green score: 50

Blue moves: 25

Green moves: 24

Blue Average Nodes/Move: 32120

Green Average Nodes/Move: 31127

Blue Average Time/Move: 0.962838373184

Green Average Time/Move: 0.962838373184

G	G	B	G	B	B	B		1	1	1	1	1	1	1
G	G	G	B	G	B	G		1	3	4	5	4	3	1
B	G	B	G	B	G	B		1	4	2	5	2	4	1
G	B	G	B	G	B	G		1	4	2	5	2	4	1
B	B	B	G	B	G	G		1	3	4	5	4	3	1
B	B	G	B	G	G	B		1	1	1	5	1	1	1
B	G	B	G	G	B	B		1	1	1	1	1	1	1

WesterplatteLarge minimax vs alpha-beta -- minimax goes first
Green wins

Blue score: 49 Green score: 56
Blue moves: 25 Green moves: 24
Blue Average Nodes/Move: 29610 Green Average Nodes/Move: 40272
Blue Average Time/Move: 0.864396781921 Green Average Time/Move: 0.864396781921

G	G	B	B	B	B	B	B	1	1	1	1	1	1	1
G	G	G	B	B	B	B	B	1	3	4	5	4	3	1
B	G	B	G	B	B	B	B	1	4	2	5	2	4	1
G	B	G	B	G	B	G	B	1	4	2	5	2	4	1
G	G	G	G	G	G	G	G	1	3	4	5	4	3	1
B	G	G	B	G	G	G	G	1	1	1	5	1	1	1
G	B	G	G	G	G	B	B	1	1	1	1	1	1	1

WesterplatteLarge alpha-beta vs minimax -- alpha-beta goes first
Blue wins

Blue score: 69 Green score: 36
Blue moves: 25 Green moves: 24
Blue Average Nodes/Move: 30204 Green Average Nodes/Move: 28417
Blue Average Time/Move: 0.835222120285 Green Average Time/Move: 0.835222120285

G	G	G	G	G	G	G	G	1	1	1	1	1	1	1
G	B	G	B	G	B	G	B	1	3	4	5	4	3	1
B	G	B	G	B	G	B	B	1	4	2	5	2	4	1
B	B	G	B	G	B	B	B	1	4	2	5	2	4	1
B	B	B	B	B	B	B	B	1	3	4	5	4	3	1
B	B	B	B	B	B	B	B	1	1	1	5	1	1	1
G	B	G	B	B	B	B	B	1	1	1	1	1	1	1

Random minimax vs minimax

Blue wins

Blue score: 957 Green score: 787
Blue moves: 25 Green moves: 24
Blue Average Nodes/Move: 29610 Green Average Nodes/Move: 28417
Blue Average Time/Move: 0.82103348732 Green Average Time/Move: 0.82103348732

B	B	B	B	B	B	B	66	62	28	56	11	9	5
B	G	B	B	B	G	B	1	39	50	18	33	14	23
B	B	B	B	G	B	G	1	76	9	59	2	18	44
G	B	G	B	B	B	B	50	7	43	3	13	3	27
G	G	G	G	G	B	B	9	45	12	77	49	4	35
G	G	G	G	G	B	B	80	36	29	8	61	53	77
G	G	G	G	B	B	B	25	66	55	43	56	55	99

Random alpha-beta vs alpha-beta

Blue wins

Blue score: 984 Green score: 760
Blue moves: 25 Green moves: 24
Blue Average Nodes/Move: 76137 Green Average Nodes/Move: 85417
Blue Average Time/Move: 2.15656134605 Green Average Time/Move: 2.15656134605

G	G	G	G	B	B	B	66	62	28	56	11	9	5
B	G	G	B	G	B	B	1	39	50	18	33	14	23
B	B	B	B	B	B	G	1	76	9	59	2	18	44
B	B	G	B	B	G	B	50	7	43	3	13	3	27
B	G	B	B	B	B	G	9	45	12	77	49	4	35
G	B	B	G	B	B	G	80	36	29	8	61	53	77
G	G	B	B	B	B	B	25	66	55	43	56	55	99

Random minimax vs alpha-beta -- minimax goes first

Green wins

Blue score: 620 Green score: 1124

Blue score: 320 Green score: 1
Blue moves: 25 Green moves: 24

Blue Average Nodes/Move: 29610 Green Average Nodes/Move: 46017

Blue Average Time/Move: 0.87192527771 Green Average Time/Move: 0.87192527771

G	B	G	B	G	G	G		66	62	28	56	11	9	5
B	G	B	G	B	G	B		1	39	50	18	33	14	23
B	B	G	G	G	B	G		1	76	9	59	2	18	44
G	B	G	G	B	G	G		50	7	43	3	13	3	27
B	G	G	G	G	G	G		9	45	12	77	49	4	35
G	G	G	B	G	B	G		80	36	29	8	61	53	77
G	G	G	G	B	B	B		25	66	55	43	56	55	99

Random alpha-beta vs minimax -- alpha-beta goes first

Green wins

Blue score: 845 Green score: 899

Blue moves: 25 Green moves: 24

Blue Average Nodes/Move: 186988 Green Average Nodes/Move: 28417

Blue Average Time/Move: 5.29887242317 Green Average Time/Move: 5.29887242317

B	G	B	G	B	G	B		66	62	28	56	11	9	5
G	B	G	B	G	G	G		1	39	50	18	33	14	23
G	G	B	G	G	G	B		1	76	9	59	2	18	44
G	B	B	B	G	B	B		50	7	43	3	13	3	27
B	B	B	G	B	B	B		9	45	12	77	49	4	35
B	B	B	G	G	B	G		80	36	29	8	61	53	77
B	B	G	G	G	G	B		25	66	55	43	56	55	99

Results – Both at Depth 3

```
Sevastopol minimax vs alpha-beta -- minimax goes first
Blue wins
Blue score: 226 Green score: 152
Blue moves: 18 Green moves: 18
Blue Average Nodes/Move: 12097 Green Average Nodes/Move: 8466
Blue Average Time/Move: 0.264713380072 Green Average Time/Move: 0.264713380072

B B B B B B 1 1 1 1 1 1
B B B B B B 2 2 2 2 2 2
B B B B B B 4 4 4 4 4 4
G B B B B B 8 8 8 8 8 8
G G B B G B 16 16 16 16 16 16
G B B G B G 32 32 32 32 32 32
```

INDIVIDUAL CONTRIBUTIONS

Abhishek Deep Nigam

I developed the infrastructure for 2.1, and tested and improved the infrastructure for 1.1. We both sat down and worked together on the development of the rest of the project. I implemented the Map Coloring algorithm and was responsible for the bulk of the reporting tasks.

Jakub Klapacz

I developed the infrastructure section for 1.1, and tested and improved the infrastructure for 2.1. We both sat down and worked together on the development of the rest of the project. I was responsible for the bulk of debugging tasks.

APPENDIX A: SEARCH TRACES

Numbering indicates which variable is being assigned.

Puzzle 1 - Word

Searching in order of categories: emotion body adverb adjective interjection verb
root[0]->AWE[1]->ARM(Backtracking)
[1]->EAR(Backtracking)
[1]->EYE(Backtracking)
[1]->HIP(Backtracking)
[1]->JAW(Backtracking)
[1]->LEG(Backtracking)
[1]->LIP(Backtracking)
[1]->RIB(Backtracking)
[1]->TOE(Backtracking)
[0]->CRY[1]->ARM(Backtracking)
[1]->EAR(Backtracking)
[1]->EYE(Backtracking)
[1]->HIP(Backtracking)
[1]->JAW(Backtracking)
[1]->LEG(Backtracking)
[1]->LIP(Backtracking)
[1]->RIB(Backtracking)
[1]->TOE(Backtracking)
[0]->JOY[1]->ARM(Backtracking)
[1]->EAR(Backtracking)
[1]->EYE(Backtracking)
[1]->HIP(Backtracking)
[1]->JAW(Backtracking)
[1]->LEG(Backtracking)
[1]->LIP(Backtracking)
[1]->RIB(Backtracking)
[1]->TOE(Backtracking)
[0]->MAD[1]->ARM(Backtracking)
[1]->EAR(Backtracking)
[1]->EYE[2]->NAE[3]->NEE[4]->MAN[5]->DYE(Found result: NNEMANDYE)
[3]->WEE[4]->MAN[5]->DYE(Found result: NWEMANDYE)
[1]->HIP(Backtracking)
[1]->JAW[2]->NAW(Backtracking)
[1]->LEG(Backtracking)
[1]->LIP(Backtracking)
[1]->RIB(Backtracking)
[1]->TOE[2]->NAE(Backtracking)
[0]->SAD[1]->ARM(Backtracking)

```
[1]->EAR(Backtracking)
[1]->EYE[2]->NAE[3]->NEE[4]->SAY[5]->DYE(Found result: NNESAYDYE)
[3]->WEE[4]->SAY[5]->DYE(Found result: NWESAYDYE)
[1]->HIP(Backtracking)
[1]->JAW[2]->NAW(Backtracking)
[1]->LEG(Backtracking)
[1]->LIP(Backtracking)
[1]->RIB(Backtracking)
[1]->TOE[2]->NAE(Backtracking)
[0]->WOE[1]->ARM(Backtracking)
[1]->EAR(Backtracking)
[1]->EYE(Backtracking)
[1]->HIP(Backtracking)
[1]->JAW(Backtracking)
[1]->LEG(Backtracking)
[1]->LIP(Backtracking)
[1]->RIB(Backtracking)
[1]->TOE(Backtracking)
Search Iterations: 79
```

Puzzle 1 - Letter

```
Searching in order of indicies in the solution array [0] ... [8]
root[0]->A[1]->A[2]->A[3]->A[4]->A[5]->H(Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->A(Backtracking)
[7]->R(Backtracking)
[3]->S[4]->A[5]->Y[6]->D[7]->A(Backtracking)
[7]->R(Backtracking)
[3]->W(Backtracking)
[2]->R[3]->A[4]->A[5]->H(Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->A(Backtracking)
[7]->I(Backtracking)
[7]->R(Backtracking)
[3]->S[4]->A[5]->Y[6]->D[7]->A(Backtracking)
[7]->I(Backtracking)
[7]->R(Backtracking)
[3]->W(Backtracking)
[1]->B(Backtracking)
[1]->C(Backtracking)
[1]->D[2]->E[3]->A[4]->A[5]->H(Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->A(Backtracking)
[7]->E(Backtracking)
[7]->O(Backtracking)
[7]->Y(Backtracking)
[3]->S[4]->A[5]->Y[6]->D[7]->A(Backtracking)
[7]->E(Backtracking)
```

```
[7]->O(Backtracking)
[7]->Y(Backtracking)
[3]->W(Backtracking)
[2]->L[3]->A[4]->A[5]->H(Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->E(Backtracking)
[7]->I(Backtracking)
[3]->S[4]->A[5]->Y[6]->D[7]->E(Backtracking)
[7]->I(Backtracking)
[3]->W(Backtracking)
[1]->F[2]->E[3]->A[4]->A[5]->H(Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->A(Backtracking)
[7]->E(Backtracking)
[7]->O(Backtracking)
[7]->Y(Backtracking)
[3]->S[4]->A[5]->Y[6]->D[7]->A(Backtracking)
[7]->E(Backtracking)
[7]->O(Backtracking)
[7]->Y(Backtracking)
[3]->W(Backtracking)
[1]->H[2]->T[3]->A[4]->A[5]->H(Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->O(Backtracking)
[3]->S[4]->A[5]->Y[6]->D[7]->O(Backtracking)
[3]->W(Backtracking)
[1]->I(Backtracking)
[1]->L[2]->A[3]->A[4]->A[5]->H(Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->A(Backtracking)
[7]->R(Backtracking)
[3]->S[4]->A[5]->Y[6]->D[7]->A(Backtracking)
[7]->R(Backtracking)
[3]->W(Backtracking)
[2]->L[3]->A[4]->A[5]->H(Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->E(Backtracking)
[7]->I(Backtracking)
[3]->S[4]->A[5]->Y[6]->D[7]->E(Backtracking)
[7]->I(Backtracking)
[3]->W(Backtracking)
[1]->M(Backtracking)
[1]->N[2]->E[3]->A[4]->A[5]->H(Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->A(Backtracking)
[7]->E(Backtracking)
[7]->O(Backtracking)
[7]->Y(Backtracking)
[3]->S[4]->A[5]->Y[6]->D[7]->A(Backtracking)
[7]->E(Backtracking)
[7]->O(Backtracking)
[7]->Y(Backtracking)
```

```
[3]->W(Backtracking)
[2]->T[3]->A[4]->A[5]->H(Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->O(Backtracking)
[3]->S[4]->A[5]->Y[6]->D[7]->O(Backtracking)
[3]->W(Backtracking)
[1]->O[2]->L[3]->A[4]->A[5]->H(Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->E(Backtracking)
[7]->I(Backtracking)
[3]->S[4]->A[5]->Y[6]->D[7]->E(Backtracking)
[7]->I(Backtracking)
[3]->W(Backtracking)
[1]->R[2]->E[3]->A[4]->A[5]->H(Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->A(Backtracking)
[7]->E(Backtracking)
[7]->O(Backtracking)
[7]->Y(Backtracking)
[3]->S[4]->A[5]->Y[6]->D[7]->A(Backtracking)
[7]->E(Backtracking)
[7]->O(Backtracking)
[7]->Y(Backtracking)
[3]->W(Backtracking)
[2]->R[3]->A[4]->A[5]->H(Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->A(Backtracking)
[7]->I(Backtracking)
[7]->R(Backtracking)
[3]->S[4]->A[5]->Y[6]->D[7]->A(Backtracking)
[7]->I(Backtracking)
[7]->R(Backtracking)
[3]->W(Backtracking)
[1]->S[2]->L[3]->A[4]->A[5]->H(Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->E(Backtracking)
[7]->I(Backtracking)
[3]->S[4]->A[5]->Y[6]->D[7]->E(Backtracking)
[7]->I(Backtracking)
[3]->W(Backtracking)
[1]->W[2]->A[3]->A[4]->A[5]->H(Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->A(Backtracking)
[7]->R(Backtracking)
[3]->S[4]->A[5]->Y[6]->D[7]->A(Backtracking)
[7]->R(Backtracking)
[3]->W(Backtracking)
[2]->E[3]->A[4]->A[5]->H(Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->A(Backtracking)
[7]->E(Backtracking)
[7]->O(Backtracking)
[7]->Y(Backtracking)
```

```
[3]->S[4]->A[5]->Y[6]->D[7]->A(Backtracking)
[7]->E(Backtracking)
[7]->O(Backtracking)
[7]->Y(Backtracking)
[3]->W(Backtracking)
[0]->N[1]->A[2]->A[3]->A[4]->A[5]->H(Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->A(Backtracking)
[7]->R(Backtracking)
[3]->S[4]->A[5]->Y[6]->D[7]->A(Backtracking)
[7]->R(Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->A(Backtracking)
[2]->R[3]->A[4]->A[5]->H(Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->A(Backtracking)
[7]->I(Backtracking)
[7]->R(Backtracking)
[3]->S[4]->A[5]->Y[6]->D[7]->A(Backtracking)
[7]->I(Backtracking)
[7]->R(Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->A(Backtracking)
[7]->I(Backtracking)
[1]->B(Backtracking)
[1]->C(Backtracking)
[1]->D[2]->E[3]->A[4]->A[5]->H(Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->A(Backtracking)
[7]->E(Backtracking)
[7]->O(Backtracking)
[7]->Y(Backtracking)
[3]->S[4]->A[5]->Y[6]->D[7]->A(Backtracking)
[7]->E(Backtracking)
[7]->O(Backtracking)
[7]->Y(Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->A(Backtracking)
[7]->E(Backtracking)
[7]->Y(Backtracking)
[2]->L[3]->A[4]->A[5]->H(Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->E(Backtracking)
[7]->I(Backtracking)
[3]->S[4]->A[5]->Y[6]->D[7]->E(Backtracking)
[7]->I(Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->E(Backtracking)
[7]->I(Backtracking)
[1]->F[2]->E[3]->A[4]->A[5]->H(Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->A(Backtracking)
[7]->E(Backtracking)
[7]->O(Backtracking)
[7]->Y(Backtracking)
```

```
[3]->S[4]->A[5]->Y[6]->D[7]->A(Backtracking)
[7]->E(Backtracking)
[7]->O(Backtracking)
[7]->Y(Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->A(Backtracking)
[7]->E(Backtracking)
[7]->Y(Backtracking)
[1]->H[2]->T[3]->A[4]->A[5]->H(Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->O(Backtracking)
[3]->S[4]->A[5]->Y[6]->D[7]->O(Backtracking)
[3]->W[4]->O[5]->W[6]->E(Backtracking)
[1]->I(Backtracking)
[1]->L[2]->A[3]->A[4]->A[5]->H(Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->A(Backtracking)
[7]->R(Backtracking)
[3]->S[4]->A[5]->Y[6]->D[7]->A(Backtracking)
[7]->R(Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->A(Backtracking)
[2]->L[3]->A[4]->A[5]->H(Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->E(Backtracking)
[7]->I(Backtracking)
[3]->S[4]->A[5]->Y[6]->D[7]->E(Backtracking)
[7]->I(Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->E(Backtracking)
[7]->I(Backtracking)
[1]->M(Backtracking)
[1]->N[2]->E[3]->A[4]->A[5]->H(Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->A(Backtracking)
[7]->E(Backtracking)
[7]->O(Backtracking)
[7]->Y[8]->E(Found result: NNEMANDYE)
[3]->S[4]->A[5]->Y[6]->D[7]->A(Backtracking)
[7]->E(Backtracking)
[7]->O(Backtracking)
[7]->Y[8]->E(Found result: NNESAYDYE)
[3]->W[4]->O[5]->W[6]->E[7]->A(Backtracking)
[7]->E(Backtracking)
[7]->Y(Backtracking)
[2]->T[3]->A[4]->A[5]->H(Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->O(Backtracking)
[3]->S[4]->A[5]->Y[6]->D[7]->O(Backtracking)
[3]->W[4]->O[5]->W[6]->E(Backtracking)
[1]->O[2]->L[3]->A[4]->A[5]->H(Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->E(Backtracking)
[7]->I(Backtracking)
[3]->S[4]->A[5]->Y[6]->D[7]->E(Backtracking)
```

```
[7]->I (Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->E (Backtracking)
[7]->I (Backtracking)
[1]->R[2]->E[3]->A[4]->A[5]->H (Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->A (Backtracking)
[7]->E (Backtracking)
[7]->O (Backtracking)
[7]->Y (Backtracking)
[3]->S[4]->A[5]->Y[6]->D[7]->A (Backtracking)
[7]->E (Backtracking)
[7]->O (Backtracking)
[7]->Y (Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->A (Backtracking)
[7]->E (Backtracking)
[7]->Y (Backtracking)
[2]->R[3]->A[4]->A[5]->H (Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->A (Backtracking)
[7]->I (Backtracking)
[7]->R (Backtracking)
[3]->S[4]->A[5]->Y[6]->D[7]->A (Backtracking)
[7]->I (Backtracking)
[7]->R (Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->A (Backtracking)
[7]->I (Backtracking)
[1]->S[2]->L[3]->A[4]->A[5]->H (Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->E (Backtracking)
[7]->I (Backtracking)
[3]->S[4]->A[5]->Y[6]->D[7]->E (Backtracking)
[7]->I (Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->E (Backtracking)
[7]->I (Backtracking)
[1]->W[2]->A[3]->A[4]->A[5]->H (Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->A (Backtracking)
[7]->R (Backtracking)
[3]->S[4]->A[5]->Y[6]->D[7]->A (Backtracking)
[7]->R (Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->A (Backtracking)
[2]->E[3]->A[4]->A[5]->H (Backtracking)
[3]->M[4]->A[5]->N[6]->D[7]->A (Backtracking)
[7]->E (Backtracking)
[7]->O (Backtracking)
[7]->Y[8]->E (Found result: NWEMANDYE)
[3]->S[4]->A[5]->Y[6]->D[7]->A (Backtracking)
[7]->E (Backtracking)
[7]->O (Backtracking)
[7]->Y[8]->E (Found result: NWESAYDYE)
```

```
[3]->W[4]->O[5]->W[6]->E[7]->A(Backtracking)
[7]->E(Backtracking)
[7]->Y(Backtracking)
[0]->O[1]->A[2]->A[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->A(Backtracking)
[2]->R[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->A(Backtracking)
[7]->I(Backtracking)
[1]->B(Backtracking)
[1]->C(Backtracking)
[1]->D[2]->E[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->A(Backtracking)
[7]->E(Backtracking)
[7]->Y(Backtracking)
[2]->L[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->E(Backtracking)
[7]->I(Backtracking)
[1]->F[2]->E[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->A(Backtracking)
[7]->E(Backtracking)
[7]->Y(Backtracking)
[1]->H[2]->T[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W[4]->O[5]->W[6]->E(Backtracking)
[1]->I(Backtracking)
[1]->L[2]->A[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W[4]->O[5]->W[6]->E(Backtracking)
[2]->L[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->E(Backtracking)
[7]->I(Backtracking)
[1]->M(Backtracking)
```

```
[1]->N[2]->E[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->A(Backtracking)
[7]->E(Backtracking)
[7]->Y(Backtracking)
[2]->T[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W[4]->O[5]->W[6]->E(Backtracking)
[1]->O[2]->L[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W[4]->O[5]->W[6]->E(Backtracking)
[7]->I(Backtracking)
[1]->R[2]->E[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->A(Backtracking)
[7]->E(Backtracking)
[7]->Y(Backtracking)
[2]->R[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->A(Backtracking)
[7]->I(Backtracking)
[1]->S[2]->L[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->A(Backtracking)
[7]->I(Backtracking)
[1]->W[2]->A[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->A(Backtracking)
[2]->E[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->A(Backtracking)
[7]->E(Backtracking)
[7]->Y(Backtracking)
[0]->P[1]->A[2]->A[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[2]->R[3]->A(Backtracking)
```

```
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[1]->B(Backtracking)
[1]->C(Backtracking)
[1]->D[2]->E[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[2]->L[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[1]->F[2]->E[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[1]->H[2]->T[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[1]->I(Backtracking)
[1]->L[2]->A[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[2]->L[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[1]->M(Backtracking)
[1]->N[2]->E[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[2]->T[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[1]->O[2]->L[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[1]->R[2]->E[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
```

```
[3]->W(Backtracking)
[2]->R[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[1]->S[2]->L[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[1]->W[2]->A[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[2]->E[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[0]->Q[1]->A[2]->A[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[2]->R[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[1]->B(Backtracking)
[1]->C(Backtracking)
[1]->D[2]->E[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[2]->L[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[1]->F[2]->E[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[1]->H[2]->T[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[1]->I(Backtracking)
[1]->L[2]->A[3]->A(Backtracking)
[3]->M(Backtracking)
```

```
[3]->S(Backtracking)
[3]->W(Backtracking)
[2]->L[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[1]->M(Backtracking)
[1]->N[2]->E[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[2]->T[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[1]->O[2]->L[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[1]->R[2]->E[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[2]->R[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[1]->S[2]->L[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[1]->W[2]->A[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[2]->E[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[0]->S[1]->A[2]->A[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[2]->R[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
```

```
[3]->W(Backtracking)
[1]->B(Backtracking)
[1]->C(Backtracking)
[1]->D[2]->E[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[2]->L[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[1]->F[2]->E[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[1]->H[2]->T[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[1]->I(Backtracking)
[1]->L[2]->A[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[2]->L[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[1]->M(Backtracking)
[1]->N[2]->E[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[2]->T[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[1]->O[2]->L[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[1]->R[2]->E[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[2]->R[3]->A(Backtracking)
```

```
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[1]->S[2]->L[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[1]->W[2]->A[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[2]->E[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W(Backtracking)
[0]->Y[1]->A[2]->A[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->A(Backtracking)
[2]->R[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->A(Backtracking)
[7]->I(Backtracking)
[1]->B(Backtracking)
[1]->C(Backtracking)
[1]->D[2]->E[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->A(Backtracking)
[7]->E(Backtracking)
[7]->Y(Backtracking)
[2]->L[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->E(Backtracking)
[7]->I(Backtracking)
[1]->F[2]->E[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->A(Backtracking)
[7]->E(Backtracking)
[7]->Y(Backtracking)
[1]->H[2]->T[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
```

```
[3]->W[4]->O[5]->W[6]->E (Backtracking)
[1]->I (Backtracking)
[1]->L[2]->A[3]->A (Backtracking)
[3]->M (Backtracking)
[3]->S (Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->A (Backtracking)
[2]->L[3]->A (Backtracking)
[3]->M (Backtracking)
[3]->S (Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->E (Backtracking)
[7]->I (Backtracking)
[1]->M (Backtracking)
[1]->N[2]->E[3]->A (Backtracking)
[3]->M (Backtracking)
[3]->S (Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->A (Backtracking)
[7]->E (Backtracking)
[7]->Y (Backtracking)
[2]->T[3]->A (Backtracking)
[3]->M (Backtracking)
[3]->S (Backtracking)
[3]->W[4]->O[5]->W[6]->E (Backtracking)
[1]->O[2]->L[3]->A (Backtracking)
[3]->M (Backtracking)
[3]->S (Backtracking)
[3]->W[4]->O[5]->W[6]->E (Backtracking)
[7]->I (Backtracking)
[1]->R[2]->E[3]->A (Backtracking)
[3]->M (Backtracking)
[3]->S (Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->E (Backtracking)
[7]->E (Backtracking)
[7]->Y (Backtracking)
[2]->R[3]->A (Backtracking)
[3]->M (Backtracking)
[3]->S (Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->A (Backtracking)
[7]->I (Backtracking)
[1]->S[2]->L[3]->A (Backtracking)
[3]->M (Backtracking)
[3]->S (Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->E (Backtracking)
[7]->I (Backtracking)
[1]->W[2]->A[3]->A (Backtracking)
[3]->M (Backtracking)
[3]->S (Backtracking)
```

```
[3]->W[4]->O[5]->W[6]->E[7]->A(Backtracking)
[2]->E[3]->A(Backtracking)
[3]->M(Backtracking)
[3]->S(Backtracking)
[3]->W[4]->O[5]->W[6]->E[7]->A(Backtracking)
[7]->E(Backtracking)
[7]->Y(Backtracking)
Search Iterations: 1328
```

Puzzle 2 - Word

```
Searching in order of categories: pronoun palindrome math interjection verb noun
root[0]->ANY(Backtracking)
[0]->FEW[1]->WOW(Backtracking)
[0]->HER(Backtracking)
[0]->HIS[1]->SIS[2]->SIN[3]->HAH(Backtracking)
[3]->HAW[4]->SAW[5]->SAC(Found result: HSIAIWNCS)
[5]->SAP(Found result: HSIAIWNPS)
[3]->HEM(Backtracking)
[3]->HEY(Backtracking)
[3]->HMM(Backtracking)
[3]->HOW[4]->SOW[5]->SOD(Found result: HSIOIWNS)
[5]->SOY(Found result: HSIOIWNYS)
[3]->HUH(Backtracking)
[3]->HUM(Backtracking)
[0]->HIM[1]->MOM(Backtracking)
[0]->ITS[1]->SIS[2]->SIN[3]->ICK(Backtracking)
[0]->ONE[1]->EVE(Backtracking)
[1]->EWE(Backtracking)
[1]->EYE(Backtracking)
[0]->OUR(Backtracking)
[0]->SHE[1]->EVE(Backtracking)
[1]->EWE(Backtracking)
[1]->EYE(Backtracking)
[0]->WHO(Backtracking)
[0]->YOU(Backtracking)
Search Iterations: 39
```

Puzzle 2 - Letter

```
Searching in order of indicies in the solution array [0] ... [8]
root[0]->A[1]->A[2]->N[3]->A[4]->A(Backtracking)
[3]->C[4]->A(Backtracking)
[1]->D[2]->N[3]->A[4]->A(Backtracking)
[3]->E[4]->A(Backtracking)
[3]->Y[4]->A[5]->E[6]->G[7]->E(Backtracking)
```

```
[1]->H[2]->N (Backtracking)
[1]->S[2]->N[3]->A[4]->I (Backtracking)
[3]->E[4]->I (Backtracking)
[1]->T[2]->N[3]->A[4]->O (Backtracking)
[3]->E[4]->O (Backtracking)
[0]->F[1]->A[2]->E (Backtracking)
[1]->D[2]->E[3]->I[4]->A[5]->E[6]->G[7]->N (Backtracking)
[7]->P (Backtracking)
[3]->O[4]->A (Backtracking)
[1]->H[2]->E[3]->I (Backtracking)
[3]->O (Backtracking)
[1]->S[2]->E[3]->I[4]->I (Backtracking)
[3]->O[4]->I (Backtracking)
[1]->T[2]->E[3]->I[4]->O[5]->E (Backtracking)
[3]->O[4]->O (Backtracking)
[0]->H[1]->A[2]->E[3]->A[4]->A (Backtracking)
[3]->C[4]->A (Backtracking)
[2]->H[3]->A[4]->A (Backtracking)
[3]->C[4]->A (Backtracking)
[2]->I[3]->A[4]->A (Backtracking)
[3]->C[4]->A (Backtracking)
[1]->D[2]->E[3]->A[4]->A (Backtracking)
[3]->E[4]->A (Backtracking)
[3]->O[4]->A (Backtracking)
[2]->H[3]->A[4]->A (Backtracking)
[3]->E[4]->A (Backtracking)
[3]->O[4]->A (Backtracking)
[2]->I[3]->A[4]->A (Backtracking)
[3]->E[4]->A (Backtracking)
[3]->O[4]->A (Backtracking)
[1]->H[2]->E[3]->O (Backtracking)
[3]->U (Backtracking)
[2]->H[3]->O (Backtracking)
[3]->U (Backtracking)
[2]->I[3]->O (Backtracking)
[3]->U (Backtracking)
[1]->S[2]->E[3]->A[4]->I[5]->W[6]->N[7]->C (Backtracking)
[7]->P (Backtracking)
[3]->E[4]->I (Backtracking)
[3]->O[4]->I[5]->W[6]->N[7]->D (Backtracking)
[7]->Y (Backtracking)
[2]->H[3]->A[4]->I[5]->W[6]->N[7]->C (Backtracking)
[7]->P (Backtracking)
[3]->E[4]->I (Backtracking)
[3]->O[4]->I[5]->W[6]->N[7]->D (Backtracking)
[7]->Y (Backtracking)
```

```
[2]->I[3]->A[4]->I[5]->W[6]->N[7]->C[8]->S (Found result: HSIAIWNCs)
[7]->P[8]->S (Found result: HSIAIWNPs)
[3]->E[4]->I (Backtracking)
[3]->O[4]->I[5]->W[6]->N[7]->D[8]->S (Found result: HSIOIWNSd)
[7]->Y[8]->S (Found result: HSIOIWNYs)
[1]->T[2]->E[3]->A[4]->O (Backtracking)
[3]->E[4]->O (Backtracking)
[3]->O[4]->O[5]->W (Backtracking)
[3]->U[4]->O (Backtracking)
[2]->H[3]->A[4]->O (Backtracking)
[3]->E[4]->O (Backtracking)
[3]->O[4]->O[5]->W (Backtracking)
[3]->U[4]->O (Backtracking)
[2]->I[3]->A[4]->O (Backtracking)
[3]->E[4]->O (Backtracking)
[3]->O[4]->O[5]->W (Backtracking)
[3]->U[4]->O (Backtracking)
[0]->I[1]->A[2]->I[3]->C[4]->A (Backtracking)
[2]->T[3]->C[4]->A (Backtracking)
[1]->D[2]->I[3]->I[4]->A (Backtracking)
[2]->T[3]->I[4]->A (Backtracking)
[1]->H[2]->I[3]->I (Backtracking)
[2]->T[3]->I (Backtracking)
[1]->S[2]->I[3]->I[4]->I (Backtracking)
[2]->T[3]->I[4]->I (Backtracking)
[1]->T[2]->I[3]->I[4]->O (Backtracking)
[2]->T[3]->I[4]->O (Backtracking)
[0]->O[1]->A[2]->H (Backtracking)
[2]->N (Backtracking)
[2]->O (Backtracking)
[2]->U (Backtracking)
[1]->D[2]->H[3]->O[4]->A (Backtracking)
[2]->N[3]->O[4]->A (Backtracking)
[2]->O[3]->O[4]->A (Backtracking)
[2]->U[3]->O[4]->A (Backtracking)
[1]->H[2]->H[3]->O (Backtracking)
[2]->N[3]->O (Backtracking)
[2]->O[3]->O (Backtracking)
[2]->U[3]->O (Backtracking)
[1]->S[2]->H[3]->O[4]->I (Backtracking)
[2]->N[3]->O[4]->I (Backtracking)
[2]->O[3]->O[4]->I (Backtracking)
[2]->U[3]->O[4]->I (Backtracking)
[1]->T[2]->H[3]->O[4]->O (Backtracking)
[2]->N[3]->O[4]->O (Backtracking)
[2]->O[3]->O[4]->O (Backtracking)
```

```
[2]->U[3]->O[4]->O (Backtracking)
[0]->S[1]->A[2]->H[3]->A[4]->A (Backtracking)
[3]->S[4]->A (Backtracking)
[2]->I[3]->A[4]->A (Backtracking)
[3]->S[4]->A (Backtracking)
[2]->T[3]->A[4]->A (Backtracking)
[3]->S[4]->A (Backtracking)
[1]->D[2]->H[3]->A[4]->A (Backtracking)
[2]->I[3]->A[4]->A (Backtracking)
[2]->T[3]->A[4]->A (Backtracking)
[1]->H[2]->H[3]->U (Backtracking)
[2]->I[3]->U (Backtracking)
[2]->T[3]->U (Backtracking)
[1]->S[2]->H[3]->A[4]->I[5]->Y[6]->N[7]->C (Backtracking)
[7]->P (Backtracking)
[3]->S[4]->I (Backtracking)
[2]->I[3]->A[4]->I[5]->Y[6]->N[7]->C (Backtracking)
[7]->P (Backtracking)
[3]->S[4]->I (Backtracking)
[2]->T[3]->A[4]->I[5]->Y[6]->N[7]->C (Backtracking)
[7]->P (Backtracking)
[3]->S[4]->I (Backtracking)
[1]->T[2]->H[3]->A[4]->O (Backtracking)
[3]->U[4]->O (Backtracking)
[2]->I[3]->A[4]->O (Backtracking)
[3]->U[4]->O (Backtracking)
[2]->T[3]->A[4]->O (Backtracking)
[3]->U[4]->O (Backtracking)
[0]->W[1]->A[2]->E[3]->A[4]->A (Backtracking)
[2]->H[3]->A[4]->A (Backtracking)
[1]->D[2]->E[3]->A[4]->A (Backtracking)
[3]->E[4]->A (Backtracking)
[3]->O[4]->A (Backtracking)
[2]->H[3]->A[4]->A (Backtracking)
[3]->E[4]->A (Backtracking)
[3]->O[4]->A (Backtracking)
[1]->H[2]->E[3]->O (Backtracking)
[2]->H[3]->O (Backtracking)
[1]->S[2]->E[3]->A[4]->I (Backtracking)
[3]->E[4]->I (Backtracking)
[3]->O[4]->I (Backtracking)
[2]->H[3]->W[6]->N[7]->D (Backtracking)
[7]->Y (Backtracking)
[2]->H[3]->A[4]->I (Backtracking)
[3]->E[4]->I (Backtracking)
[3]->O[4]->I[5]->W[6]->N[7]->D (Backtracking)
[7]->Y (Backtracking)
```

```
[1]->T[2]->E[3]->A[4]->O(Backtracking)
[3]->E[4]->O(Backtracking)
[3]->O[4]->O[5]->W(Backtracking)
[2]->H[3]->A[4]->O(Backtracking)
[3]->E[4]->O(Backtracking)
[3]->O[4]->O[5]->W(Backtracking)
[0]->Y[1]->A[2]->N[3]->A[4]->A(Backtracking)
[2]->O[3]->A[4]->A(Backtracking)
[1]->D[2]->N[3]->A[4]->A(Backtracking)
[3]->E[4]->A(Backtracking)
[3]->O[4]->A(Backtracking)
[3]->Y[4]->A(Backtracking)
[2]->O[3]->A[4]->A(Backtracking)
[3]->E[4]->A(Backtracking)
[3]->O[4]->A(Backtracking)
[3]->Y[4]->A(Backtracking)
[1]->H[2]->N[3]->O(Backtracking)
[3]->U(Backtracking)
[2]->O[3]->O(Backtracking)
[3]->U(Backtracking)
[1]->S[2]->N[3]->A[4]->I[5]->Y[6]->N[7]->C(Backtracking)
[7]->P(Backtracking)
[3]->E[4]->I[5]->E[6]->N[7]->A(Backtracking)
[7]->E(Backtracking)
[7]->T(Backtracking)
[3]->O[4]->I[5]->W[6]->N[7]->D(Backtracking)
[7]->Y(Backtracking)
[2]->O[3]->A[4]->I[5]->Y[6]->N[7]->C(Backtracking)
[7]->P(Backtracking)
[3]->E[4]->I[5]->E[6]->N[7]->A(Backtracking)
[7]->E(Backtracking)
[7]->T(Backtracking)
[3]->O[4]->I[5]->W[6]->N[7]->D(Backtracking)
[7]->Y(Backtracking)
[1]->T[2]->N[3]->A[4]->O(Backtracking)
[3]->E[4]->O(Backtracking)
[3]->O[4]->O[5]->W(Backtracking)
[3]->U[4]->O(Backtracking)
[2]->O[3]->A[4]->O(Backtracking)
[3]->E[4]->O(Backtracking)
[3]->O[4]->O[5]->W(Backtracking)
[3]->U[4]->O(Backtracking)
Search Iterations: 523
```

Searching in order of categories: nature food animal interjection noun

```
root[0]->ALP[1]->PEA[2]->ASP[3]->SUP[4]->LEA (Found result: ASULPEA)
[1]->PIE[2]->ASP[3]->SUP[4]->LIE (Found result: ASULPIE)
[0]->BOT[1]->TEA[2]->BAT (Backtracking)
[0]->DAL[1]->LOX (Backtracking)
[0]->DAW (Backtracking)
[0]->EFT[1]->TEA (Backtracking)
[0]->GAT[1]->TEA (Backtracking)
[0]->IFE[1]->EGG (Backtracking)
[0]->IVI (Backtracking)
[0]->JUG (Backtracking)
[0]->KED[1]->DIP (Backtracking)
[0]->MEW (Backtracking)
[0]->NEB[1]->BOK (Backtracking)
[1]->BUN (Backtracking)
[0]->PED[1]->DIP (Backtracking)
[0]->PUY[1]->YAM (Backtracking)
[0]->RIA (Backtracking)
[0]->ROC[1]->CEP (Backtracking)
[1]->COB (Backtracking)
[1]->COD (Backtracking)
[0]->TED[1]->DIP (Backtracking)
[0]->TOW (Backtracking)
[0]->VUG (Backtracking)
[0]->YAY[1]->YAM (Backtracking)
[0]->ZHO[1]->OIL[2]->ZHO (Backtracking)
[1]->OAT[2]->ZHO (Backtracking)
```

Search Iterations: 50

Puzzle 3 - Letter

Searching in order of indicies in the solution array [0] ... [6]

```
root[0]->A[1]->A[2]->A[3]->A (Backtracking)
[3]->I (Backtracking)
[3]->L (Backtracking)
[2]->C[3]->A (Backtracking)
[3]->I (Backtracking)
[3]->L (Backtracking)
[2]->E[3]->A (Backtracking)
[3]->I (Backtracking)
[3]->L (Backtracking)
[2]->H[3]->A (Backtracking)
[3]->I (Backtracking)
[3]->L (Backtracking)
[2]->Y[3]->A (Backtracking)
[3]->I (Backtracking)
```

```
[3]->L(Backtracking)
[1]->N[2]->A[3]->A(Backtracking)
[3]->I(Backtracking)
[3]->L(Backtracking)
[2]->O[3]->A(Backtracking)
[3]->I(Backtracking)
[3]->L(Backtracking)
[1]->O[2]->H[3]->A(Backtracking)
[3]->I(Backtracking)
[3]->L(Backtracking)
[2]->O[3]->A(Backtracking)
[3]->I(Backtracking)
[3]->L(Backtracking)
[1]->P[2]->A[3]->A(Backtracking)
[3]->I(Backtracking)
[3]->L(Backtracking)
[2]->E[3]->A(Backtracking)
[3]->I(Backtracking)
[3]->L(Backtracking)
[2]->F[3]->A(Backtracking)
[3]->I(Backtracking)
[3]->L(Backtracking)
[2]->U[3]->A(Backtracking)
[3]->I(Backtracking)
[3]->L(Backtracking)
[1]->S[2]->A[3]->A(Backtracking)
[3]->I(Backtracking)
[3]->L(Backtracking)
[2]->H[3]->A(Backtracking)
[3]->I(Backtracking)
[3]->L(Backtracking)
[2]->S[3]->A(Backtracking)
[3]->I(Backtracking)
[3]->L(Backtracking)
[2]->U[3]->A(Backtracking)
[3]->I(Backtracking)
[3]->L[4]->P[5]->E[6]->A(Found result: ASULPEA)
[5]->I[6]->E(Found result: ASULPIE)
[0]->B[1]->A[2]->A[3]->E(Backtracking)
[3]->O(Backtracking)
[2]->C[3]->E(Backtracking)
[3]->O(Backtracking)
[2]->E[3]->E(Backtracking)
[3]->O(Backtracking)
[2]->H[3]->E(Backtracking)
[3]->O(Backtracking)
```

```
[2]->Y[3]->E (Backtracking)
[3]->O(Backtracking)
[1]->E[2]->E[3]->E(Backtracking)
[3]->O(Backtracking)
[2]->I[3]->E(Backtracking)
[3]->O(Backtracking)
[2]->Y[3]->E(Backtracking)
[3]->O(Backtracking)
[1]->U[2]->G[3]->E(Backtracking)
[3]->O(Backtracking)
[2]->U[3]->E(Backtracking)
[3]->O(Backtracking)
[0]->D[1]->A[2]->A[3]->A(Backtracking)
[3]->E(Backtracking)
[2]->C[3]->A(Backtracking)
[3]->E(Backtracking)
[2]->E[3]->A(Backtracking)
[3]->E(Backtracking)
[2]->H[3]->A(Backtracking)
[3]->E(Backtracking)
[2]->Y[3]->A(Backtracking)
[3]->E(Backtracking)
[1]->O[2]->H[3]->A(Backtracking)
[3]->E(Backtracking)
[2]->O[3]->A(Backtracking)
[3]->E(Backtracking)
[1]->Z[2]->A[3]->A(Backtracking)
[3]->E(Backtracking)
[2]->Z[3]->A(Backtracking)
[3]->E(Backtracking)
[0]->E[1]->E[2]->E[3]->E(Backtracking)
[3]->F(Backtracking)
[2]->I[3]->E(Backtracking)
[3]->F(Backtracking)
[2]->Y[3]->E(Backtracking)
[3]->F(Backtracking)
[1]->M[2]->A[3]->E(Backtracking)
[3]->F(Backtracking)
[2]->E[3]->E(Backtracking)
[3]->F(Backtracking)
[2]->M[3]->E(Backtracking)
[3]->F(Backtracking)
[2]->U[3]->E(Backtracking)
[3]->F(Backtracking)
[1]->O[2]->H[3]->E(Backtracking)
[3]->F(Backtracking)
```

```
[2]->O[3]->E(Backtracking)
[3]->F(Backtracking)
[1]->P[2]->A[3]->E(Backtracking)
[3]->F(Backtracking)
[2]->E[3]->E(Backtracking)
[3]->F(Backtracking)
[2]->F[3]->E(Backtracking)
[3]->F(Backtracking)
[2]->U[3]->E(Backtracking)
[3]->F(Backtracking)
[1]->W[2]->A[3]->E(Backtracking)
[3]->F(Backtracking)
[2]->E[3]->E(Backtracking)
[3]->F(Backtracking)
[2]->H[3]->E(Backtracking)
[3]->F(Backtracking)
[2]->O[3]->E(Backtracking)
[3]->F(Backtracking)
[0]->G[1]->A[2]->A[3]->A(Backtracking)
[3]->U(Backtracking)
[2]->C[3]->A(Backtracking)
[3]->U(Backtracking)
[2]->E[3]->A(Backtracking)
[3]->U(Backtracking)
[2]->H[3]->A(Backtracking)
[3]->U(Backtracking)
[2]->Y[3]->A(Backtracking)
[3]->U(Backtracking)
[1]->E[2]->E[3]->A(Backtracking)
[3]->U(Backtracking)
[2]->I[3]->A(Backtracking)
[3]->U(Backtracking)
[2]->Y[3]->A(Backtracking)
[3]->U(Backtracking)
[1]->I[2]->C[3]->A(Backtracking)
[3]->U(Backtracking)
[2]->I[3]->A(Backtracking)
[3]->U(Backtracking)
[1]->N[2]->A[3]->A(Backtracking)
[3]->U(Backtracking)
[2]->O[3]->A(Backtracking)
[3]->U(Backtracking)
[1]->O[2]->H[3]->A(Backtracking)
[3]->U(Backtracking)
[2]->O[3]->A(Backtracking)
[3]->U(Backtracking)
```

```
[1]->U[2]->G[3]->A(Backtracking)
[3]->U(Backtracking)
[2]->U[3]->A(Backtracking)
[3]->U(Backtracking)
[0]->J[1]->A[2]->A[3]->U(Backtracking)
[2]->C[3]->U(Backtracking)
[2]->E[3]->U(Backtracking)
[2]->H[3]->U(Backtracking)
[2]->Y[3]->U(Backtracking)
[0]->M[1]->A[2]->A[3]->E(Backtracking)
[2]->C[3]->E(Backtracking)
[2]->E[3]->E(Backtracking)
[2]->H[3]->E(Backtracking)
[2]->Y[3]->E(Backtracking)
[1]->M[2]->A[3]->E(Backtracking)
[2]->E[3]->E(Backtracking)
[2]->M[3]->E(Backtracking)
[2]->U[3]->E(Backtracking)
[1]->O[2]->H[3]->E(Backtracking)
[2]->O[3]->E(Backtracking)
[0]->P[1]->I[2]->C[3]->E(Backtracking)
[3]->L(Backtracking)
[3]->U(Backtracking)
[2]->I[3]->E(Backtracking)
[3]->L(Backtracking)
[3]->U(Backtracking)
[1]->P[2]->A[3]->E(Backtracking)
[3]->L(Backtracking)
[3]->U(Backtracking)
[2]->E[3]->E(Backtracking)
[3]->L(Backtracking)
[3]->U(Backtracking)
[1]->F[3]->E(Backtracking)
[3]->L(Backtracking)
[3]->U(Backtracking)
[2]->U[3]->E(Backtracking)
[3]->L(Backtracking)
[3]->U(Backtracking)
[1]->S[2]->A[3]->E(Backtracking)
[3]->L(Backtracking)
[3]->U(Backtracking)
[2]->H[3]->E(Backtracking)
[3]->L(Backtracking)
[3]->U(Backtracking)
[2]->S[3]->E(Backtracking)
[3]->L(Backtracking)
```

```
[3]->U(Backtracking)
[2]->U[3]->E(Backtracking)
[3]->L(Backtracking)
[3]->U(Backtracking)
[1]->U[2]->G[3]->E(Backtracking)
[3]->L(Backtracking)
[3]->U(Backtracking)
[2]->U[3]->E(Backtracking)
[3]->L(Backtracking)
[3]->U(Backtracking)
[2]->R[1]->A[2]->A[3]->I(Backtracking)
[3]->O(Backtracking)
[2]->C[3]->I(Backtracking)
[3]->O(Backtracking)
[2]->E[3]->I(Backtracking)
[3]->O(Backtracking)
[2]->H[3]->I(Backtracking)
[3]->O(Backtracking)
[2]->Y[3]->I(Backtracking)
[3]->O(Backtracking)
[0]->T[1]->A[2]->A[3]->A(Backtracking)
[3]->E(Backtracking)
[3]->F(Backtracking)
[3]->O(Backtracking)
[2]->C[3]->A(Backtracking)
[3]->E(Backtracking)
[3]->F(Backtracking)
[3]->O(Backtracking)
[2]->E[3]->A(Backtracking)
[3]->E(Backtracking)
[3]->F(Backtracking)
[3]->O(Backtracking)
[2]->H[3]->A(Backtracking)
[3]->E(Backtracking)
[3]->F(Backtracking)
[3]->O(Backtracking)
[2]->Y[3]->A(Backtracking)
[3]->E(Backtracking)
[3]->F(Backtracking)
[3]->O(Backtracking)
[1]->E[2]->E[3]->A(Backtracking)
[3]->E(Backtracking)
[3]->F(Backtracking)
[3]->O(Backtracking)
[2]->I[3]->A(Backtracking)
[3]->E(Backtracking)
```

```
[3]->F(Backtracking)
[3]->O(Backtracking)
[2]->Y[3]->A(Backtracking)
[3]->E(Backtracking)
[3]->F(Backtracking)
[3]->O(Backtracking)
[1]->N[2]->A[3]->A(Backtracking)
[3]->E(Backtracking)
[3]->F(Backtracking)
[3]->O(Backtracking)
[2]->O[3]->A(Backtracking)
[3]->E(Backtracking)
[3]->F(Backtracking)
[3]->O(Backtracking)
[1]->O[2]->H[3]->A(Backtracking)
[3]->E(Backtracking)
[3]->F(Backtracking)
[3]->O(Backtracking)
[2]->O[3]->A(Backtracking)
[3]->E(Backtracking)
[3]->F(Backtracking)
[3]->O(Backtracking)
[0]->Y[1]->A[2]->A[3]->A(Backtracking)
[3]->U(Backtracking)
[2]->C[3]->A(Backtracking)
[3]->U(Backtracking)
[2]->E[3]->A(Backtracking)
[3]->U(Backtracking)
[2]->H[3]->A(Backtracking)
[3]->U(Backtracking)
[2]->Y[3]->A(Backtracking)
[3]->U(Backtracking)
[0]->Z[1]->H[2]->A[3]->H(Backtracking)
[2]->C[3]->H(Backtracking)
[2]->E[3]->H(Backtracking)
[2]->G[3]->H(Backtracking)
[2]->H[3]->H(Backtracking)
[2]->M[3]->H(Backtracking)
[2]->O[3]->H[4]->O[5]->A[6]->T(Backtracking)
[5]->I(Backtracking)
[5]->O(Backtracking)
[2]->U[3]->H(Backtracking)
[1]->Z[2]->A[3]->H(Backtracking)
[2]->Z[3]->H(Backtracking)
Search Iterations: 475
```

Puzzle 4 - Word

Searching in order of categories: body pronoun computer interjection verb noun
root[0]->ARM(Backtracking)
[0]->EAR[1]->FEW[2]->FAX(Backtracking)
[1]->HER[2]->HIT(Backtracking)
[0]->EYE[1]->FEW[2]->FAX(Backtracking)
[1]->HER[2]->HIT[3]->HEY[4]->DIE[5]->IRE(Found result: HEDITYRE)
[4]->LIE[5]->IRE(Found result: HELITYRE)
[4]->TIE[5]->IRE(Found result: HETITYRE)
[0]->HIP[1]->SHE(Backtracking)
[1]->WHO[2]->WEB(Backtracking)
[2]->WWW(Backtracking)
[0]->JAW(Backtracking)
[0]->LEG(Backtracking)
[0]->LIP(Backtracking)
[0]->RIB(Backtracking)
[0]->TOE[1]->ITS(Backtracking)
Search Iterations: 30

Puzzle 4 - Letter

Searching in order of indicies in the solution array [0] ... [7]
root[0]->A(Backtracking)
[0]->F(Backtracking)
[0]->H[1]->E[2]->A[3]->I[4]->T[5]->Y[6]->R(Backtracking)
[2]->B[3]->I[4]->T[5]->Y[6]->R(Backtracking)
[2]->C(Backtracking)
[2]->D[3]->I[4]->T[5]->Y[6]->R[7]->E(Found result: HEDITYRE)
[2]->E[3]->I[4]->T[5]->Y[6]->R(Backtracking)
[2]->F[3]->I[4]->T[5]->Y[6]->R(Backtracking)
[2]->G[3]->I[4]->T[5]->Y[6]->R(Backtracking)
[2]->H[3]->I[4]->T[5]->Y[6]->R(Backtracking)
[2]->I[3]->I[4]->T[5]->Y[6]->R(Backtracking)
[2]->J(Backtracking)
[2]->L[3]->I[4]->T[5]->Y[6]->R[7]->E(Found result: HELITYRE)
[2]->M[3]->I[4]->T[5]->Y[6]->R(Backtracking)
[2]->N[3]->I[4]->T[5]->Y[6]->R(Backtracking)
[2]->O[3]->I[4]->T[5]->Y[6]->R(Backtracking)
[2]->P[3]->I[4]->T[5]->Y[6]->R(Backtracking)
[2]->R(Backtracking)
[2]->S[3]->I[4]->T[5]->Y[6]->R(Backtracking)
[2]->T[3]->I[4]->T[5]->Y[6]->R[7]->E(Found result: HETITYRE)
[2]->U(Backtracking)
[2]->W[3]->I[4]->T[5]->Y[6]->R(Backtracking)
[2]->Z[3]->I[4]->T[5]->Y[6]->R(Backtracking)

```
[1]->H[2]->A[3]->I[4]->T(Backtracking)
[2]->B[3]->I[4]->T(Backtracking)
[2]->C(Backtracking)
[2]->D[3]->I[4]->T(Backtracking)
[2]->E[3]->I[4]->T(Backtracking)
[2]->F[3]->I[4]->T(Backtracking)
[2]->G[3]->I[4]->T(Backtracking)
[2]->H[3]->I[4]->T(Backtracking)
[2]->I[3]->I[4]->T(Backtracking)
[2]->J(Backtracking)
[2]->L[3]->I[4]->T(Backtracking)
[2]->M[3]->I[4]->T(Backtracking)
[2]->N[3]->I[4]->T(Backtracking)
[2]->O[3]->I[4]->T(Backtracking)
[2]->P[3]->I[4]->T(Backtracking)
[2]->R(Backtracking)
[2]->S[3]->I[4]->T(Backtracking)
[2]->T[3]->I[4]->T(Backtracking)
[2]->U(Backtracking)
[2]->W[3]->I[4]->T(Backtracking)
[2]->Z[3]->I[4]->T(Backtracking)
[0]->W[1]->E[2]->A(Backtracking)
[2]->B[3]->E[4]->B(Backtracking)
[2]->C(Backtracking)
[2]->D[3]->E[4]->B(Backtracking)
[2]->E[3]->E[4]->B(Backtracking)
[3]->W[4]->W(Backtracking)
[2]->F(Backtracking)
[2]->G[3]->E[4]->B(Backtracking)
[2]->H(Backtracking)
[2]->I(Backtracking)
[2]->J(Backtracking)
[2]->L[3]->E[4]->B(Backtracking)
[2]->M[3]->E[4]->B(Backtracking)
[2]->N[3]->W[4]->W(Backtracking)
[2]->O[3]->W[4]->W(Backtracking)
[2]->P[3]->E[4]->B(Backtracking)
[2]->R(Backtracking)
[2]->S[3]->E[4]->B(Backtracking)
[2]->T[3]->E[4]->B(Backtracking)
[2]->U(Backtracking)
[2]->W[3]->E[4]->B(Backtracking)
[3]->W[4]->W(Backtracking)
[2]->Z(Backtracking)
[1]->H[2]->A(Backtracking)
[2]->B[3]->E[4]->B(Backtracking)
```

```
[2]->C(Backtracking)
[2]->D[3]->E[4]->B(Backtracking)
[2]->E[3]->E[4]->B(Backtracking)
[3]->W[4]->W(Backtracking)
[2]->F(Backtracking)
[2]->G[3]->E[4]->B(Backtracking)
[2]->H(Backtracking)
[2]->I(Backtracking)
[2]->J(Backtracking)
[2]->L[3]->E[4]->B(Backtracking)
[2]->M[3]->E[4]->B(Backtracking)
[2]->N[3]->W[4]->W(Backtracking)
[2]->O[3]->W[4]->W(Backtracking)
[2]->P[3]->E[4]->B(Backtracking)
[2]->R(Backtracking)
[2]->S[3]->E[4]->B(Backtracking)
[2]->T[3]->E[4]->B(Backtracking)
[2]->U(Backtracking)
[2]->W[3]->E[4]->B(Backtracking)
[3]->W[4]->W(Backtracking)
[2]->Z(Backtracking)
Search Iterations: 254
```

Puzzle 5 - Word

```
Searching in order of categories: number container music body adverb animal noun
root[0]->ONE(Backtracking)
[0]->TWO(Backtracking)
[0]->SIX[1]->BOX(Backtracking)
[0]->TEN[1]->BIN[2]->TIE(Backtracking)
[1]->CAN(Backtracking)
[1]->TIN[2]->TIE[3]->TOE[4]->NON[5]->HEN[6]->ION(Found result: IHTTNOIEN)
[6]->TON(Found result: THTTNOIEN)
[4]->YON[5]->HEN[6]->ION(Found result: IHHTYOIEN)
[6]->TON(Found result: THHTYOIEN)
Search Iterations: 20
```

Puzzle 5 - Letter

```
Searching in order of indicies in the solution array [0] ... [8]
root[0]->A[1]->A[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
```

```
[4]->Y(Backtracking)
[1]->B[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->C[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->D[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->E[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->F[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->G[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->H[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
```

```
[4] ->P (Backtracking)
[4] ->Q (Backtracking)
[4] ->S (Backtracking)
[4] ->Y (Backtracking)
[1] ->J[2] ->T[3] ->T[4] ->A (Backtracking)
[4] ->N (Backtracking)
[4] ->O (Backtracking)
[4] ->P (Backtracking)
[4] ->Q (Backtracking)
[4] ->S (Backtracking)
[4] ->Y (Backtracking)
[1] ->M[2] ->T[3] ->T[4] ->A (Backtracking)
[4] ->N (Backtracking)
[4] ->O (Backtracking)
[4] ->P (Backtracking)
[4] ->Q (Backtracking)
[4] ->S (Backtracking)
[4] ->Y (Backtracking)
[1] ->O[2] ->T[3] ->T[4] ->A (Backtracking)
[4] ->N (Backtracking)
[4] ->O (Backtracking)
[4] ->P (Backtracking)
[4] ->Q (Backtracking)
[4] ->S (Backtracking)
[4] ->Y (Backtracking)
[1] ->P[2] ->T[3] ->T[4] ->A (Backtracking)
[4] ->N (Backtracking)
[4] ->O (Backtracking)
[4] ->P (Backtracking)
[4] ->Q (Backtracking)
[4] ->S (Backtracking)
[4] ->Y (Backtracking)
[1] ->R[2] ->T[3] ->T[4] ->A (Backtracking)
[4] ->N (Backtracking)
[4] ->O (Backtracking)
[4] ->P (Backtracking)
[4] ->Q (Backtracking)
[4] ->S (Backtracking)
[4] ->Y (Backtracking)
[1] ->S[2] ->T[3] ->T[4] ->A (Backtracking)
[4] ->N (Backtracking)
[4] ->O (Backtracking)
[4] ->P (Backtracking)
[4] ->Q (Backtracking)
[4] ->S (Backtracking)
[4] ->Y (Backtracking)
```

```
[1]->T[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->Y[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->Z[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[0]->B[1]->A[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->B[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I[7]->E(Backtracking)
[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->C[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->D[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
```

```
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->E[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I[7]->E(Backtracking)
[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
[1]->F[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->G[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I[7]->E(Backtracking)
[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
[1]->H[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I[7]->E(Backtracking)
[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
[1]->J[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->M[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->O[2]->T[3]->T[4]->A(Backtracking)
```

```
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->P[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->R[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->S[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->T[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I[7]->E (Backtracking)
[4]->O[5]->O[6]->I[7]->E (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->Y[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->Z[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
```

```
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[0]->C[1]->A[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->B[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I[7]->E(Backtracking)
[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
[1]->C[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->D[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->E[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I[7]->E(Backtracking)
[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
[1]->F[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->G[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I[7]->E(Backtracking)
```

```
[4]->O[5]->O[6]->I[7]->E (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I[7]->E (Backtracking)
[1]->H[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I[7]->E (Backtracking)
[4]->O[5]->O[6]->I[7]->E (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I[7]->E (Backtracking)
[1]->J[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->M[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->O[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->P[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->R[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
```

```
[4]->Y[5]->O[6]->I (Backtracking)
[1]->S[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->T[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I[7]->E (Backtracking)
[4]->O[5]->O[6]->I[7]->E (Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E (Backtracking)
[1]->Y[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->Z[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[0]->D[1]->A[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->B[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I[7]->E (Backtracking)
[4]->O[5]->O[6]->I[7]->E (Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E (Backtracking)
[1]->C[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
```

```
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->D[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->E[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I[7]->E(Backtracking)
[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
[1]->F[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->G[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I[7]->E(Backtracking)
[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
[1]->H[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I[7]->E(Backtracking)
[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
[1]->J[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
```

```
[1]->M[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->O[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->P[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->R[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->S[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->T[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I[7]->E (Backtracking)
[4]->O[5]->O[6]->I[7]->E (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I[7]->E (Backtracking)
[1]->Y[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
```

```
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->Z[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[0]->E[1]->A[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->B[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I[7]->E(Backtracking)
[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
[1]->C[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->D[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->E[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I[7]->E(Backtracking)
[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
[1]->F[2]->T[3]->T[4]->A(Backtracking)
```

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[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->G[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I[7]->E (Backtracking)
[4]->O[5]->O[6]->I[7]->E (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I[7]->E (Backtracking)
[1]->H[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I[7]->E (Backtracking)
[4]->O[5]->O[6]->I[7]->E (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I[7]->E (Backtracking)
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[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
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[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->O[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->P[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
```

```
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[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
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[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->T[2]->T[3]->T[4]->A(Backtracking)
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[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
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[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
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[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
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[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->B[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I[7]->E(Backtracking)
```

```
[4]->O[5]->O[6]->I[7]->E (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I[7]->E (Backtracking)
[1]->C[2]->T[3]->T[4]->A (Backtracking)
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[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->D[2]->T[3]->T[4]->A (Backtracking)
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[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->E[2]->T[3]->T[4]->A (Backtracking)
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[4]->O[5]->O[6]->I[7]->E (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->F[2]->T[3]->T[4]->A (Backtracking)
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[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
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[4]->O[5]->O[6]->I[7]->E (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I[7]->E (Backtracking)
[1]->H[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I[7]->E (Backtracking)
[4]->O[5]->O[6]->I[7]->E (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
```

```
[4]->Y[5]->O[6]->I[7]->E (Backtracking)
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[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
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[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->O[2]->T[3]->T[4]->A (Backtracking)
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[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
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[1]->P[2]->T[3]->T[4]->A (Backtracking)
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[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
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[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
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[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->T[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I[7]->E (Backtracking)
[4]->O[5]->O[6]->I[7]->E (Backtracking)
```

```
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
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[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->Z[2]->T[3]->T[4]->A(Backtracking)
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[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[0]->G[1]->A[2]->T[3]->T[4]->A(Backtracking)
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[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->B[2]->T[3]->T[4]->A(Backtracking)
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[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
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[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->D[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
```

```
[1]->E[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I[7]->E(Backtracking)
[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
[1]->F[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->G[2]->T[3]->T[4]->A(Backtracking)
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[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
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[4]->N[5]->O[6]->I[7]->E(Backtracking)
[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
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[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->M[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->O[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
```

```
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->P[2]->T[3]->T[4]->A(Backtracking)
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[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->R[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->S[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->T[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I[7]->E(Backtracking)
[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
[1]->Y[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->Z[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[0]->H[1]->A[2]->T[3]->T[4]->A(Backtracking)
```

```
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->B[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I[7]->E (Backtracking)
[4]->O[5]->O[6]->I[7]->E (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I[7]->E (Backtracking)
[1]->C[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->D[2]->T[3]->T[4]->A (Backtracking)
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[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->E[2]->T[3]->T[4]->A (Backtracking)
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[4]->O[5]->O[6]->I[7]->E (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I[7]->E (Backtracking)
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[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->G[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I[7]->E (Backtracking)
[4]->O[5]->O[6]->I[7]->E (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
```

```
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
[1]->H[2]->T[3]->T[4]->A(Backtracking)
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[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
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[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->M[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
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[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
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[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->R[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->S[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
```

```
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->T[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I[7]->E (Backtracking)
[4]->O[5]->O[6]->I[7]->E (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I[7]->E (Backtracking)
[1]->Y[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->Z[2]->T[3]->T[4]->A (Backtracking)
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[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[0]->I[1]->A[2]->T[3]->T[4]->A (Backtracking)
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[4]->P (Backtracking)
[4]->Q (Backtracking)
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[4]->O[5]->O[6]->I[7]->E (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I[7]->E (Backtracking)
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[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
```

```
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[1]->D[2]->T[3]->T[4]->A (Backtracking)
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[4]->O[5]->O[6]->I (Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->E[2]->T[3]->T[4]->A (Backtracking)
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[4]->O[5]->O[6]->I[7]->E (Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E (Backtracking)
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[4]->O[5]->O[6]->I (Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
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[4]->N[5]->O[6]->I[7]->E (Backtracking)
[4]->O[5]->O[6]->I[7]->E (Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E (Backtracking)
[1]->H[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I[7]->E[8]->N(Found result: IHTTNOIEN)
[4]->O[5]->O[6]->I[7]->E (Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E (Backtracking)
[1]->J[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->M[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
```

```
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->O[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
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[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
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[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
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[4]->O[5]->O[6]->I(Backtracking)
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[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
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[4]->Q(Backtracking)
[4]->S(Backtracking)
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[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
```

```
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[4]->Q (Backtracking)
[4]->S (Backtracking)
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[4]->Q (Backtracking)
[4]->S (Backtracking)
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[4]->Q (Backtracking)
[4]->S (Backtracking)
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[4]->S (Backtracking)
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[4]->Q (Backtracking)
[4]->S (Backtracking)
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[4]->Q (Backtracking)
[4]->S (Backtracking)
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[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
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```
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[4]->Q(Backtracking)
[4]->S(Backtracking)
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[4]->Q(Backtracking)
[4]->S(Backtracking)
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[4]->O[5]->O[6]->I(Backtracking)
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[4]->Q(Backtracking)
[4]->S(Backtracking)
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[4]->Q(Backtracking)
[4]->S(Backtracking)
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[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
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[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
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```

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[4]->O[5]->O[6]->I (Backtracking)
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[4]->S (Backtracking)
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[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
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[4]->Q (Backtracking)
[4]->S (Backtracking)
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[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
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[4]->Q (Backtracking)
[4]->S (Backtracking)
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[4]->Q (Backtracking)
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[4]->O (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
```

```
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[4]->Y(Backtracking)
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[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
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[4]->O(Backtracking)
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[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
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[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
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[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->J[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
```

```
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[4]->P(Backtracking)
[4]->Q(Backtracking)
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[4]->Y(Backtracking)
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[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
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[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
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[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
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[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
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[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
```

```
[4]->Y(Backtracking)
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[4]->P(Backtracking)
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[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
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[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->B[2]->T[3]->T[4]->A(Backtracking)
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[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
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[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
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[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->E[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I[7]->E(Backtracking)
[4]->O[5]->O[6]->I[7]->E(Backtracking)
```

```
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[4]->Q(Backtracking)
[4]->S(Backtracking)
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[4]->Q(Backtracking)
[4]->S(Backtracking)
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[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
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[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
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[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
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[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->O[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
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[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
```

```
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[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
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[4]->P (Backtracking)
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[4]->S (Backtracking)
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[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
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[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
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[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
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[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
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[4]->N (Backtracking)
[4]->O (Backtracking)
[4]->P (Backtracking)
```

```
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[4]->Q (Backtracking)
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[4]->Y (Backtracking)
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[4]->O (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y (Backtracking)
[1]->H[2]->T[3]->T[4]->A (Backtracking)
```

```
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[4]->Y(Backtracking)
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[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
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[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
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[4]->Y(Backtracking)
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[4]->Q(Backtracking)
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[4]->Y(Backtracking)
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[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
```

```
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[4]->Y(Backtracking)
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[4]->Q(Backtracking)
[4]->S(Backtracking)
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[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
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[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->D[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
```

```
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->E[2]->T[3]->T[4]->A (Backtracking)
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[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I[7]->E (Backtracking)
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[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
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[4]->N[5]->O[6]->I[7]->E (Backtracking)
[4]->O[5]->O[6]->I[7]->E (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I[7]->E (Backtracking)
[1]->H[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I[7]->E (Backtracking)
[4]->O[5]->O[6]->I[7]->E (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I[7]->E (Backtracking)
[1]->J[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->M[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
```

```
[4]->Y[5]->O[6]->I (Backtracking)
[1]->O[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->P[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->R[2]->T[3]->T[4]->A (Backtracking)
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[4]->O[5]->O[6]->I (Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
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[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
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[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
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[4]->O[5]->O[6]->I (Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
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[1]->Z[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
```

```
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
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[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
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[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
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[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
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[4]->O[5]->O[6]->I(Backtracking)
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[4]->Q(Backtracking)
[4]->S(Backtracking)
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[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
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[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
```

```
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[4]->O[5]->O[6]->I[7]->E (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
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[4]->O[5]->O[6]->I[7]->E (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I[7]->E (Backtracking)
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[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
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[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
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[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
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[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
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[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
```

```
[4]->Q(Backtracking)
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[4]->Y[5]->O[6]->I(Backtracking)
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[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->T[2]->T[3]->T[4]->A(Backtracking)
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[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
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[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->Z[2]->T[3]->T[4]->A(Backtracking)
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[4]->O[5]->O[6]->I(Backtracking)
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[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
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[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->B[2]->T[3]->T[4]->A(Backtracking)
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[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
[1]->C[2]->T[3]->T[4]->A(Backtracking)
```

```
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
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[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
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[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
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[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
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[4]->Q (Backtracking)
[4]->S (Backtracking)
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[4]->Q (Backtracking)
[4]->S (Backtracking)
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[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
```

```
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
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[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->O[2]->T[3]->T[4]->A(Backtracking)
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[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->P[2]->T[3]->T[4]->A(Backtracking)
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[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->R[2]->T[3]->T[4]->A(Backtracking)
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[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->S[2]->T[3]->T[4]->A(Backtracking)
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[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->T[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I[7]->E(Backtracking)
[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
[1]->Y[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
```

```
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
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[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
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[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
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[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->C[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
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[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->E[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
```

```
[4]->Y(Backtracking)
[1]->F[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
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[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
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[4]->Y(Backtracking)
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[4]->Q(Backtracking)
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[4]->Y(Backtracking)
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[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
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[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
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[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->P[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
```

```
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
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[4]->Q(Backtracking)
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[4]->Y(Backtracking)
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[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
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[4]->P(Backtracking)
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[4]->Y(Backtracking)
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[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[0]->S[1]->A[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
```

```
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[4]->O[5]->O[6]->I[7]->E (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I[7]->E (Backtracking)
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[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
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[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
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[4]->O[5]->O[6]->I[7]->E (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I[7]->E (Backtracking)
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[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
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[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I[7]->E (Backtracking)
[1]->H[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I[7]->E (Backtracking)
[4]->O[5]->O[6]->I[7]->E (Backtracking)
[4]->P (Backtracking)
```

```
[4]->Q(Backtracking)
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[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
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[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
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[4]->Q(Backtracking)
[4]->S(Backtracking)
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[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->R[2]->T[3]->T[4]->A(Backtracking)
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[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->S[2]->T[3]->T[4]->A(Backtracking)
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[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->T[2]->T[3]->T[4]->A(Backtracking)
```

```
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[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
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[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->Z[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[0]->T[1]->A[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->B[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I[7]->E(Backtracking)
[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
[1]->C[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->D[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
```

```
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
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[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
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[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->G[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I[7]->E(Backtracking)
[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
[1]->H[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I[7]->E[8]->N(Found result: THTTNOIEN)
[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E[8]->N(Found result: THTTYOIEN)
[1]->J[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->M[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->O[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
```

```
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->P[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
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[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
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[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->T[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
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[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->Z[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
```

```
[4]->Y[5]->O[6]->I (Backtracking)
[0]->U[1]->A[2]->T[3]->T[4]->A (Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->B[2]->T[3]->T[4]->A (Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->C[2]->T[3]->T[4]->A (Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->D[2]->T[3]->T[4]->A (Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->E[2]->T[3]->T[4]->A (Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->F[2]->T[3]->T[4]->A (Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->G[2]->T[3]->T[4]->A (Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
```

```
[4] ->P (Backtracking)
[4] ->Q (Backtracking)
[4] ->S (Backtracking)
[4] ->Y (Backtracking)
[1] ->H[2] ->T[3] ->T[4] ->A (Backtracking)
[4] ->N (Backtracking)
[4] ->O (Backtracking)
[4] ->P (Backtracking)
[4] ->Q (Backtracking)
[4] ->S (Backtracking)
[4] ->Y (Backtracking)
[1] ->J[2] ->T[3] ->T[4] ->A (Backtracking)
[4] ->N (Backtracking)
[4] ->O (Backtracking)
[4] ->P (Backtracking)
[4] ->Q (Backtracking)
[4] ->S (Backtracking)
[4] ->Y (Backtracking)
[1] ->M[2] ->T[3] ->T[4] ->A (Backtracking)
[4] ->N (Backtracking)
[4] ->O (Backtracking)
[4] ->P (Backtracking)
[4] ->Q (Backtracking)
[4] ->S (Backtracking)
[4] ->Y (Backtracking)
[1] ->O[2] ->T[3] ->T[4] ->A (Backtracking)
[4] ->N (Backtracking)
[4] ->O (Backtracking)
[4] ->P (Backtracking)
[4] ->Q (Backtracking)
[4] ->S (Backtracking)
[4] ->Y (Backtracking)
[1] ->P[2] ->T[3] ->T[4] ->A (Backtracking)
[4] ->N (Backtracking)
[4] ->O (Backtracking)
[4] ->P (Backtracking)
[4] ->Q (Backtracking)
[4] ->S (Backtracking)
[4] ->Y (Backtracking)
[1] ->R[2] ->T[3] ->T[4] ->A (Backtracking)
[4] ->N (Backtracking)
[4] ->O (Backtracking)
[4] ->P (Backtracking)
[4] ->Q (Backtracking)
[4] ->S (Backtracking)
[4] ->Y (Backtracking)
```

```
[1]->S[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->T[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->Y[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->Z[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[0]->V[1]->A[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->B[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->C[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
```

```
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->D[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->E[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->F[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->G[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->H[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->J[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->M[2]->T[3]->T[4]->A(Backtracking)
```

```
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->O[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->P[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->R[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->S[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->T[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->Y[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
```

```
[4]->S(Backtracking)
[4]->Y(Backtracking)
[1]->Z[2]->T[3]->T[4]->A(Backtracking)
[4]->N(Backtracking)
[4]->O(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y(Backtracking)
[0]->W[1]->A[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->B[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I[7]->E(Backtracking)
[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
[1]->C[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->D[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->E[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I[7]->E(Backtracking)
[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
[1]->F[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
```

```
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->G[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I[7]->E (Backtracking)
[4]->O[5]->O[6]->I[7]->E (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I[7]->E (Backtracking)
[1]->H[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I[7]->E (Backtracking)
[4]->O[5]->O[6]->I[7]->E (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I[7]->E (Backtracking)
[1]->J[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->M[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->O[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->P[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
```

```
[4]->Y[5]->O[6]->I (Backtracking)
[1]->R[2]->T[3]->T[4]->A (Backtracking)
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[4]->O[5]->O[6]->I (Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
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[4]->O[5]->O[6]->I (Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->T[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I[7]->E (Backtracking)
[4]->O[5]->O[6]->I[7]->E (Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E (Backtracking)
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[4]->O[5]->O[6]->I (Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->Z[2]->T[3]->T[4]->A (Backtracking)
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[4]->O[5]->O[6]->I (Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[0]->Y[1]->A[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->B[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I[7]->E (Backtracking)
[4]->O[5]->O[6]->I[7]->E (Backtracking)
```

```
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
[1]->C[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->D[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->E[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I[7]->E(Backtracking)
[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
[1]->F[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->G[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I[7]->E(Backtracking)
[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
[1]->H[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I[7]->E(Backtracking)
[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
```

```
[1]->J[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->M[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->O[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->P[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->R[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->S[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I (Backtracking)
[4]->O[5]->O[6]->I (Backtracking)
[4]->P (Backtracking)
[4]->Q (Backtracking)
[4]->S (Backtracking)
[4]->Y[5]->O[6]->I (Backtracking)
[1]->T[2]->T[3]->T[4]->A (Backtracking)
[4]->N[5]->O[6]->I[7]->E (Backtracking)
[4]->O[5]->O[6]->I[7]->E (Backtracking)
[4]->P (Backtracking)
```

```
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
[1]->Y[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->Z[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[0]->Z[1]->A[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->B[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I[7]->E(Backtracking)
[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
[1]->C[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->D[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->E[2]->T[3]->T[4]->A(Backtracking)
```

```
[4]->N[5]->O[6]->I[7]->E(Backtracking)
[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
[1]->F[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->G[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I[7]->E(Backtracking)
[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
[1]->H[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I[7]->E(Backtracking)
[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
[1]->J[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->M[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->O[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
```

```
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->P[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->R[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->S[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->T[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I[7]->E(Backtracking)
[4]->O[5]->O[6]->I[7]->E(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I[7]->E(Backtracking)
[1]->Y[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
[1]->Z[2]->T[3]->T[4]->A(Backtracking)
[4]->N[5]->O[6]->I(Backtracking)
[4]->O[5]->O[6]->I(Backtracking)
[4]->P(Backtracking)
[4]->Q(Backtracking)
[4]->S(Backtracking)
[4]->Y[5]->O[6]->I(Backtracking)
Search Iterations: 6215
```

Jakub Klapacz – jklapac2 (3 units)
Abhishek Nigam – adnigam2 (3 units)

