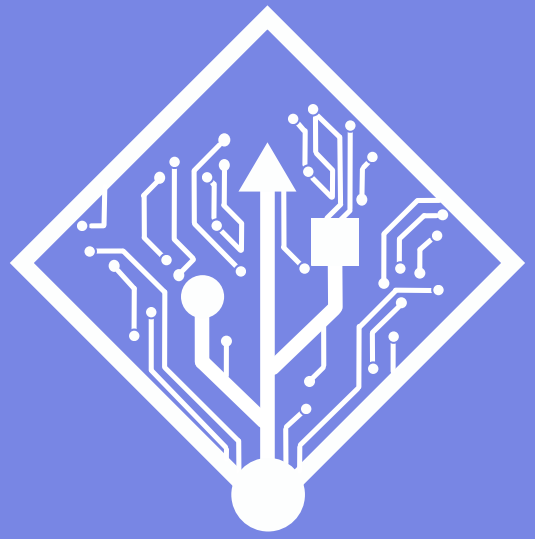

IEEE CITY

ROBOTICS SOCIETY

PROGRAMMING 2: FLOODFILL & WALL DETECTION

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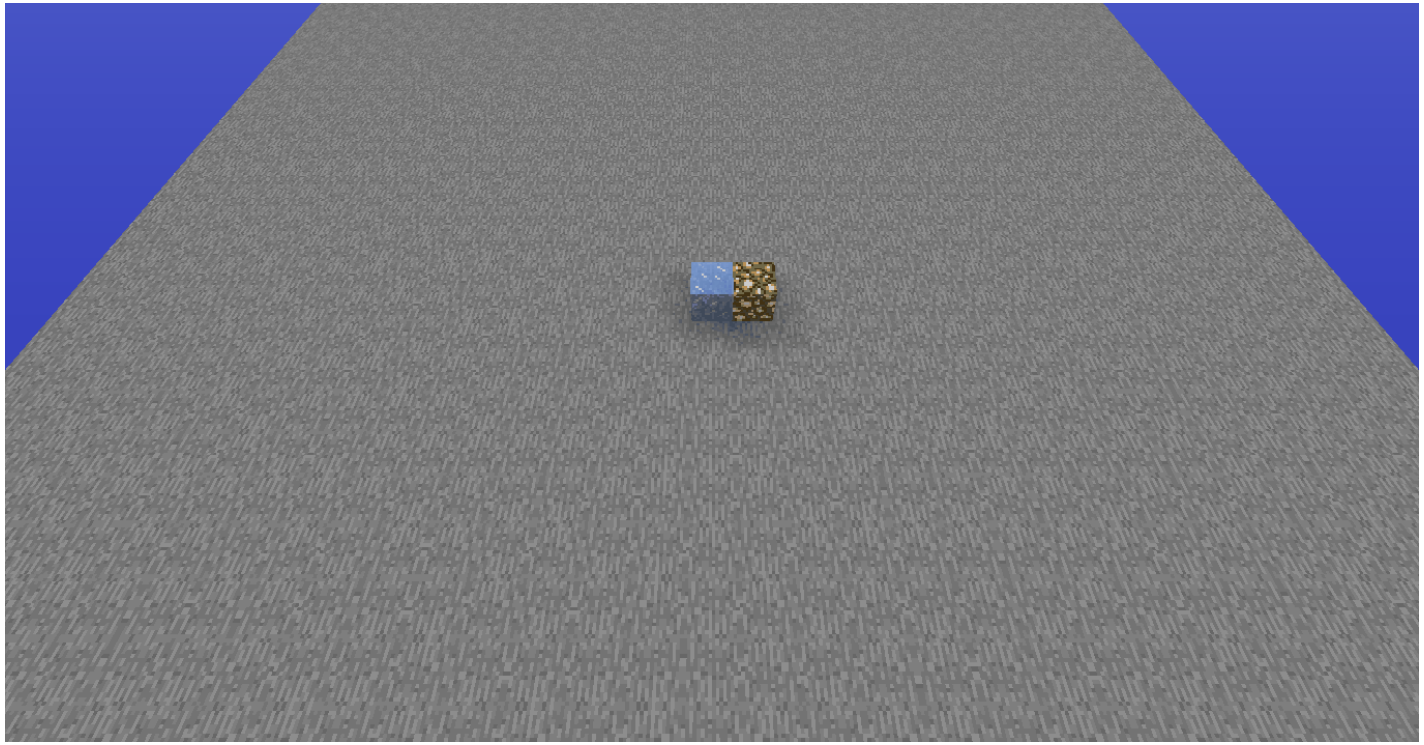
Floodfill: High Level Idea

Goal: Find the shortest path between start and end points

Intuitively, water flows in the shortest valid path from a start to end

Working principle: Water will flow around the wall and instead of through it

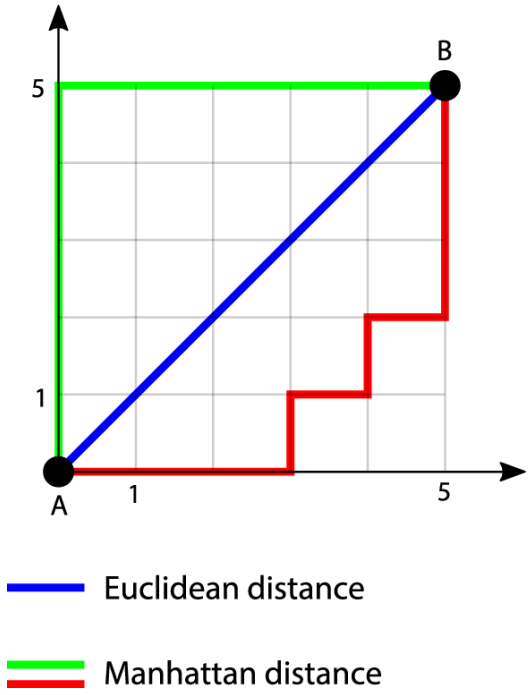


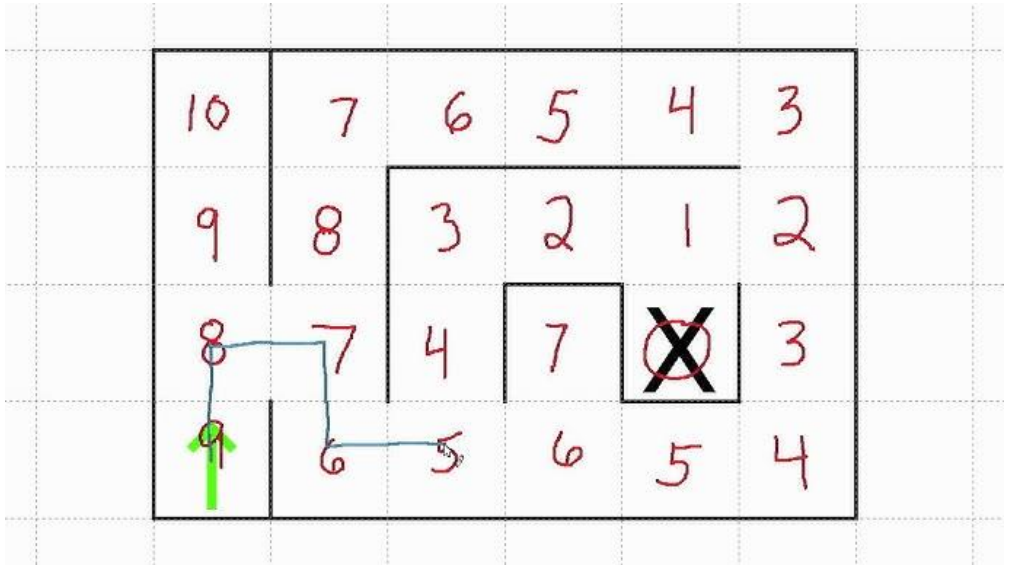
Floodfill: High Level Idea

Your mouse cannot travel through walls.

Split maze into cells, each cell has a Manhattan distance away from the goal

You want to move to the next smallest cell in the direction of the goal





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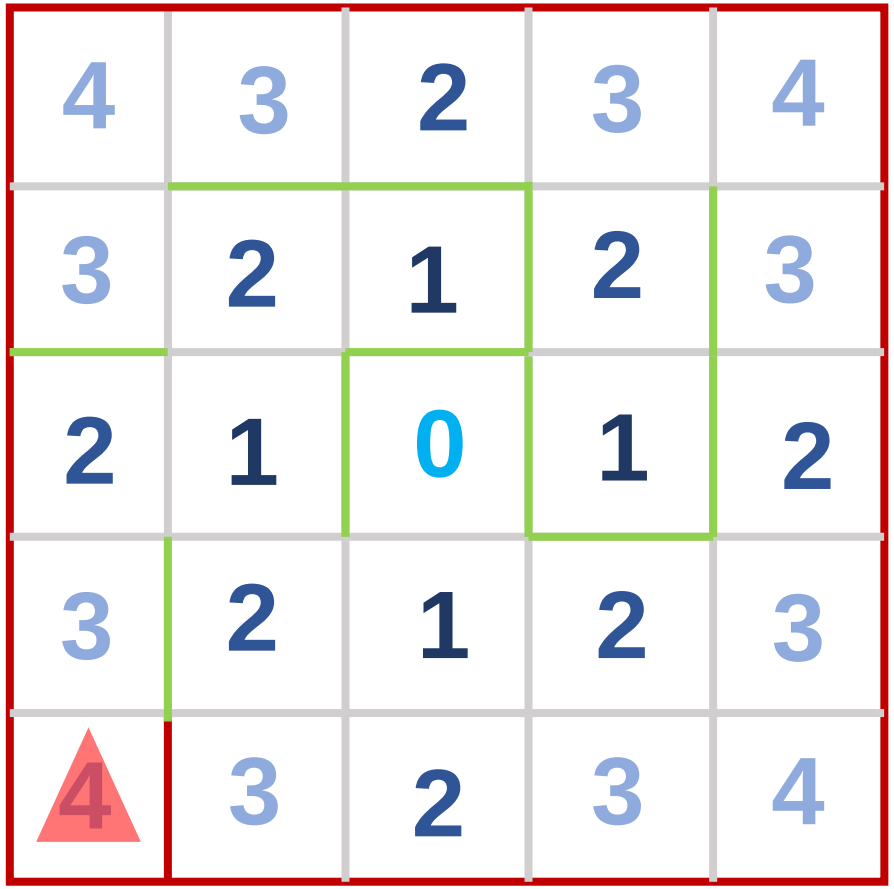
Floodfill Initialisation

Assume the maze has no walls to start. Calculate Manhattan distance to the goal

Travel to a smaller number each move

If you get stuck (encounter a wall), recalculate the distance using floodfill

Traversing the maze



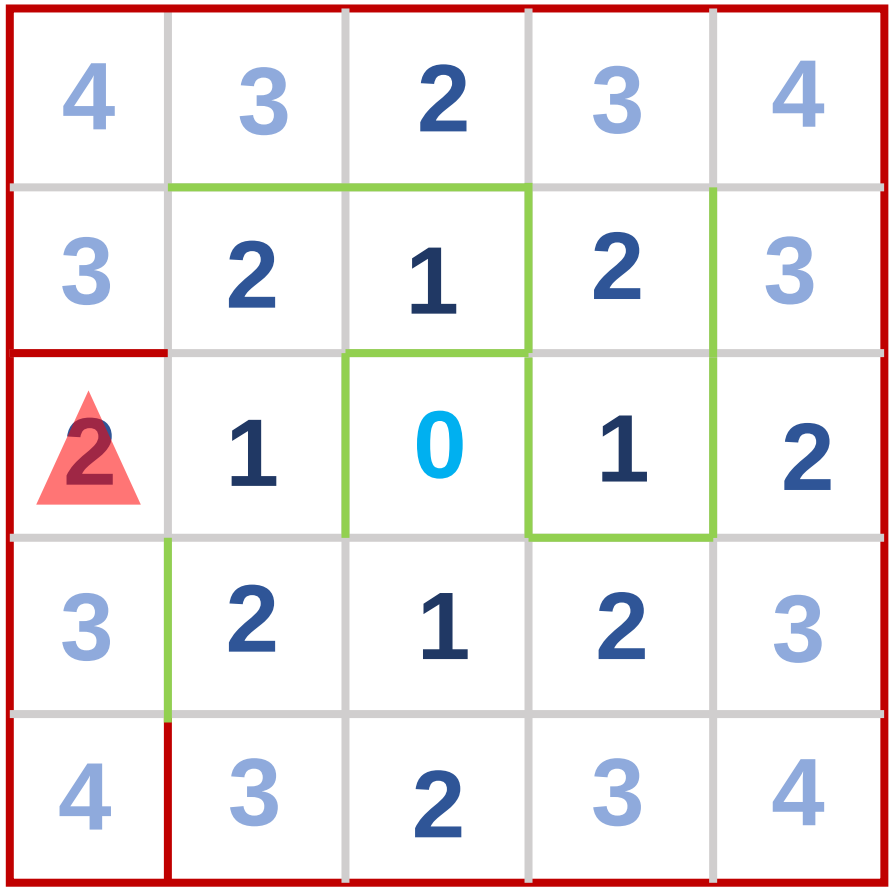
Unknown Wall Known Wall

IEEE

Traversing the maze

IEEE

Traversing the maze



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Traversing the maze

Unknown Wall Known Wall

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Traversing the maze

Mouse is stuck

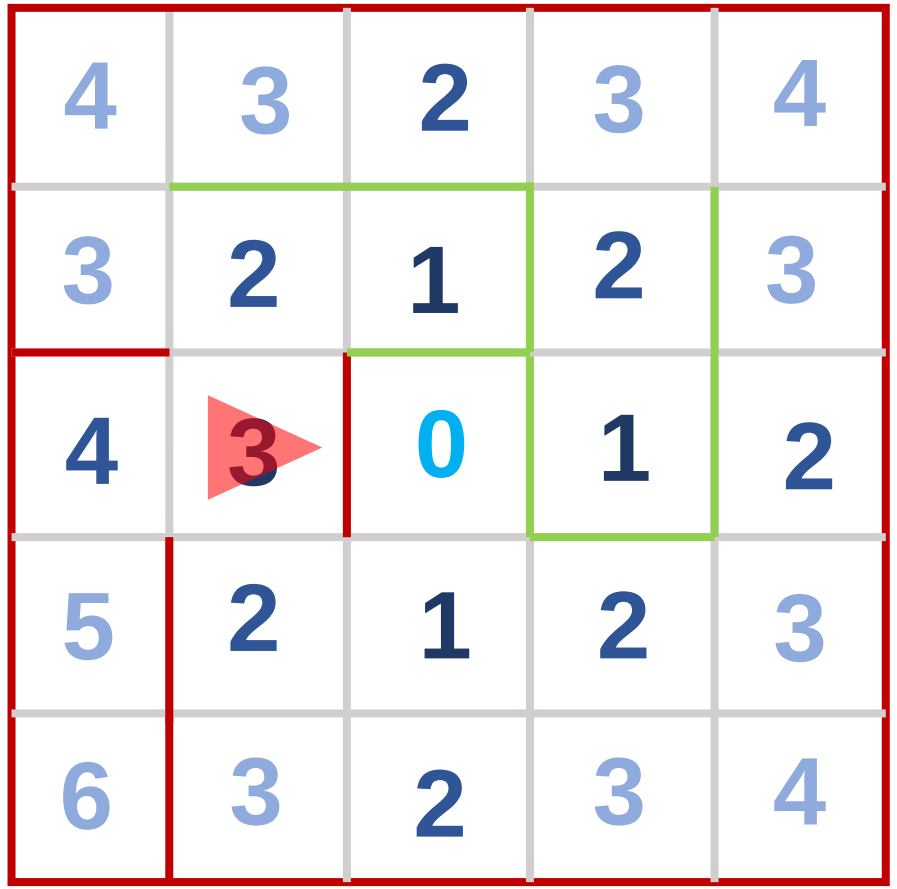
Unknown Wall

Known Wall

IEEE

Traversing the maze

Perform Floodfill →

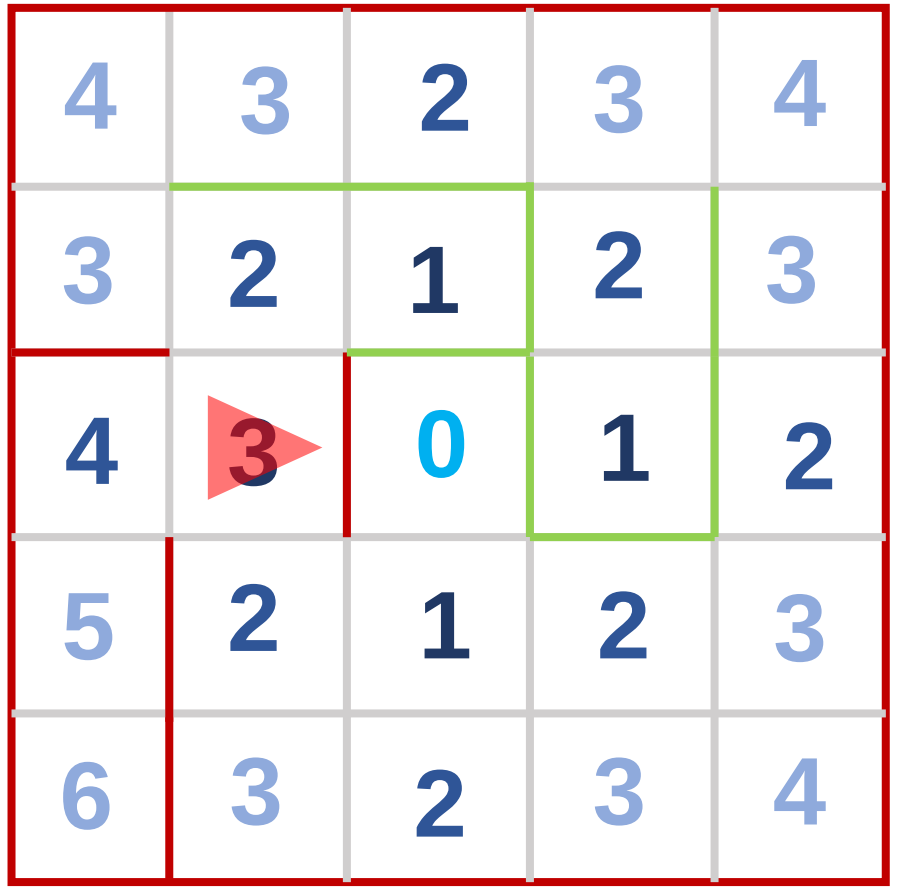


Unknown Wall Known Wall

IEEE

We need to change the cell values to reflect the presence of the walls and how water would flow around it

Perform Floodfill →



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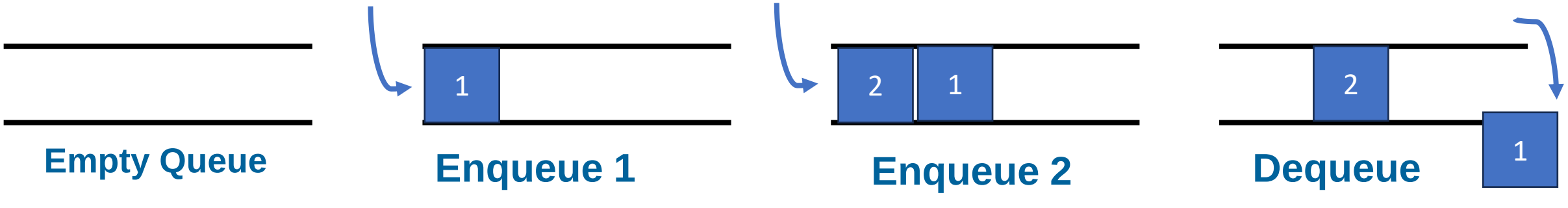

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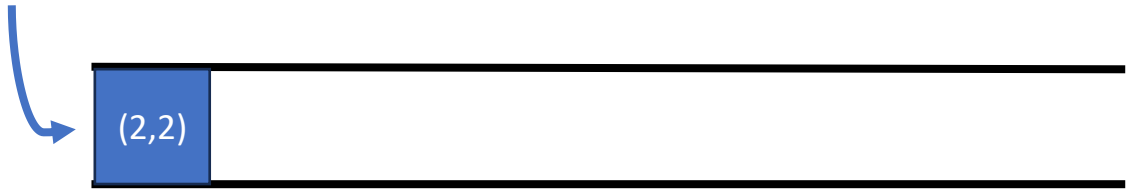

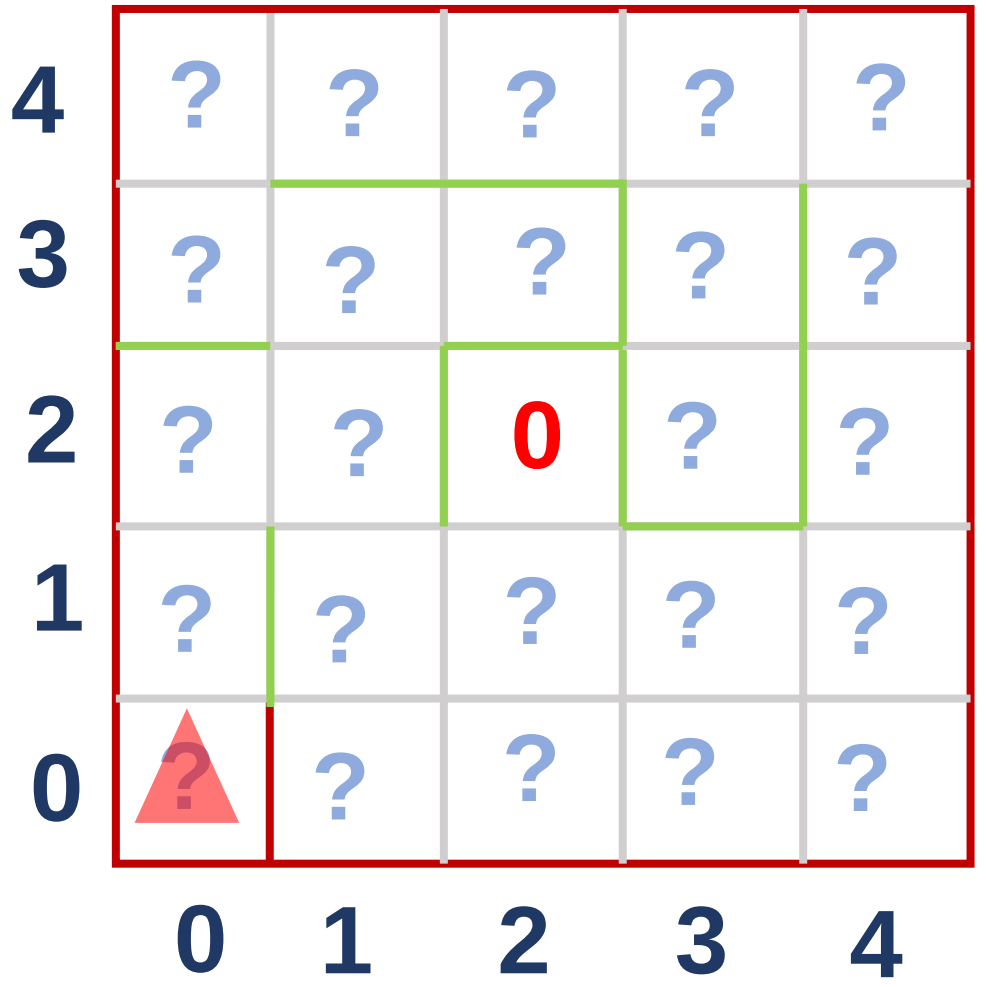

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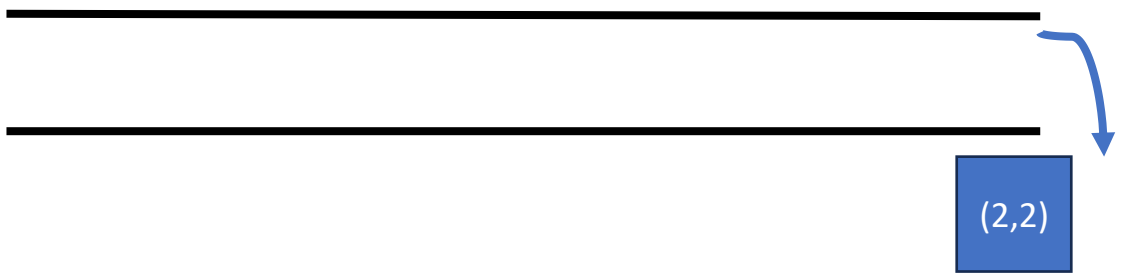

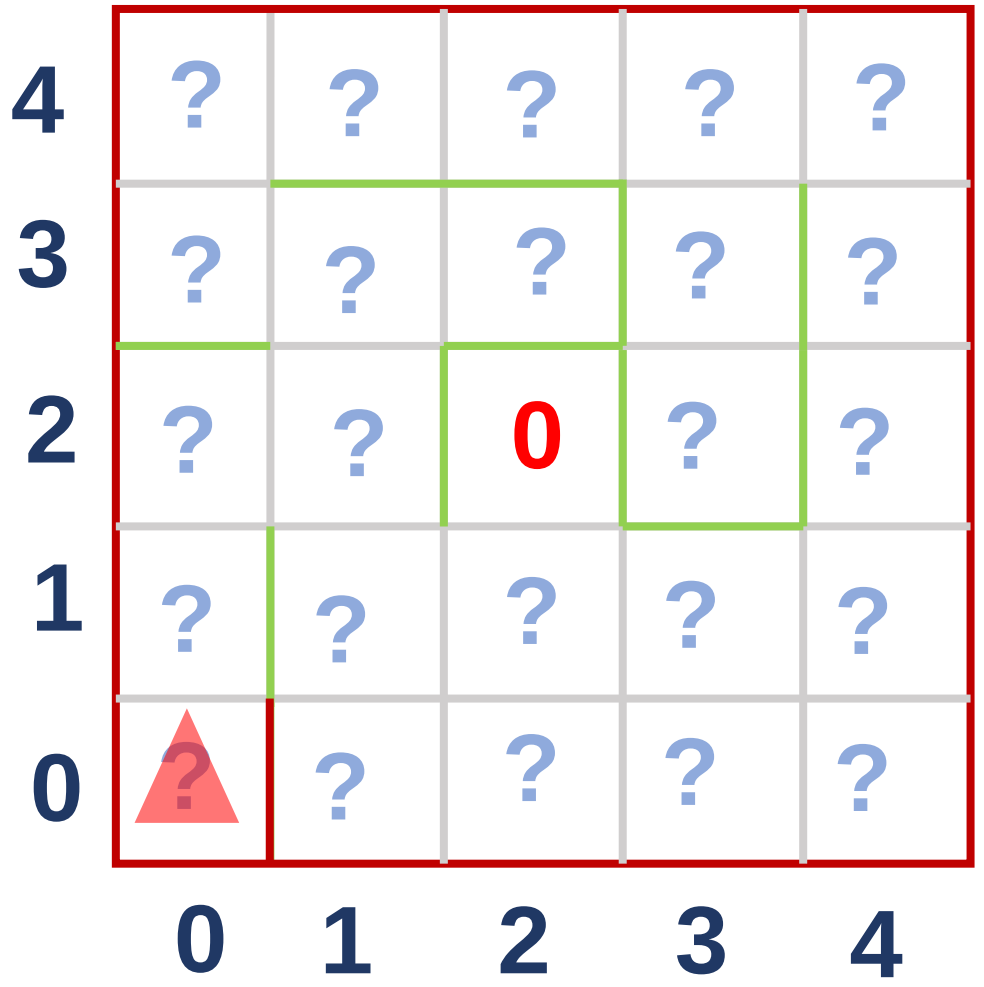

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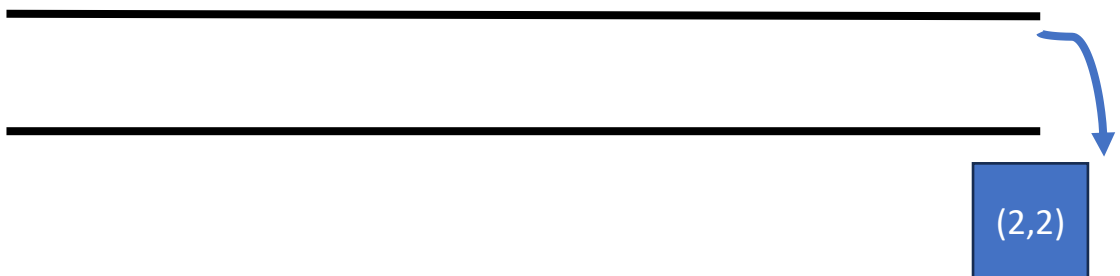

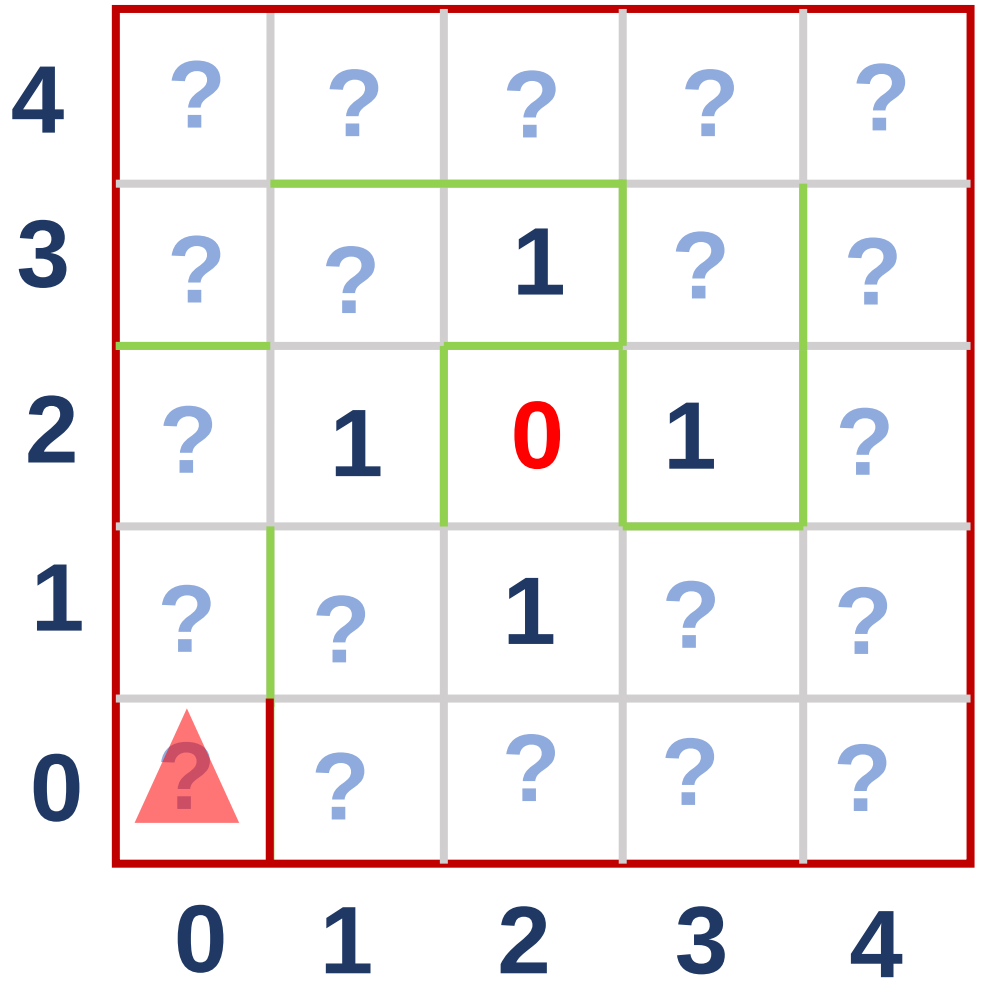

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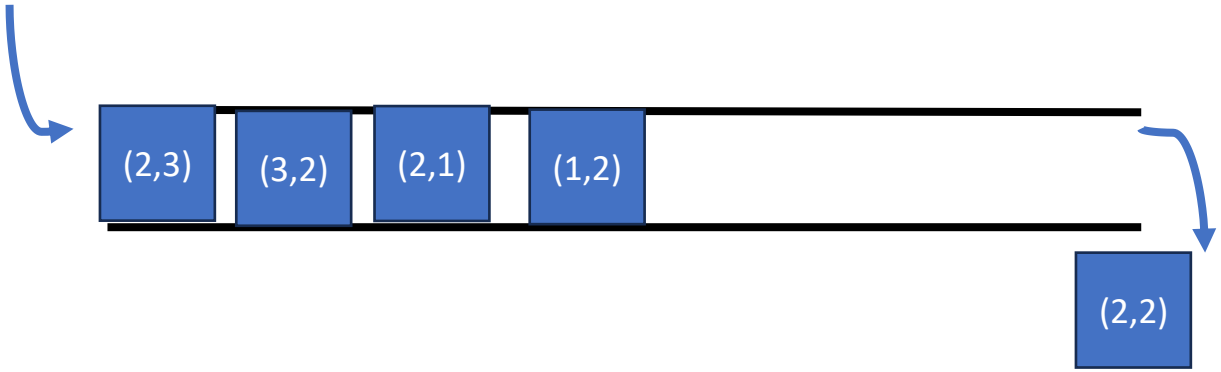

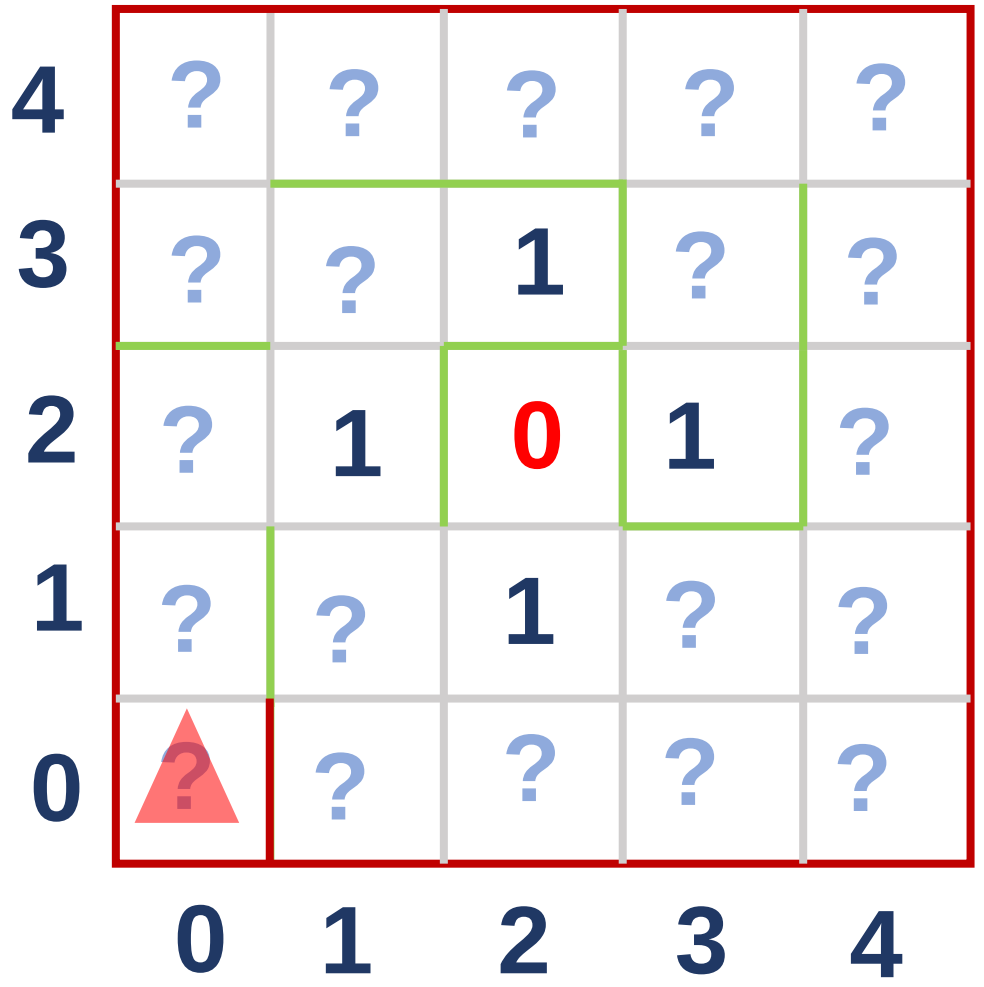

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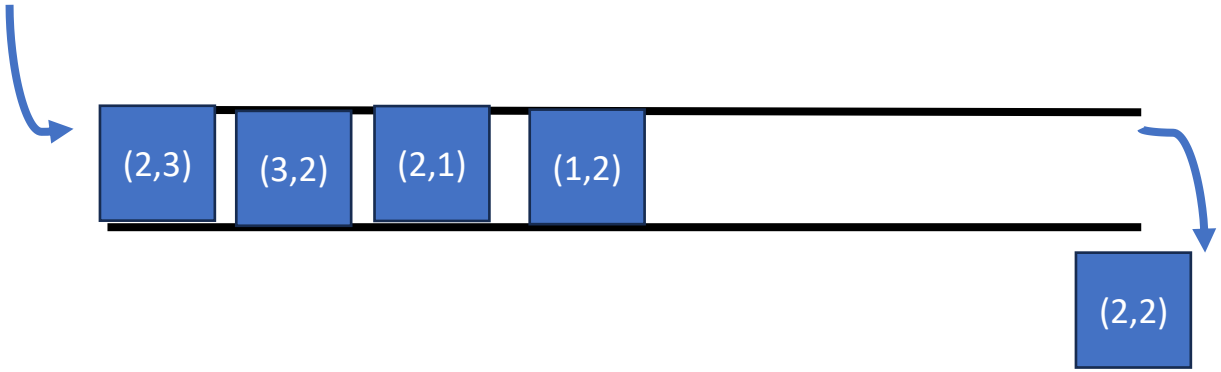

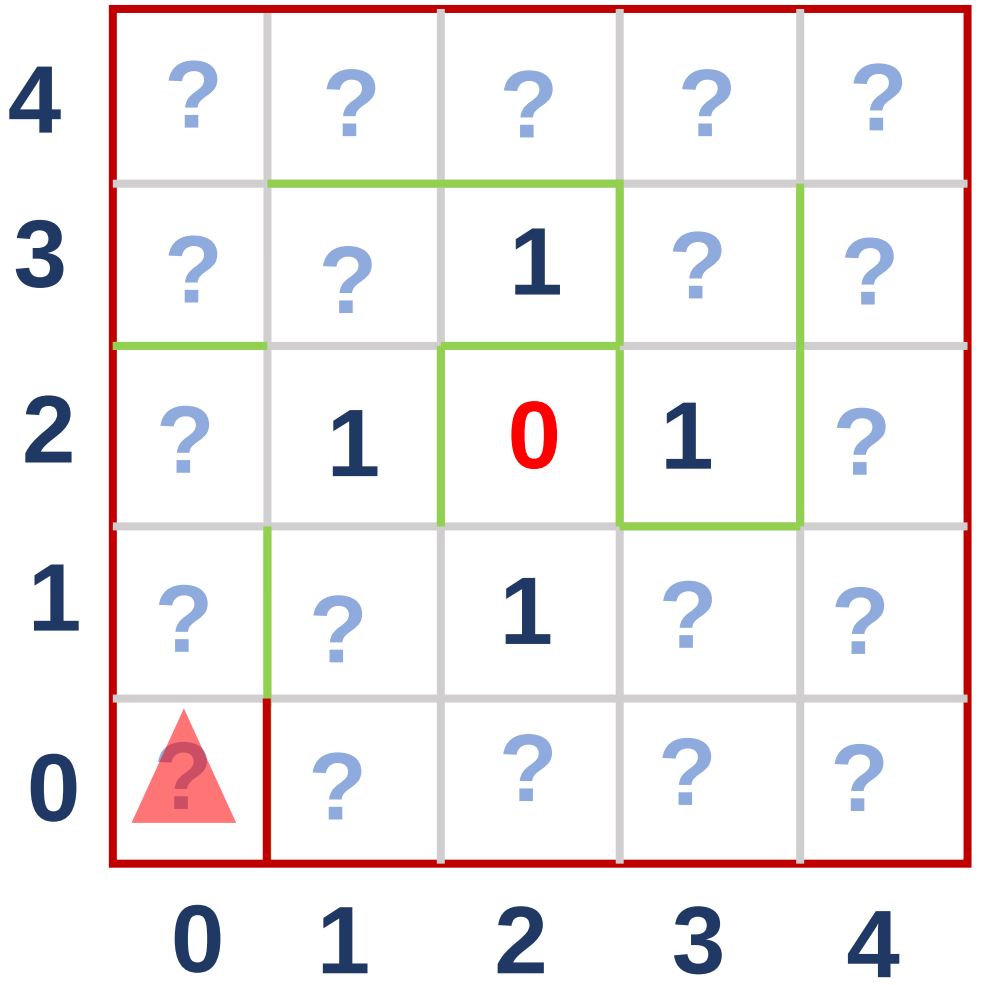

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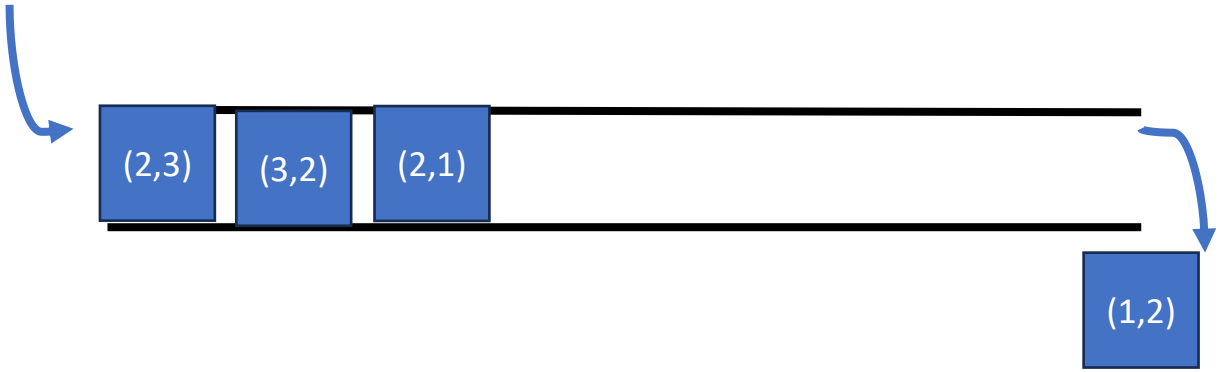

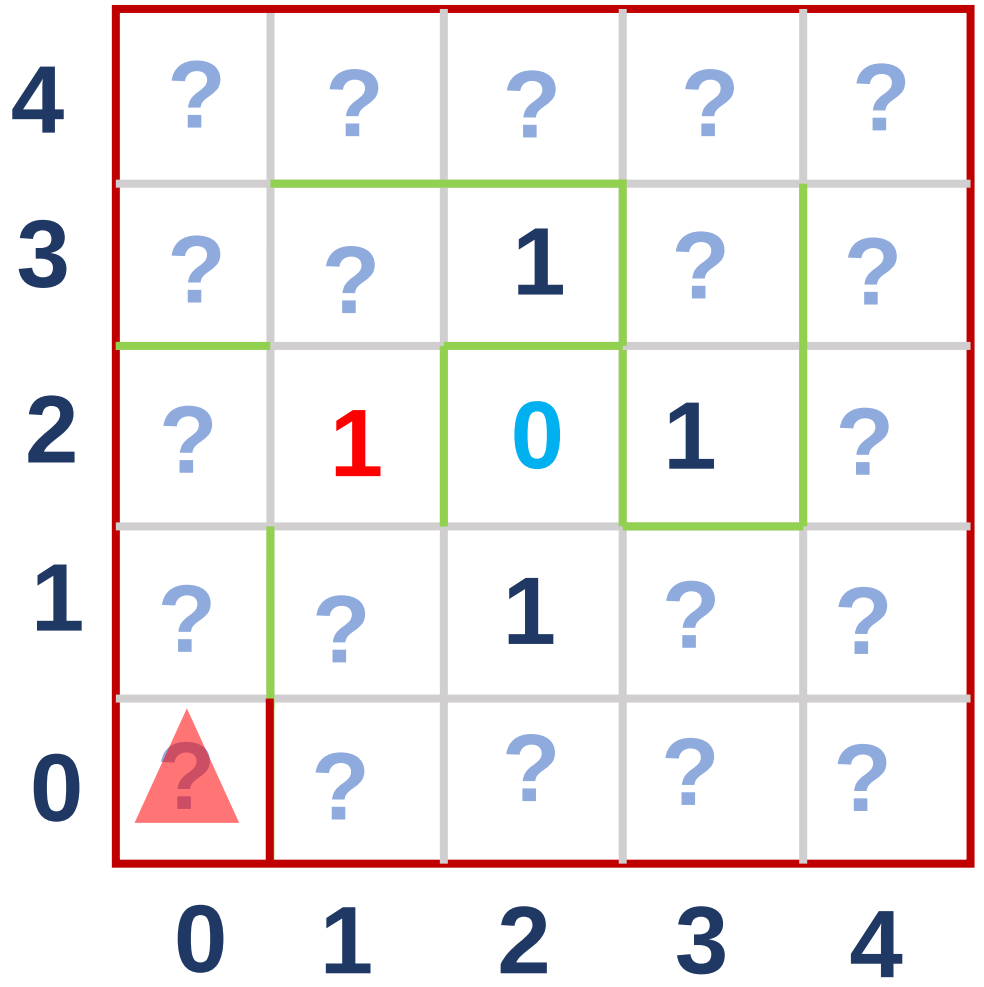

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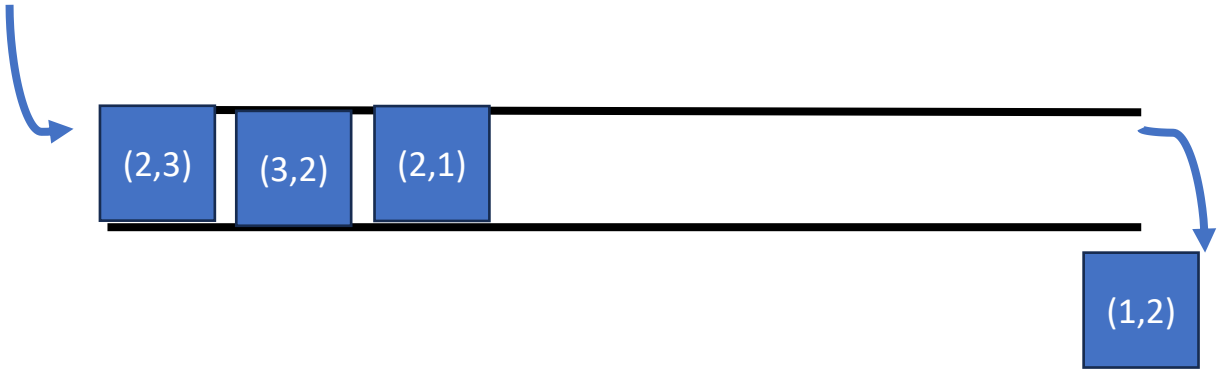

4	?	?	?	?	?
3	?	2	1	?	?
2	2	1	0	1	?
1	?	2	1	?	?
0	?	?	?	?	?
	0	1	2	3	4

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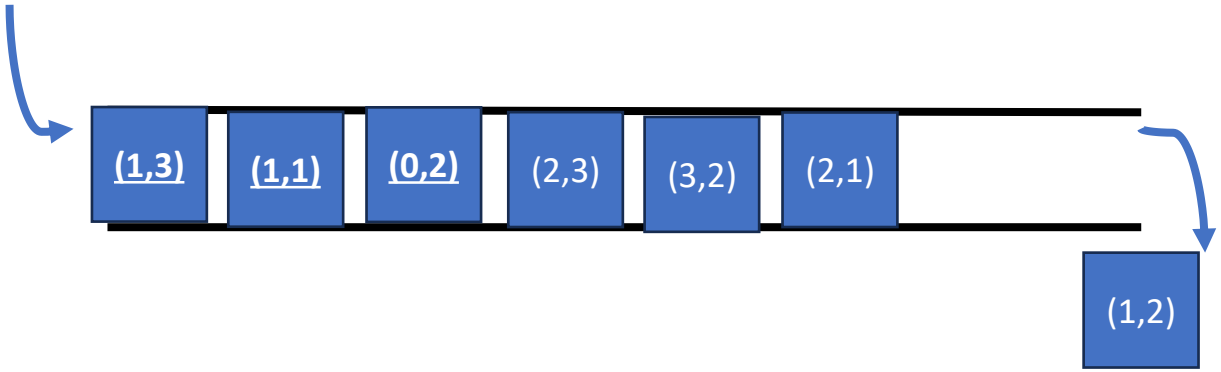

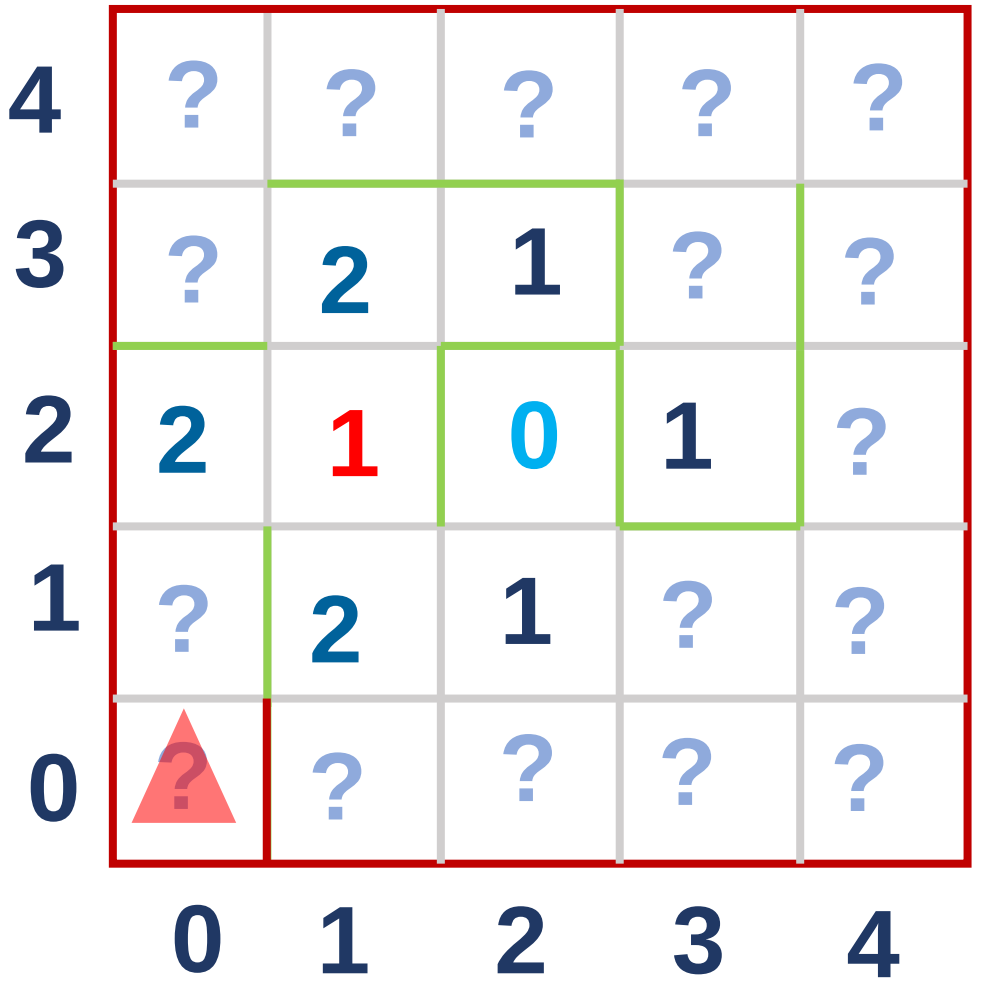

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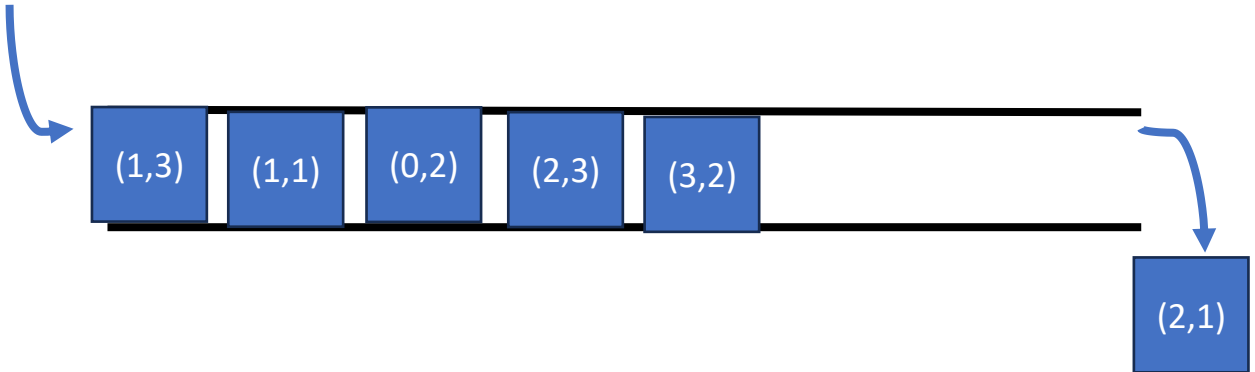

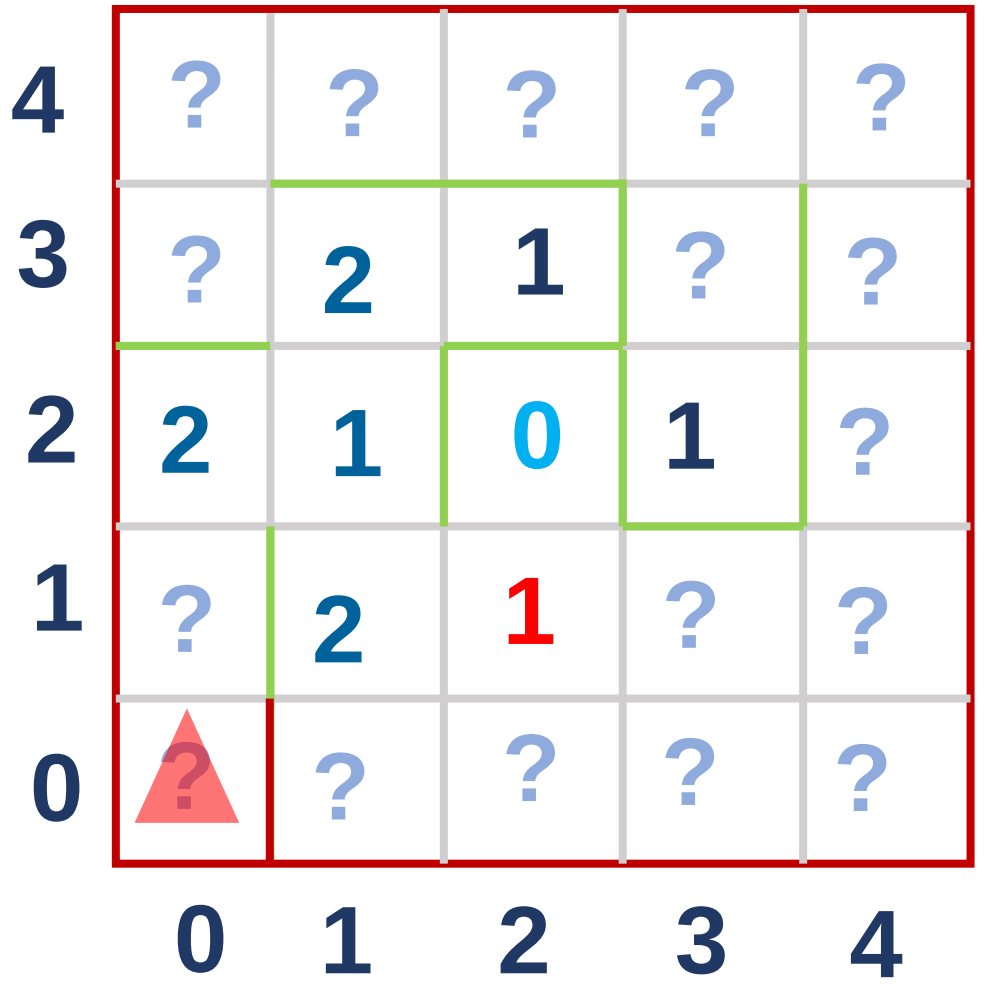

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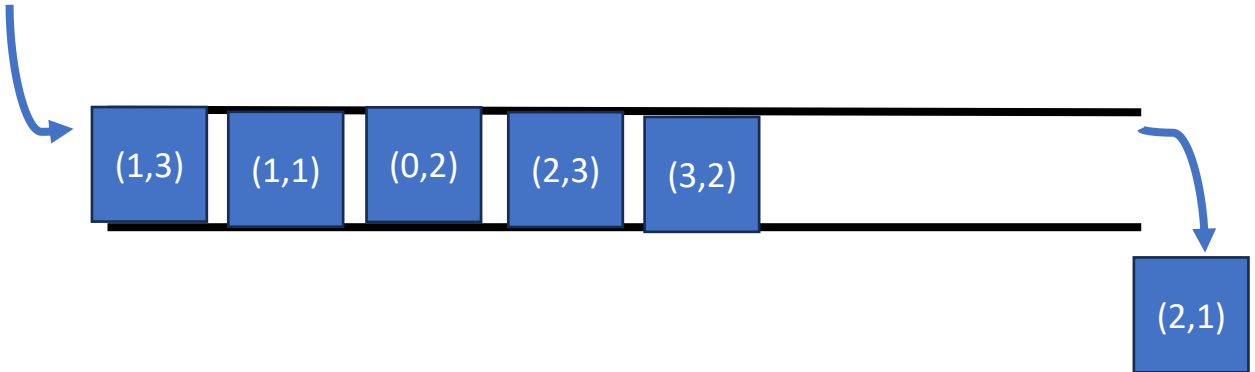

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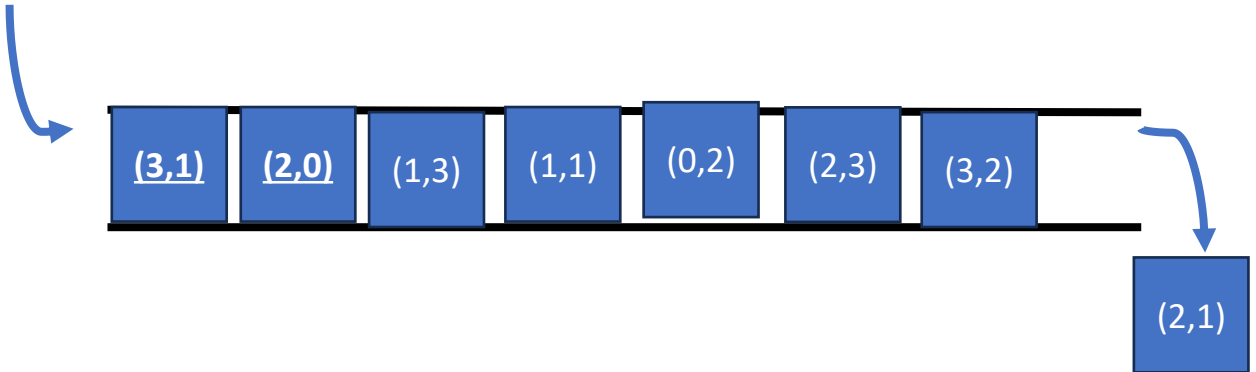

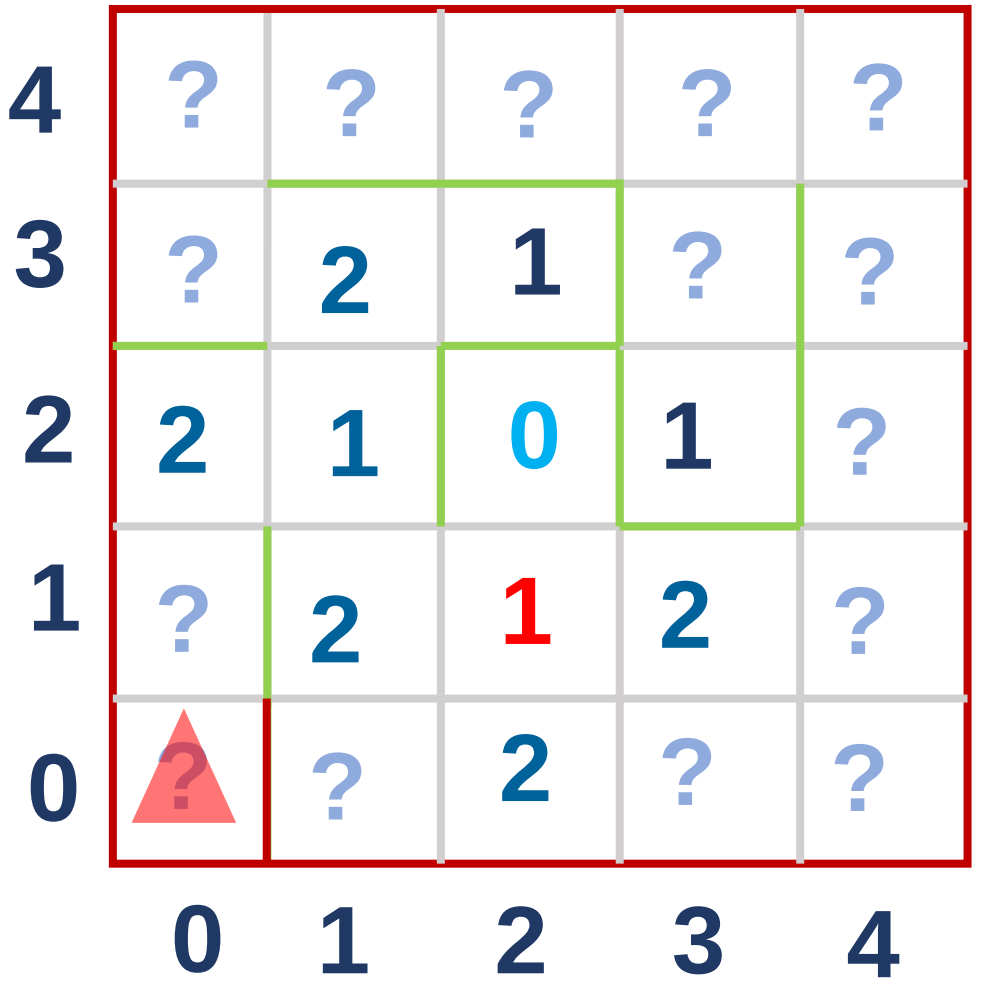

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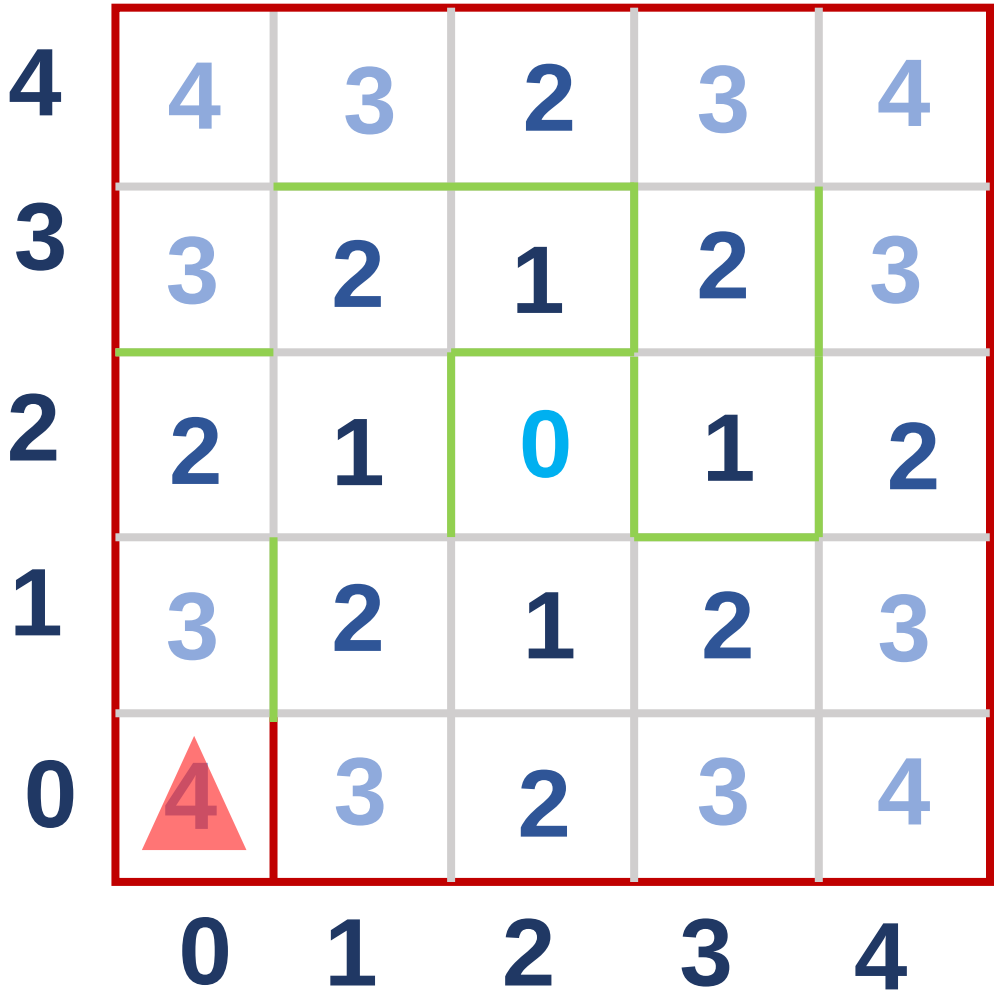

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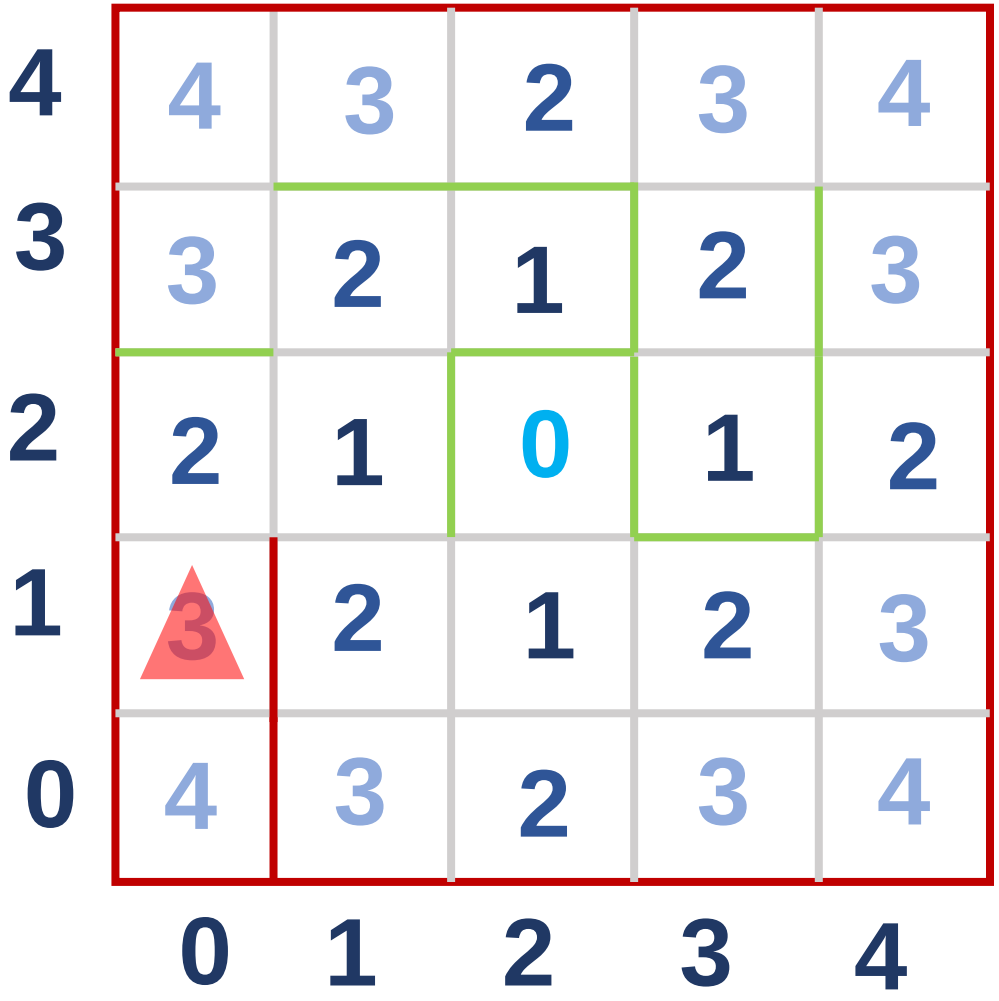

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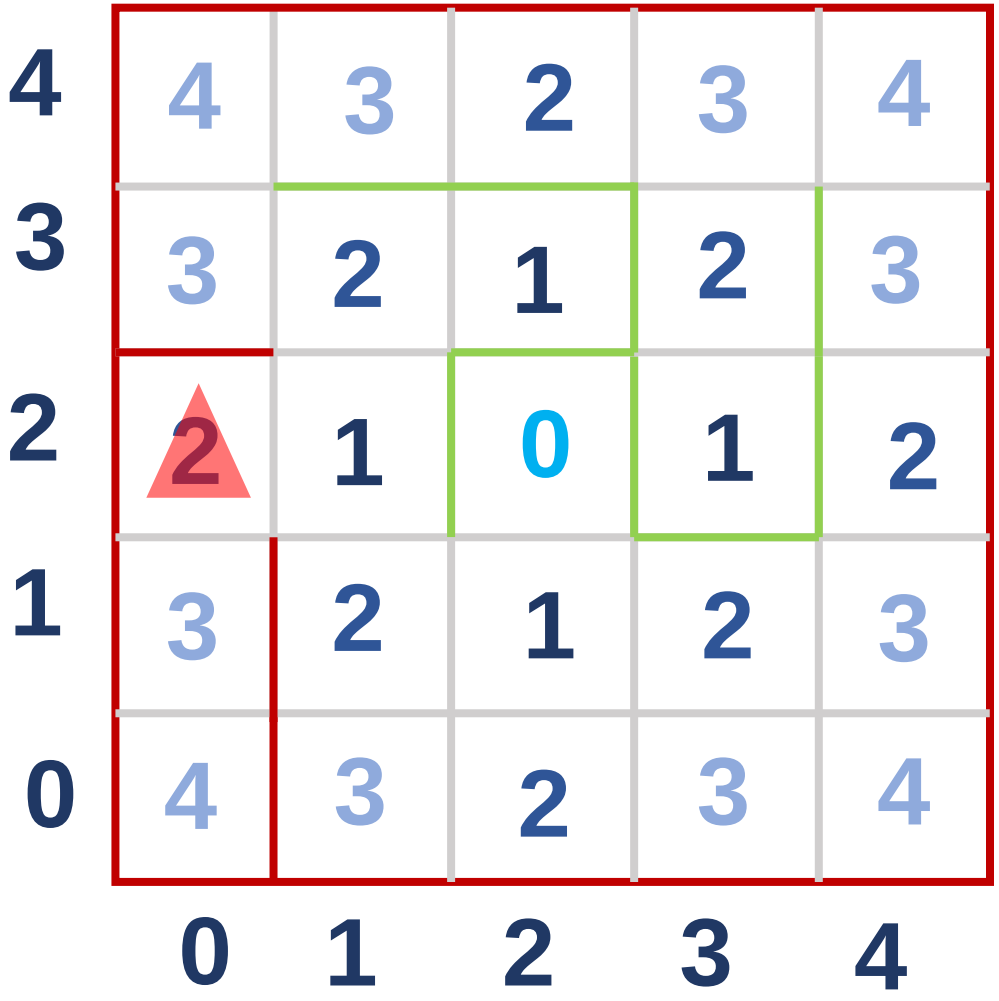
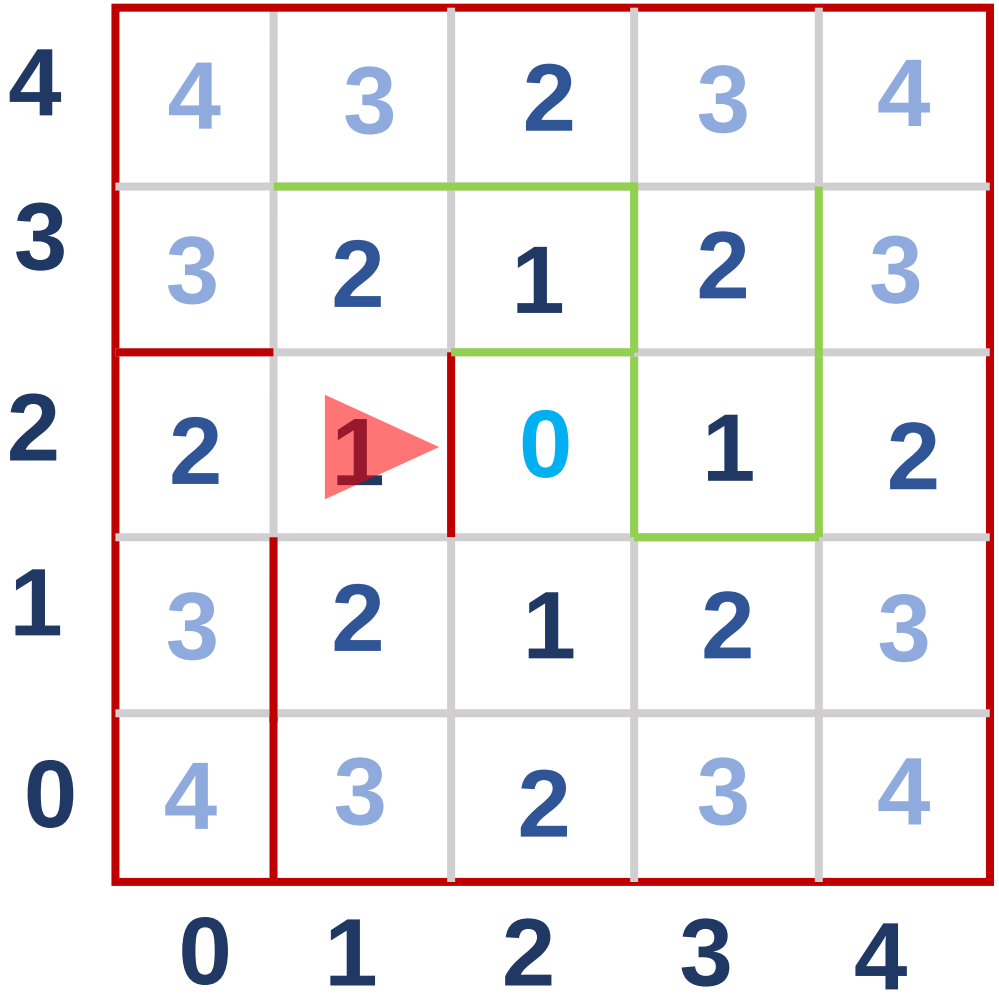


Floodfill Pseudocode

Mouse is stuck!



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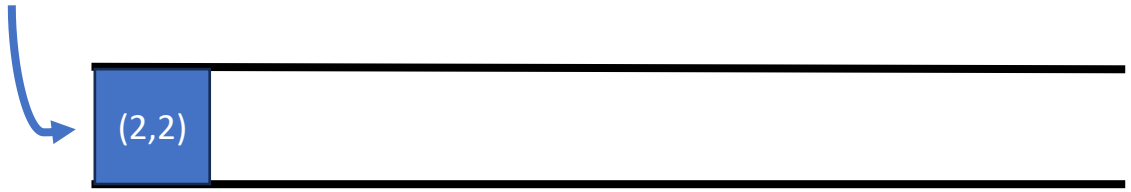

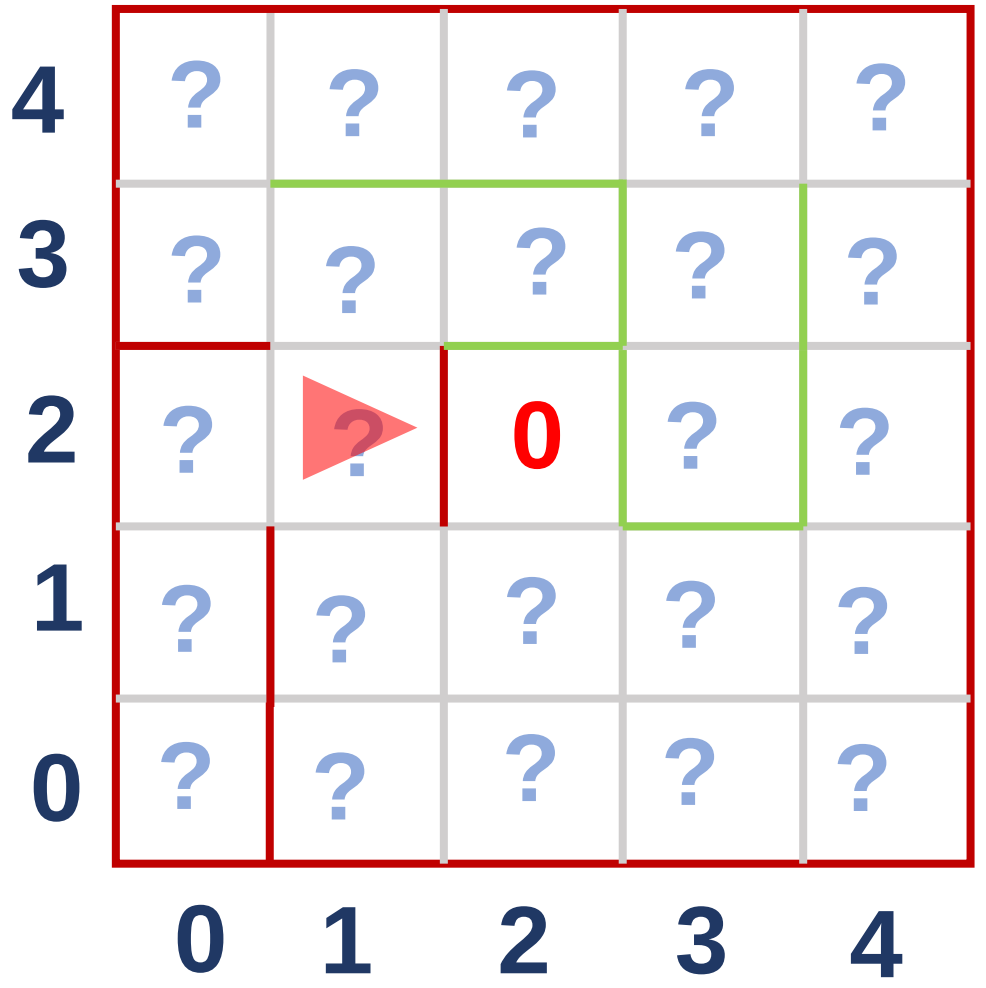

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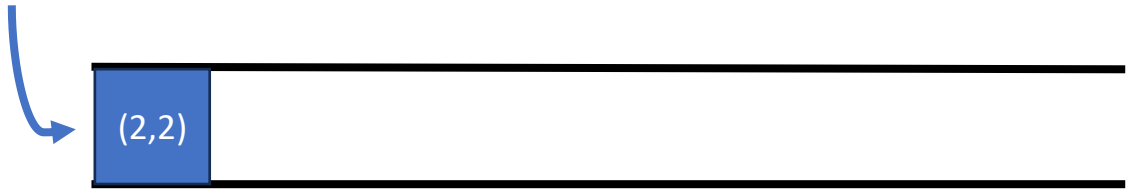

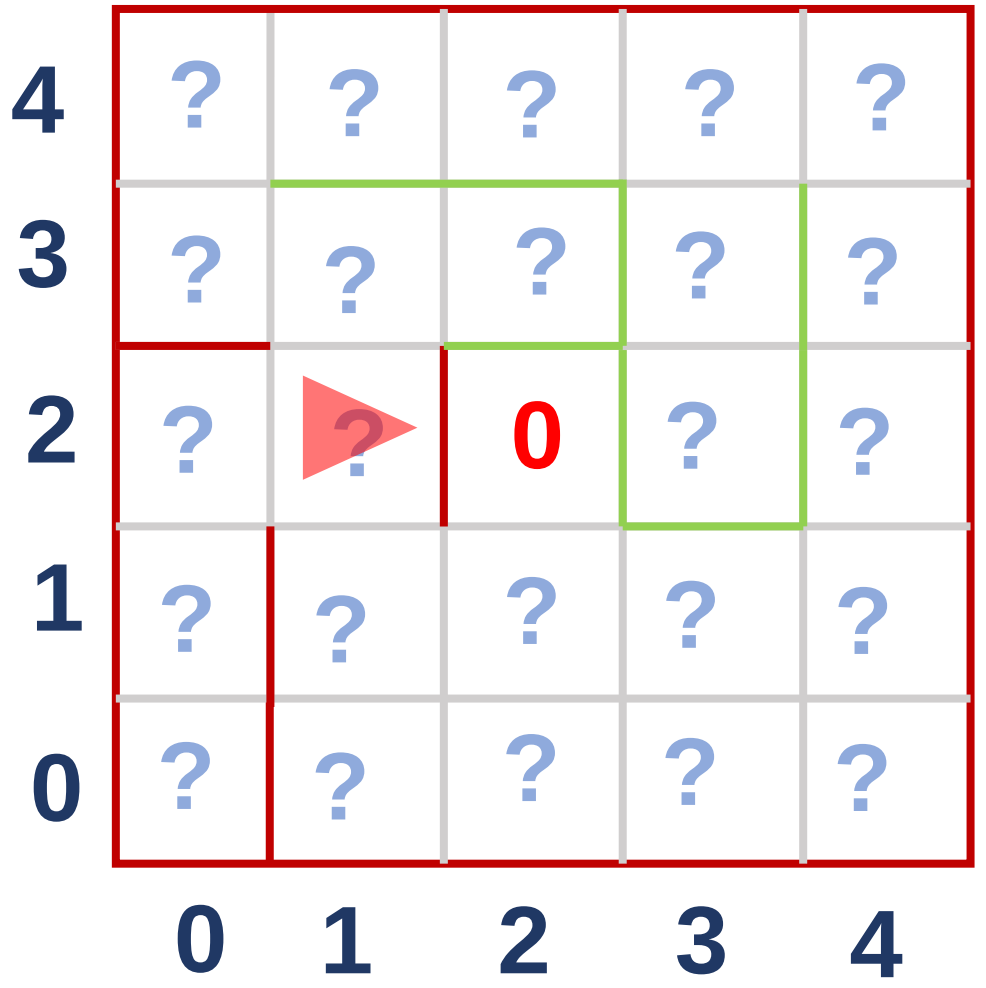

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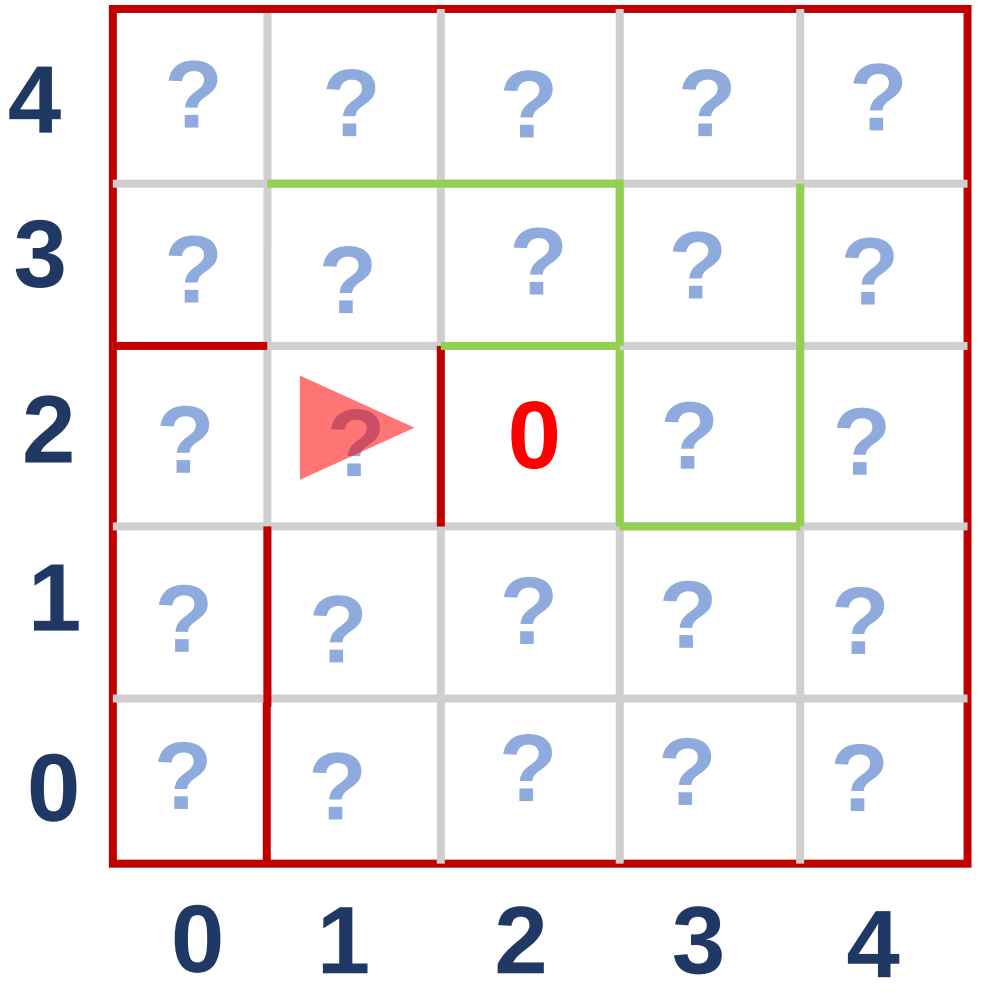

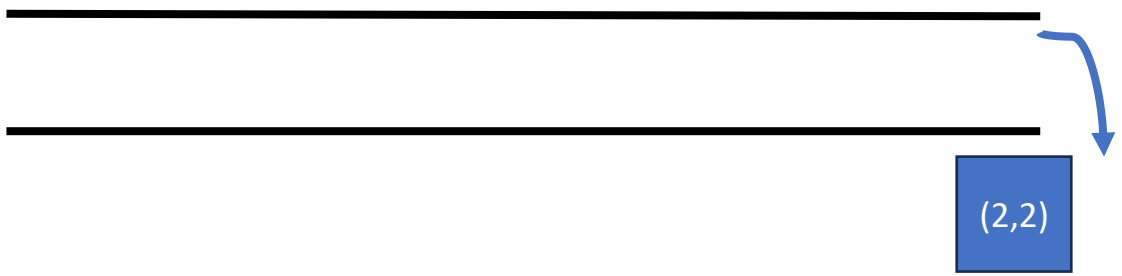

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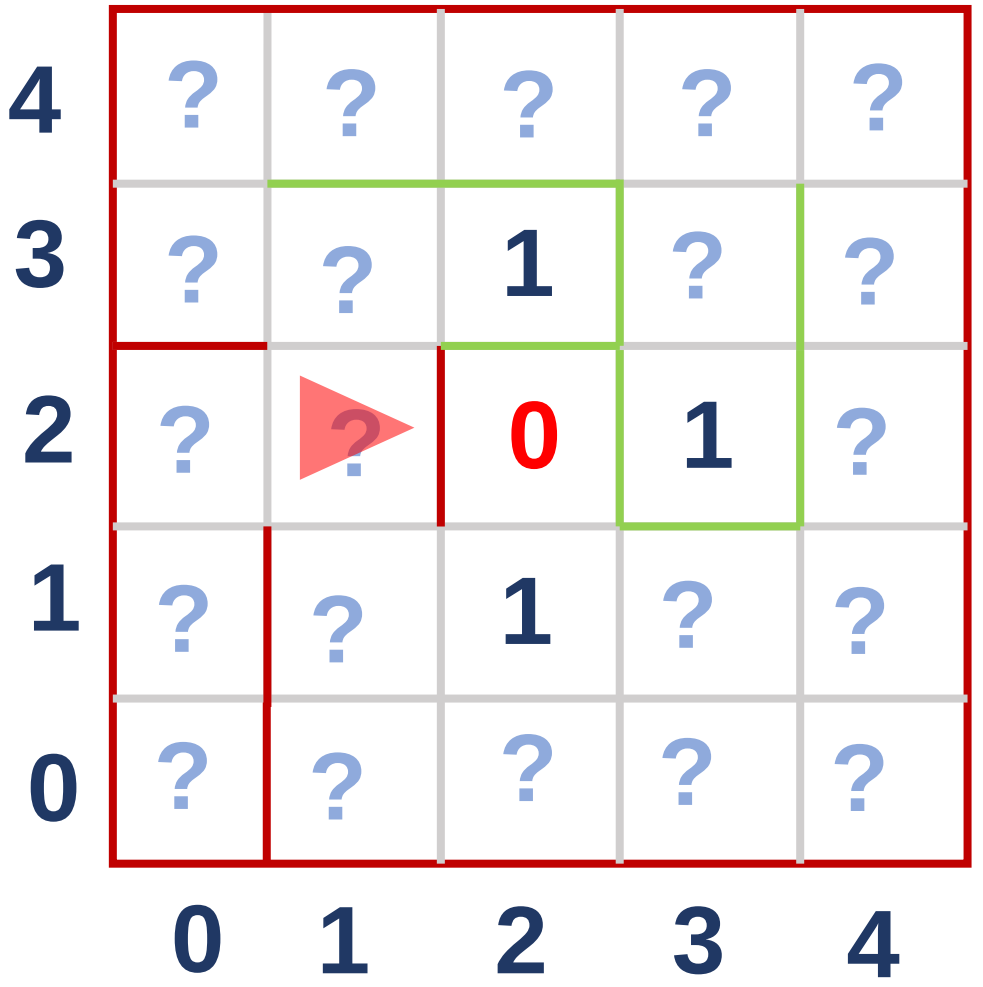

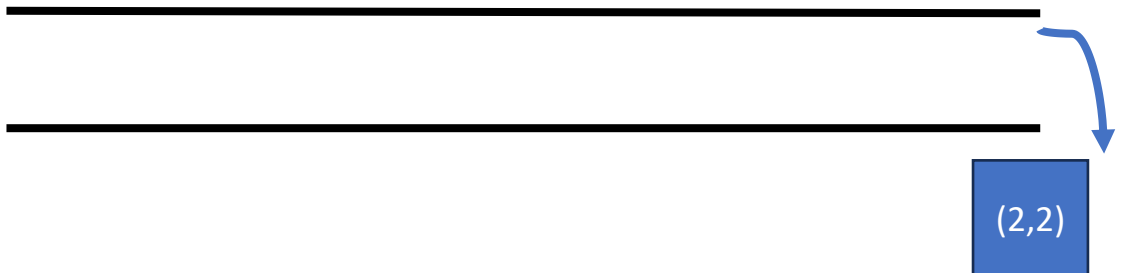

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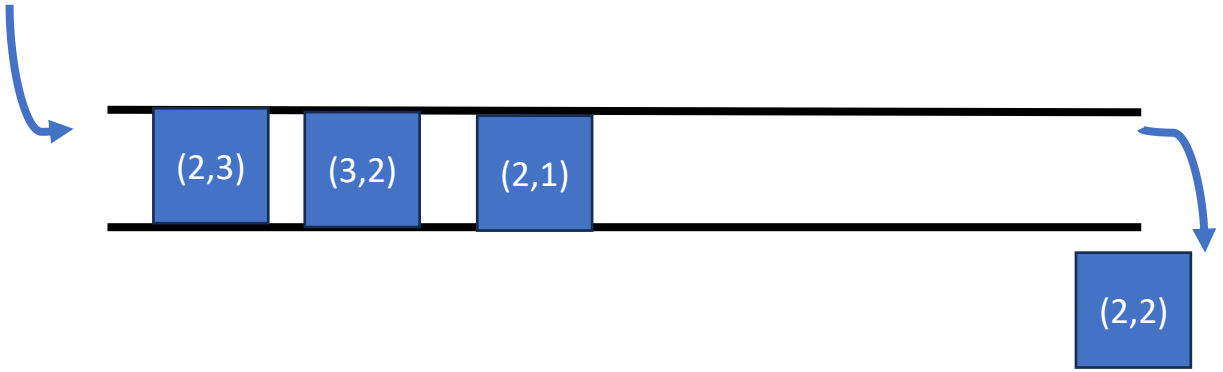

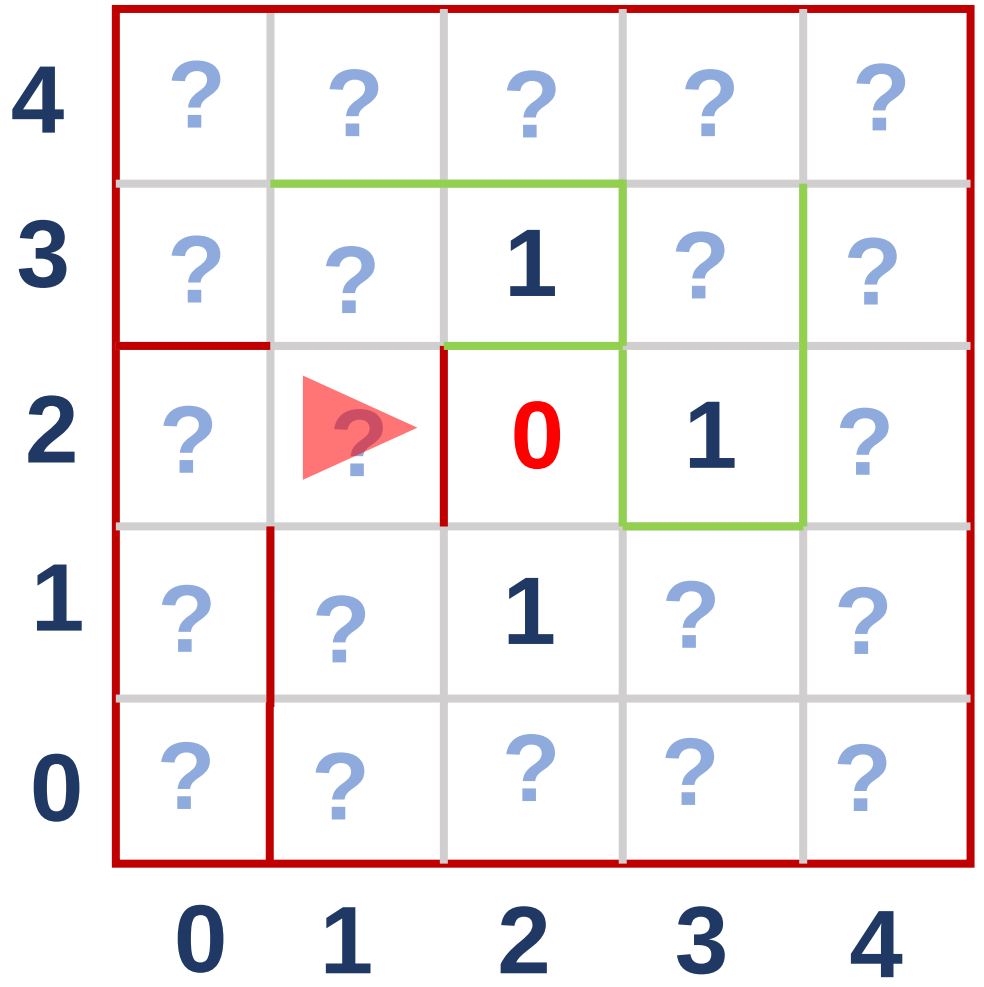

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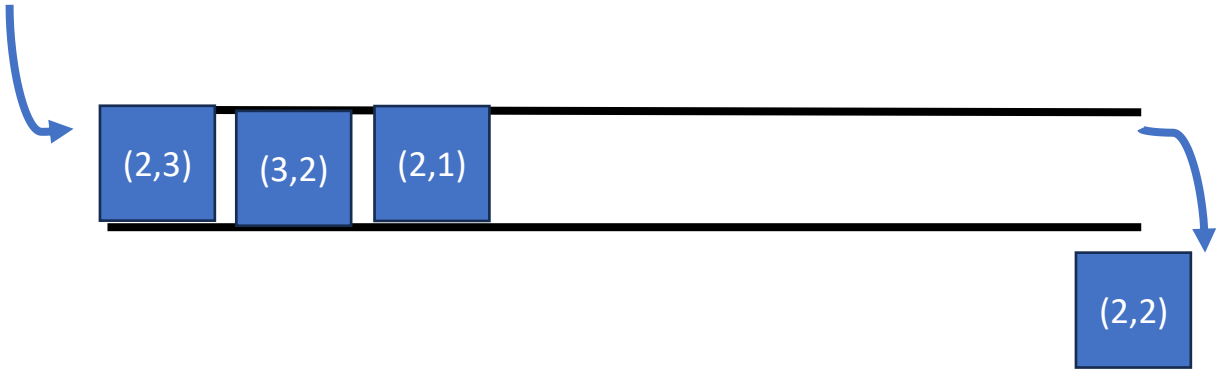

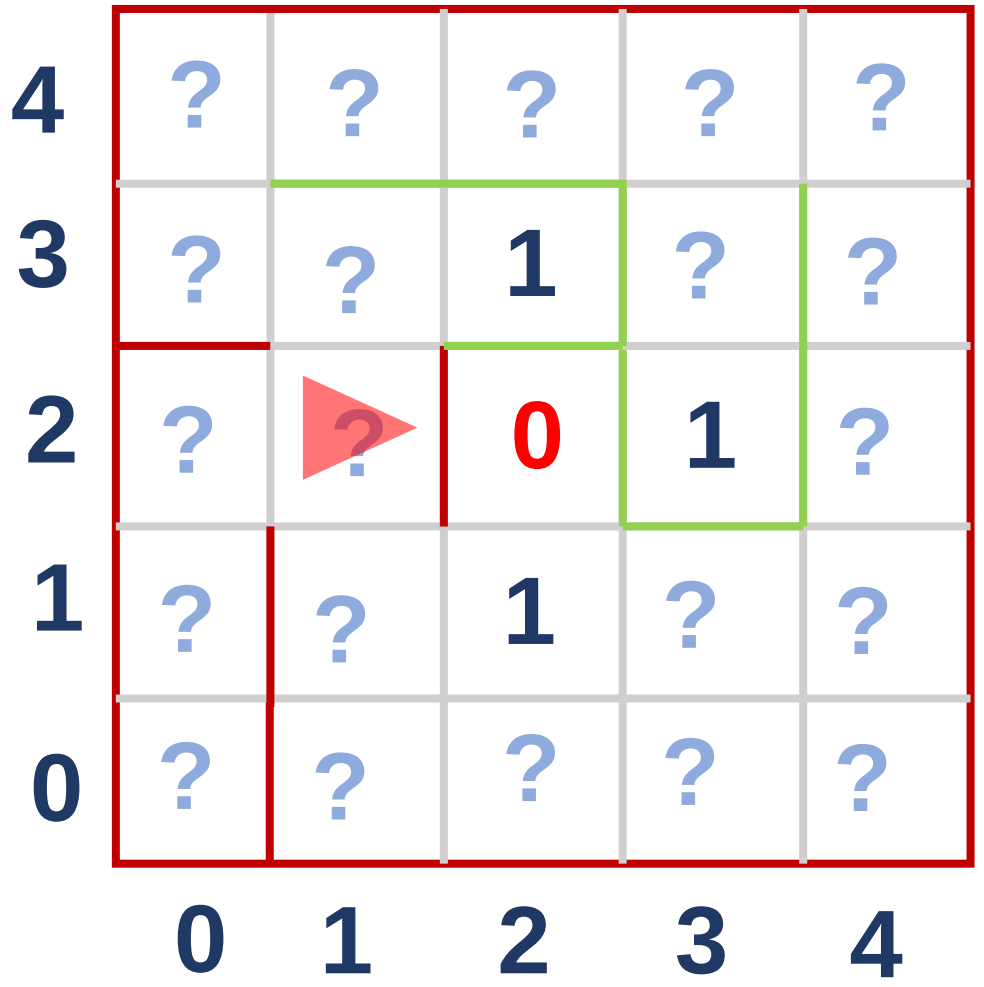

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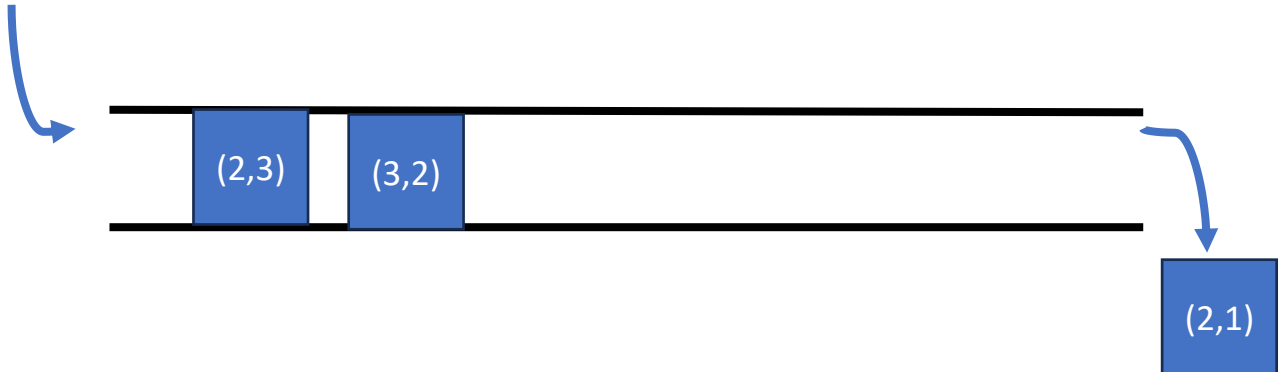

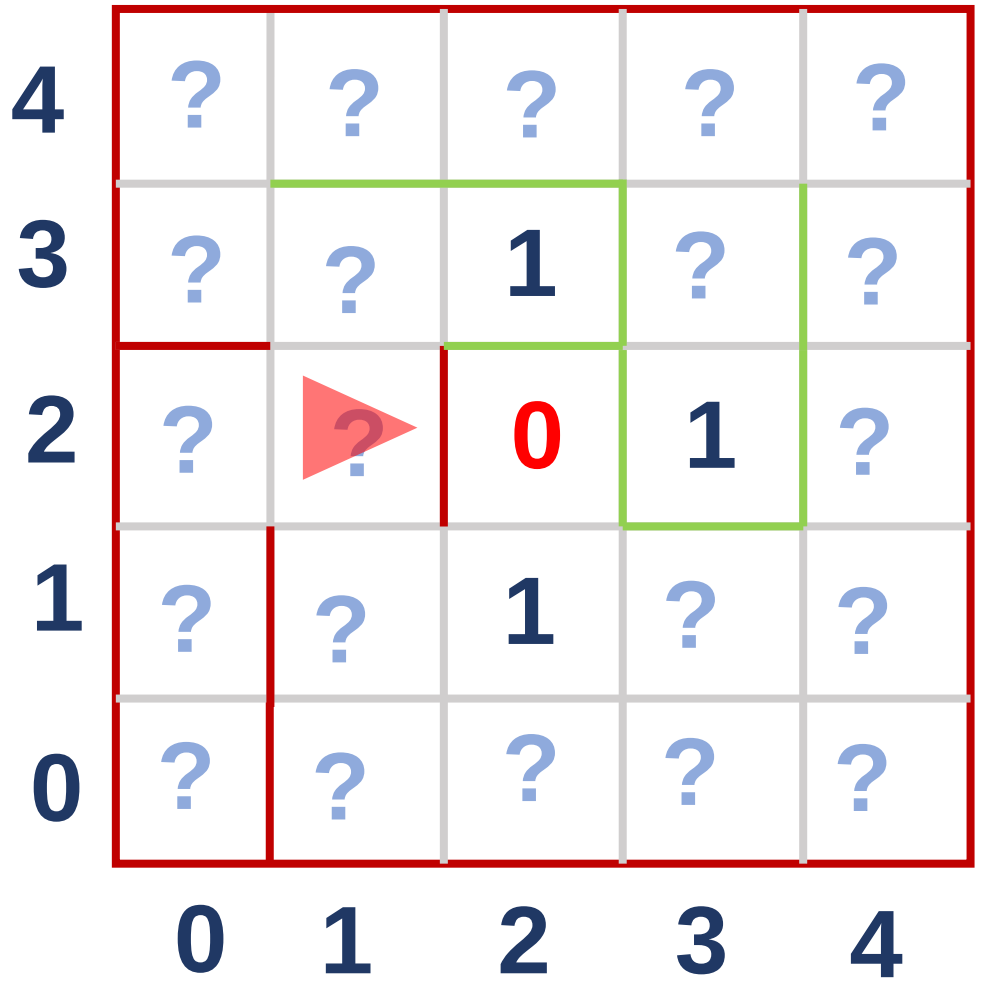

Floodfill Pseudocode

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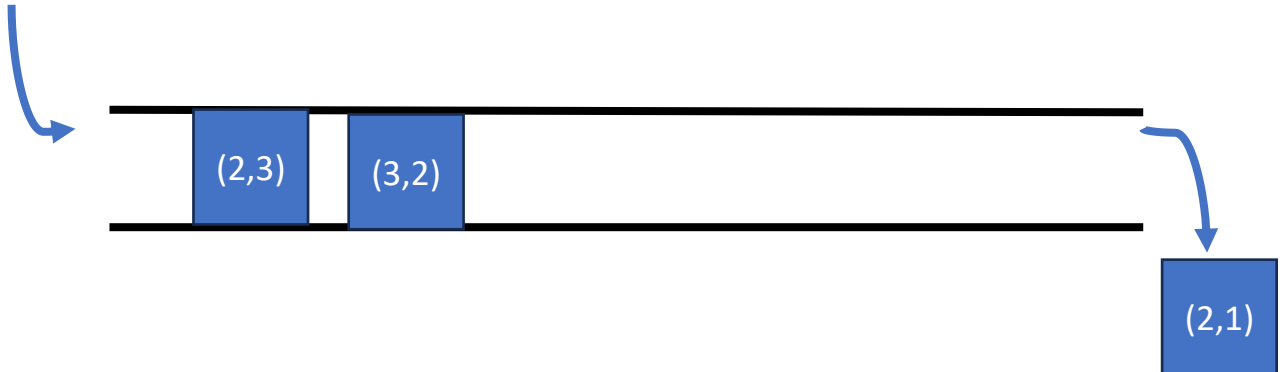

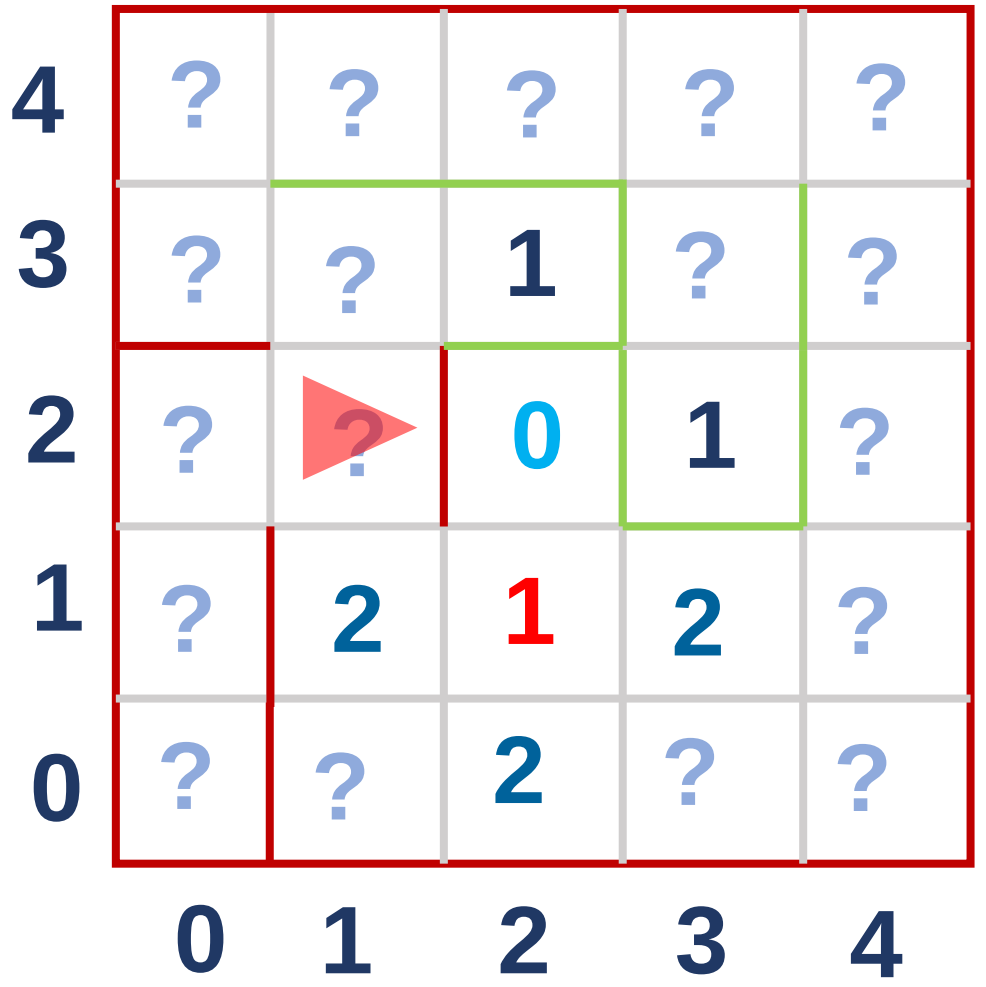

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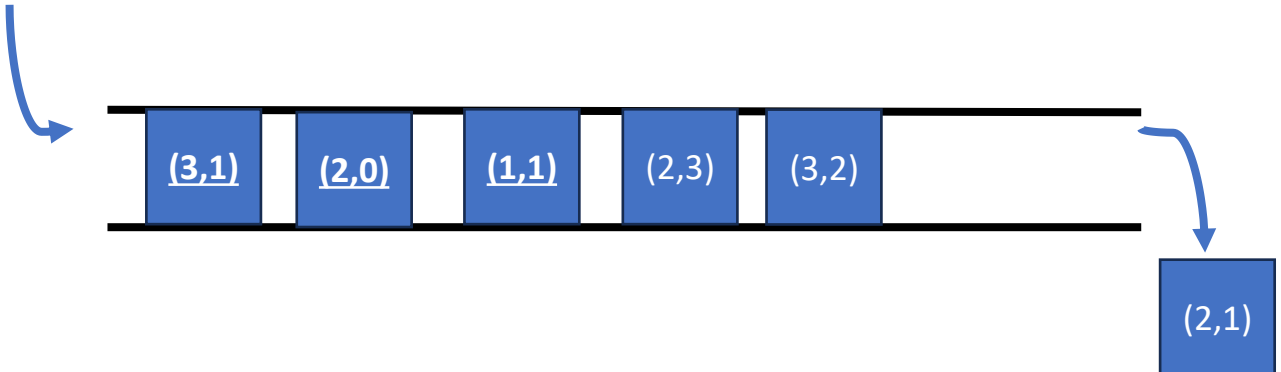

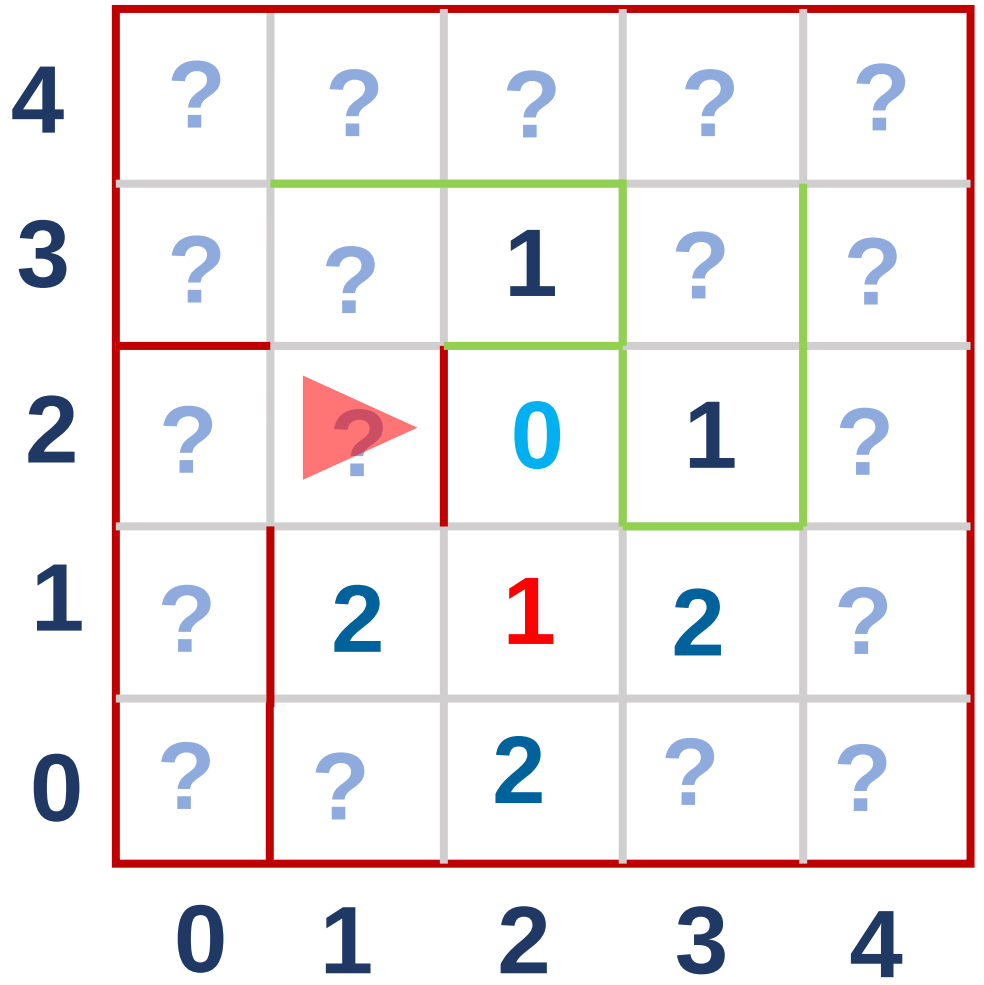

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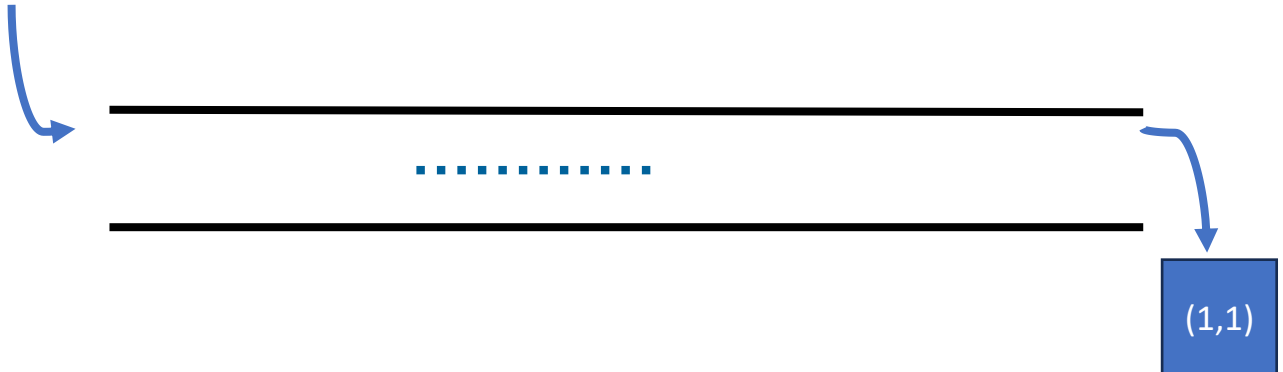

4	?	?	2	?	?
3	?	2	1	2	?
2	?	3	0	1	2
1	?	2	1	2	?
0	?	3	2	?	?
	0	1	2	3	4

Skip some more steps

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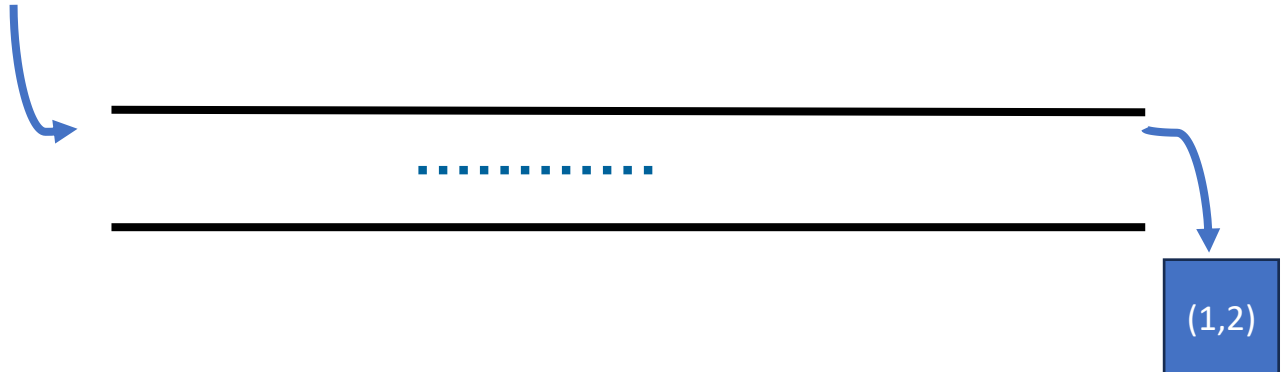
4	?	3	2	3	?
3	3	2	1	2	3
2	4	3	0	1	2
1	?	2	1	2	3
0	?	3	2	3	?
	0	1	2	3	4



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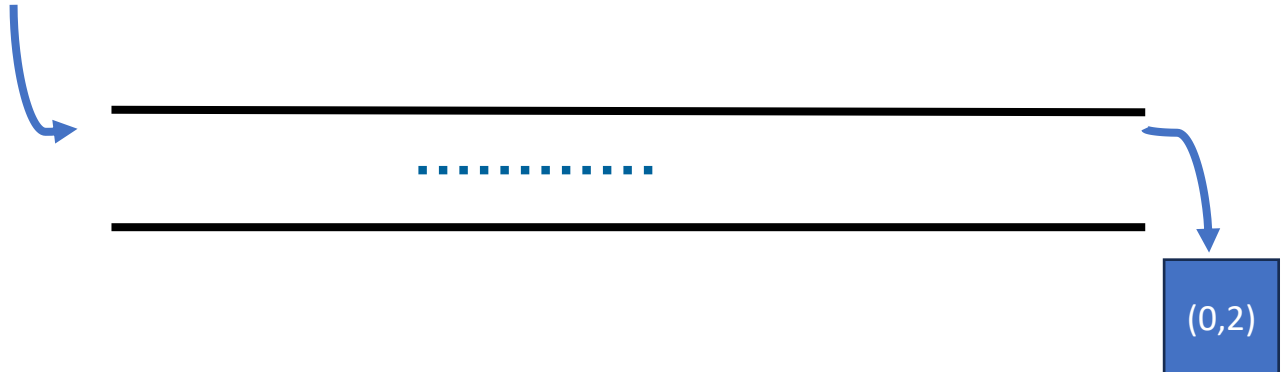
4	4	3	2	3	4
3	3	2	1	2	3
2	4	3	0	1	2
1	5	2	1	2	3
0	?	3	2	3	4
	0	1	2	3	4



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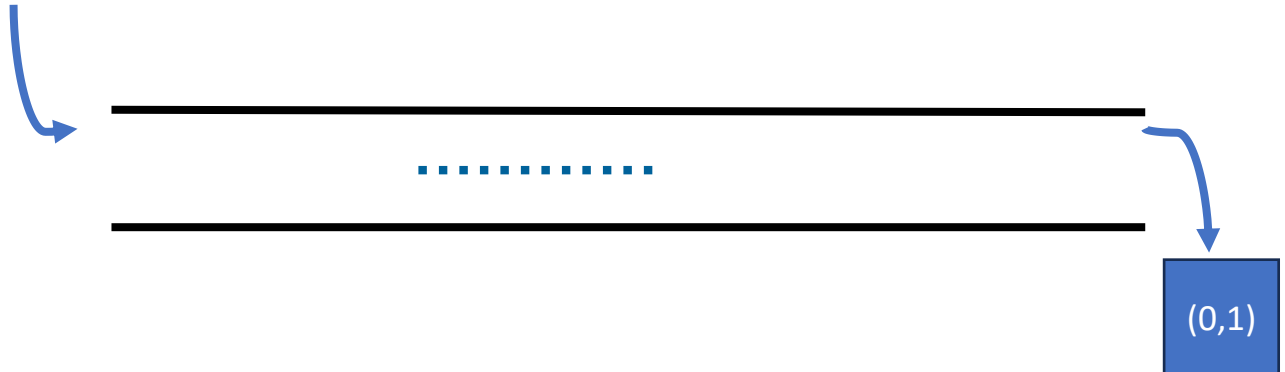
4	4	3	2	3	4
3	3	2	1	2	3
2	4	3	0	1	2
1	5	2	1	2	3
0	6	3	2	3	4
	0	1	2	3	4



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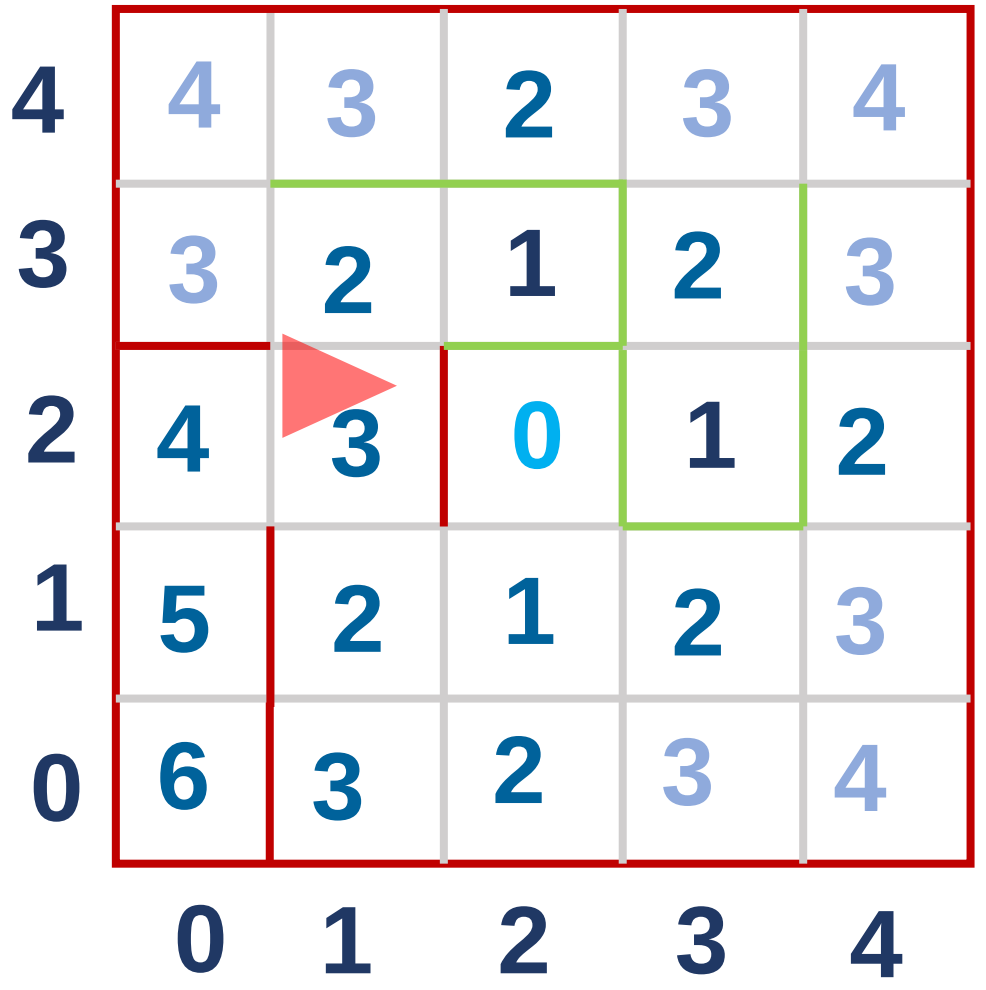
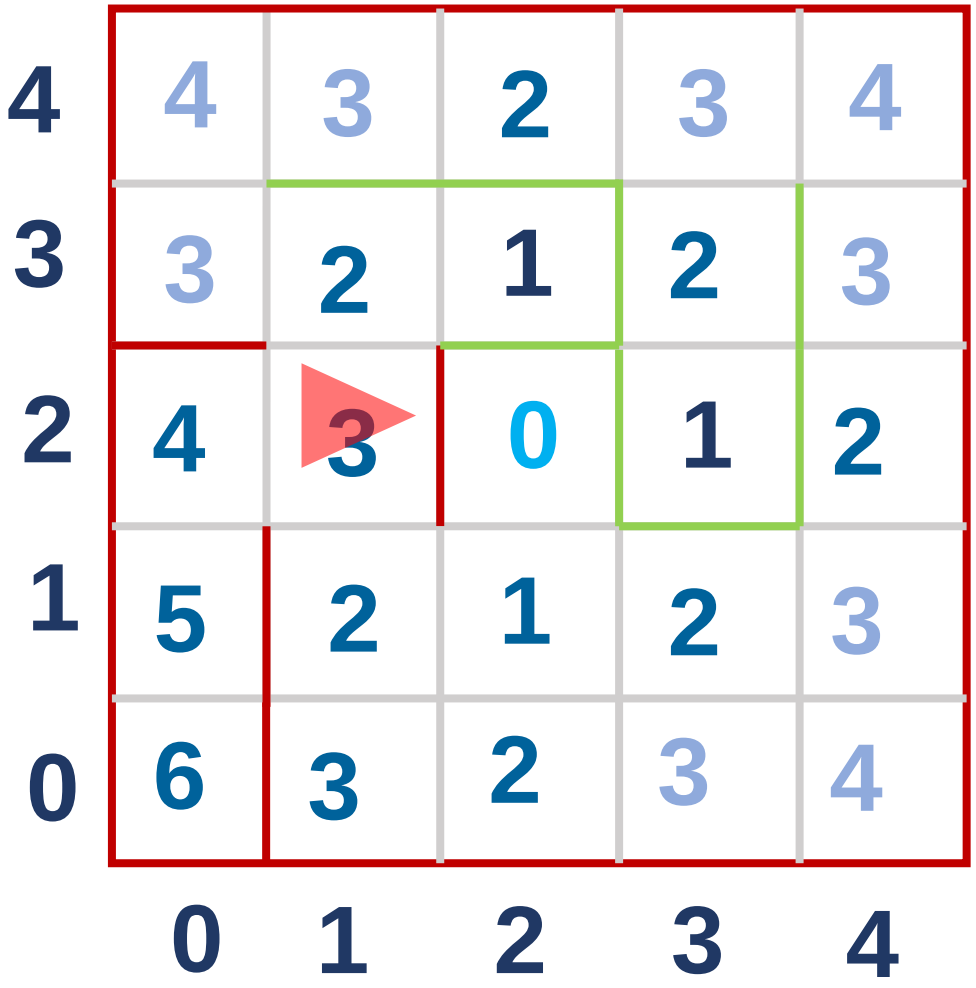
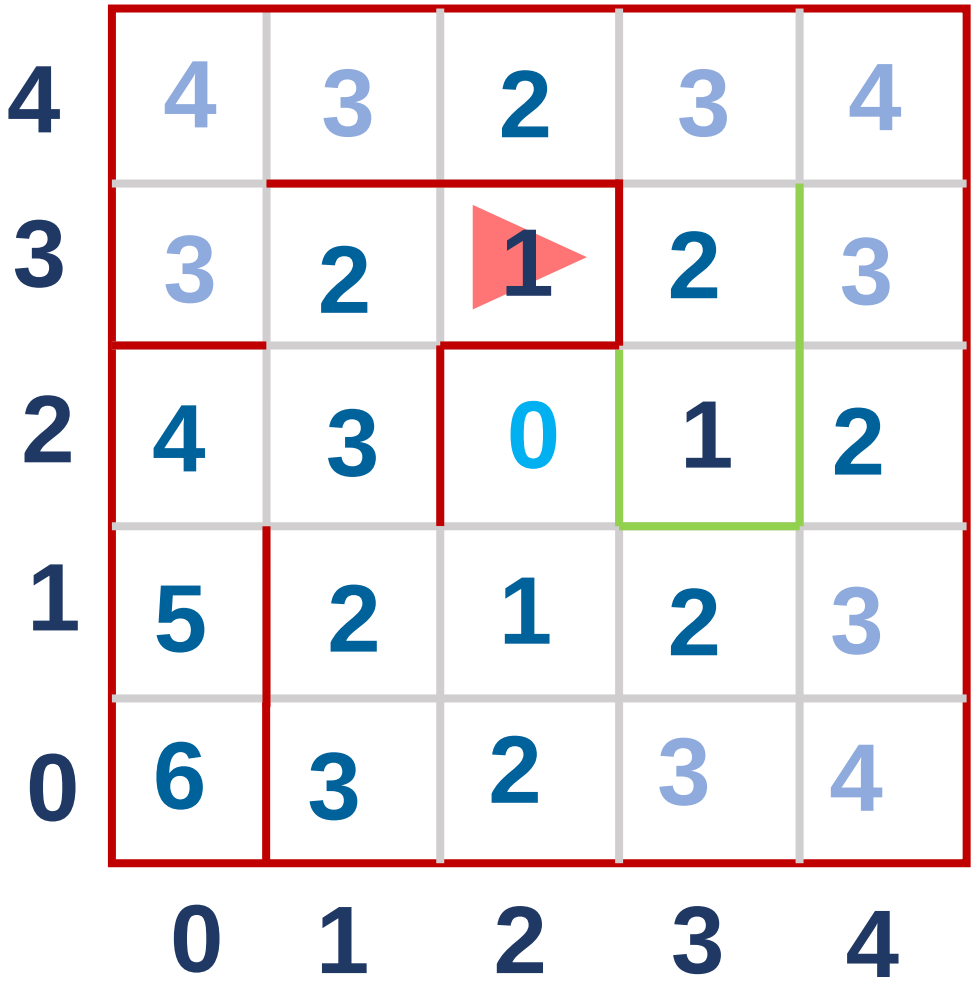
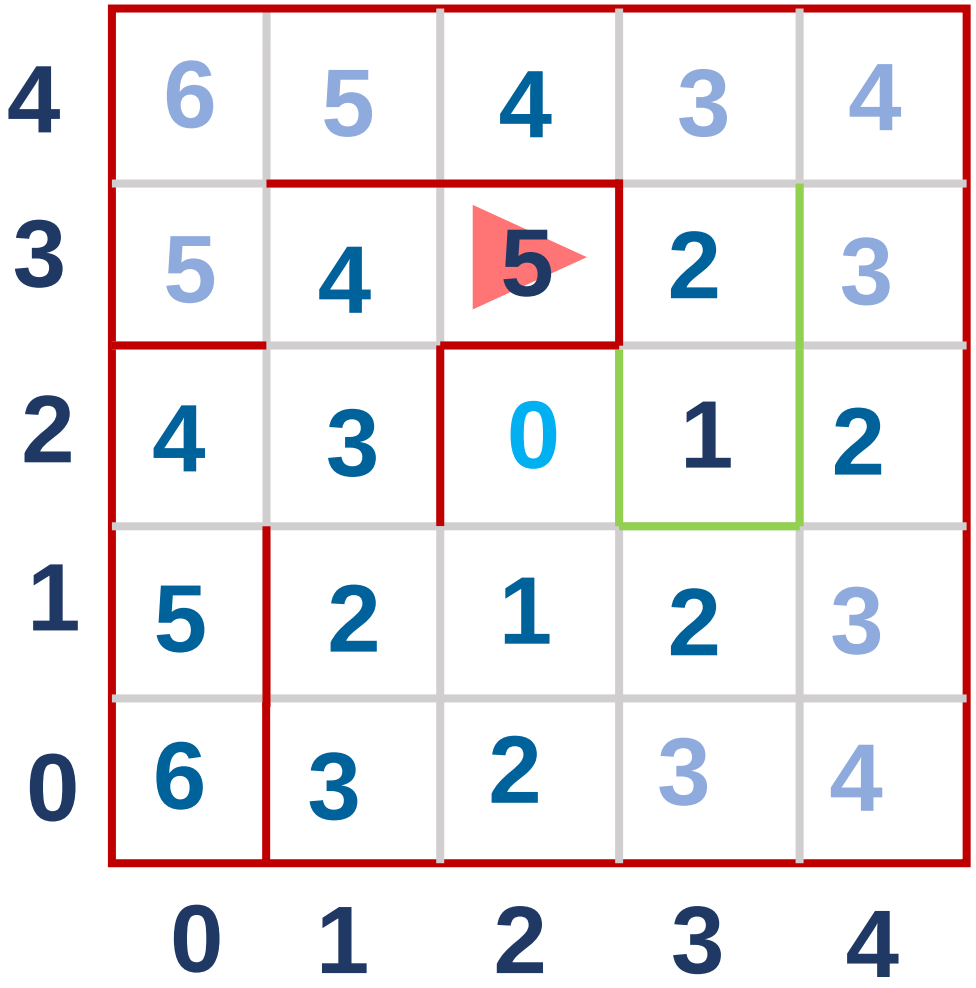
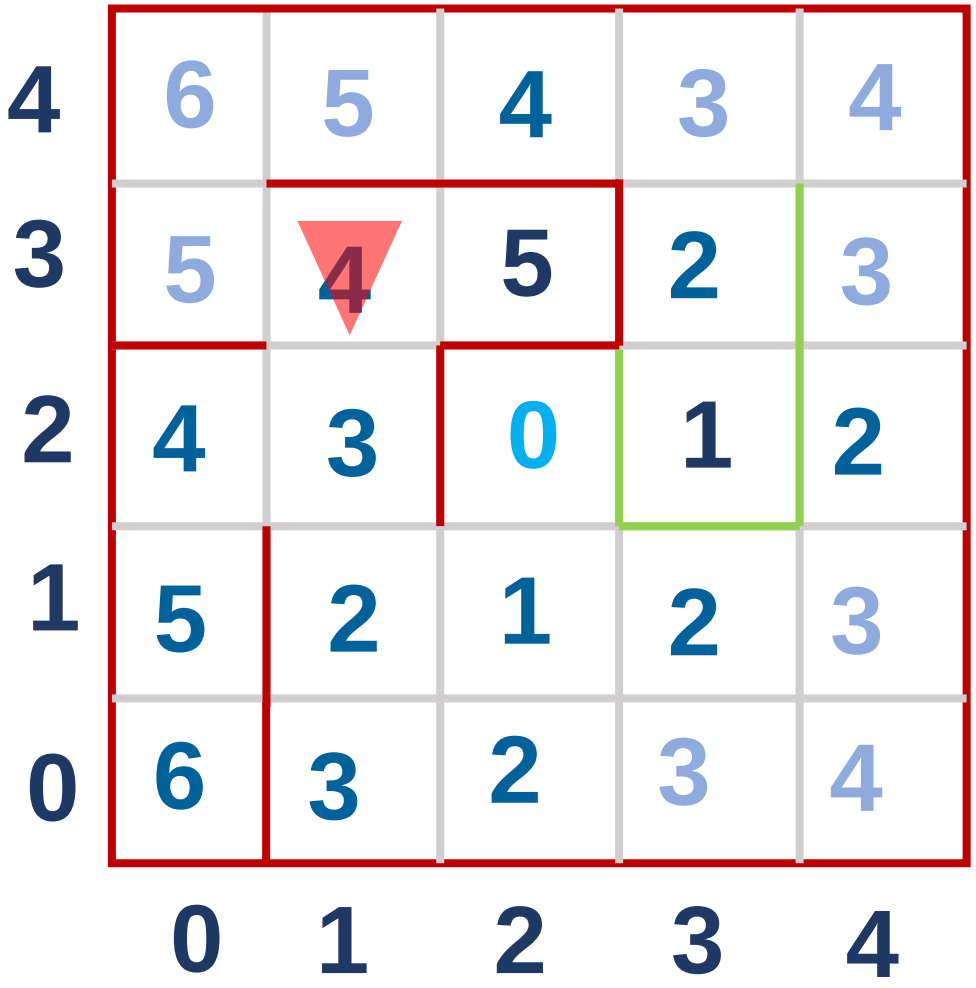
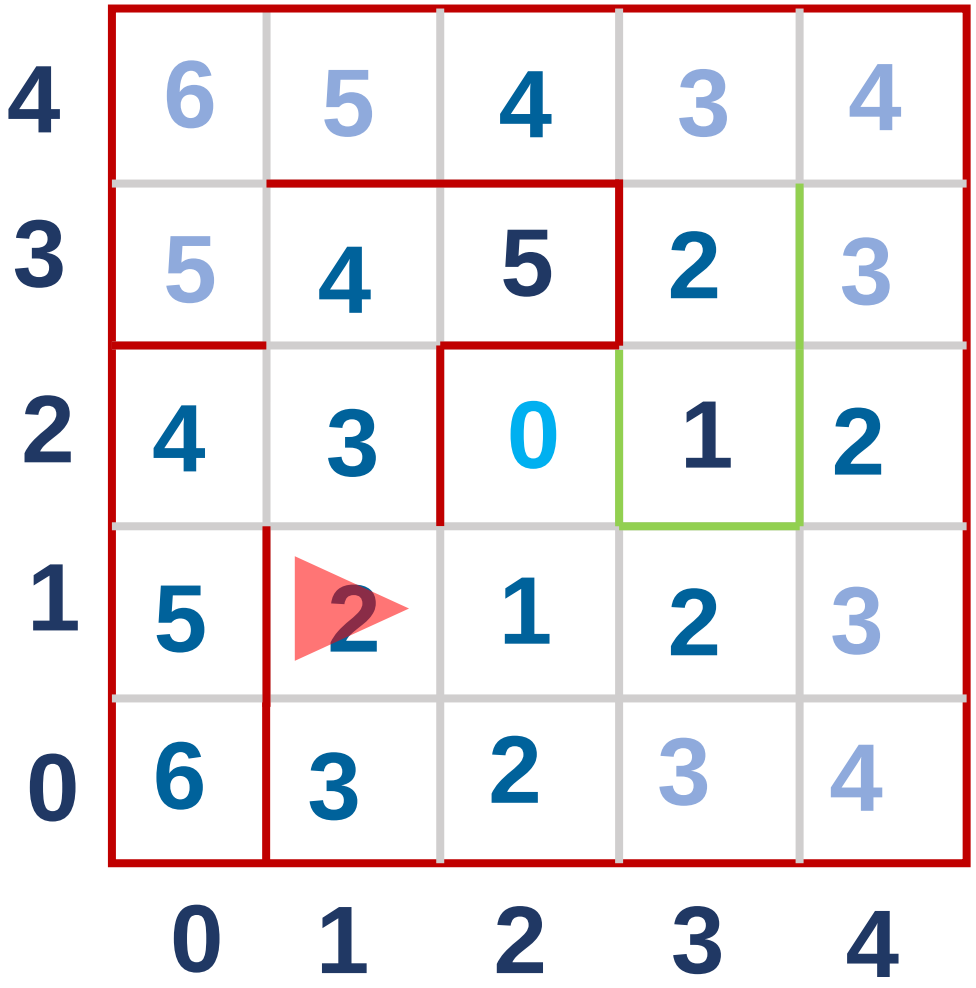


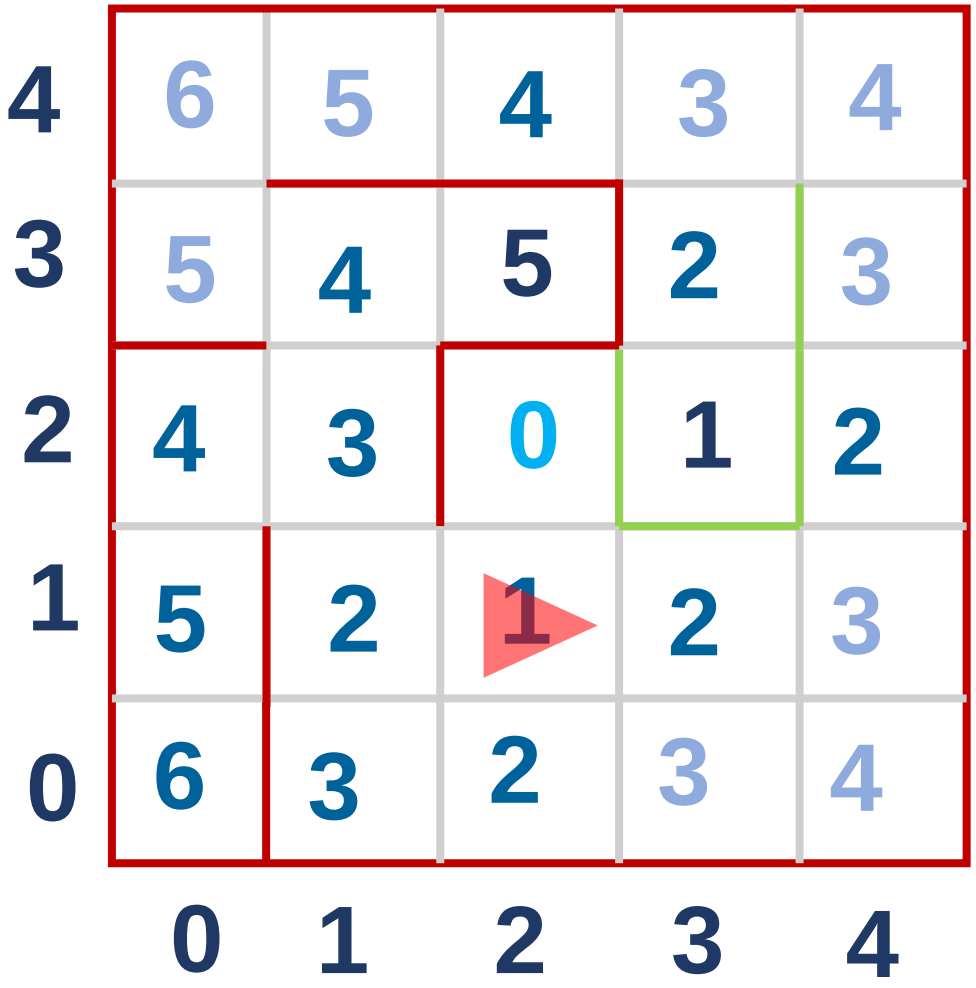

4 3 2 3 4
3 2 1 2 3
4 3 0 1 2
5 2 1 2 3
6 3 2 3 4
4 3 2 1 0
0 1 2 3 4

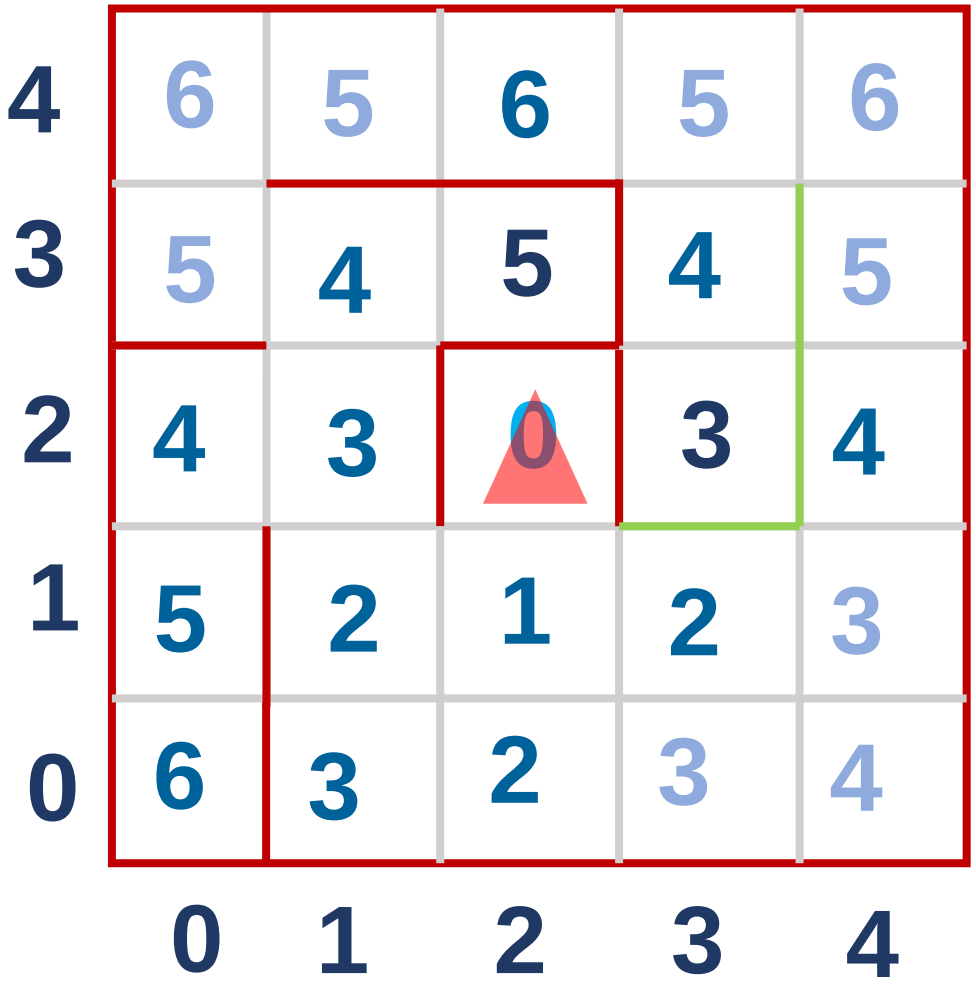

4 3 2 3 4
3 3 2 1 2 3
2 4 3 0 1 2
1 5 2 1 2 3
0 6 3 2 3 4
0 1 2 3 4


4
3
2
1
0
6 5 4 3 4
5 4 5 2 3
4 3 0 1 2
5 2 1 2 3
6 3 2 3 4
0 1 2 3 4

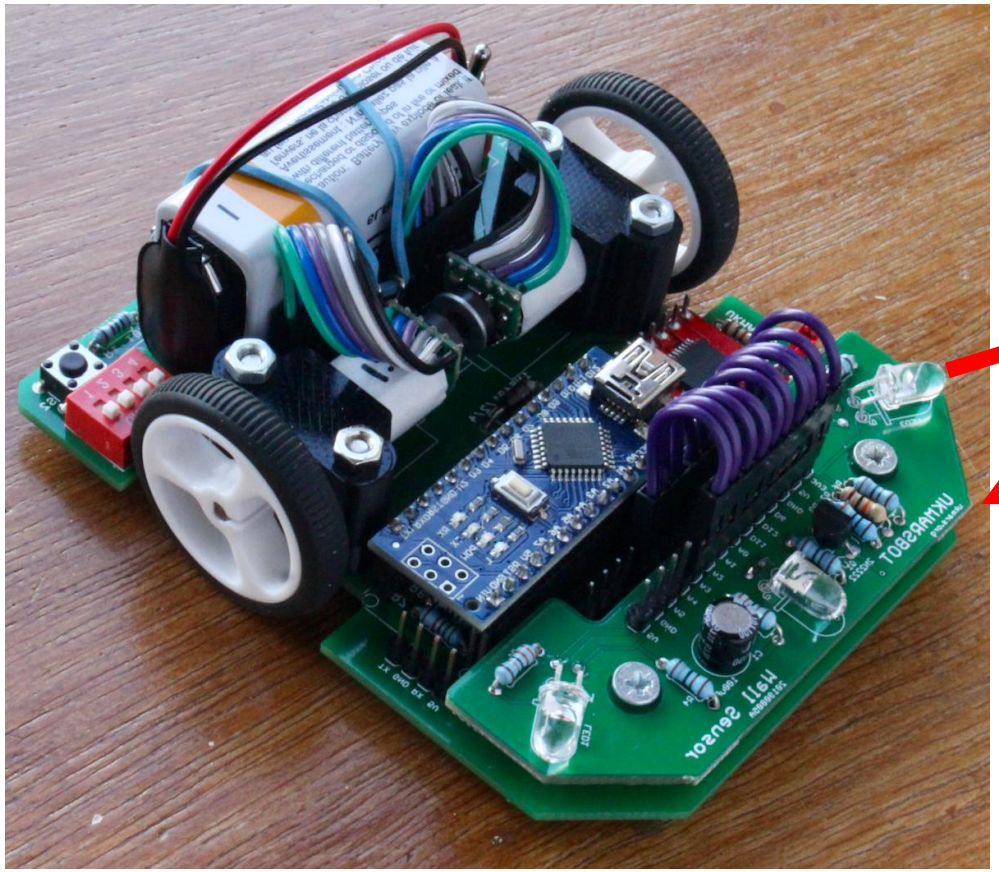

4 6 5 4 3 4
3 5 4 5 2 3
2 4 3 0 1 2
1 5 2 1 2 3
0 6 3 2 3 4
0 1 2 3 4

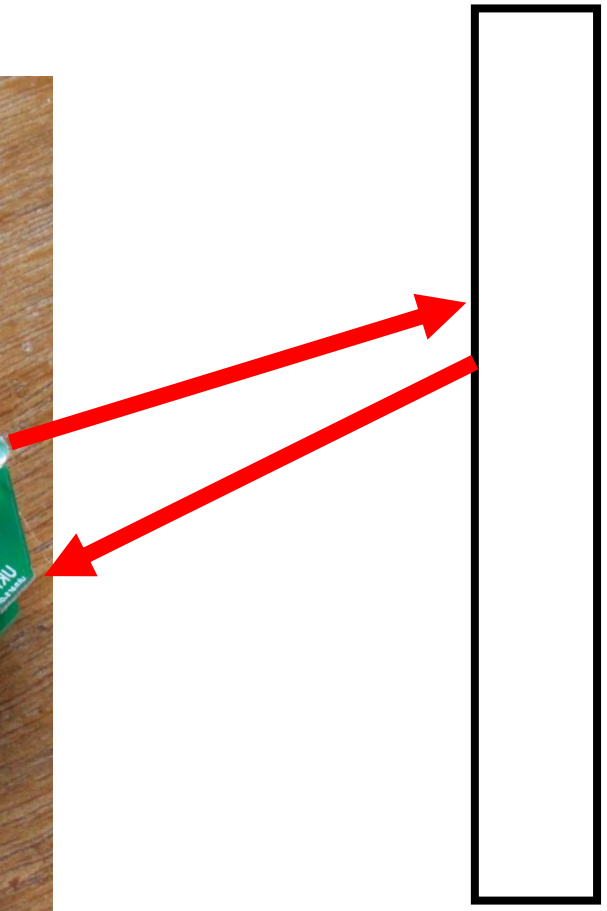

4 6 5 4 3 4
3 5 4 5 2 3
2 4 3 0 1 2
1 5 2 1 2 3
0 6 3 2 3 4
0 1 2 3 4


4 6 5 4 3 4
3 5 4 5 2 3
2 4 3 0 1 2
1 5 2 1 2 3
0 6 3 2 3 4
0 1 2 3 4


4
3
2
1
0
6 5 6 5 6
5 4 5 4 5
4 3 0 3 4
5 2 1 2 3
6 3 2 3 4
0 1 2 3 4

Wall Detection





Right Receiver A0
Middle Receiver A1
Left Receiver A2

analogRead(A1); - > value between 0-1023

Emitters: Pin 12
digitalWrite(12, HIGH);

Wall Detection

```
const int EMITTERS = 12; // EMITTERS
const int RED_LED = 13; // RED LED AT H BRIDGE

const int INDICATOR_LED_R = 6; // INDICATOR LED RIGHT
const int INDICATOR_LED_L = 11; // INDICATOR LED LEFT
// Phototransistors
const int RIGHT_SENSOR = A0;
const int LEFT_SENSOR = A2;
const int MIDDLE_SENSOR = A1;
void setup() {
  Serial.begin(9600);

  pinMode(EMITTERS, OUTPUT);
  pinMode(RED_LED, OUTPUT);
  pinMode(INDICATOR_LED_R, OUTPUT);
  pinMode(INDICATOR_LED_L, OUTPUT);
```

Wall Detection

```
void loop() {

  digitalWrite(EMITTERS, HIGH);
  Serial.println(analogRead(RIGHT_SENSOR));
```

STARTER CODE ON GITHUB:

https://github.com/ieeecity/micromouse2024/

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