

Digital Schoolhouse Puzzle Page

“If I had an hour to solve a problem I'd spend 55 minutes thinking about the problem and 5 minutes thinking about solutions”

Albert Einstein

Welcome to the Digital Schoolhouse Puzzle Page

On this paper, we will investigate a series of puzzles that can be used to promote Computational Thinking.

Find the Rank

If we generate a list of all the “words” made of letters G, I, N, R, T and U in lexicographic order starting with GINRTU and ending with UTRNIG, what position in the list will be occupied by TURING? Alan Turing (1912—1954) was an English mathematician and computer scientist. Amongst other remarkable achievements, he played a leading role in developing theoretical computer science and was a leading figure at Bletchley Park during the Second World War.

Answer: The answer is 598

The total number of words made up of the six letters is equal to $6! = 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 720$.

The words following TURING in the alphabetically ordered list are either of the form U***** or of the form TURN** where a * stands for one of the six letters not in the “word”. Since these letters can be in any order there are $5! = 5 \times 4 \times 3 \times 2 \times 1$ and $2! = 2 \times 1$ of them, respectively.

Thus, the total number of words following TURING in the alphabetically ordered list is equal to $5! + 2! = 120 + 2 = 122$.

This means that TURING will be in position $720 - 122 = 598$ in the list if the words are numbered 1 to 720.

Linkage to Computer Science

This puzzle is an instance of permutation ranking, which can be solved by a decrease-by-one algorithm.

Solutions

6	9	1	8	7	5	3	2	4	1
4	7	6	8	5	2	9	1	3	7
1	7	9	3	6	8	2	5	4	1
8	1	6	9	2	5	7	3	4	8
5	3	2	7	8	4	6	9	1	5
8	9	7	6	1	3	5	4	2	8
7	4	1	8	3	9	2	5	6	7
9	6	3	1	5	2	4	8	7	9
2	5	8	4	6	7	9	1	3	5

Puzzle 27 (Hard, difficulty rating 0.63)

4	1	2	7	8	5	6	3	9	8
9	5	3	6	2	4	1	7	8	5
7	8	6	9	1	3	4	2	5	8
3	6	1	2	5	7	9	8	4	7
8	2	4	3	6	9	5	1	7	8
5	7	9	1	4	8	3	6	2	7
2	3	5	8	9	6	7	4	1	5
1	4	7	3	5	2	8	9	6	1
6	9	8	4	7	1	2	5	3	6

Puzzle 26 (Medium, difficulty rating 0.55)

7	4	7	8	2	1	3	8	9	5
1	6	4	5	3	9	1	7	8	2
3	4	1	2	7	9	5	6	8	3
6	8	2	5	1	4	9	7	3	6
9	3	5	8	6	7	1	2	4	8
1	9	1	7	3	6	2	8	5	4
1	9	4	7	2	3	6	8	5	1
7	5	6	9	8	1	4	3	2	7
8	2	3	4	5	6	7	1	9	8

Puzzle 25 (Easy, difficulty rating 0.43)

Puzzle 25: Easy

	2		4				1	9	
7							3	2	
		4	7					5	
	1		3				5		
4	3			9			2	6	
	8				4		7		
3					9	5			
2	7							1	
5	6				8		4		

Puzzle 26: Medium

6							5		
1			5			8	9		
2		5	8		6				
5			1			3			
	2		3		9		1		
		1			7			4	
			9		3	4		5	
	5	3			4			8	
	1							9	

Puzzle 27: Hard

	5		4					3	
		3	1	5		4			
7				9	2				
8		7	6				4		
5								1	
	1				5	7		8	
		9	3					5	
		5		9	1	3			
3					8		6		