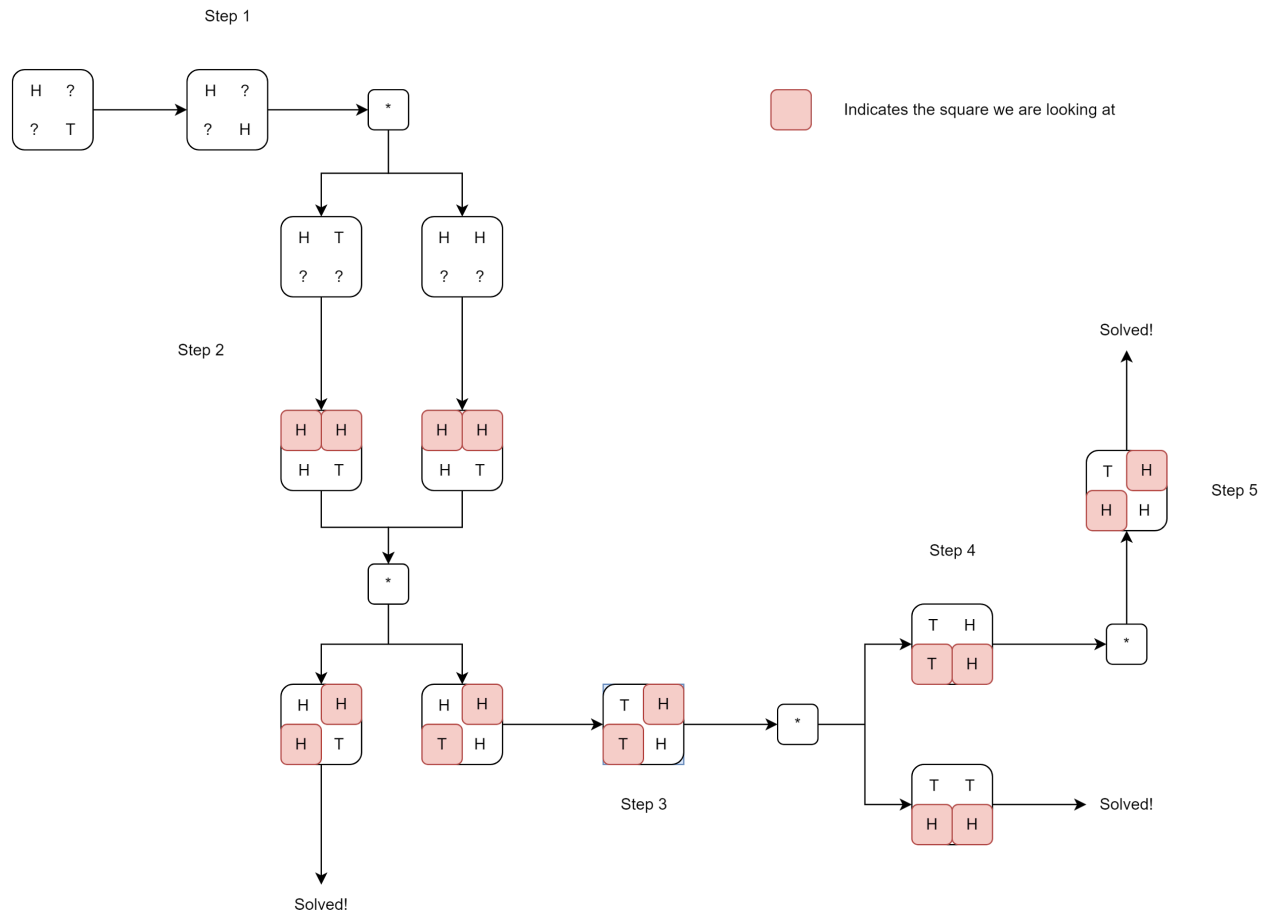


## Diagram



Note: At each step, we are always checking the value of the box in the upper left hand corner. We can call this position 1. Here is a diagram displaying the positions in the 2x2 matrix:

1	2
3	4

## Algorithm

1. Check diagonal and make sure everything is of the same type. In the example, we choose heads.
2. Check adjacent square and change everything to whatever you changed thing to in step 1
3. Check diagonal if different, change the different square to whatever you chose at step 1. If same, change one of them to the opposite
4. Check adjacent if same switch both to opposite if different invert the coin values
5. Check diagonals, invert both coin values and its solved

Max number of steps to complete a grid 5 moves

## Introduction

The “Four the Same” puzzle, as part of the Étude 8, presents an intriguing problem involving a rotating platform with four identical containers, each holding a coin that can show either heads or tails. The challenge lies in devising a method to ensure all coins show the same face (either all heads or all tails) in a finite number of steps, despite the platform’s rotation and the limited visibility of the coins.

## Walkthrough of our algorithm

Lets suggest that we have a grid of 4 the first cell is index 1 and the last cell is index 4

T	T
T	H

We first check the diagonals(1,4) and make sure they are both the same which choose to make all H in this case which results in this grid

H	T
T	H

It will then be randomly rotated to this grid to this

T	H
H	T

We then check the adjacent cells(1,2) and change any T to H if there are any, resulting in this grid

H	H
H	T

It will then be randomly rotated to this grid to this

H	H
T	H

We then check the diagonals again(1,4) if they are different change the T to a H. If they are the same as H, change one of them to the opposite (T). We will change square 1 so it results in this grid:

T	H
T	H

It will then be randomly rotated to this grid to this

H	T
H	T

Then we check the adjacent cells(1,2) if they are the same we switch them both to the opposite if they are different invert both the coins values it would result in this grid

T	H
H	T

It will then be randomly rotated to this grid to this

H	T
T	H

We then check the diagonals(1,4) and invert both coins which results in this

T	T
T	T

This problem is solved.

## Results of our Algorithm

Our algorithm, as demonstrated, guarantees a solution to the puzzle in a finite number of steps. In the worst-case scenario, it solves the puzzle in five moves. However, the beauty of this algorithm lies in its flexibility and adaptability. At any step, if the coins align in a favorable order, the puzzle could be solved instantly, reducing the number of moves required. It's important to note that the effectiveness of our algorithm is not merely theoretical. We have tested it extensively under various initial configurations of the coins. In every instance, our algorithm has successfully solved the puzzle, reaffirming its reliability and efficiency. Moreover, our algorithm does not rely on chance or random actions. Instead, it follows a clear, logical process that

systematically brings the puzzle closer to the solution with each move. This deterministic approach eliminates uncertainty and ensures consistent results.

## Conclusions

The “Four the Same” puzzle posed in Étude 8 presents a unique challenge that tests our problem-solving skills and our ability to devise effective strategies under constraints. Our method, which involves a series of checks and changes based on the state of the coins, successfully solves this problem in a finite number of moves. In our case, it’s five. Our solution underscores the power of systematic and logical thinking in tackling complex problems. By carefully analyzing the puzzle and understanding its constraints, we were able to devise a strategy that guarantees success. This exercise has not only provided us with a solution to a specific puzzle but also highlighted the broader applicability of systematic problem-solving methods. The success of our algorithm in solving the “Four the Same” puzzle is a testament to the power of logical reasoning and strategic thinking. It serves as a reminder that even in the face of seemingly random factors, a well-devised plan can lead to consistent and reliable outcomes.