DIGITAL SCHOOLHOUSE together with NINTENDO SWITCH

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. This month we will investigate Santa's Glove Selection conundrum.

Upside-Down Glasses

There are *n* glasses on a table, all standing upside down. In one move, you are allowed to turn over exactly *n—1* of them.

Determine all values of *n* for which all the glasses can be turned up, and outline an algorithm that does this in the minimum number of moves.

Answer:

There is no solution for any odd value of *n,* i.e. 3 glasses, 5 glasses,

If *n* is an even number then the problem can be solved in *n* moves, which is the fewest number of moves required.

If *n* is even, the puzzle can be solved by making the following moves n times: turn over all the glasses except the *i*th glass, where *i* = 1, 2, 3, …, n (Assuming the glasses are labelled from 1 to *n*.

Below is an example of an algorithm for n = 6. The upside down glasses are represented by 1's, the others are denoted by 0's; a glass is not turned over on the next move is shown in **red.**

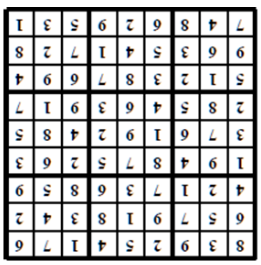
111111 ⇨ 100000 ⇨ 001111 ⇨ 111000 ⇨ 000011 ⇨ 111110 ⇨ 000000

Since, any two consecutive moves will either have no impact on the state of the glasses or change the state of exactly two of them, no algorithm can solve the problem in fewer than *n* moves.

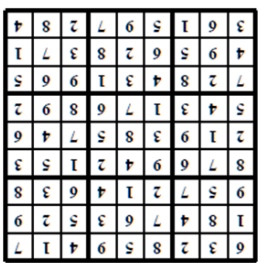
Linkage to Computer Science

This puzzle is one in which objects can be in one of two states (upside down and right way up) and the goal is to transform them from one state to another. The solution exploits parity, and when the problem can be solved, it uses the decrease and conquer strategy..

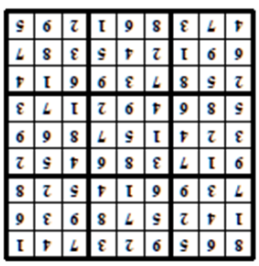
Solutions



Puzzle 51: (Hard, difficulty rating 0.75)



Puzzle 50: (Medium, difficulty rating 0.48)



Puzzle 49: (Easy, difficulty rating 0.45)

Puzzle 49: Easy

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

Puzzle 50: Medium

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

Puzzle 51: Hard

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