You are in a maze of twisty passages...

Minos 2009

Peter Harrison

www.micromouseonline.com

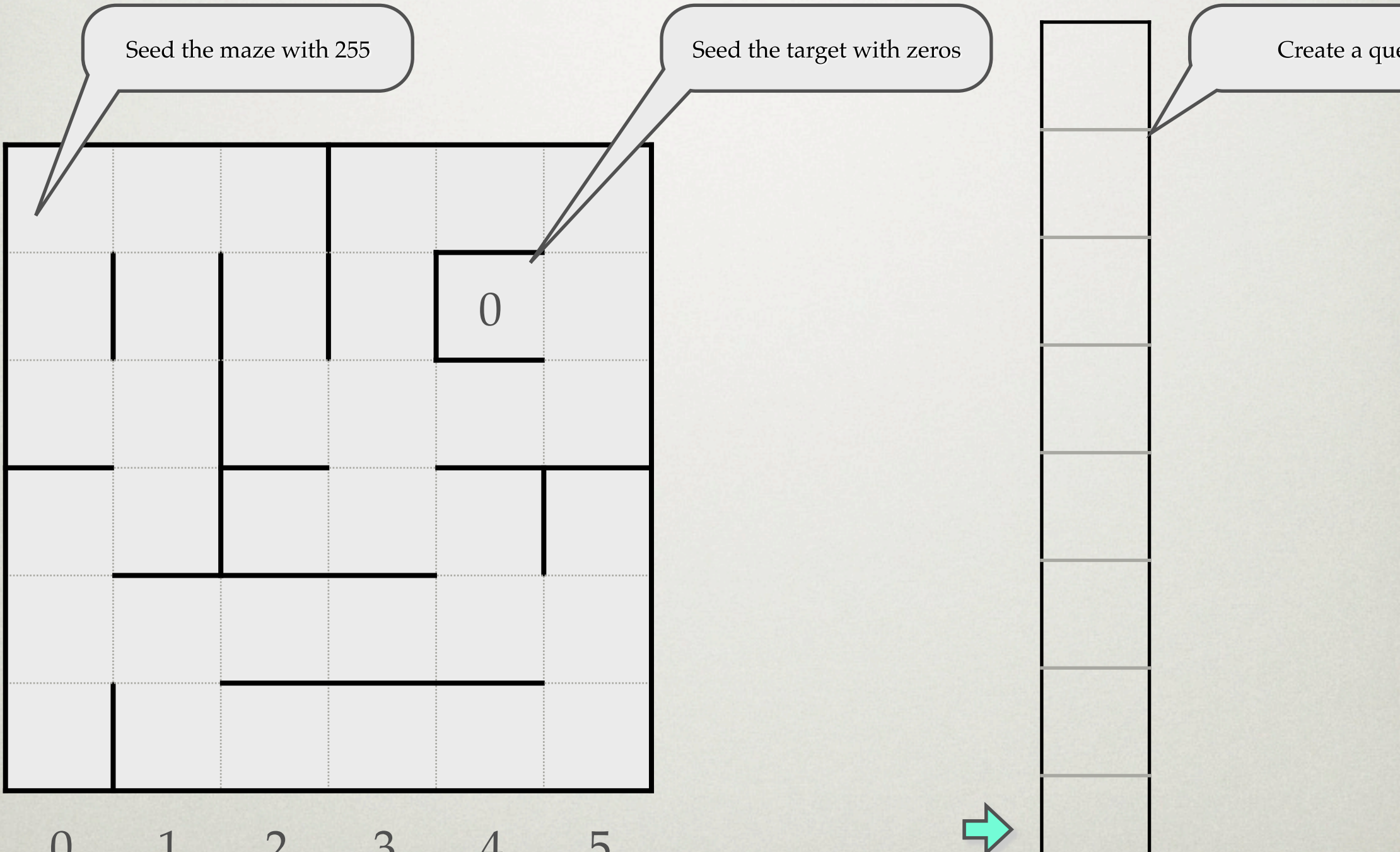
Fast is good

- Exploration Penalty
- Non-stop Exploring
- Multiple Strategies

Fast is good

- Explore: $v = 0.5ms^{-1}$, $a = 1.5ms^{-2}$
- Braking distance $s_b = v^2/2a = 83mm$
- Decide on cell boundary
- Thinking distance = 7mm
- Thinking time = s/v = 14ms

AT THE START


Seed the maze with 255
Seed the target with zeros
Create a que
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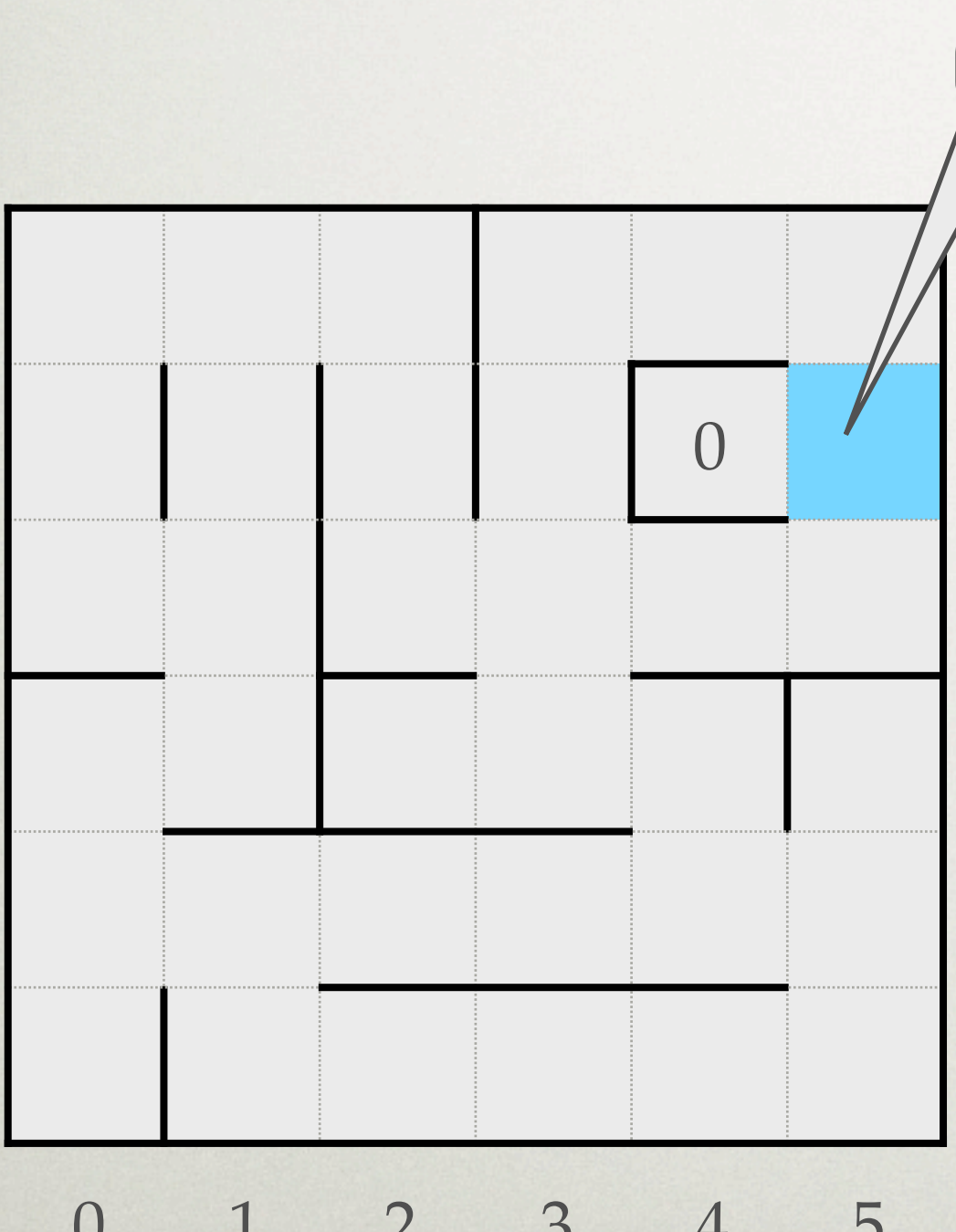
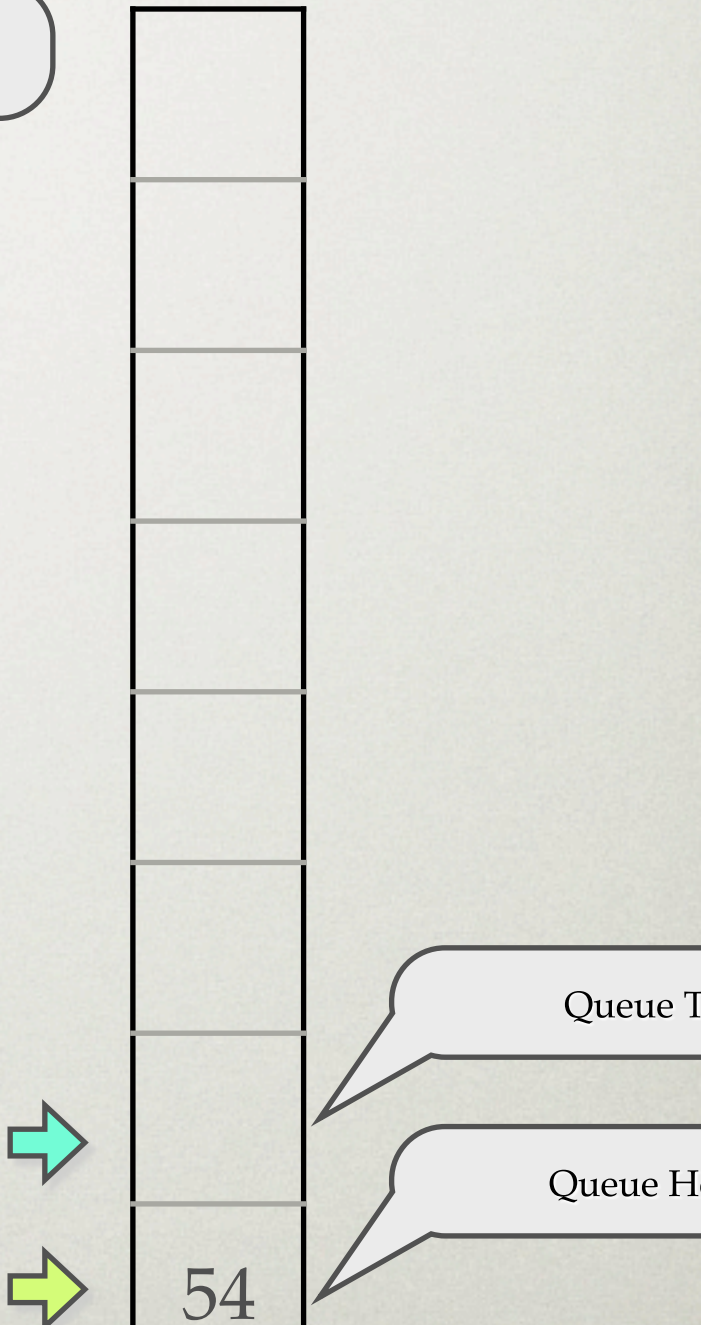
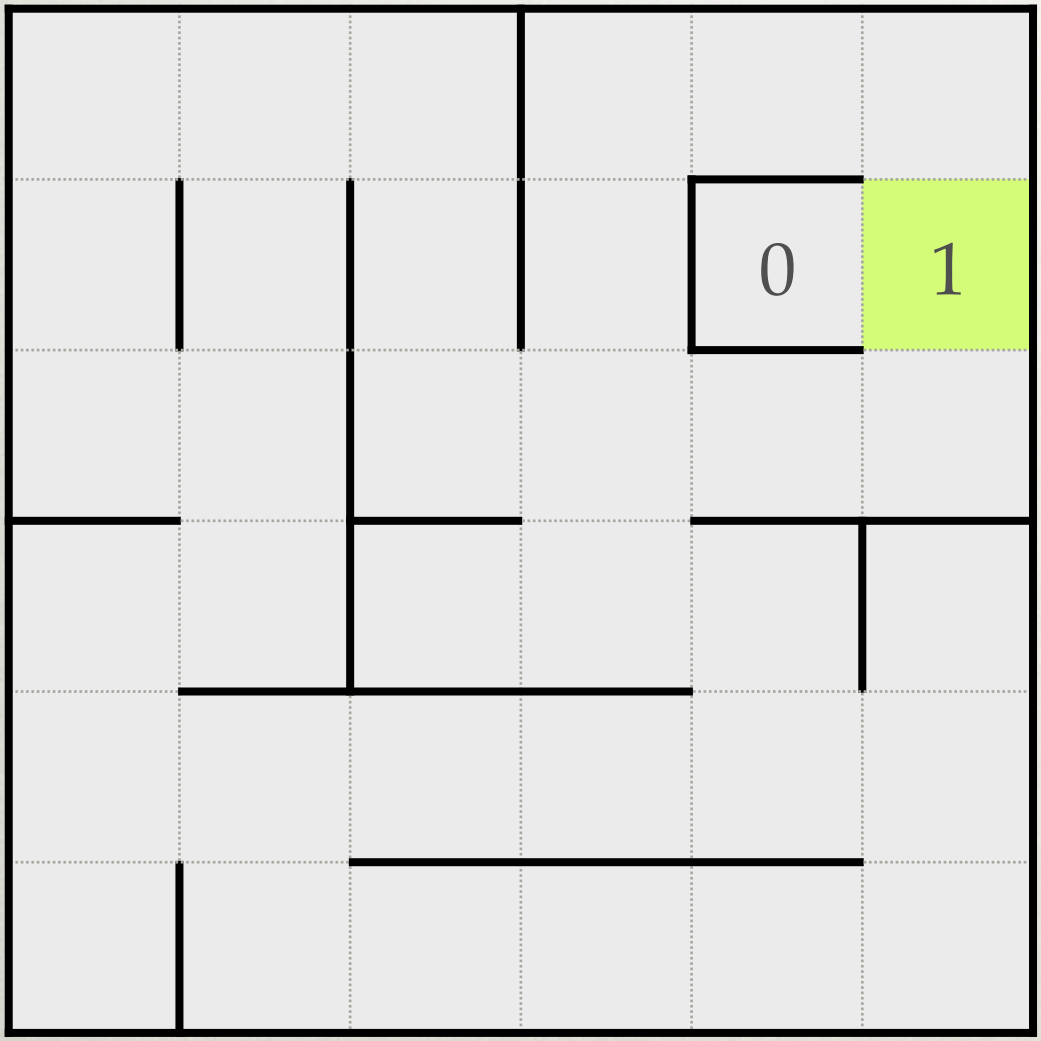
READY TO GO

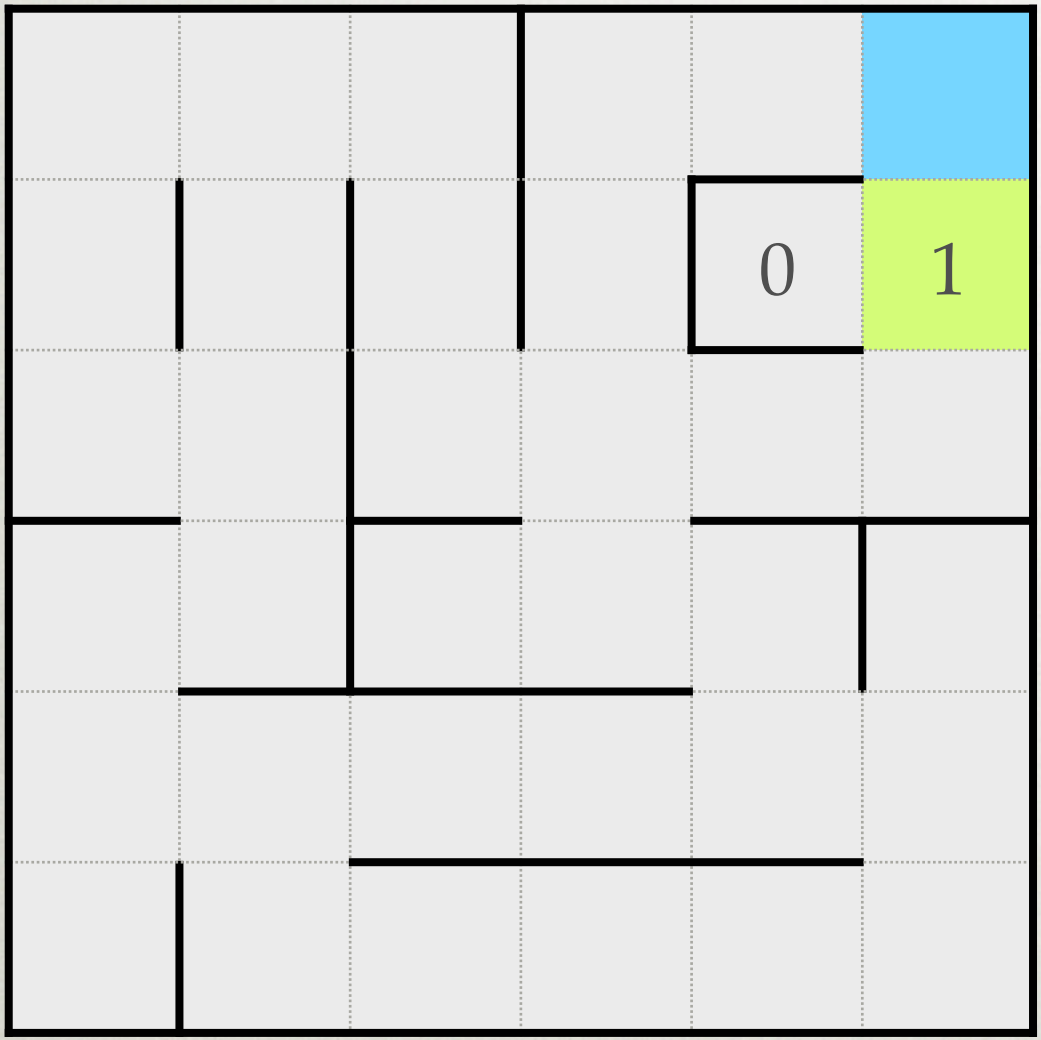




CALCULATE DISTANCE

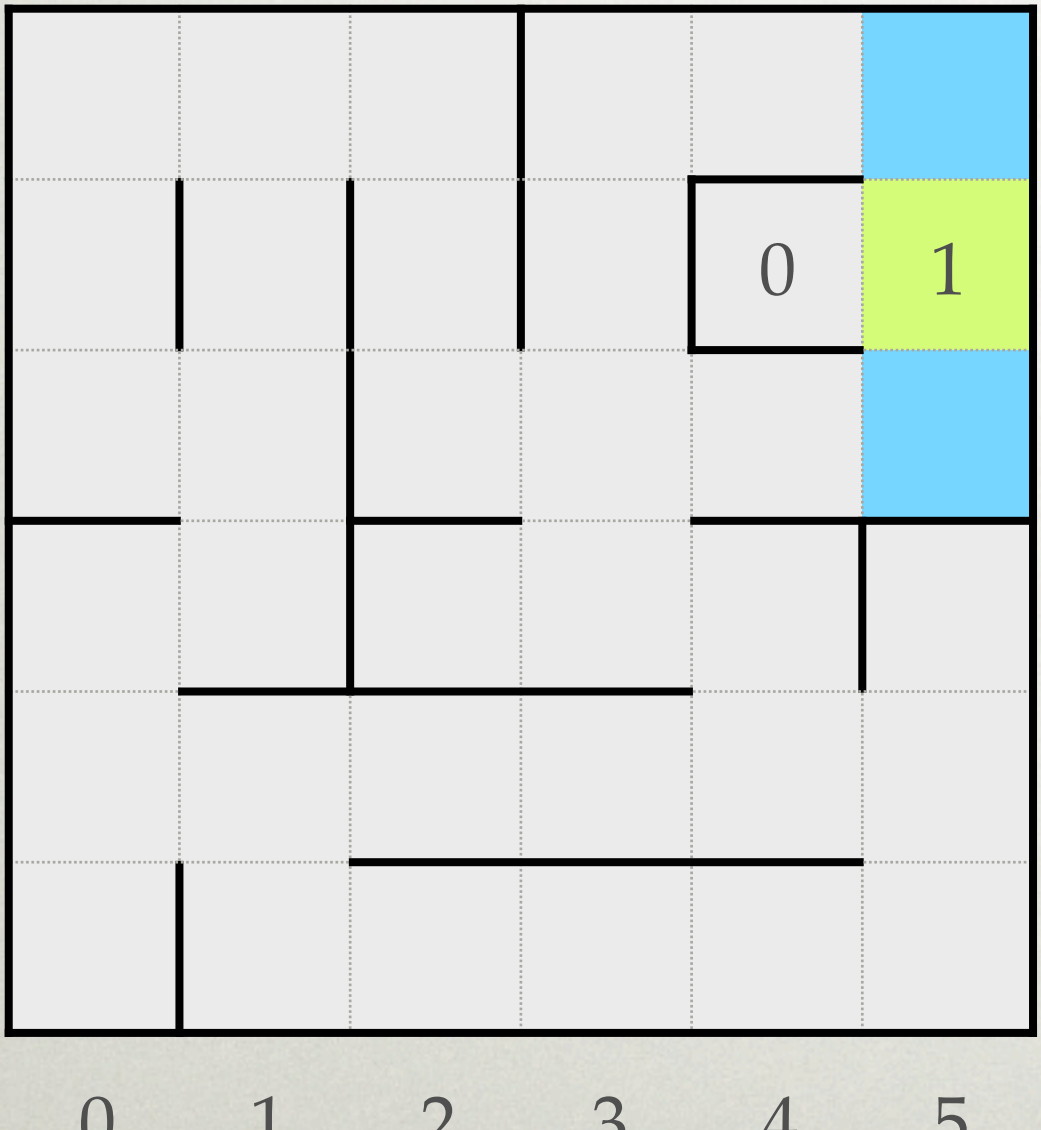


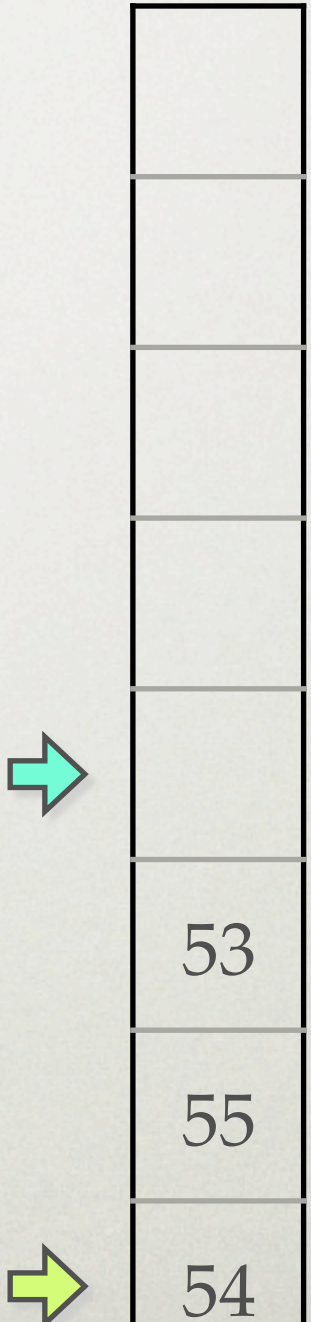
Add neighbours



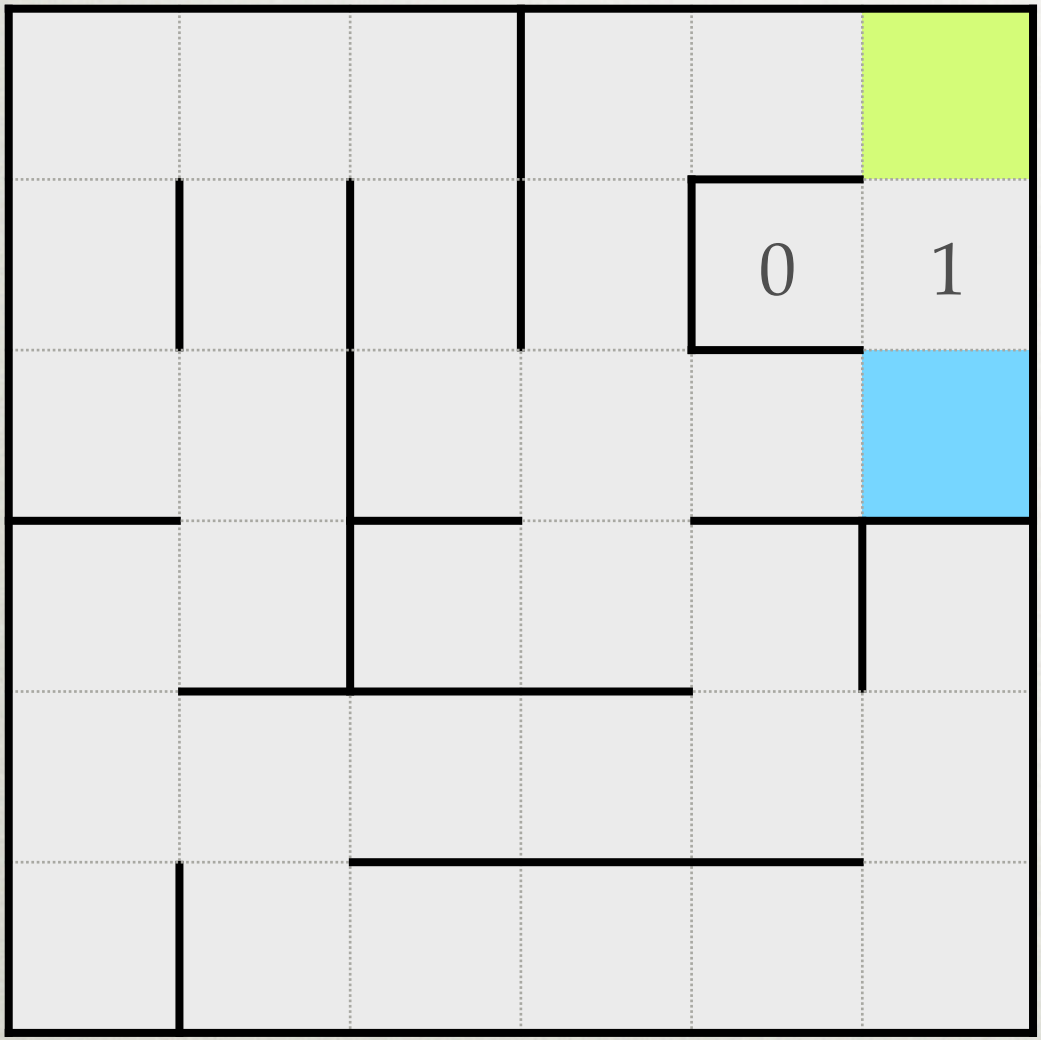
clockwise from

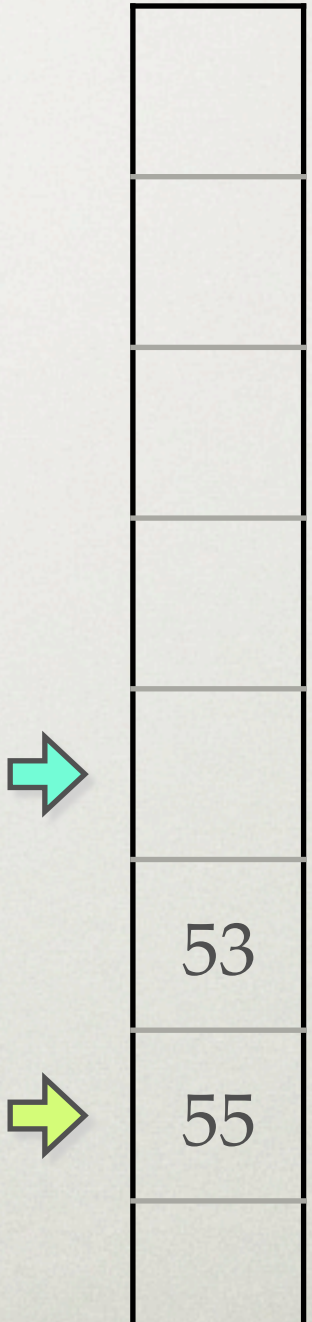
Add neighbours





FINISHED PROCESSING





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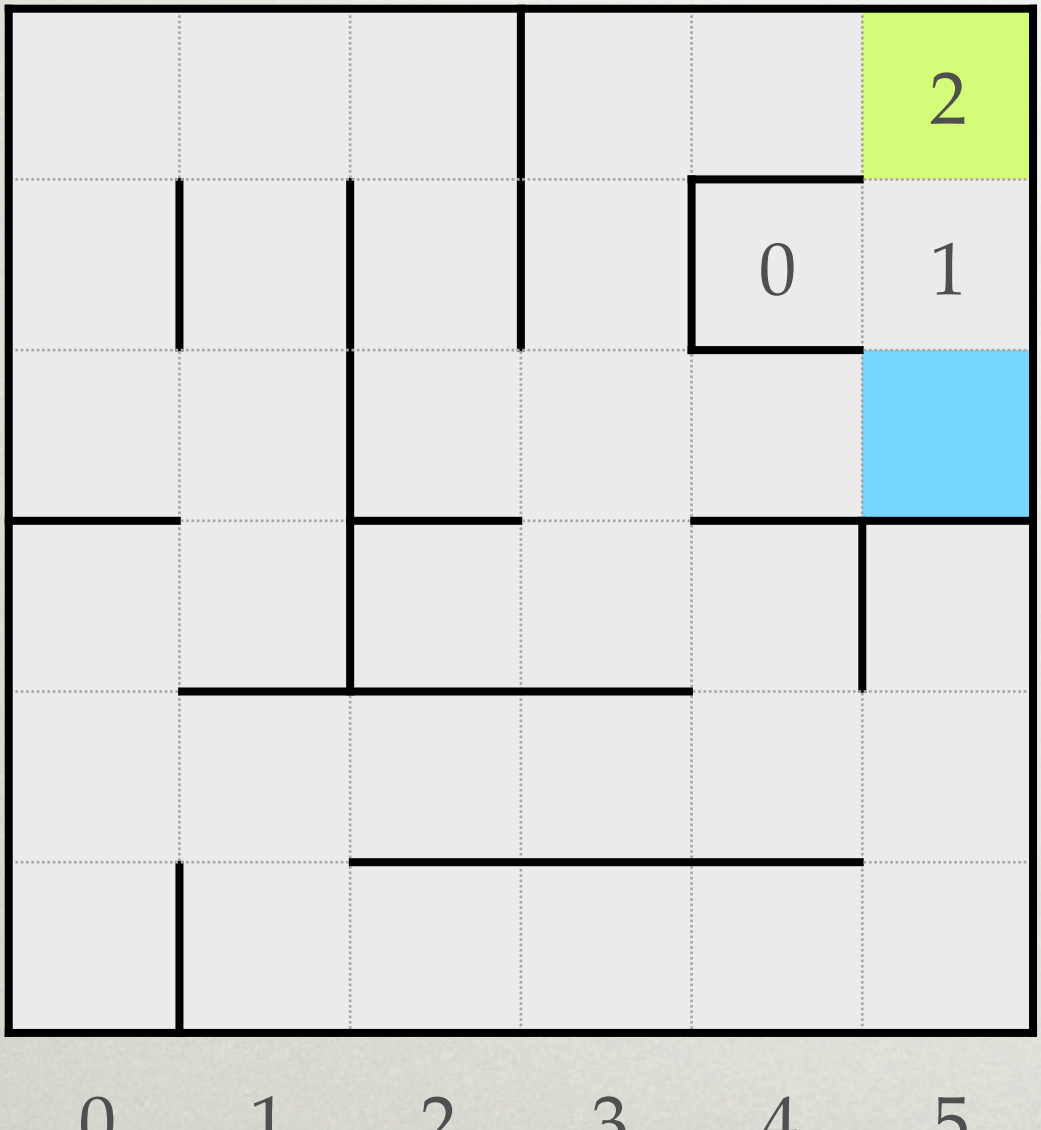
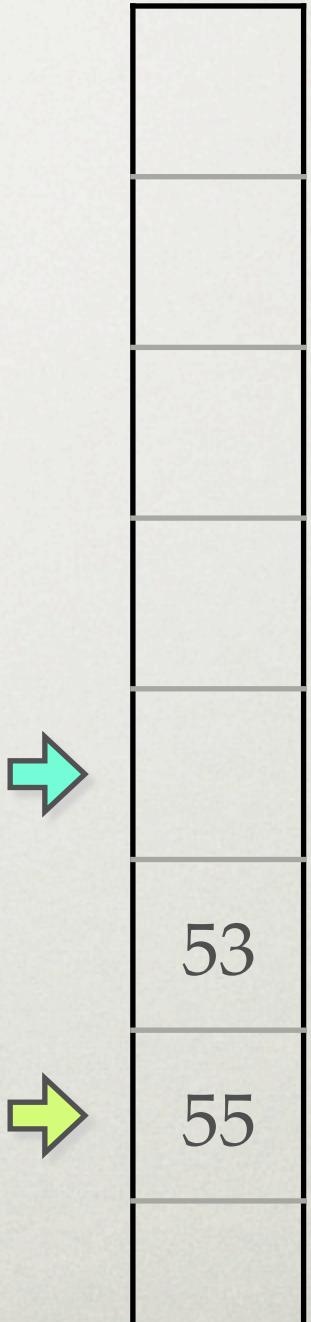
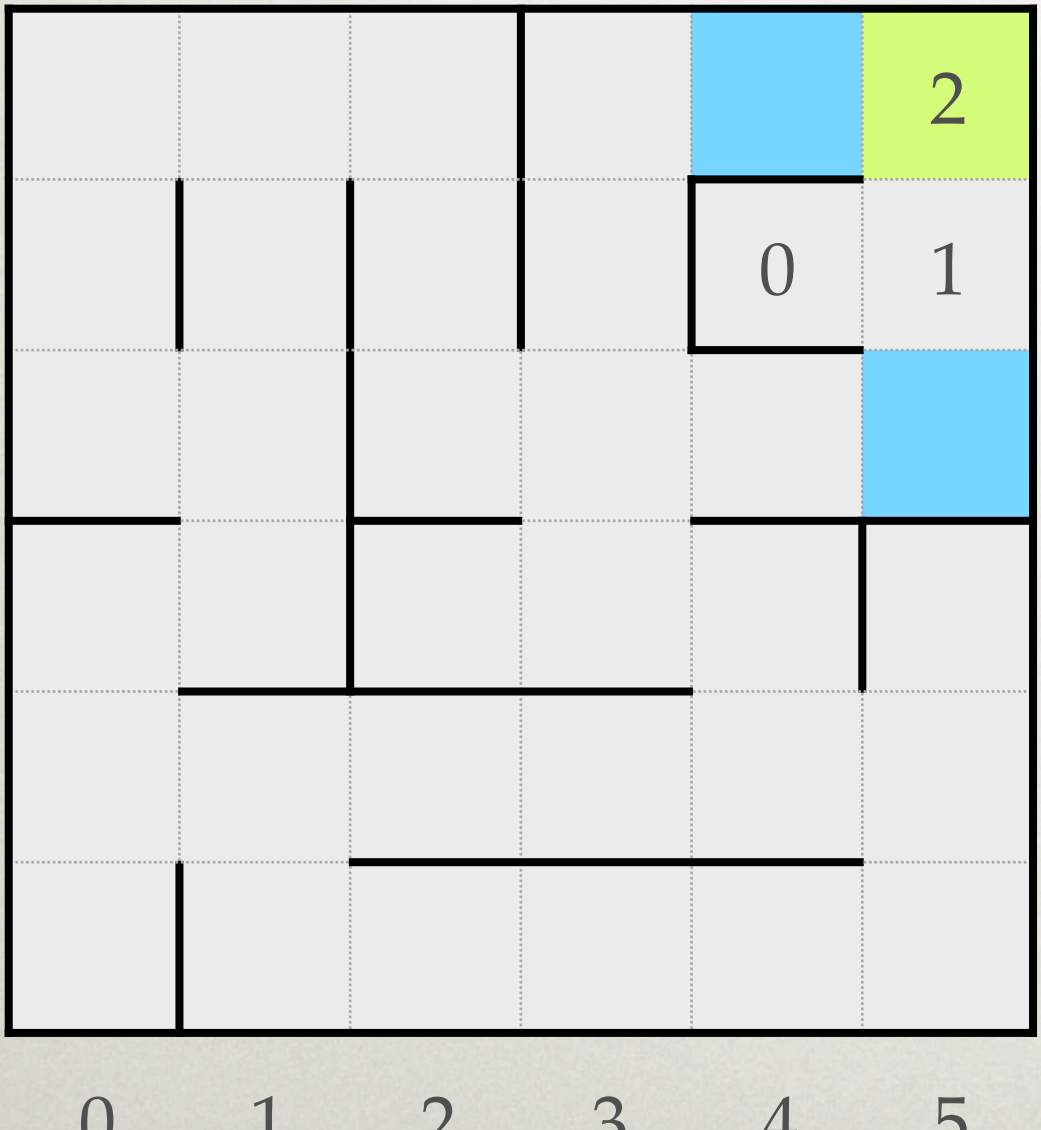
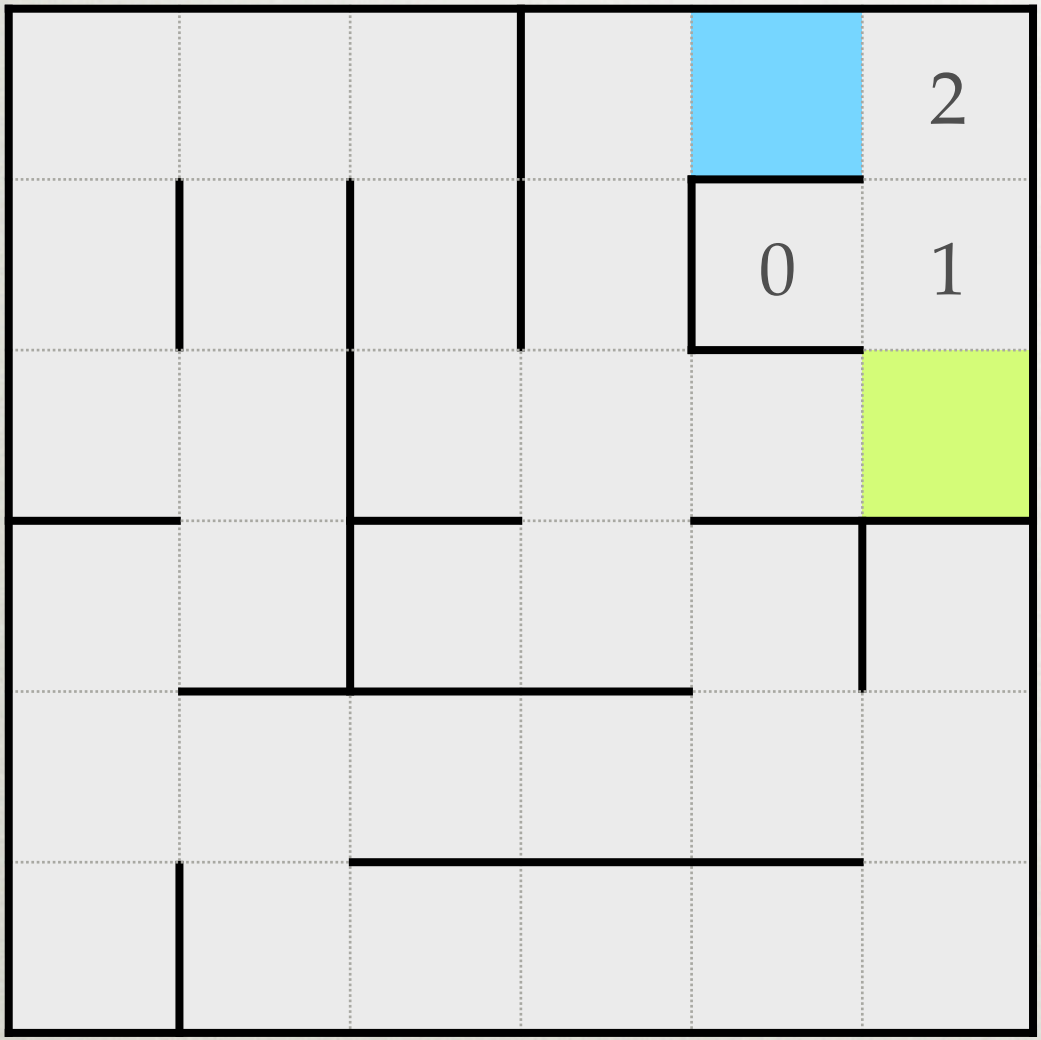




Add neighbours



MOVE HEAD



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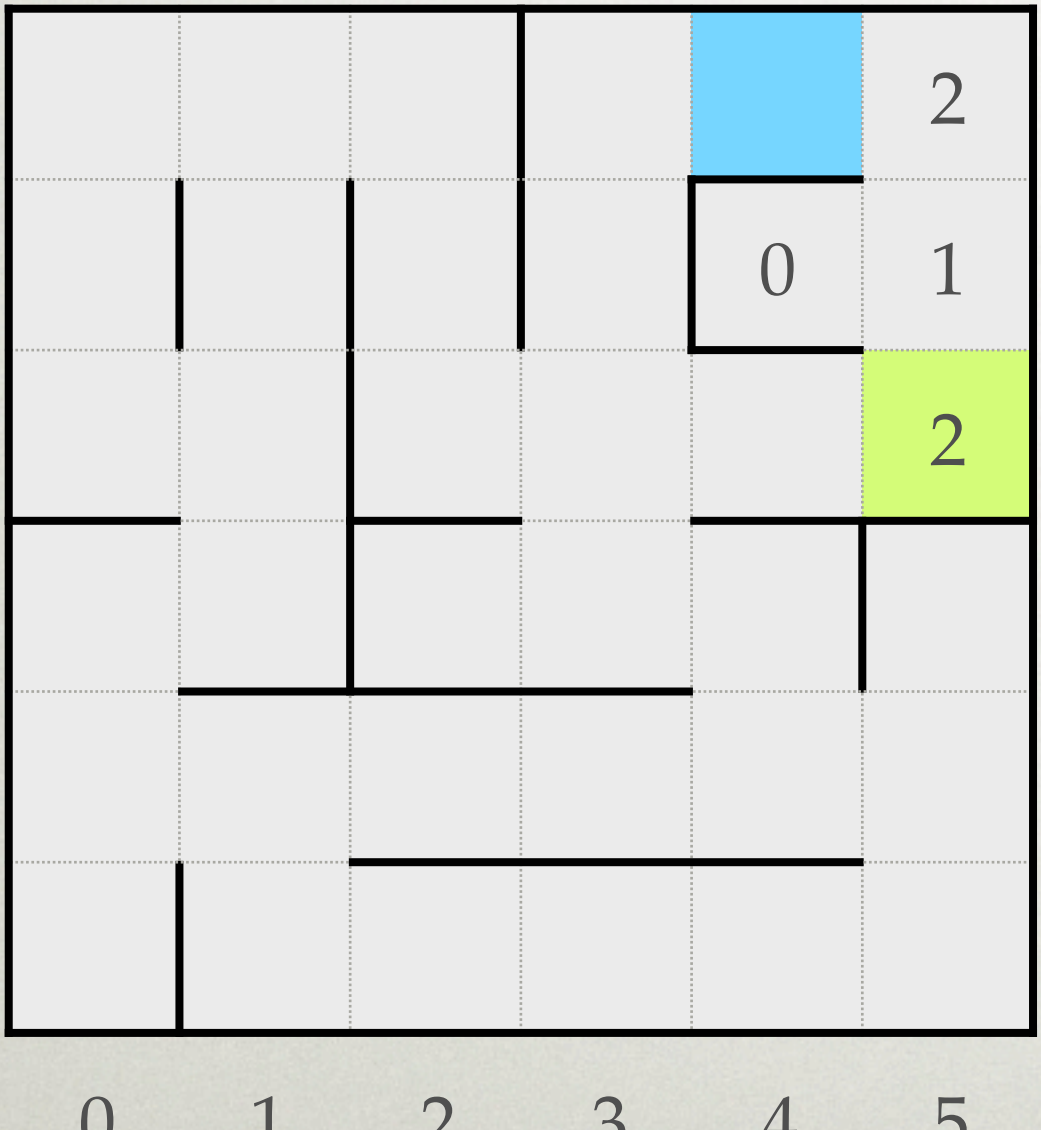

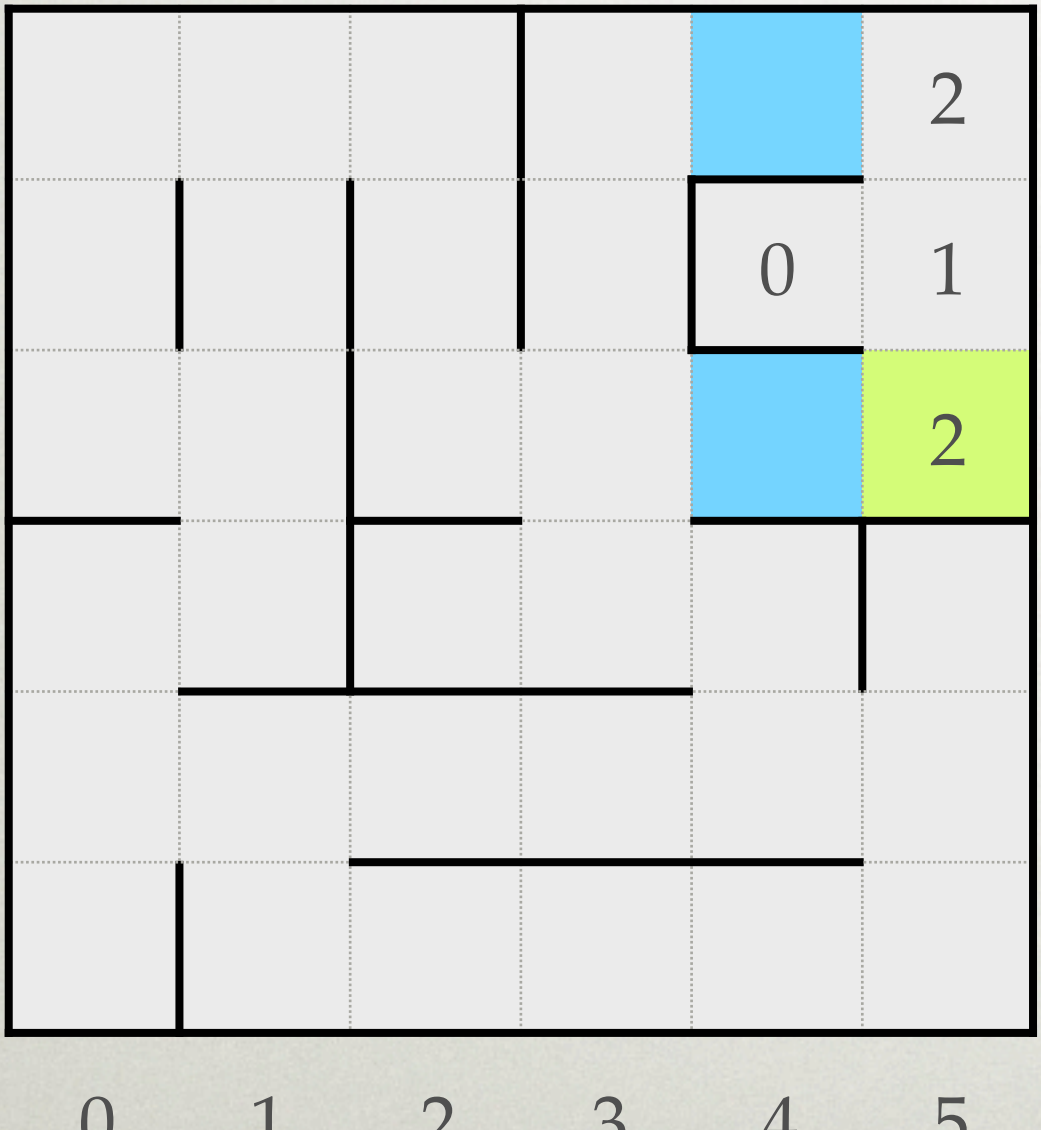
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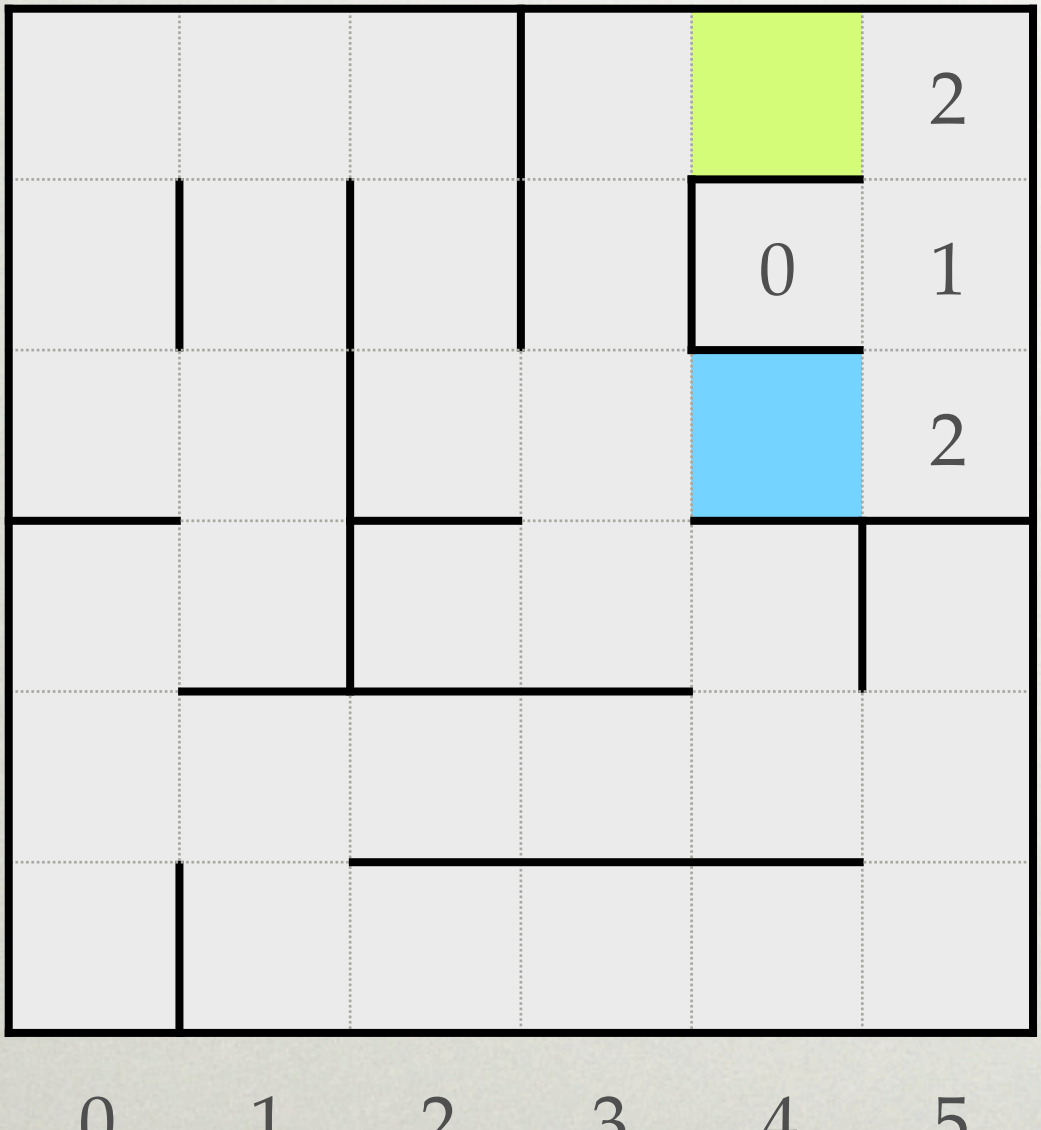
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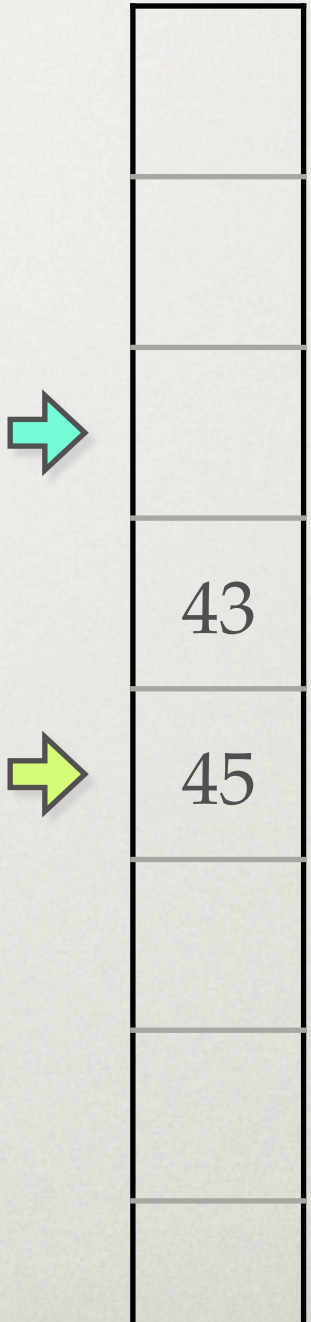
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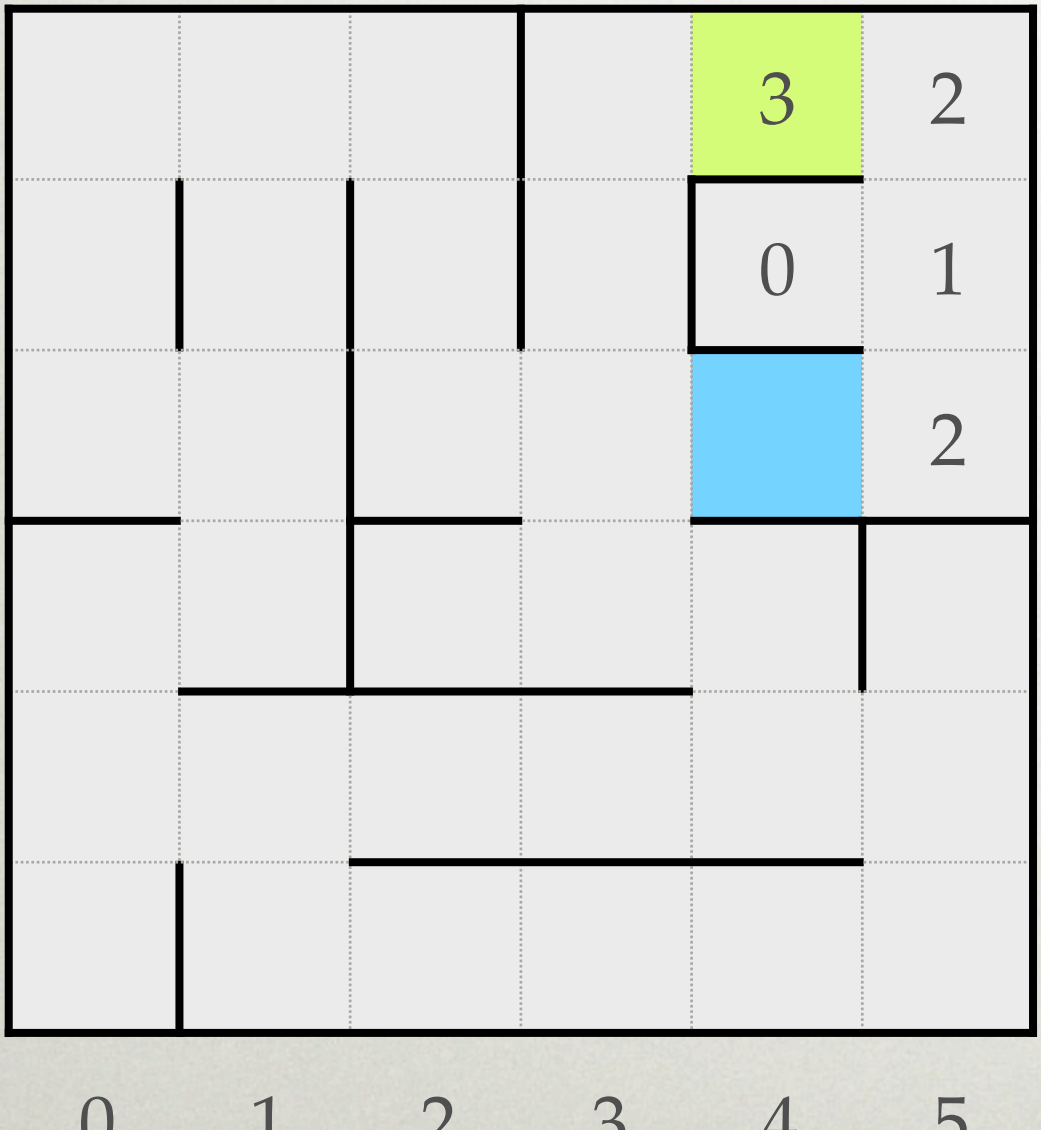
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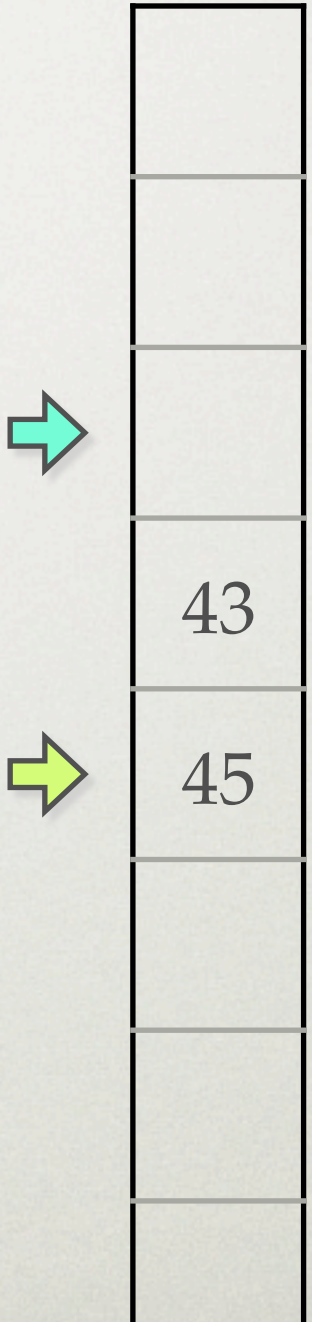
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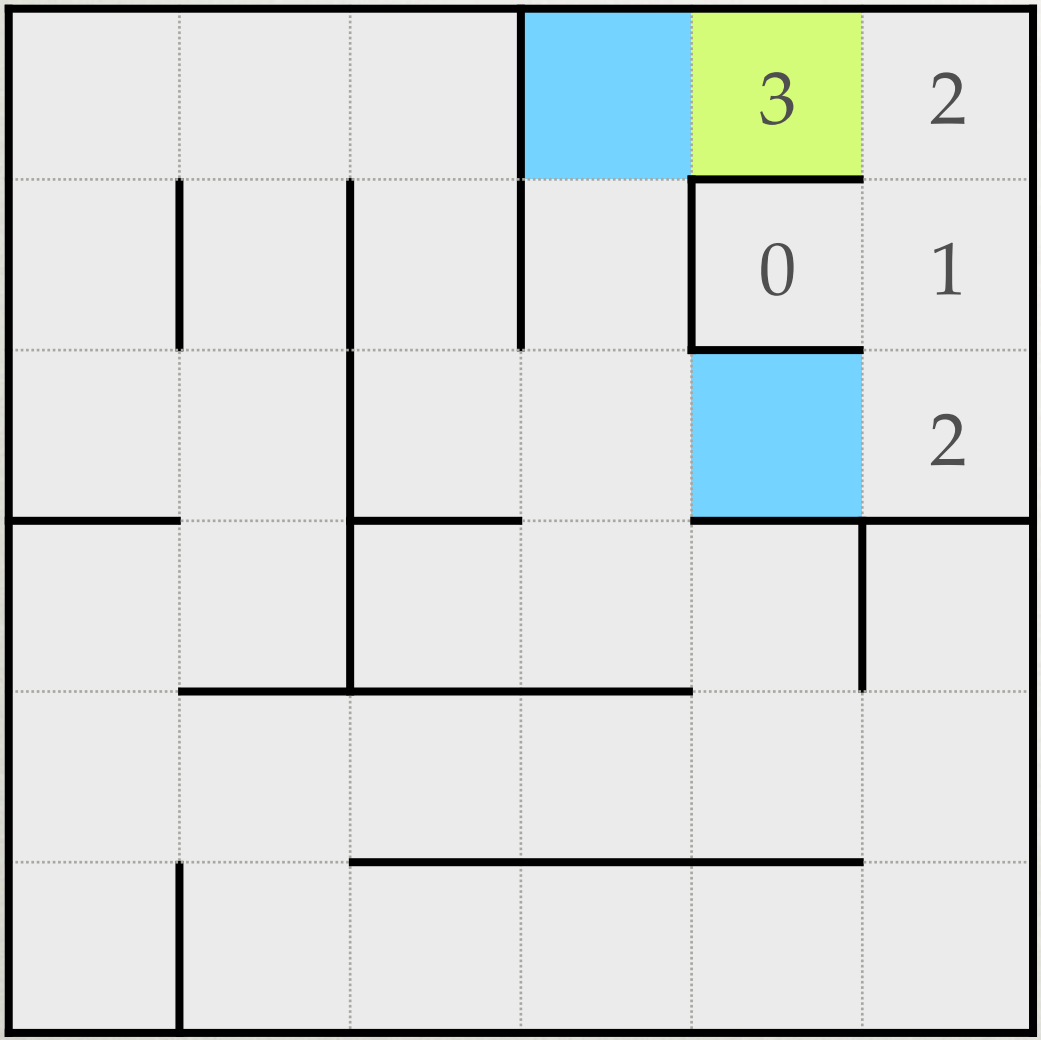
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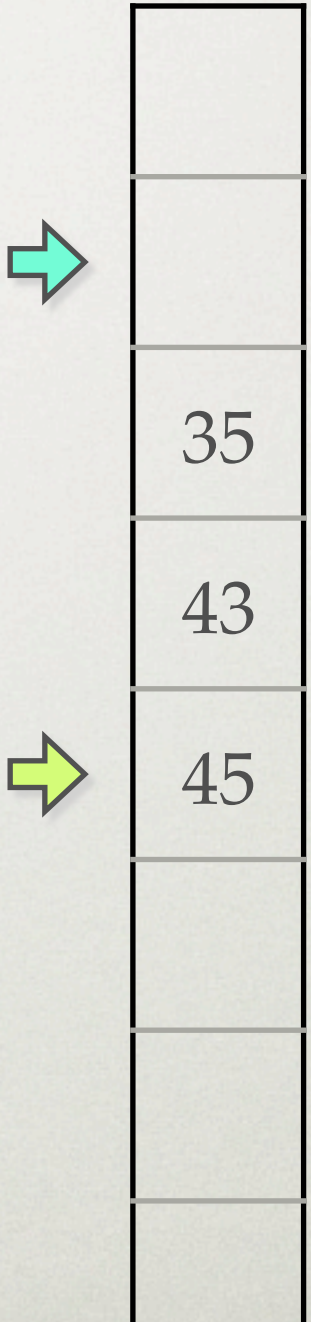
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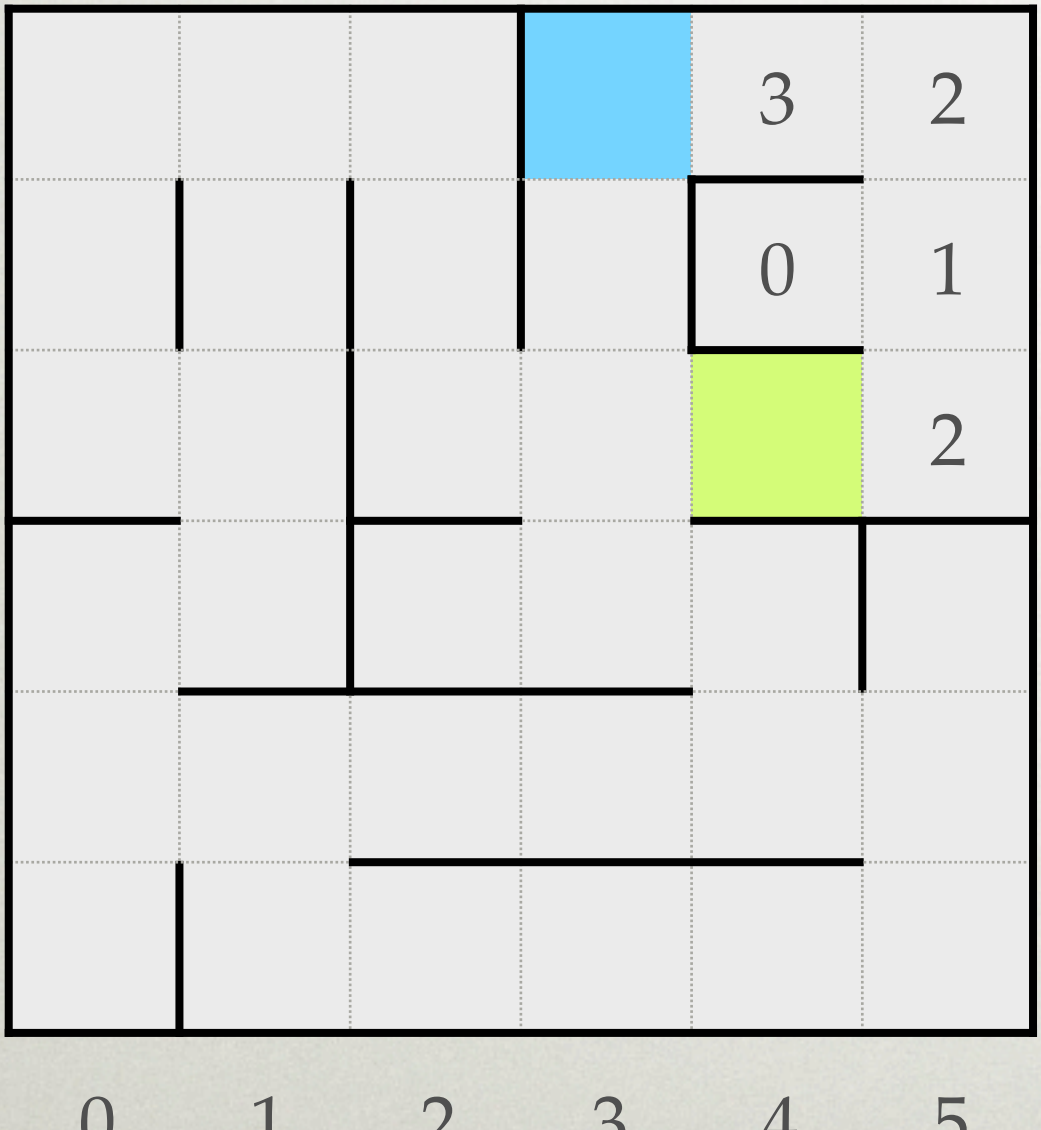
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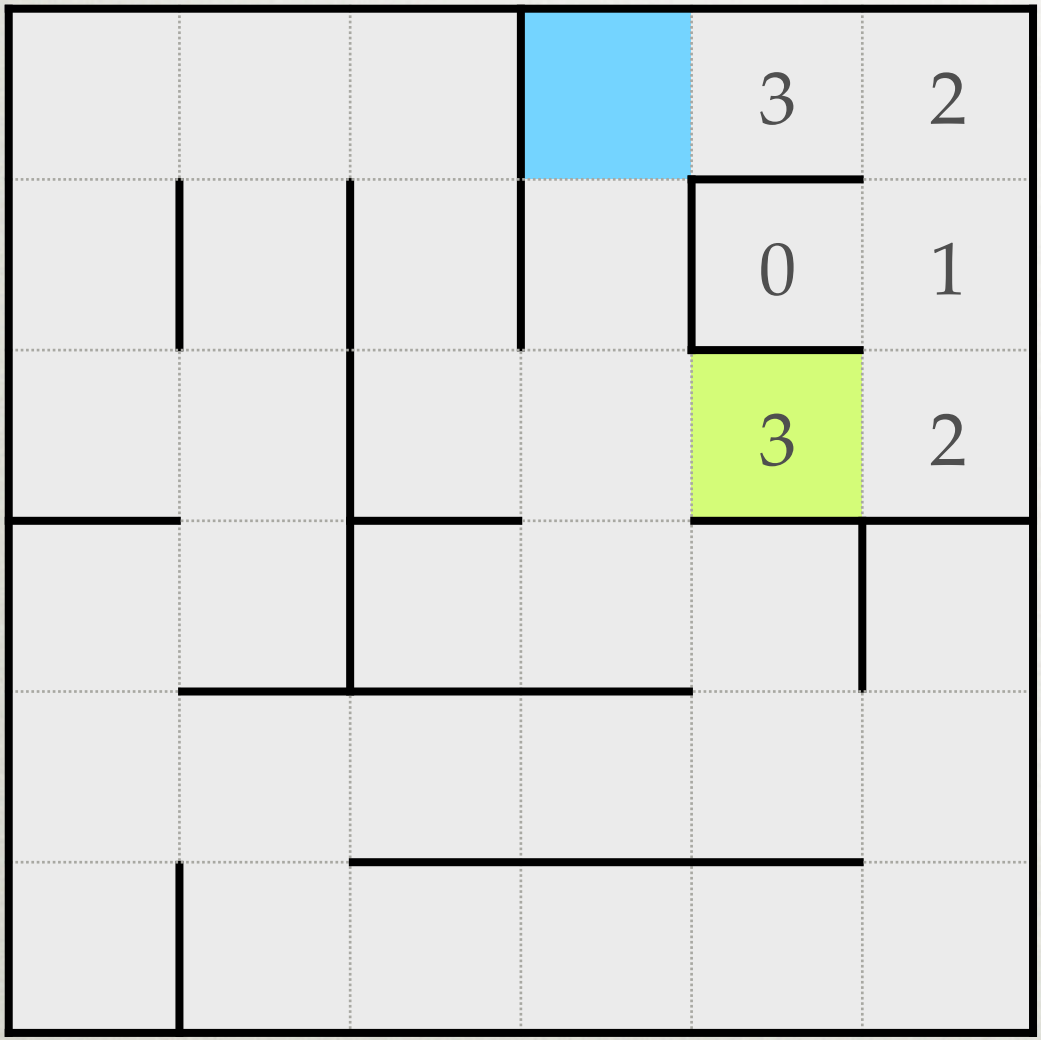
DISTANCE



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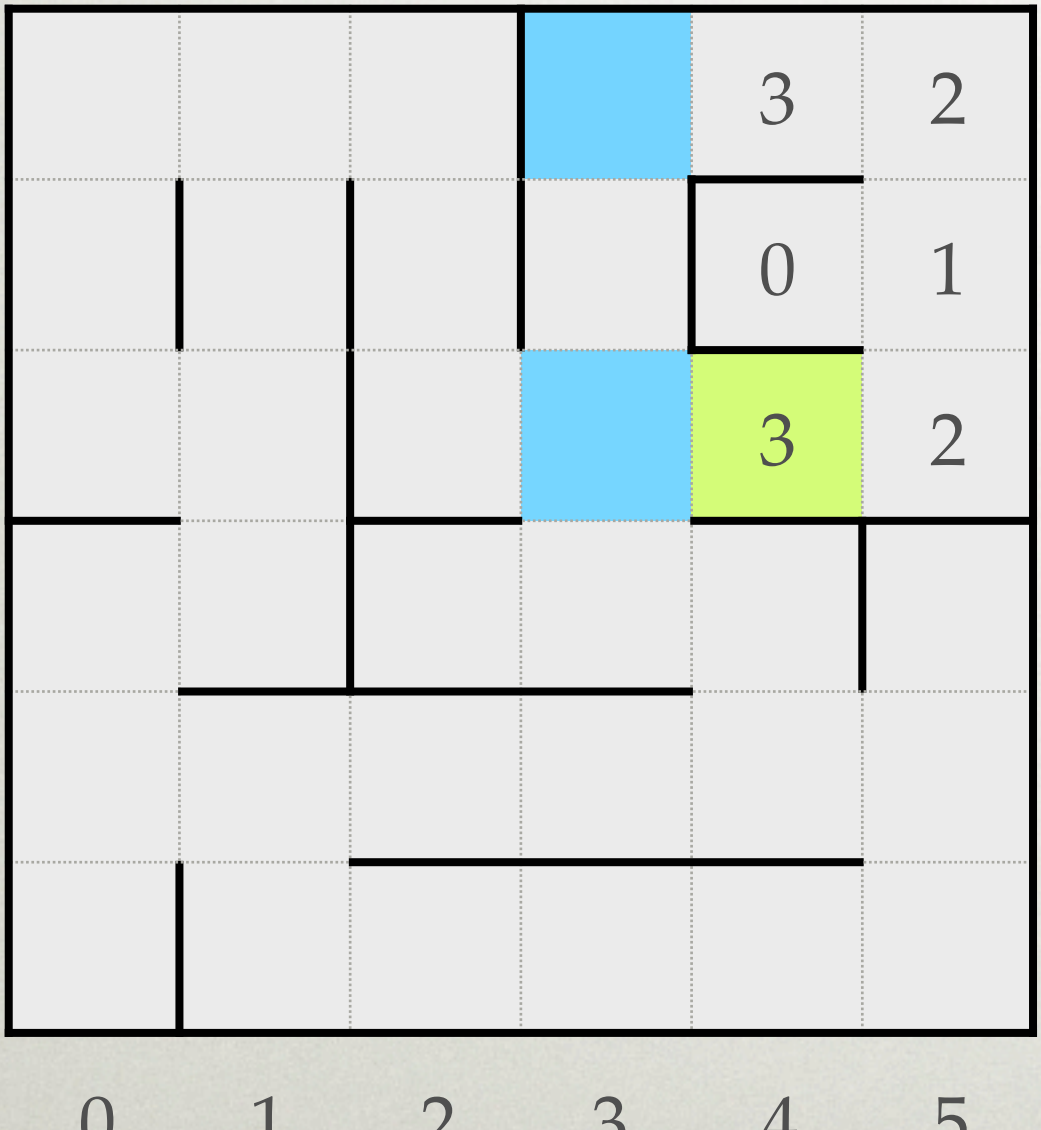

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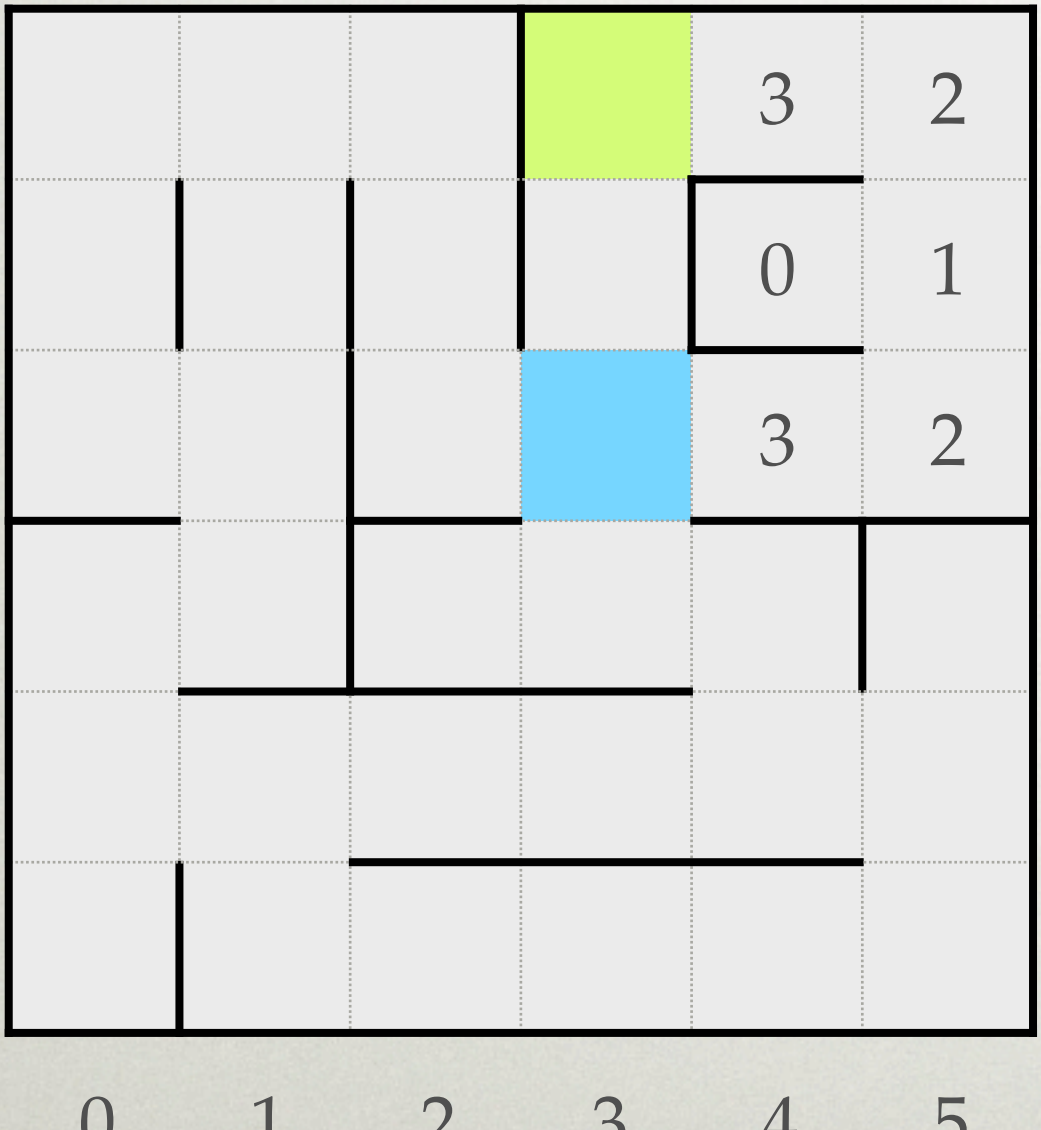

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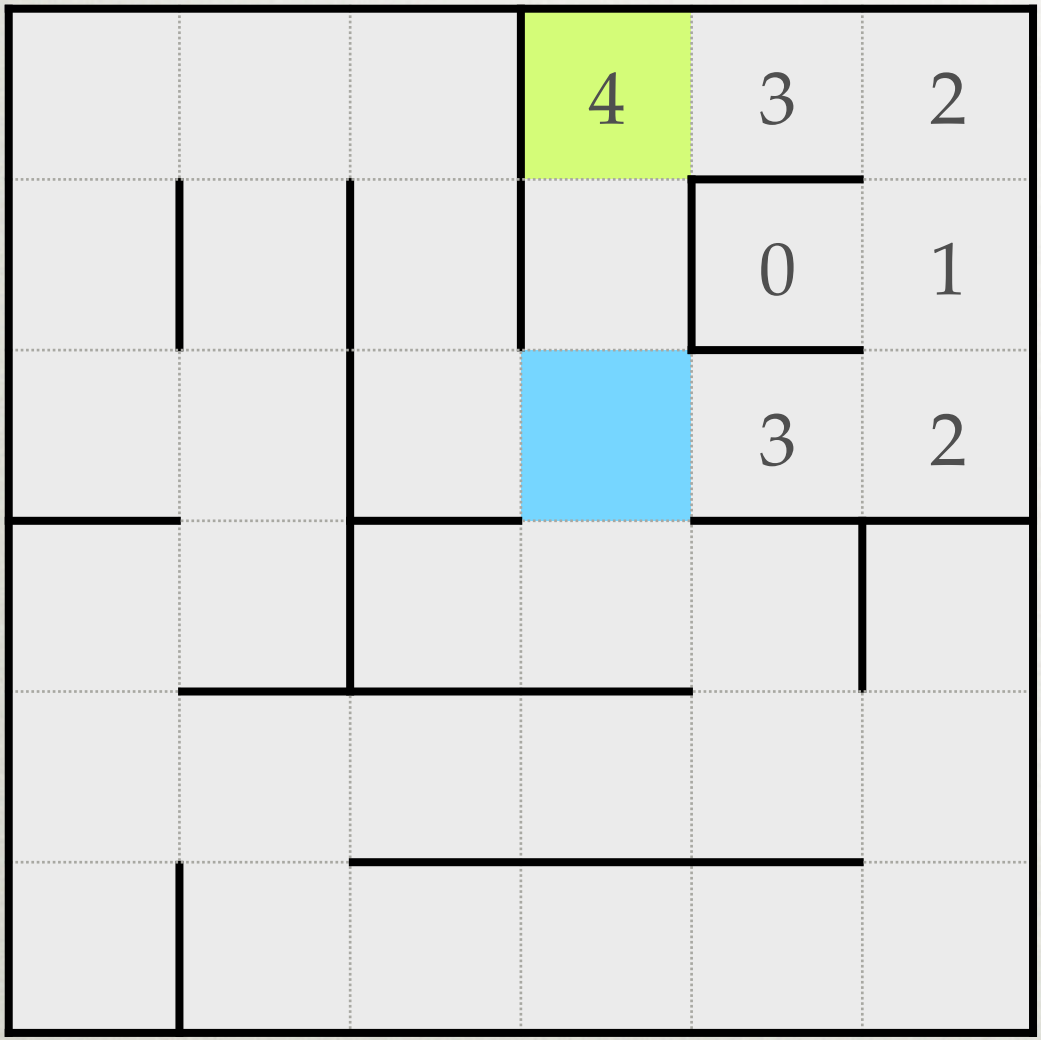

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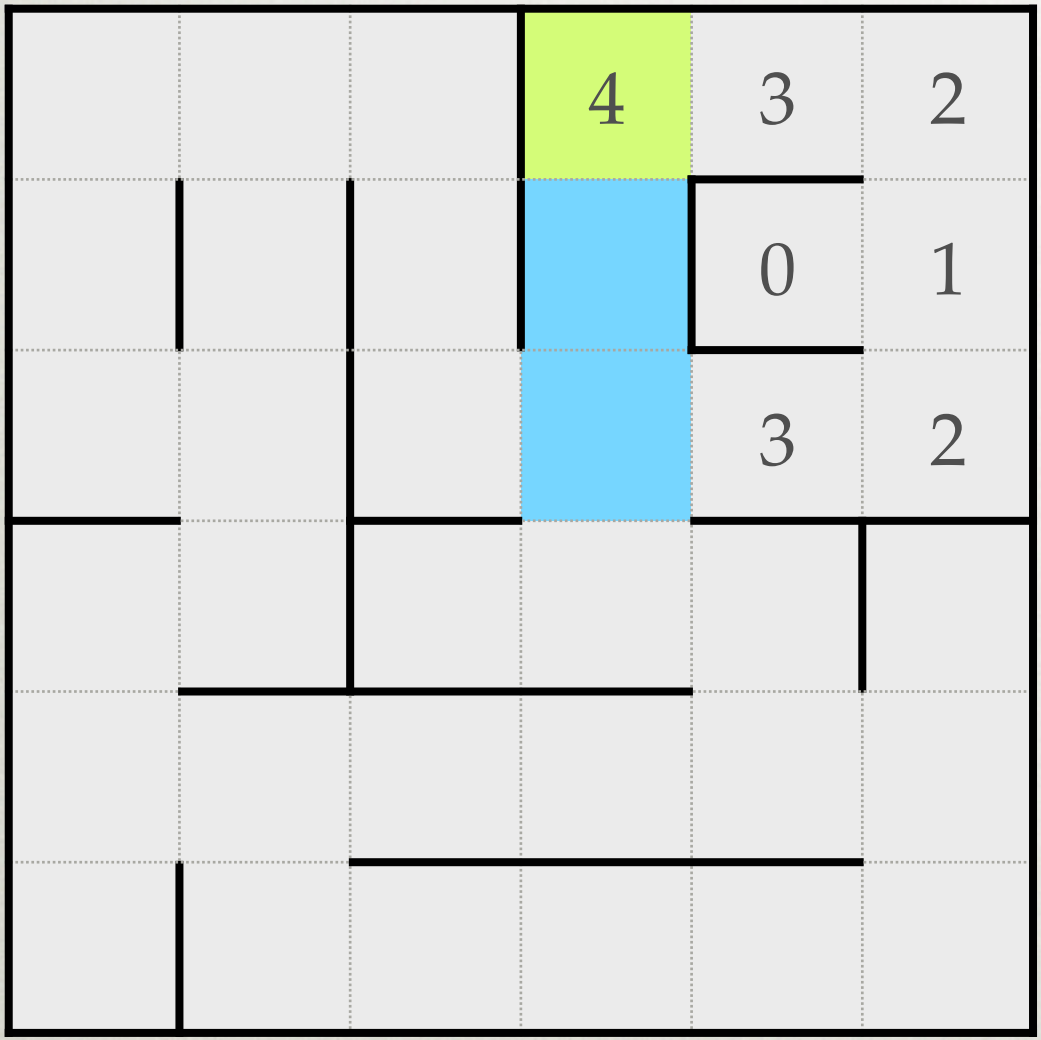

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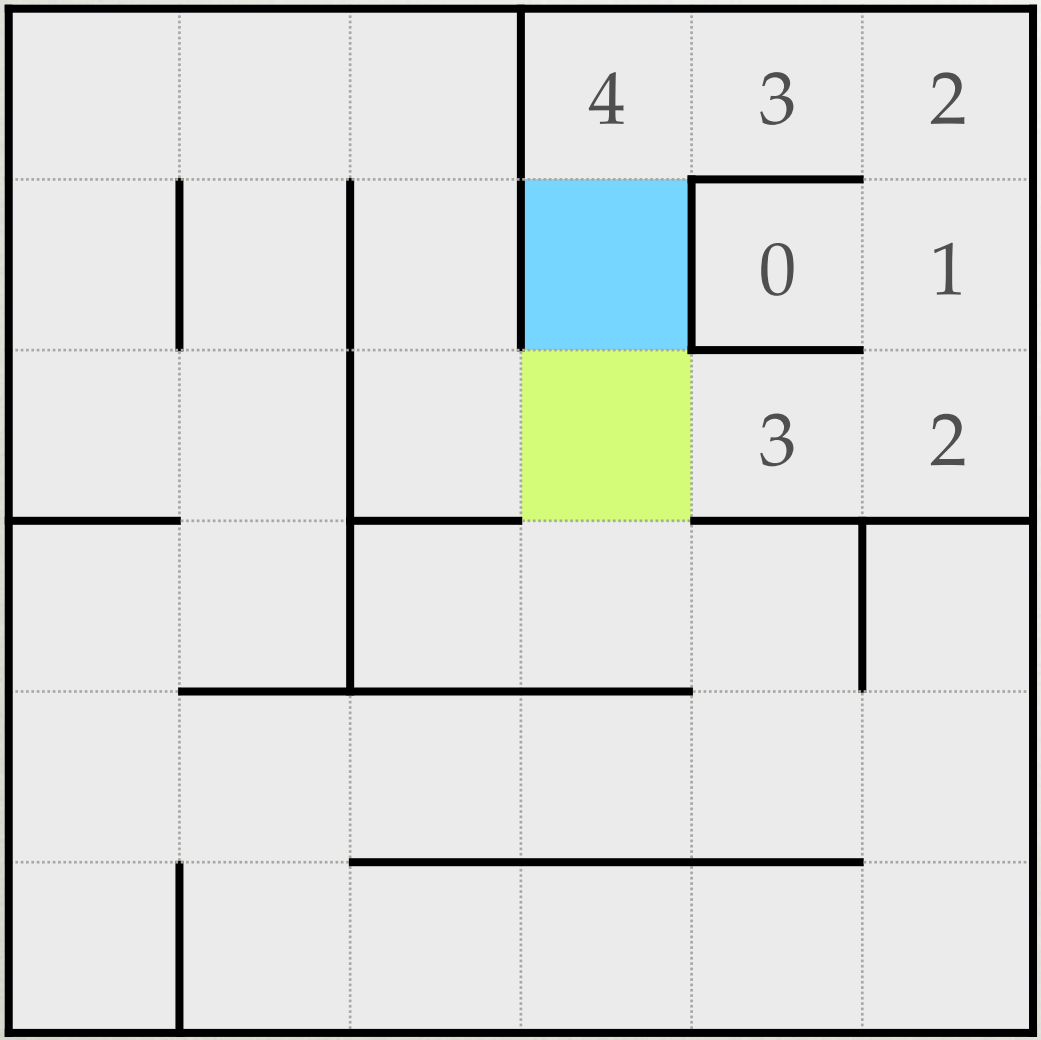

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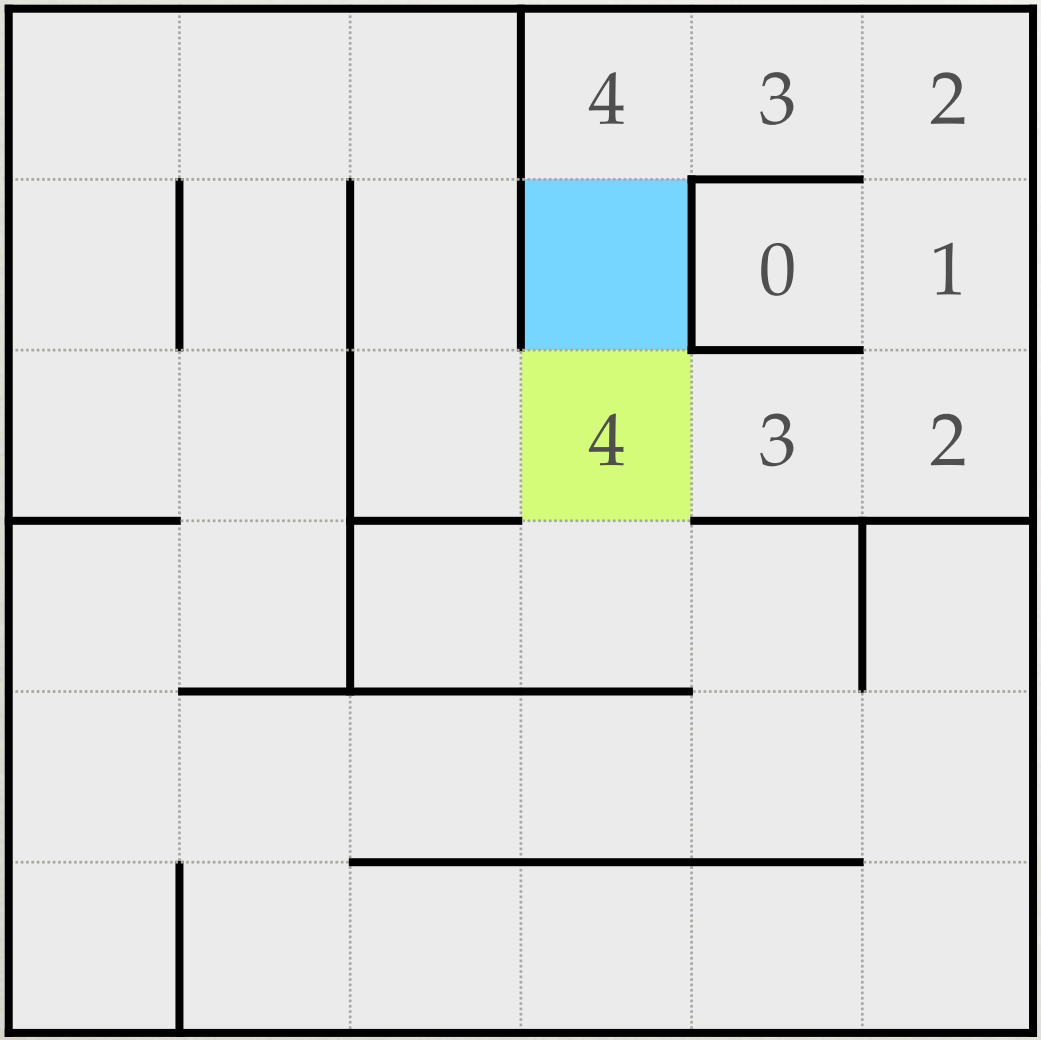

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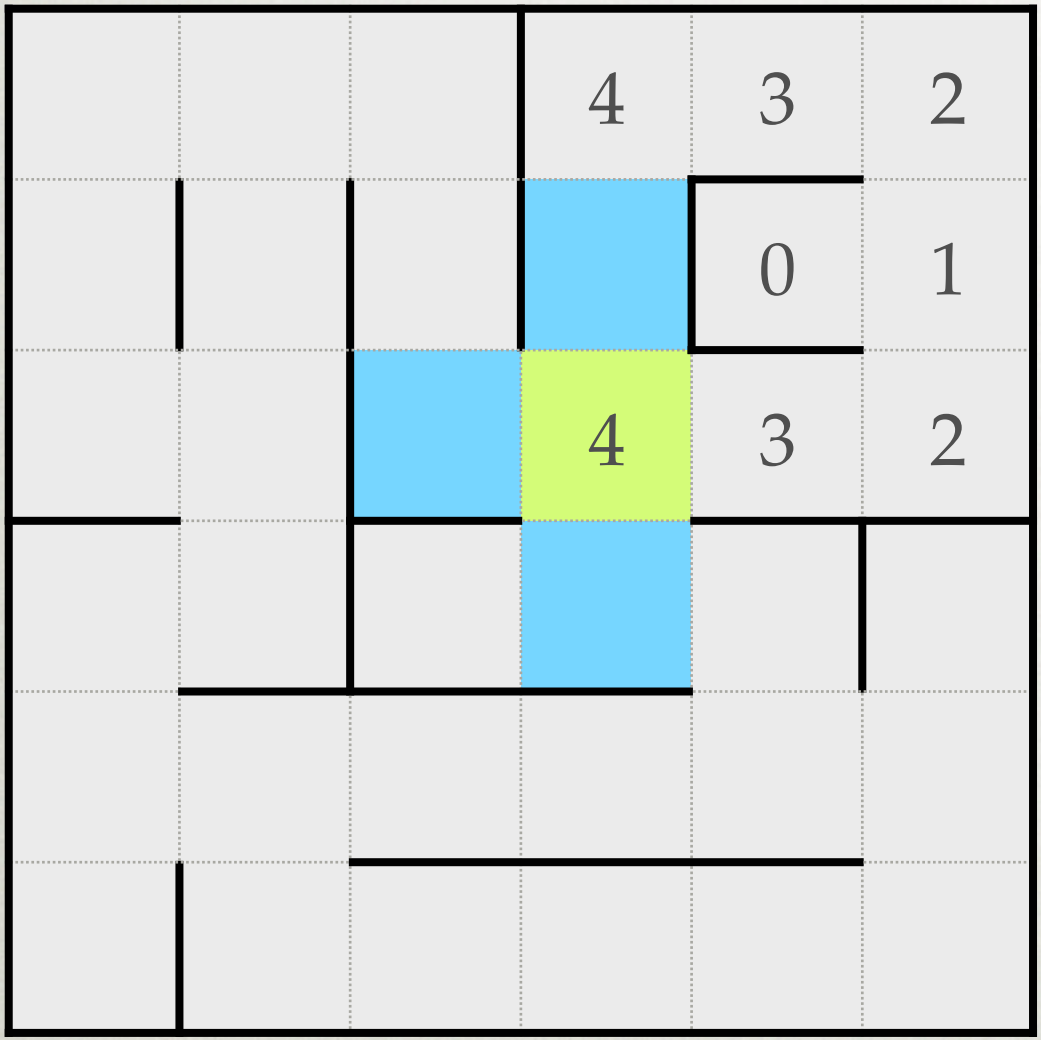

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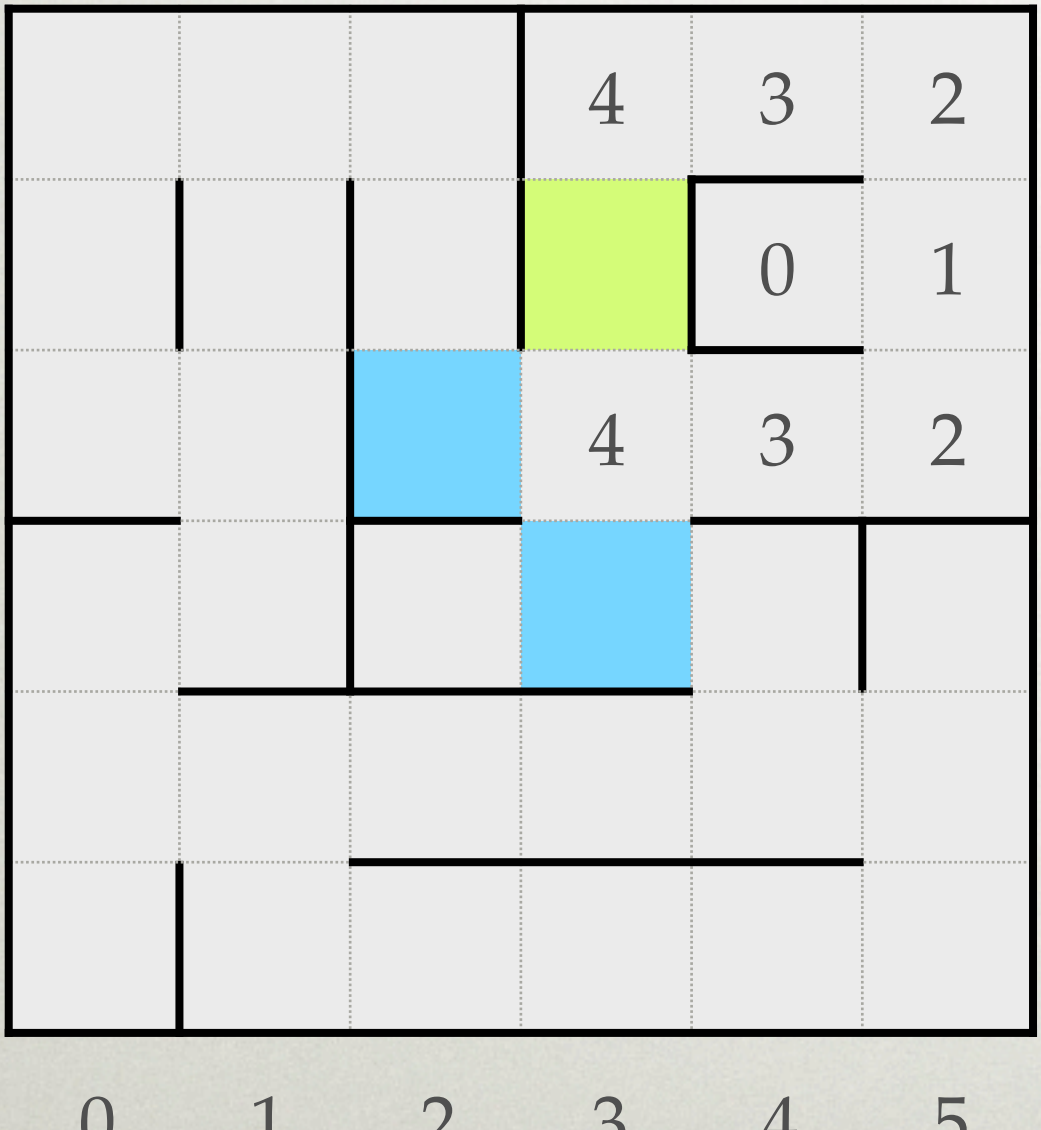

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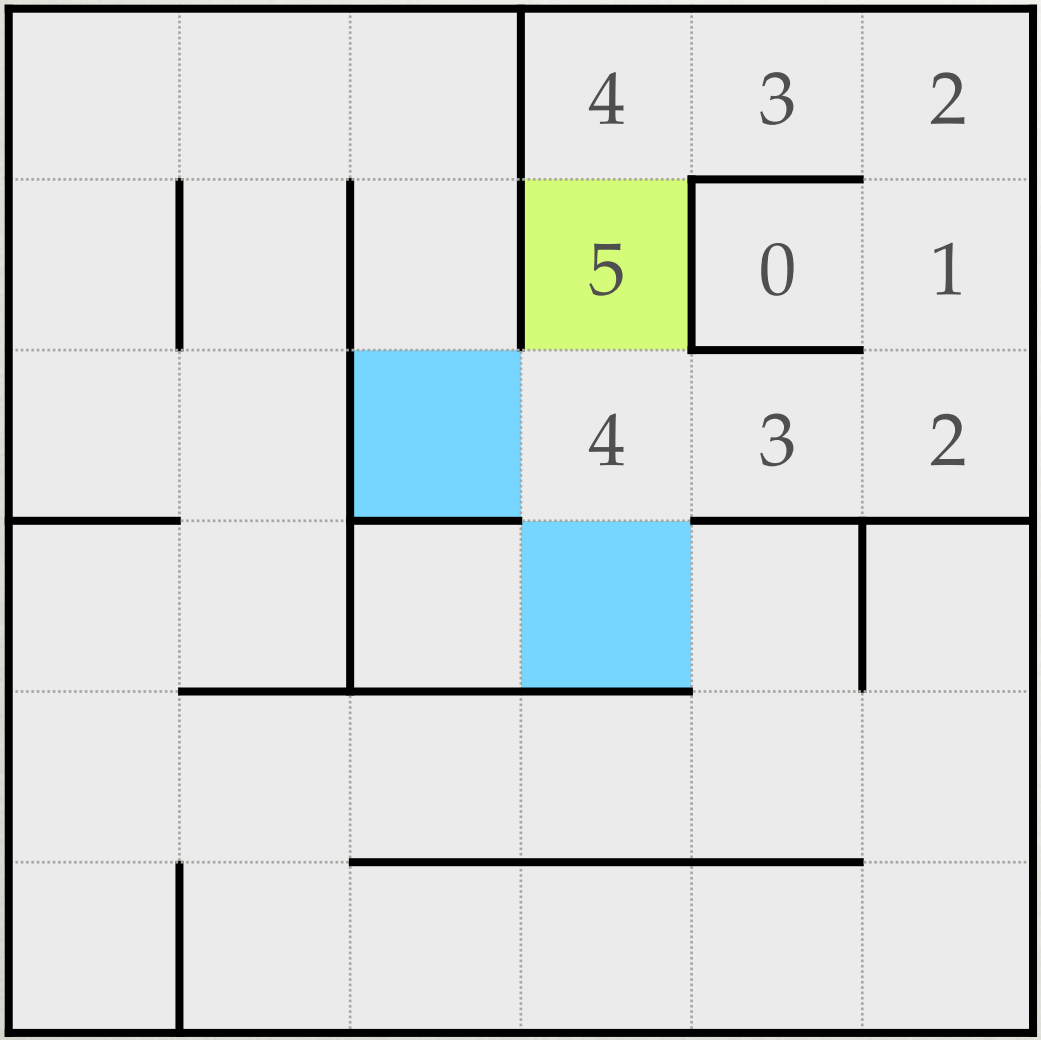

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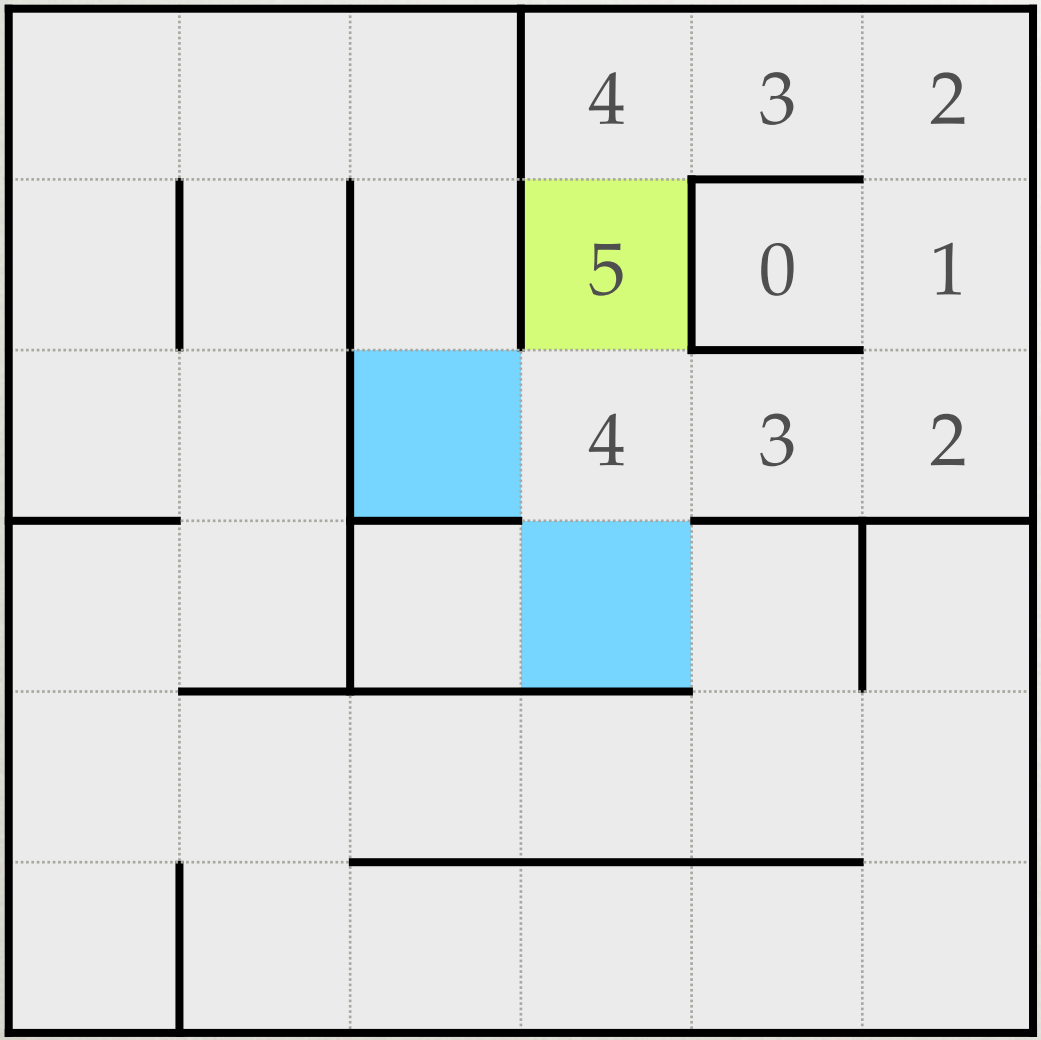

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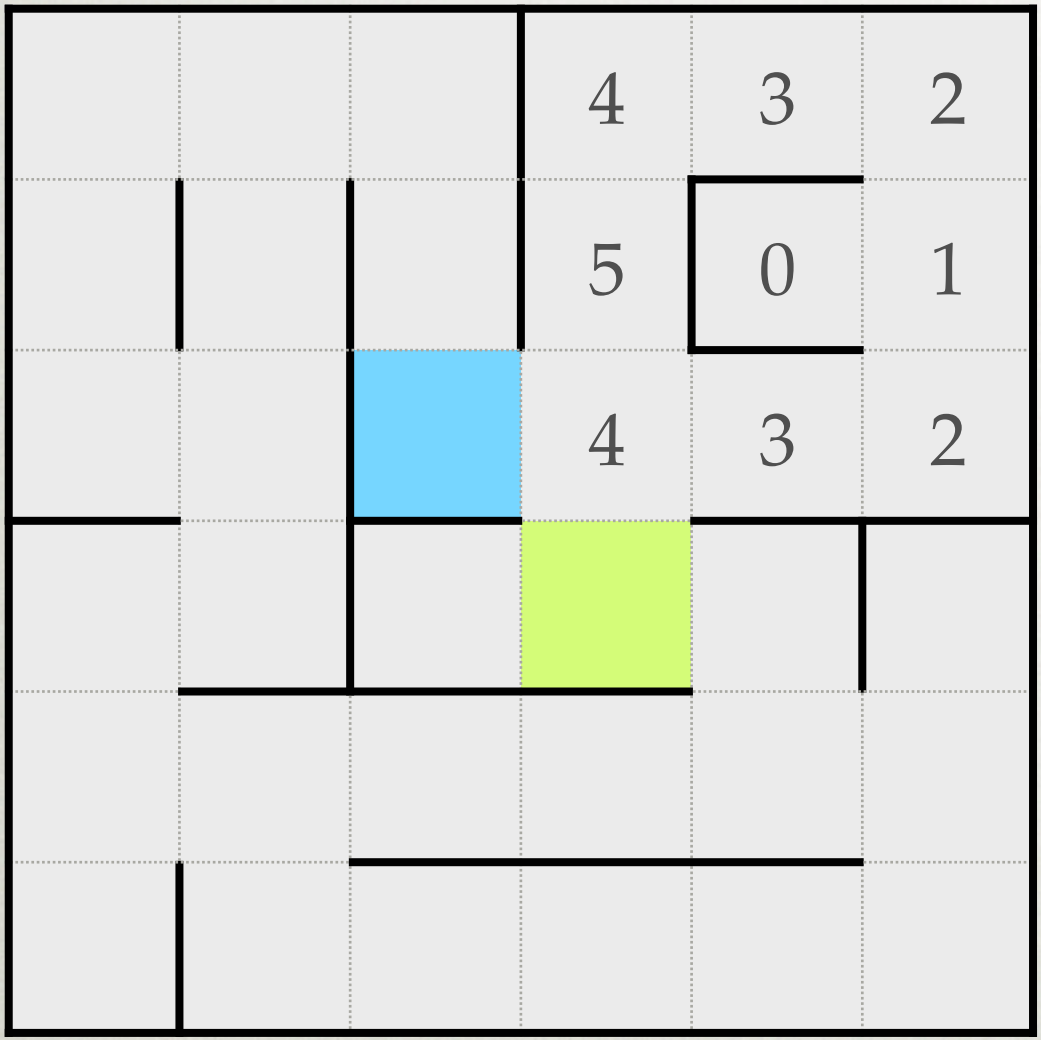

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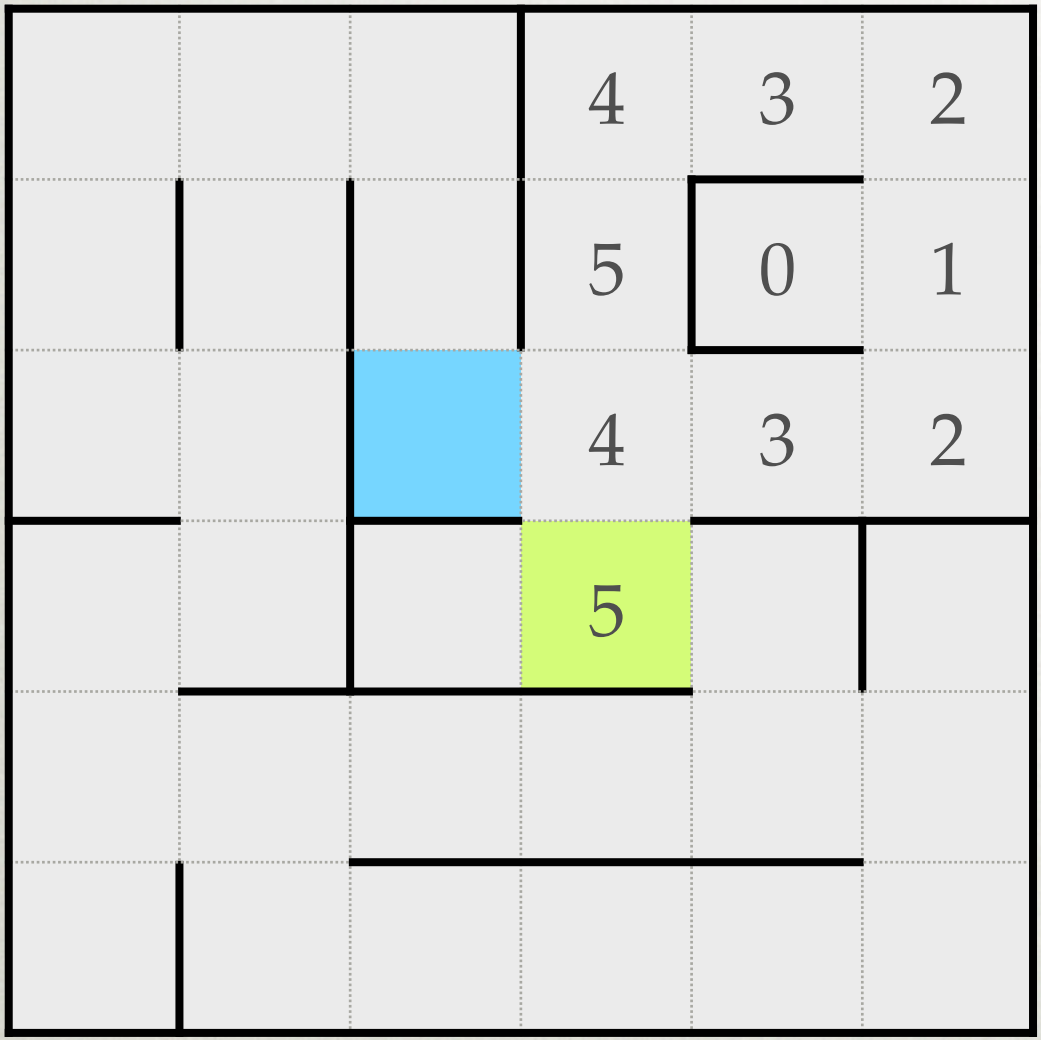

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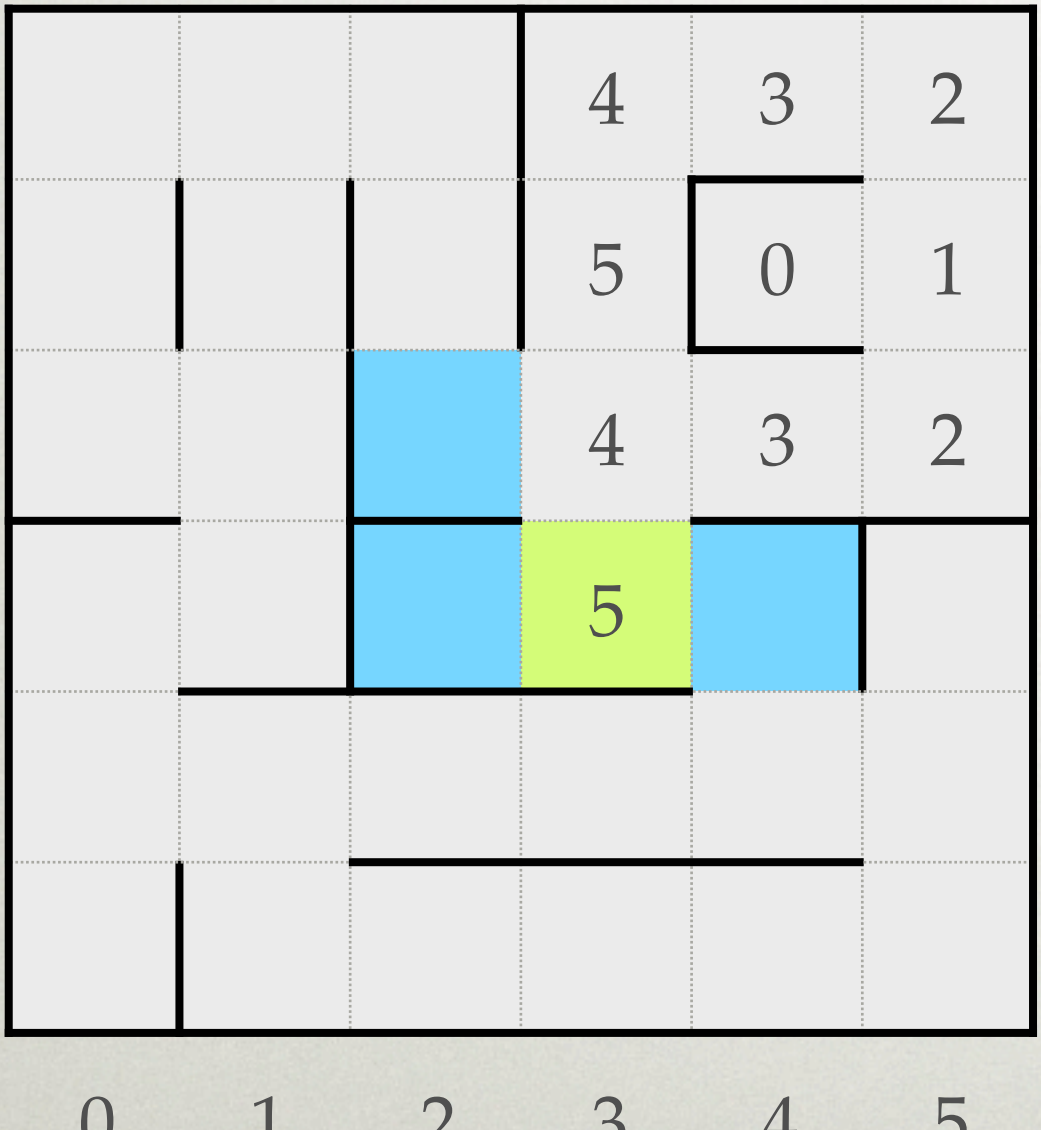

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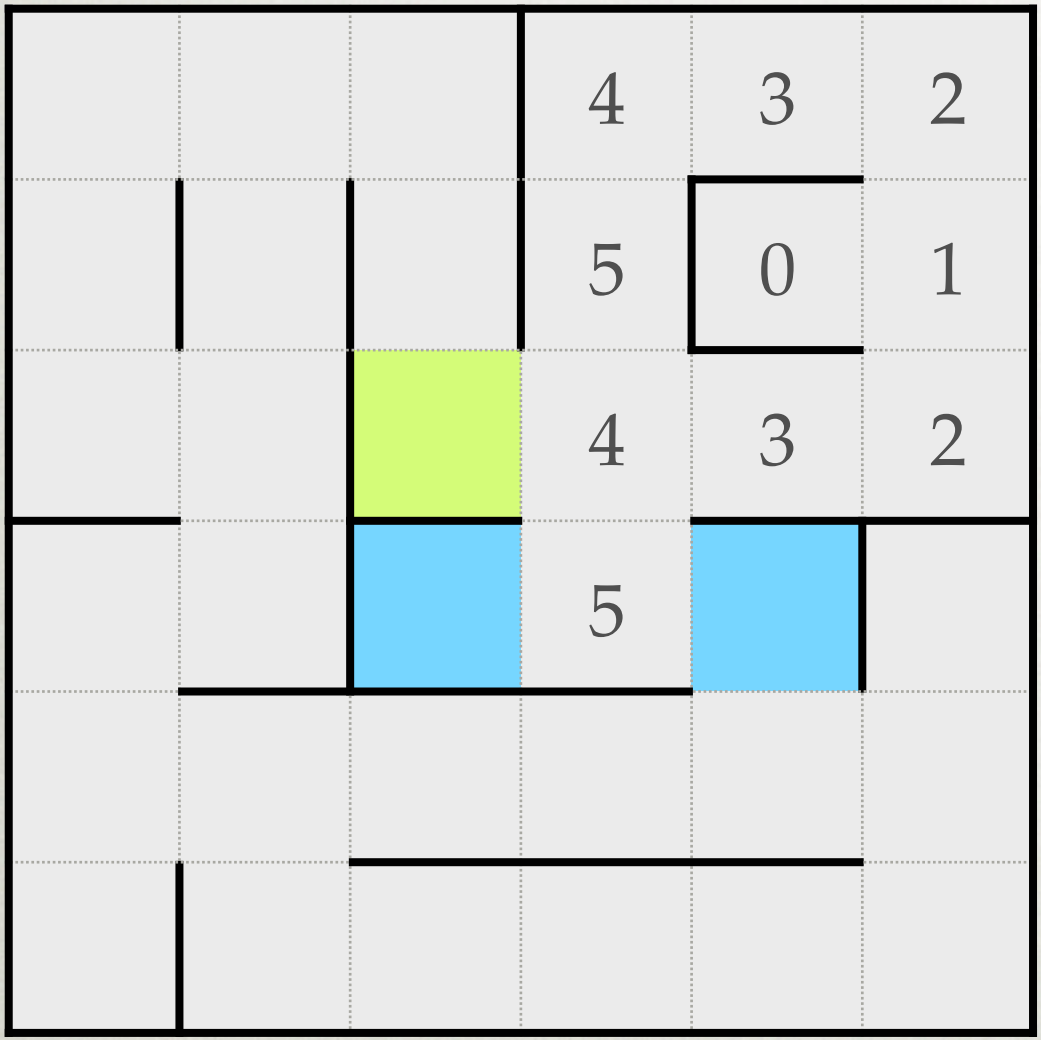

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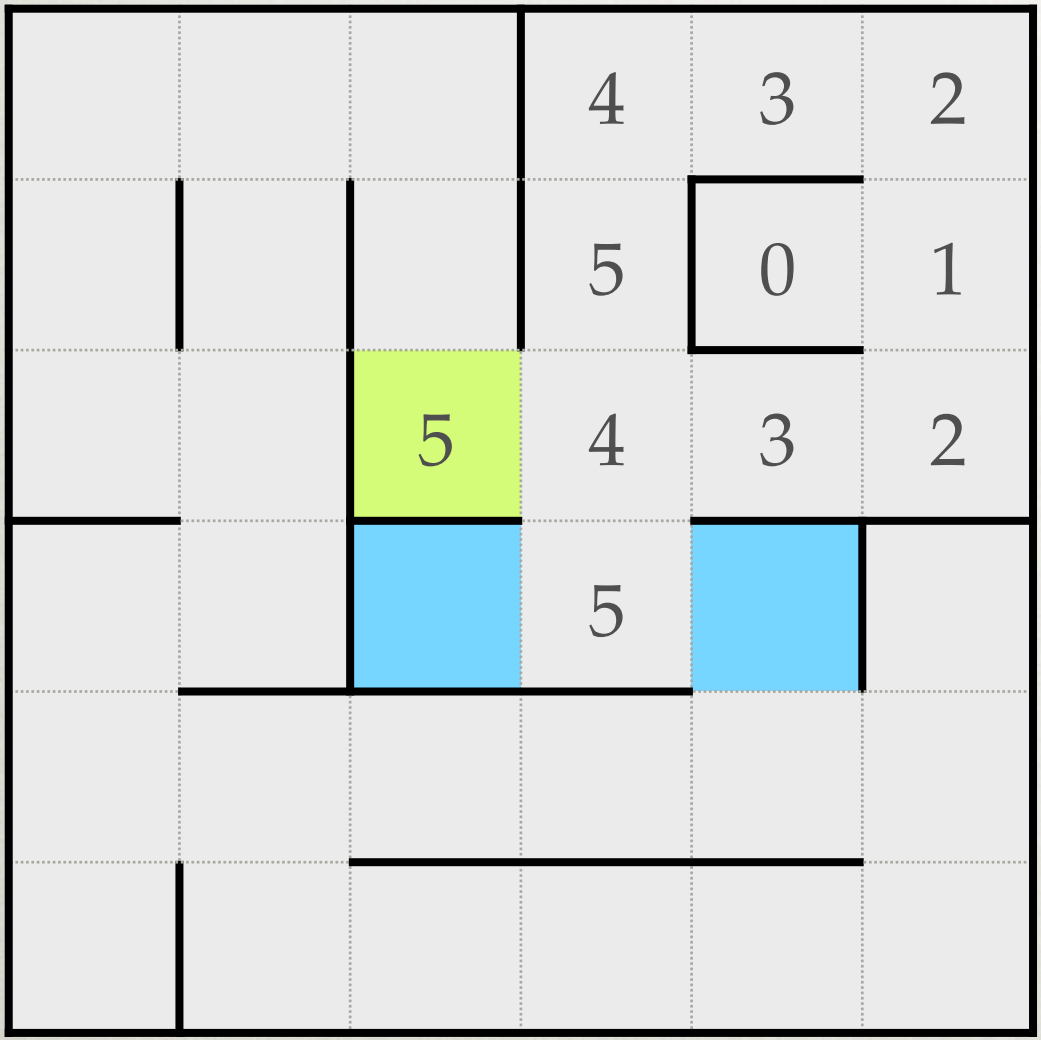

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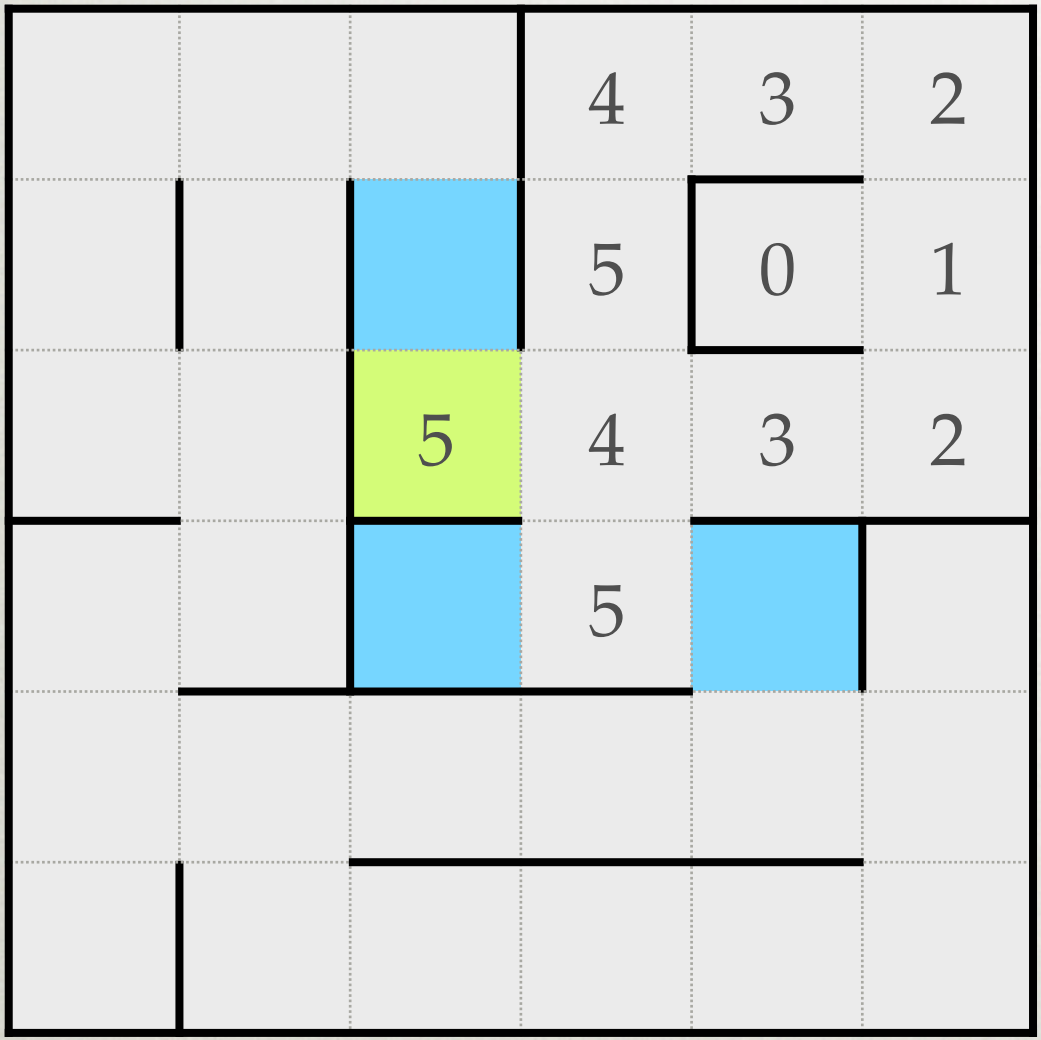

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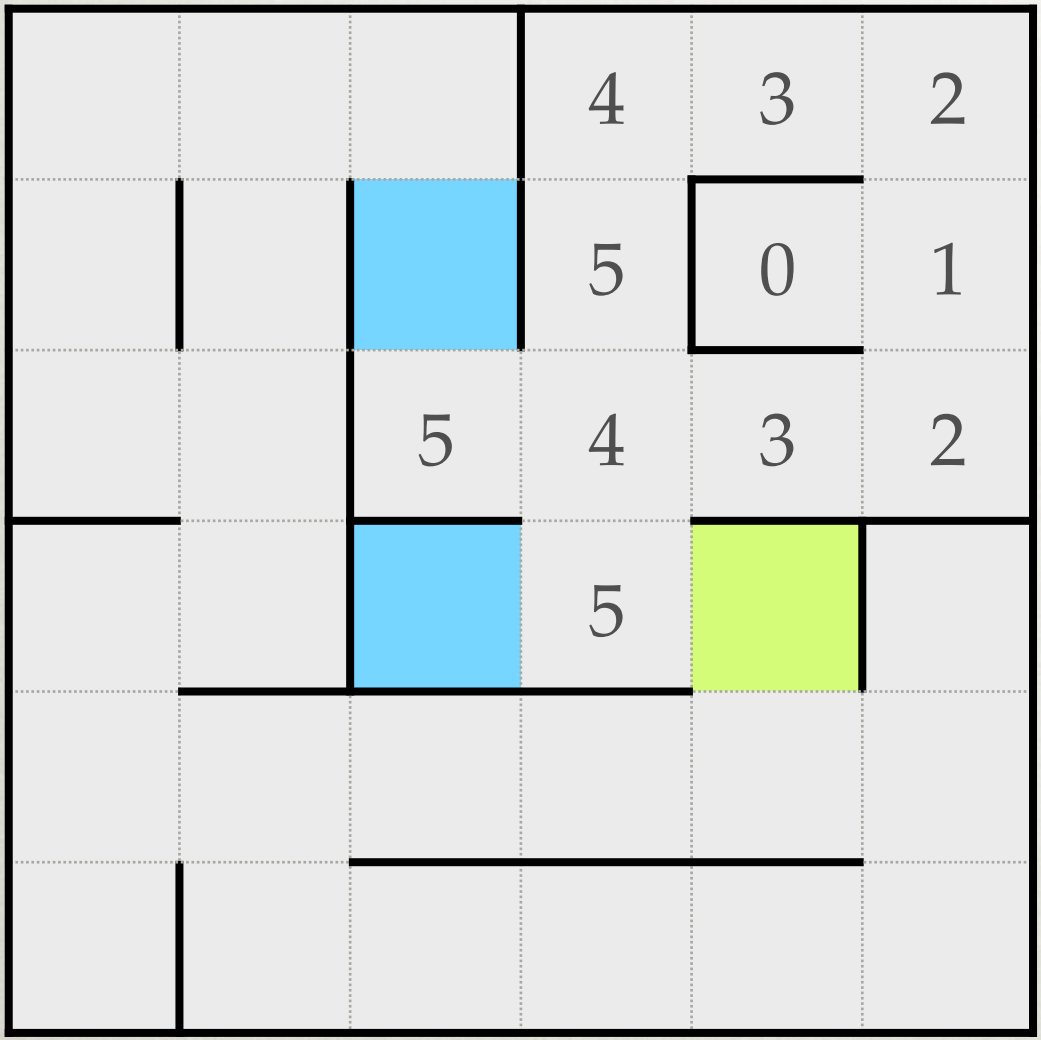
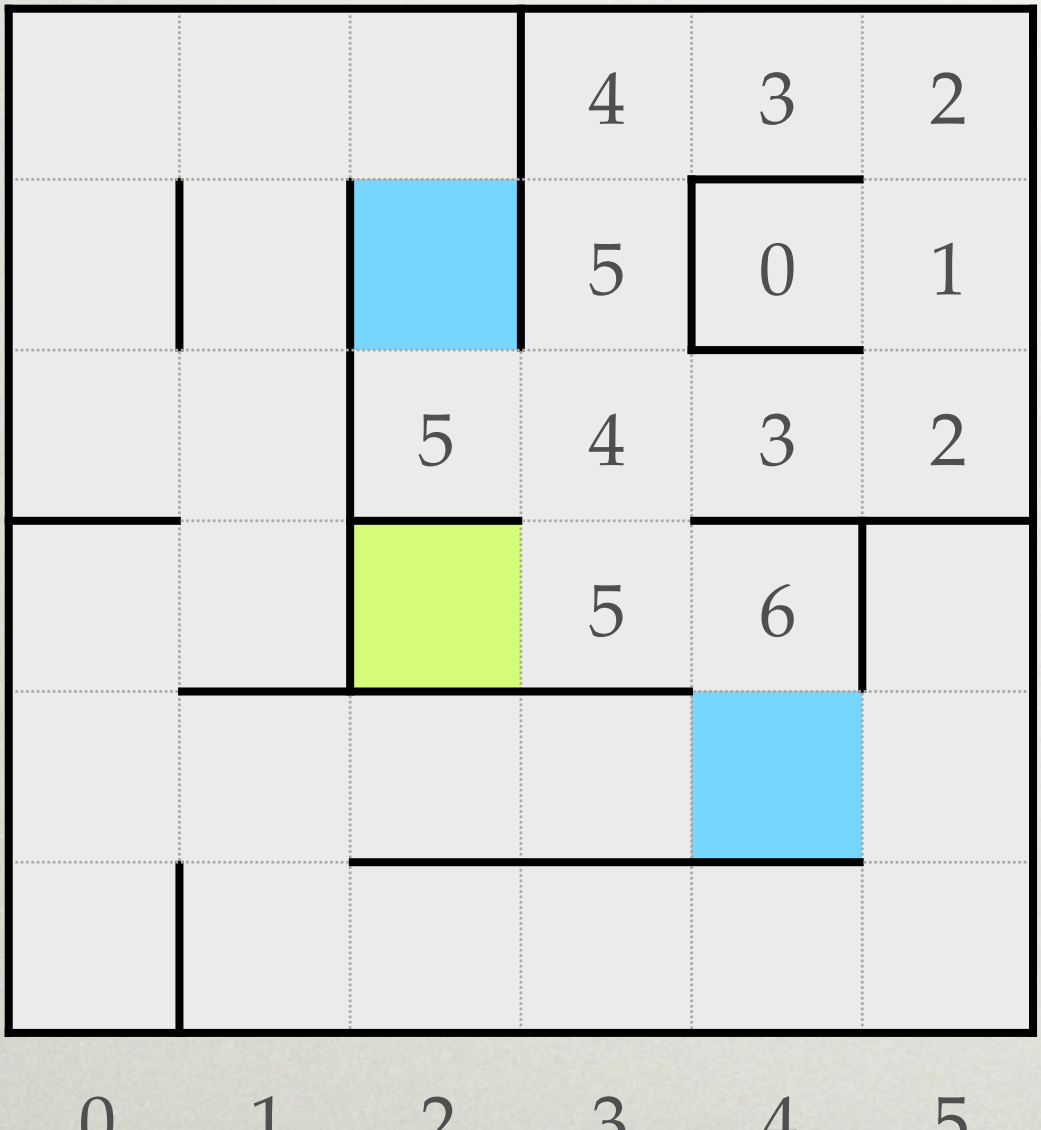
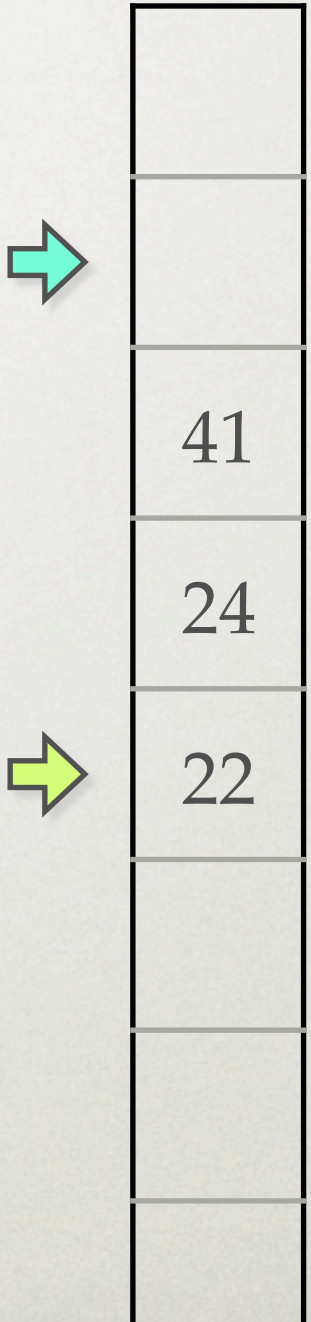


FULL STEP





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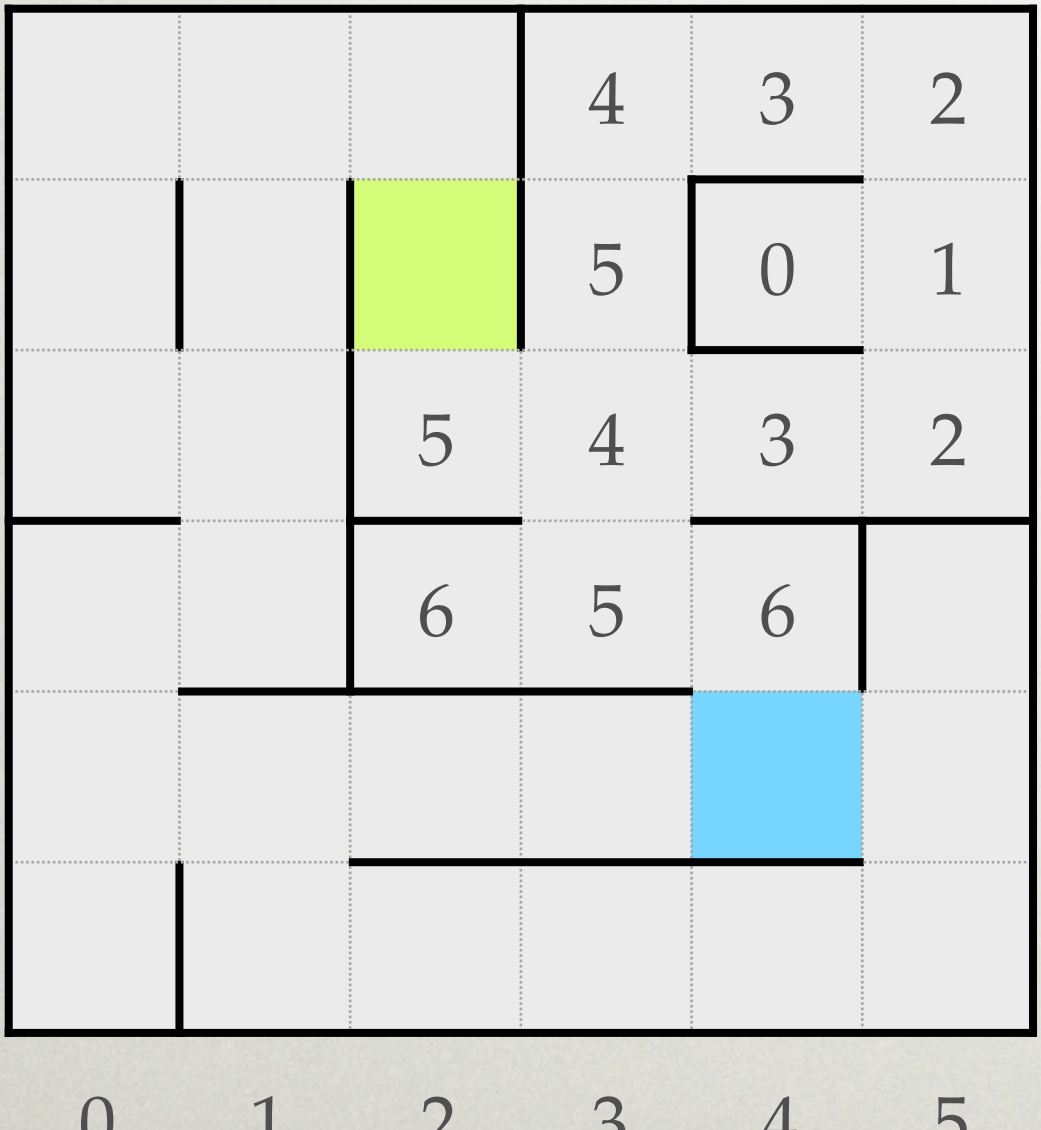

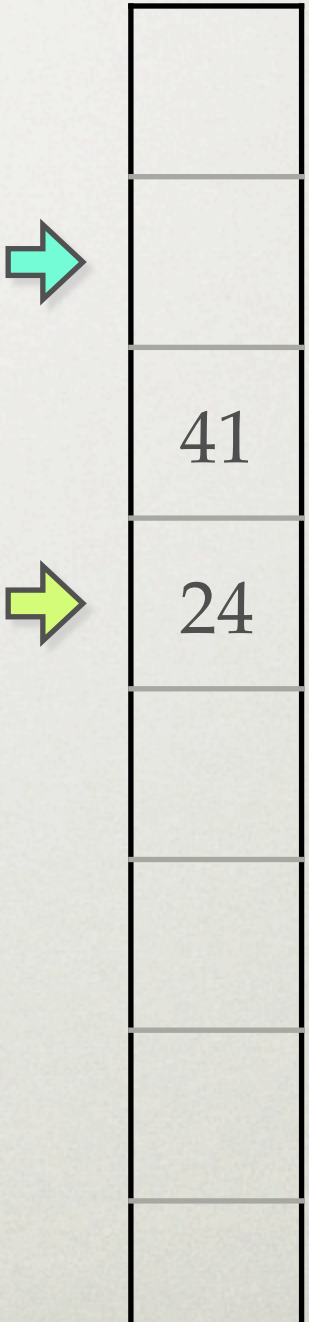

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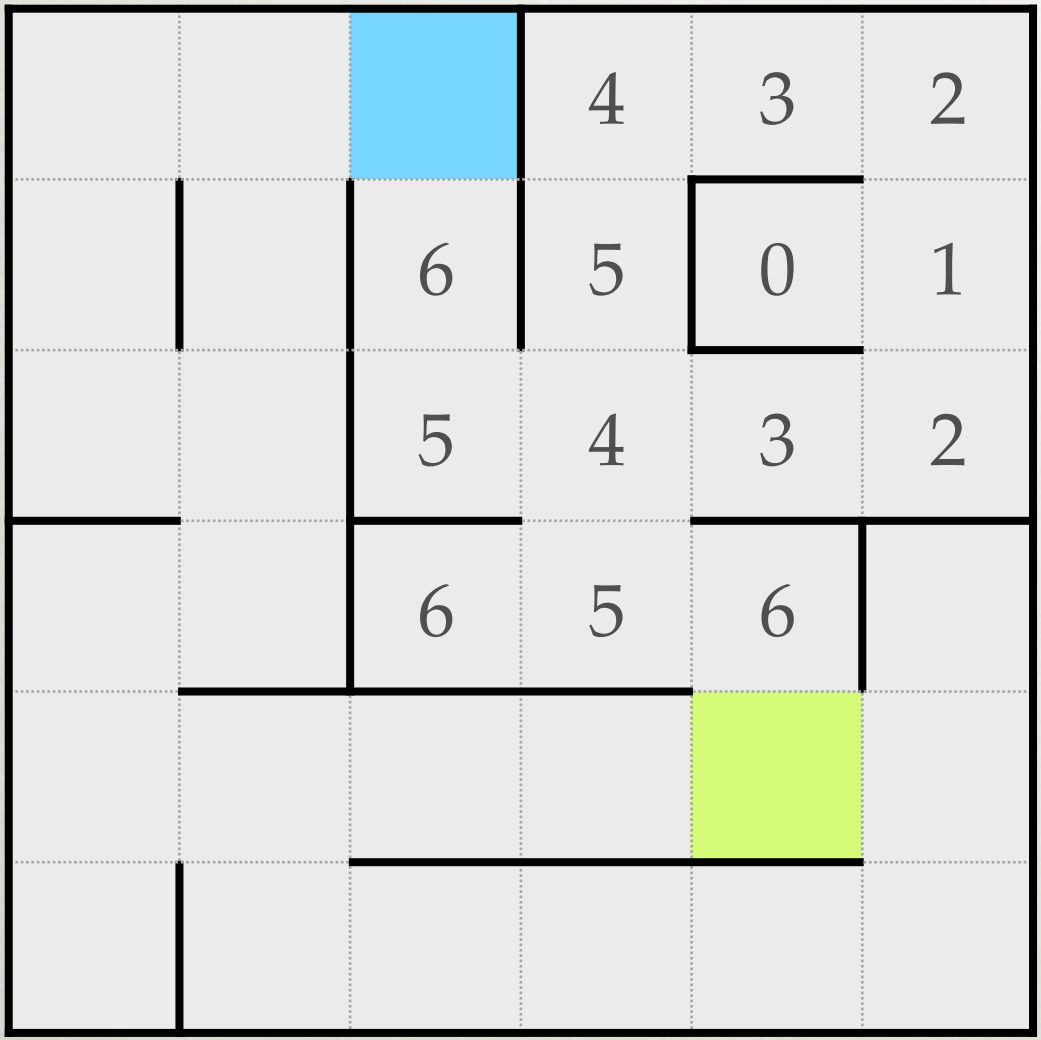

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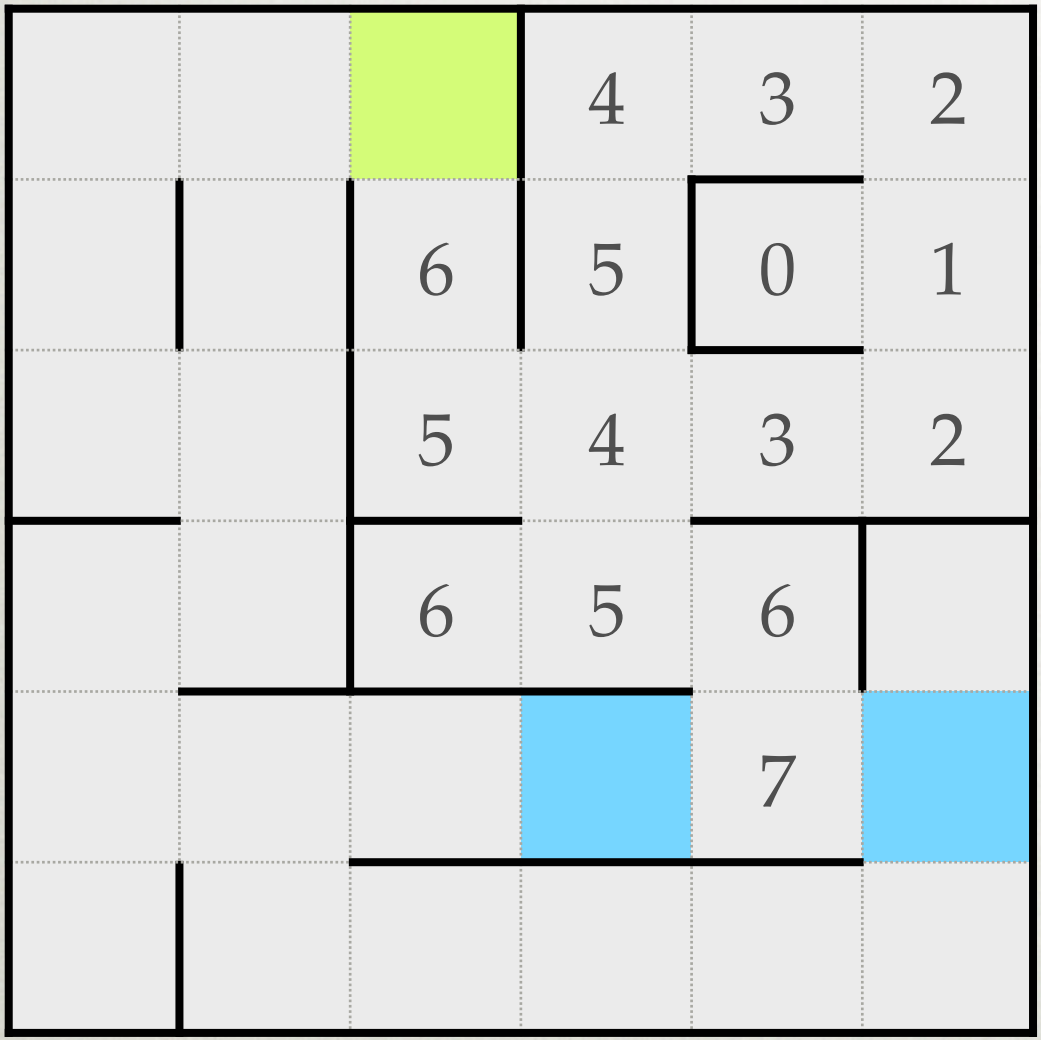

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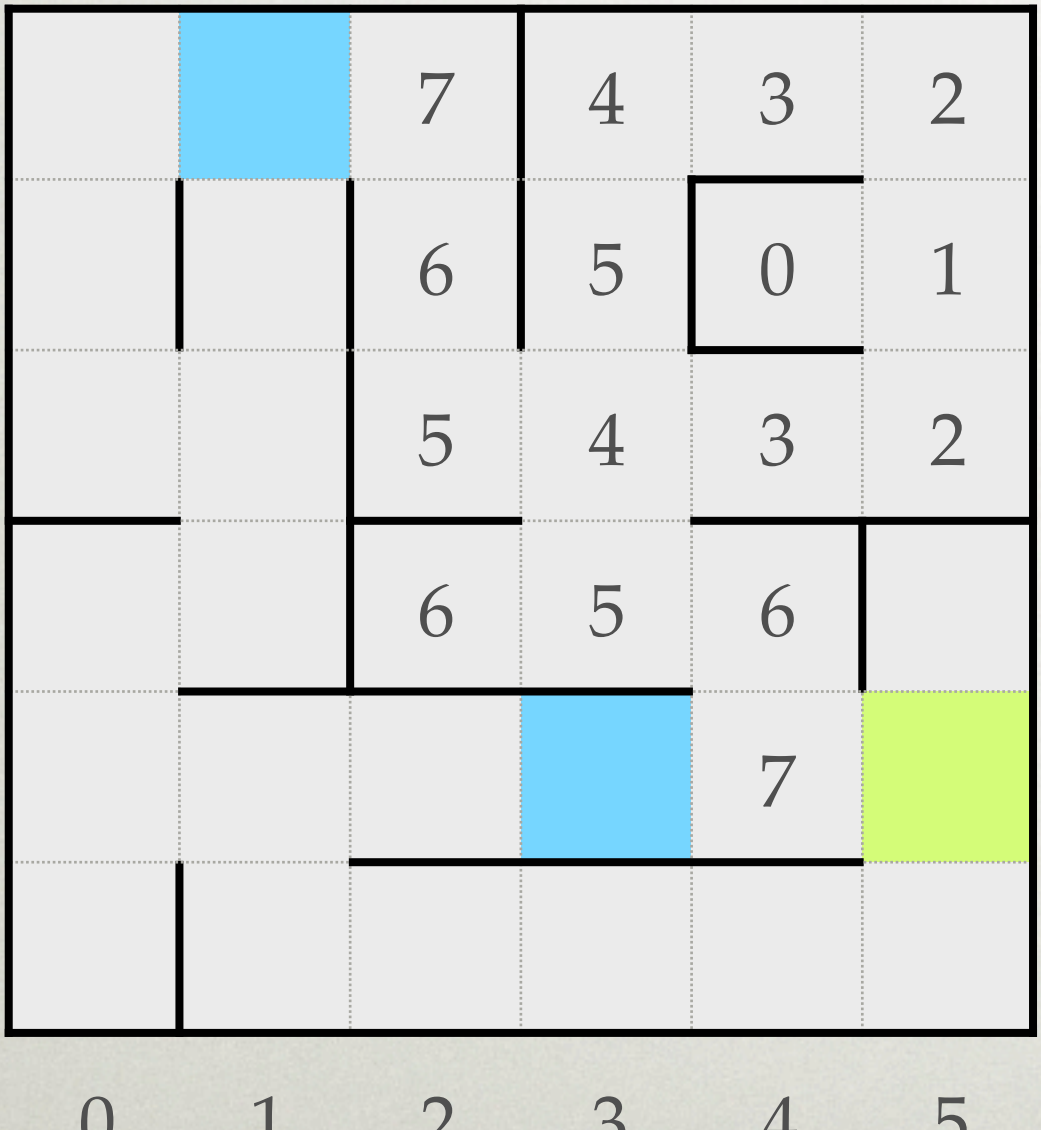

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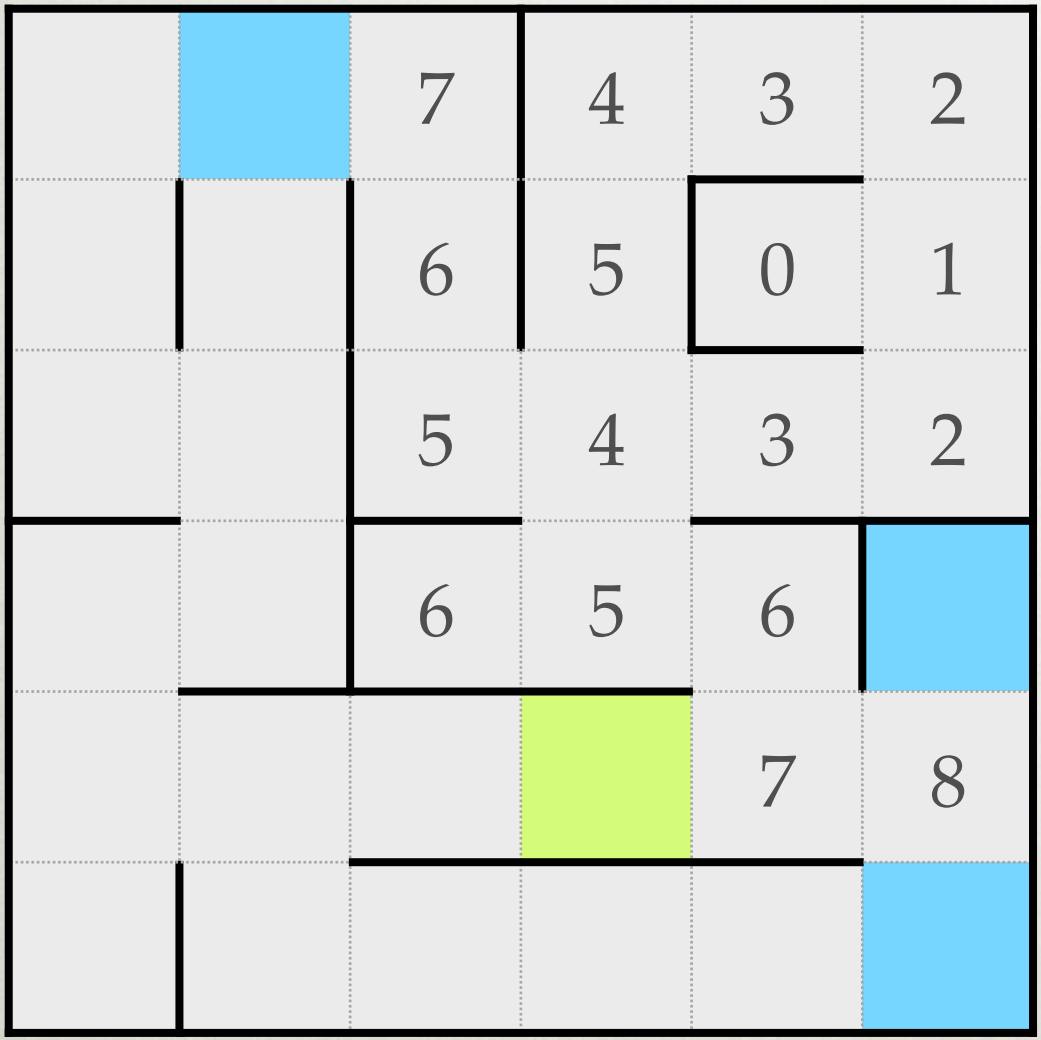

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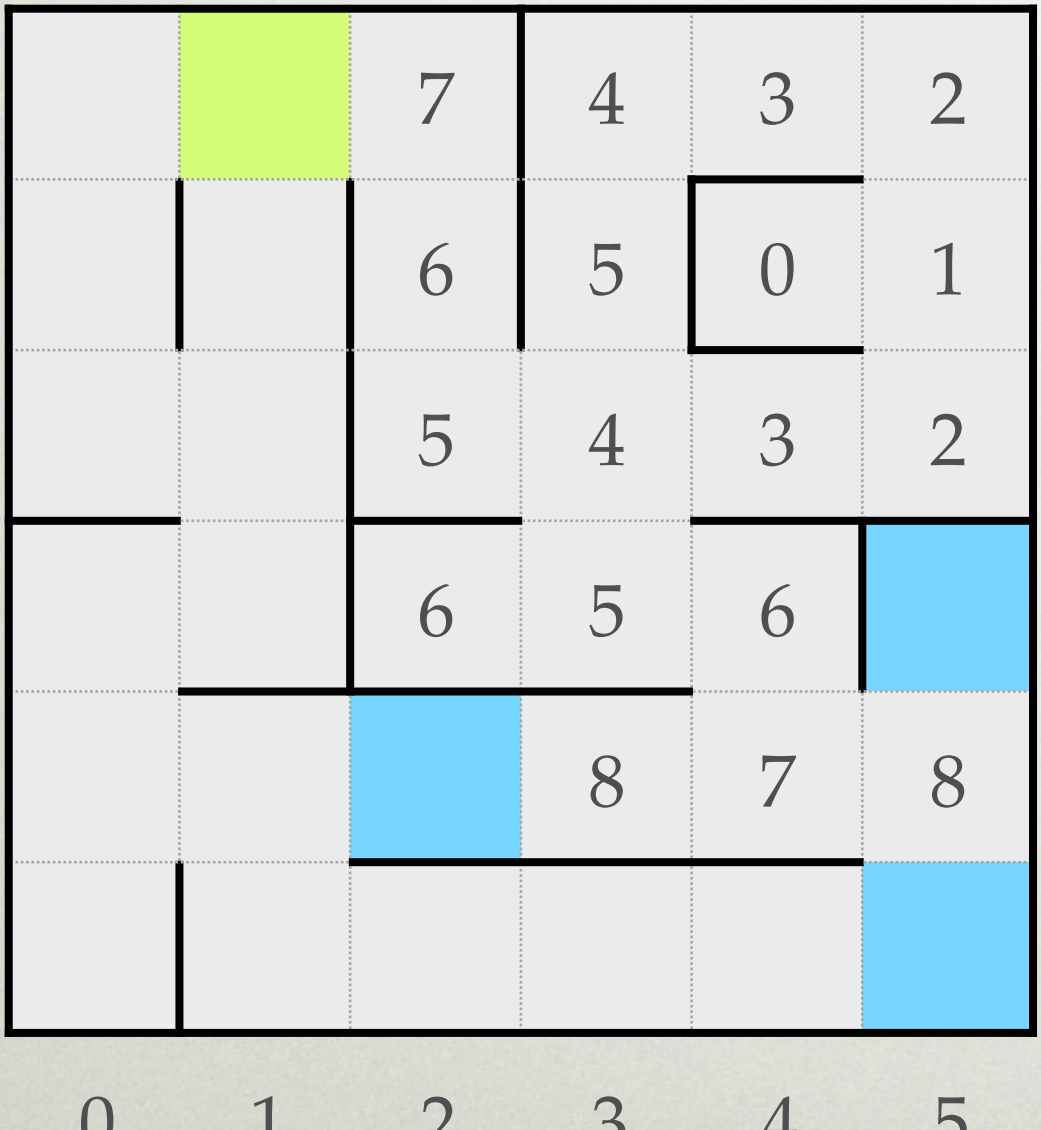
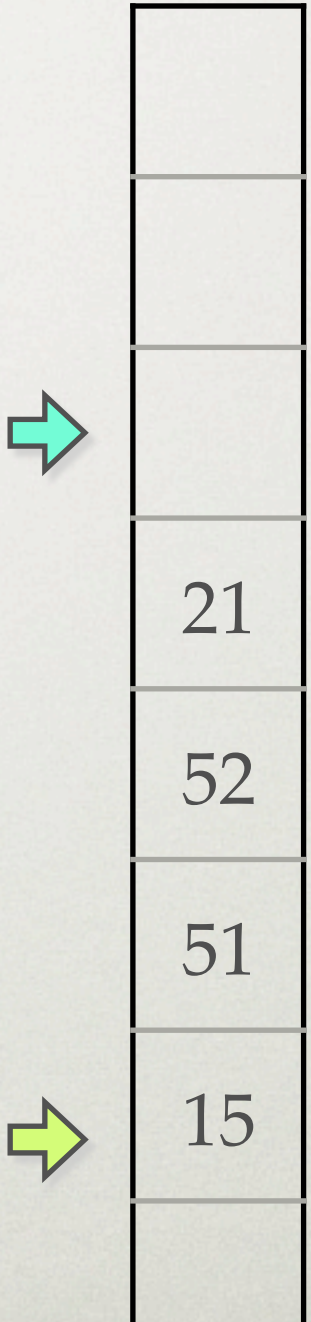
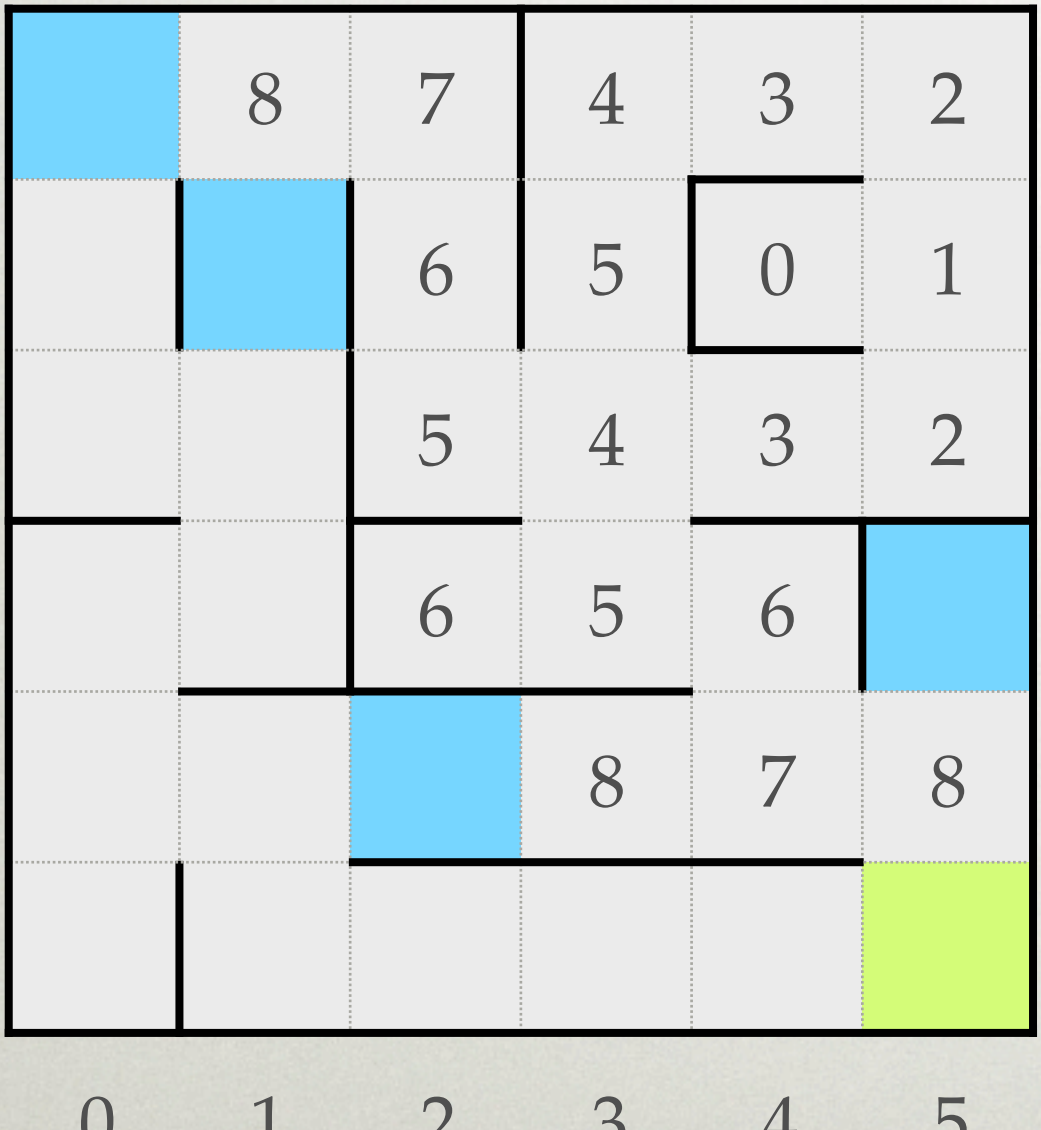
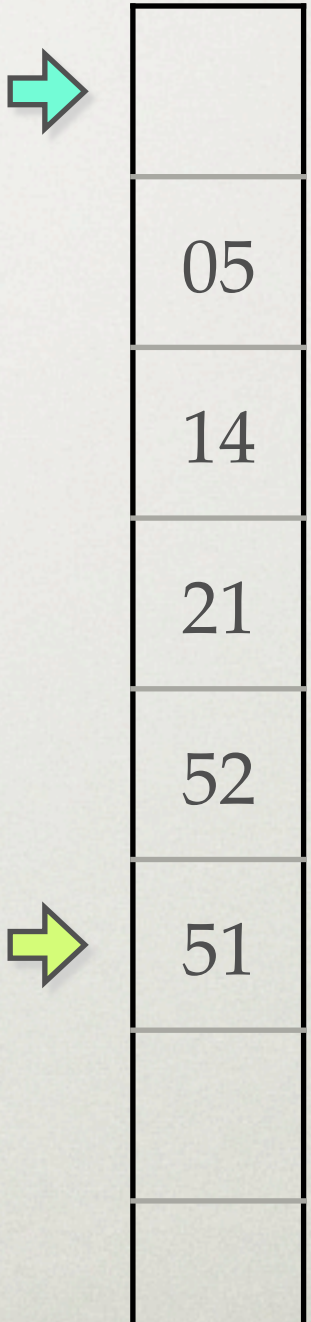




FULL STEP





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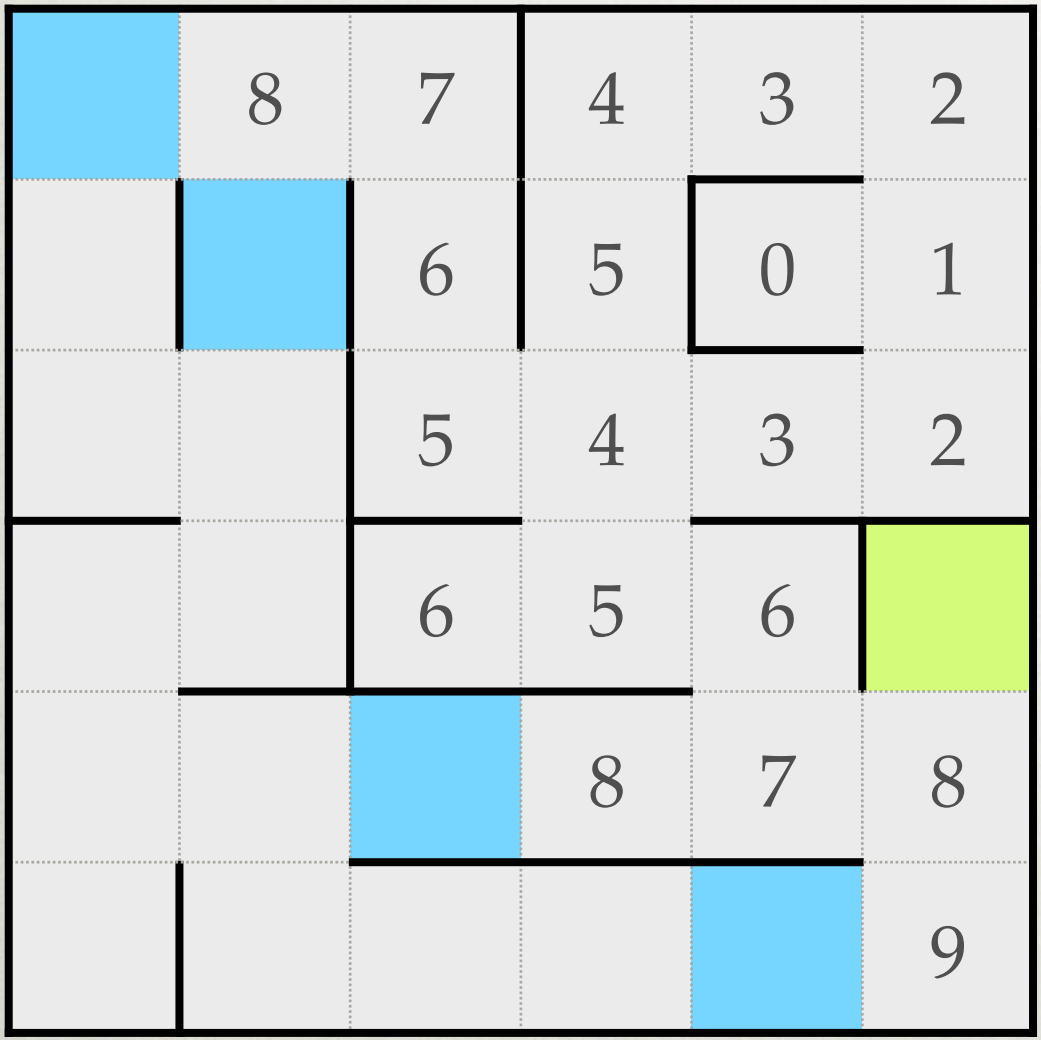

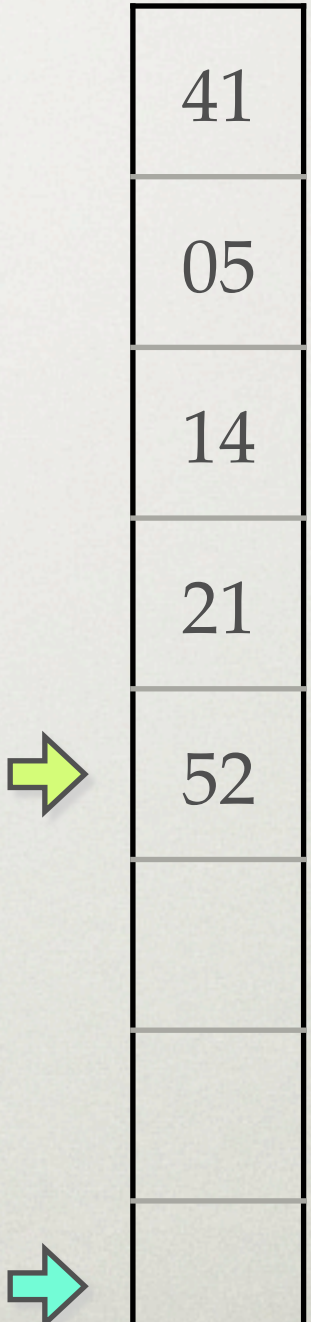

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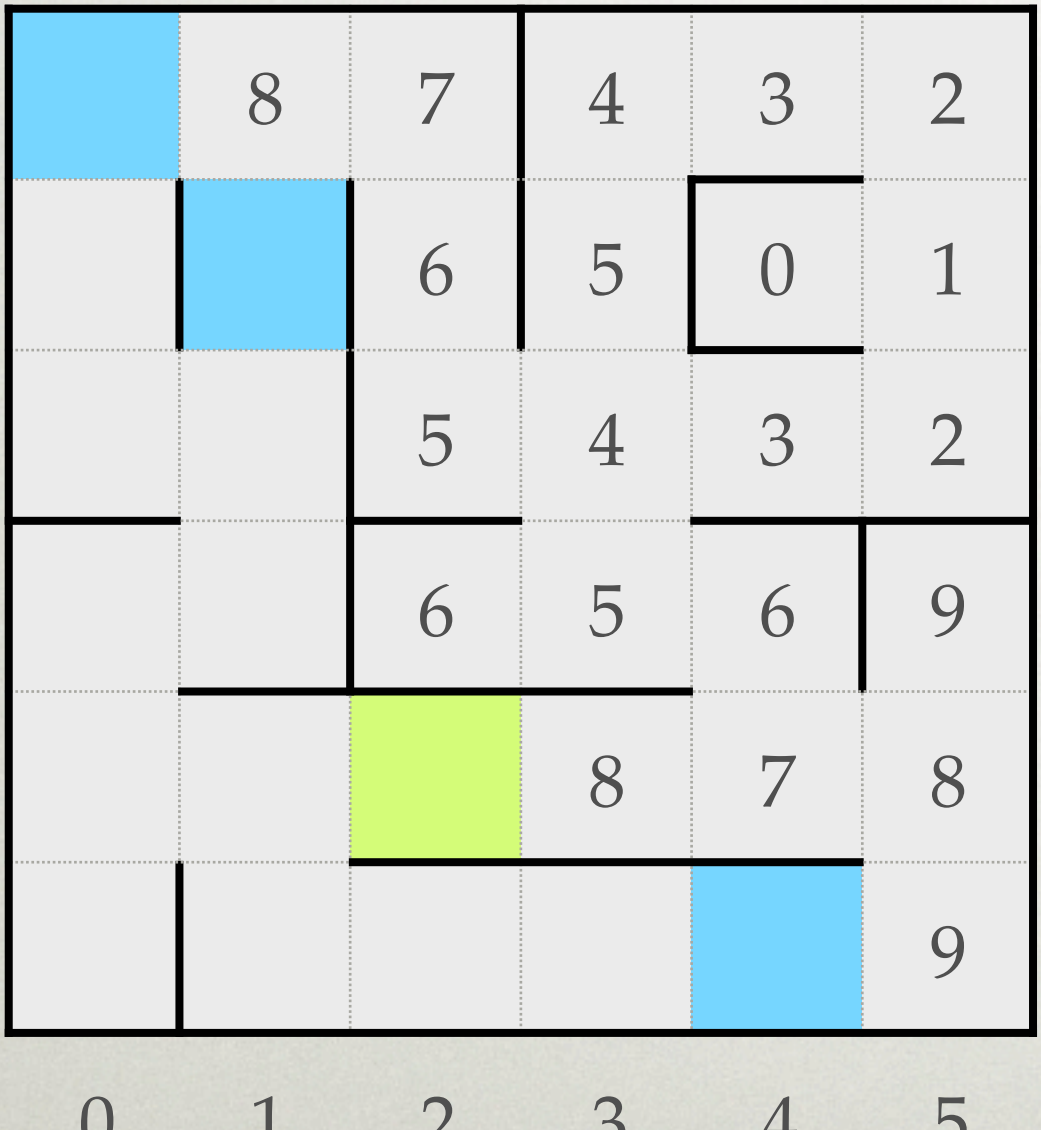
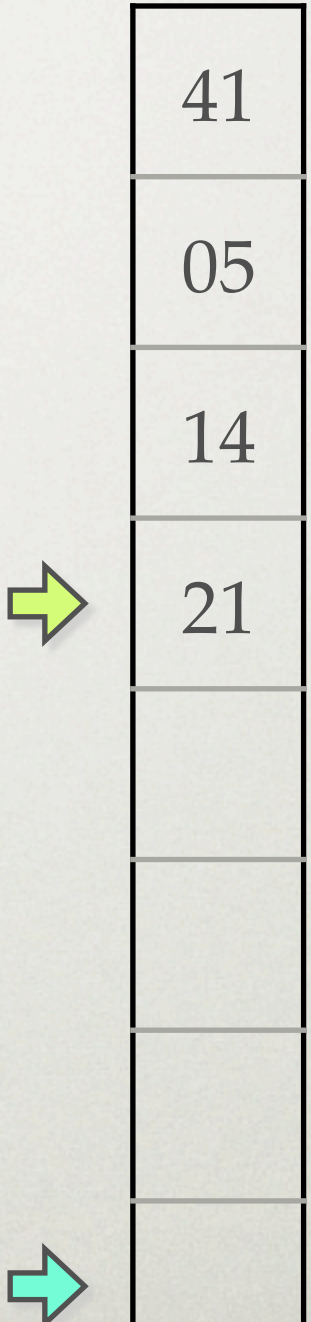
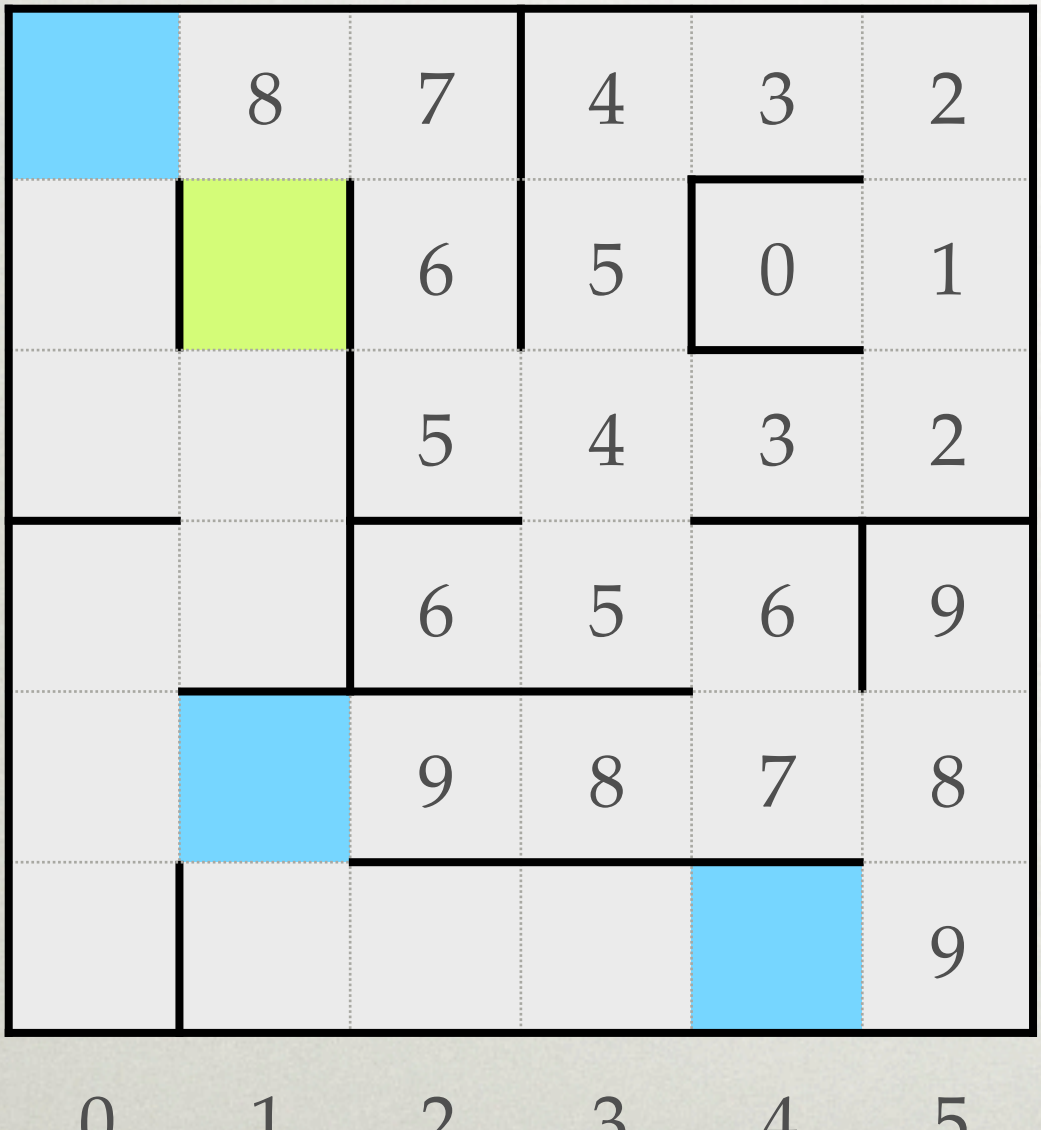
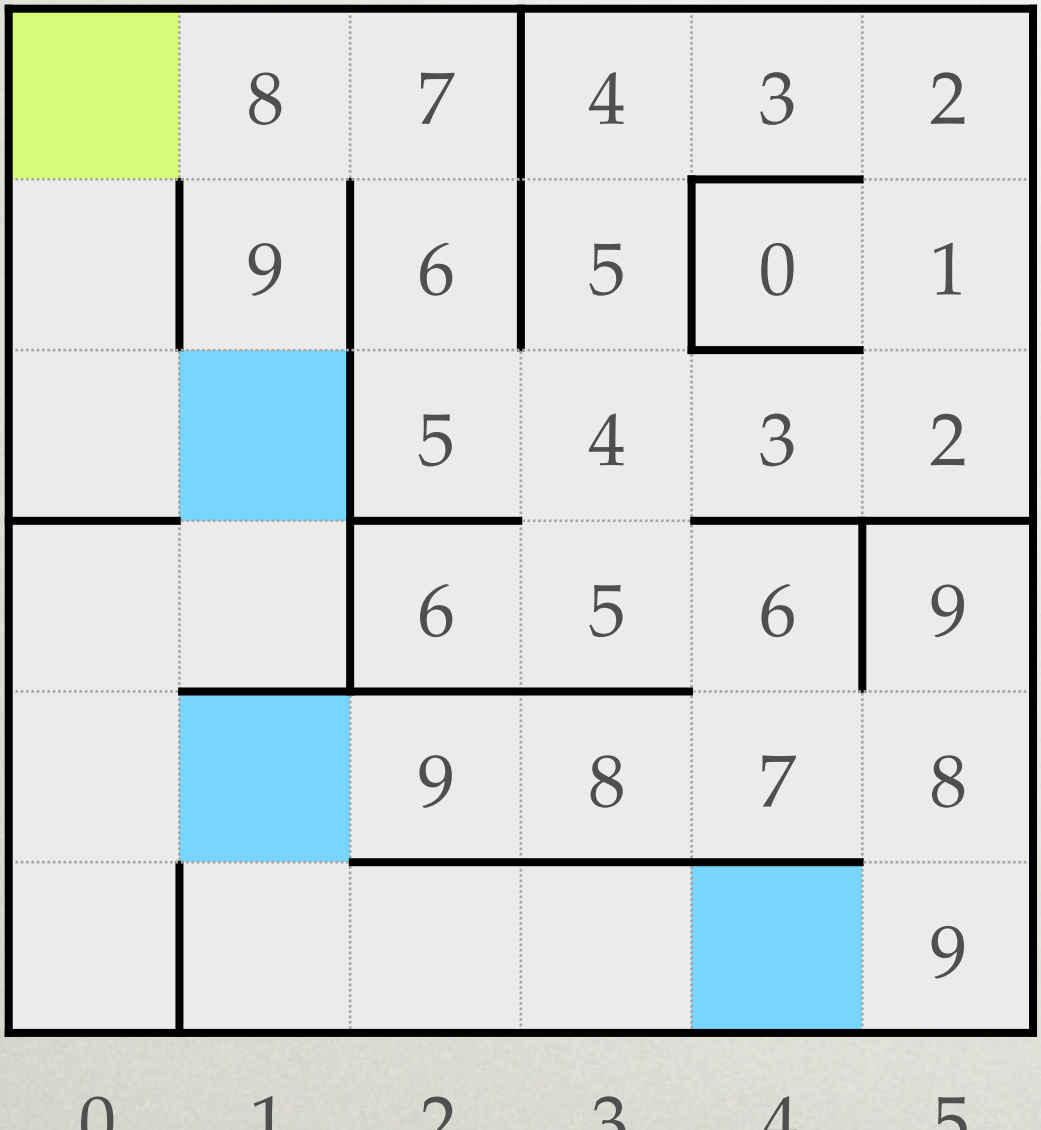




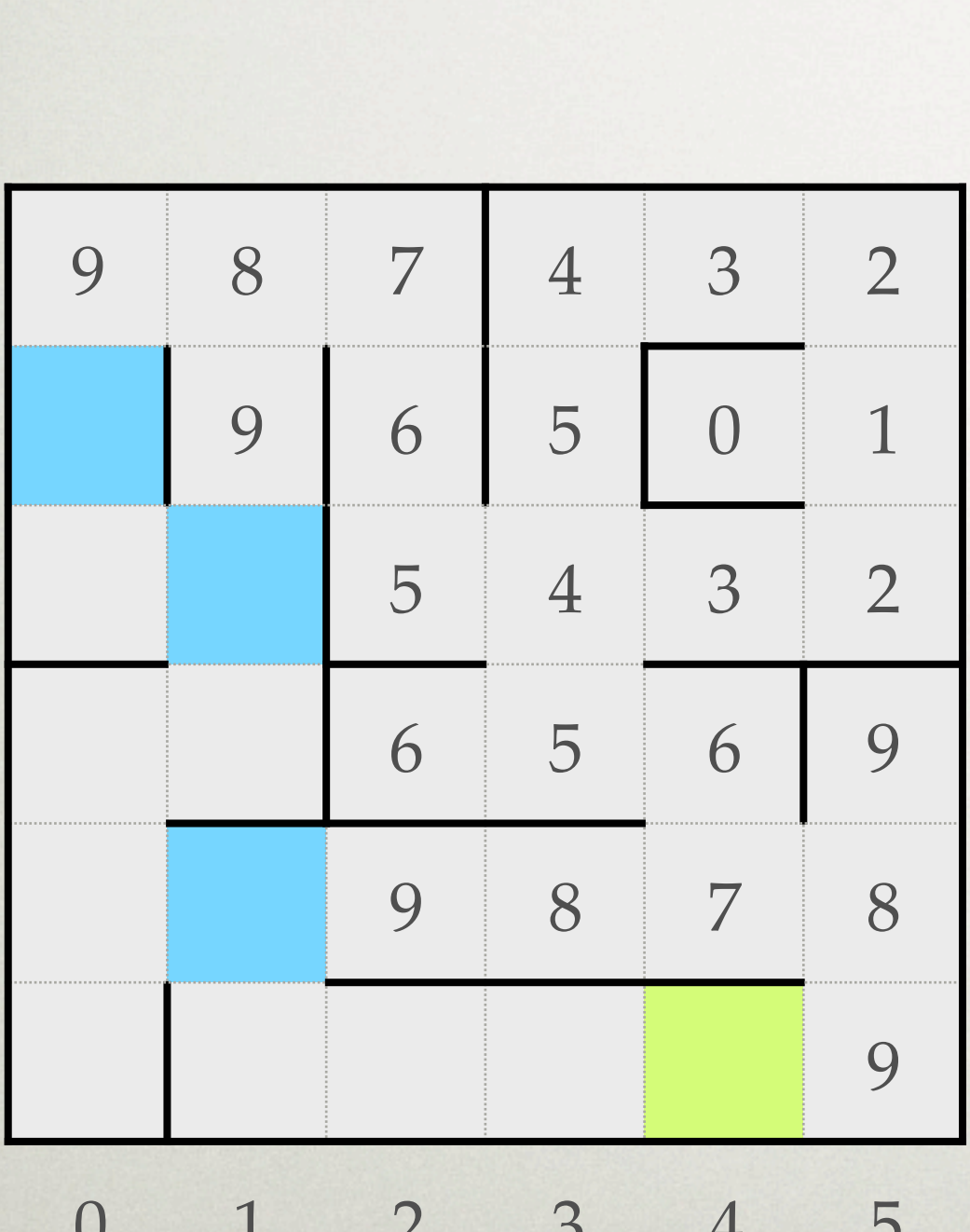
FULL STEP

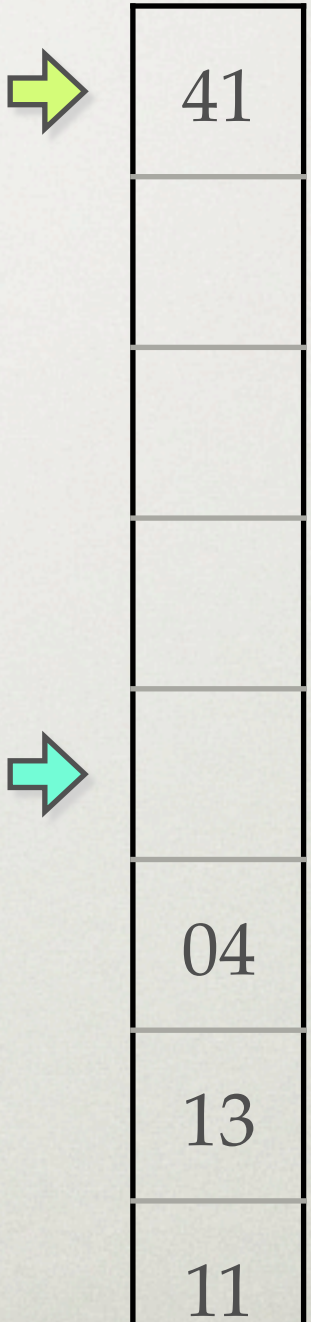


FULL STEP

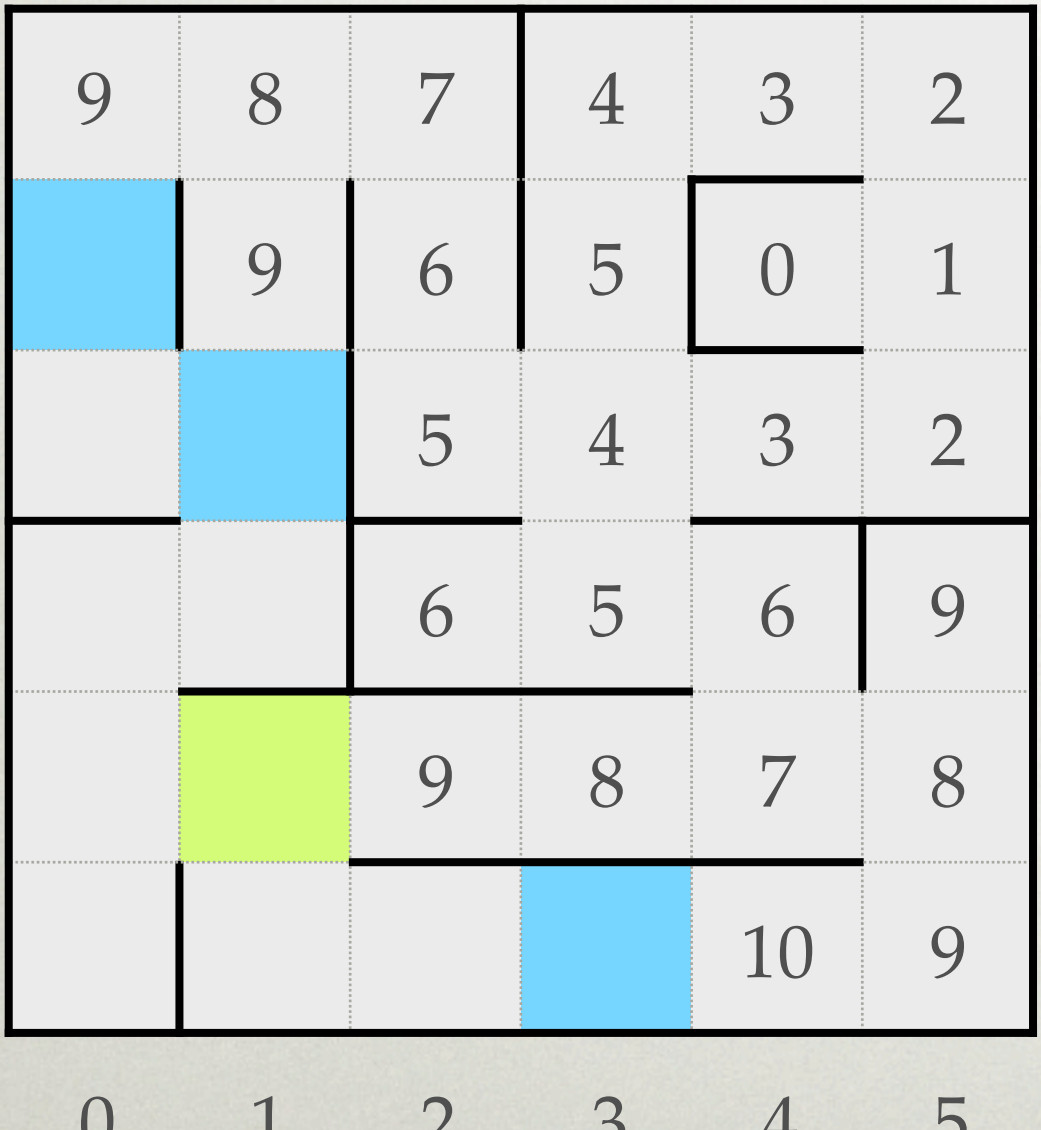


FULL STEP

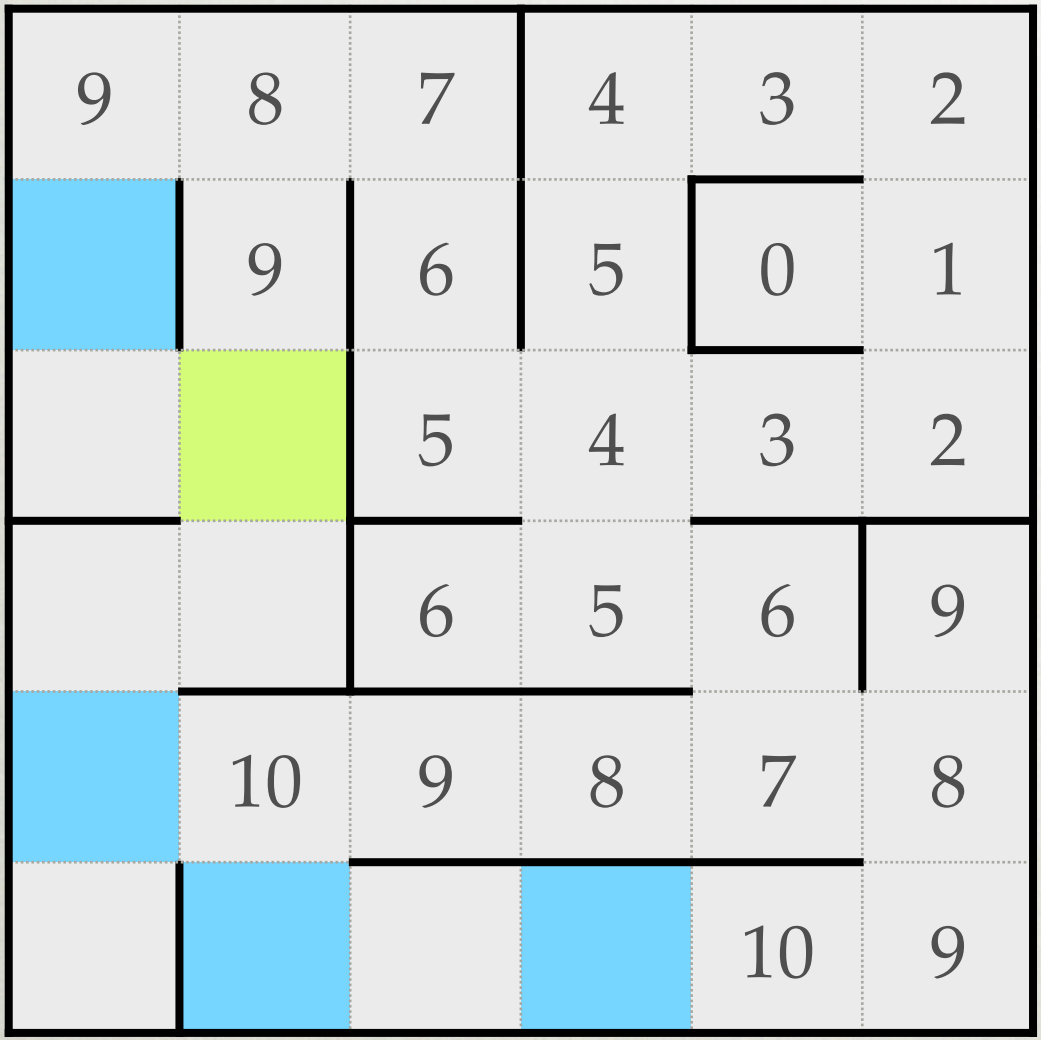


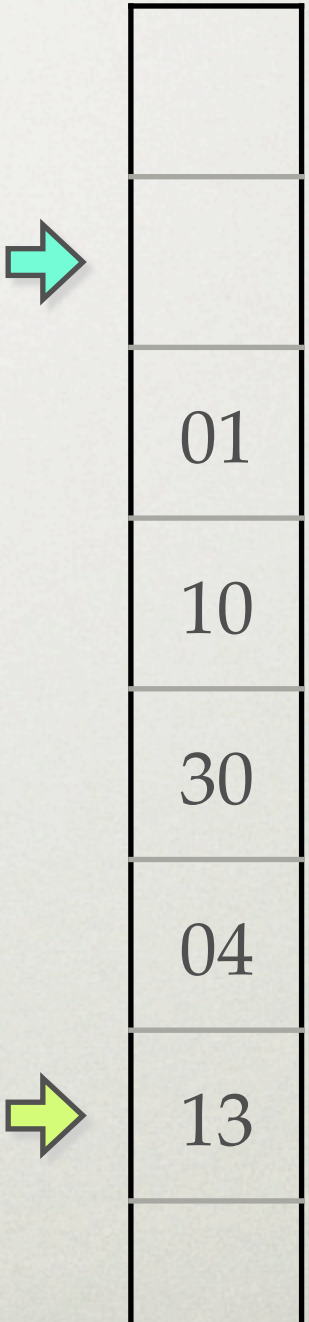


FULL STEP

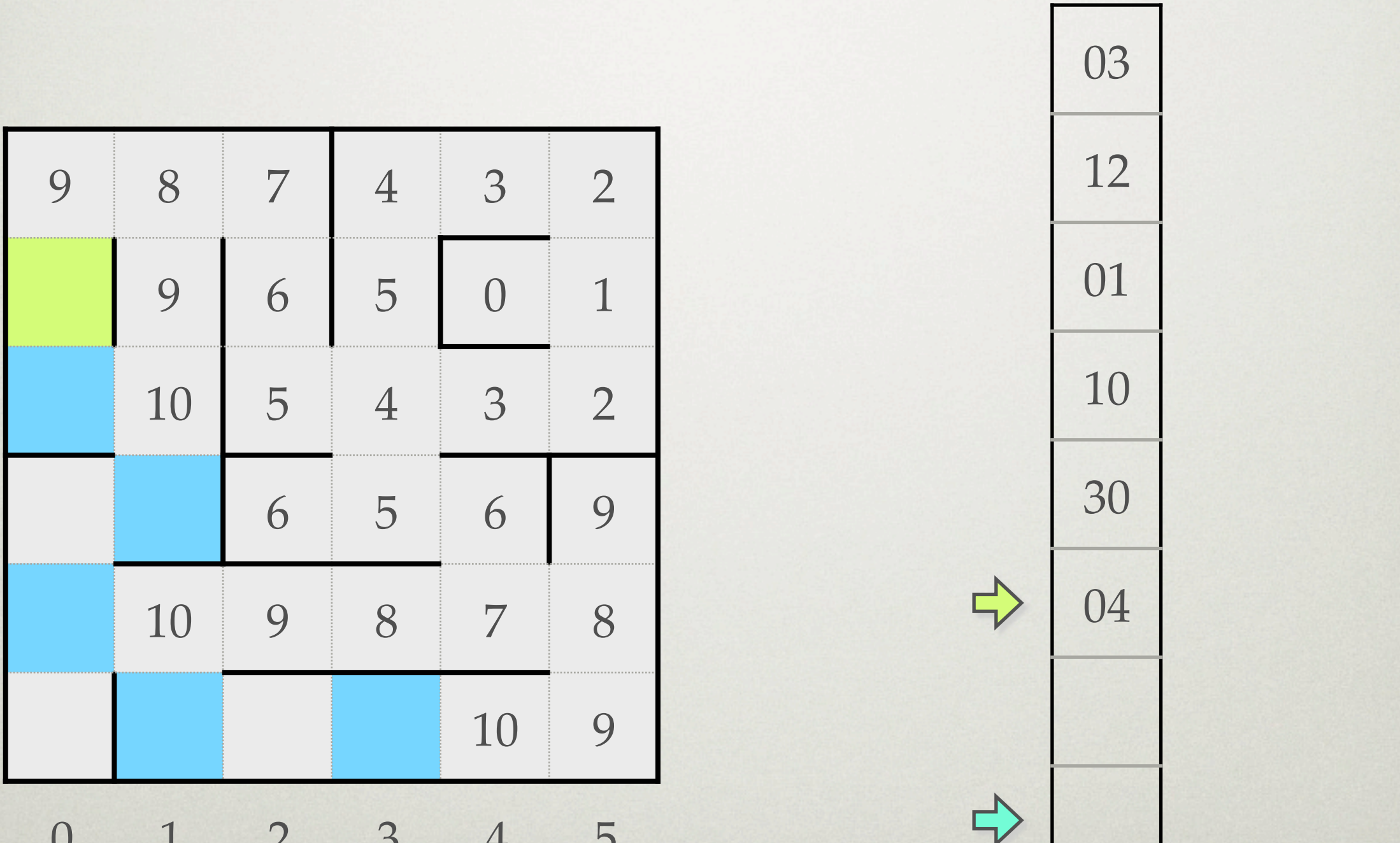


FULL STEP

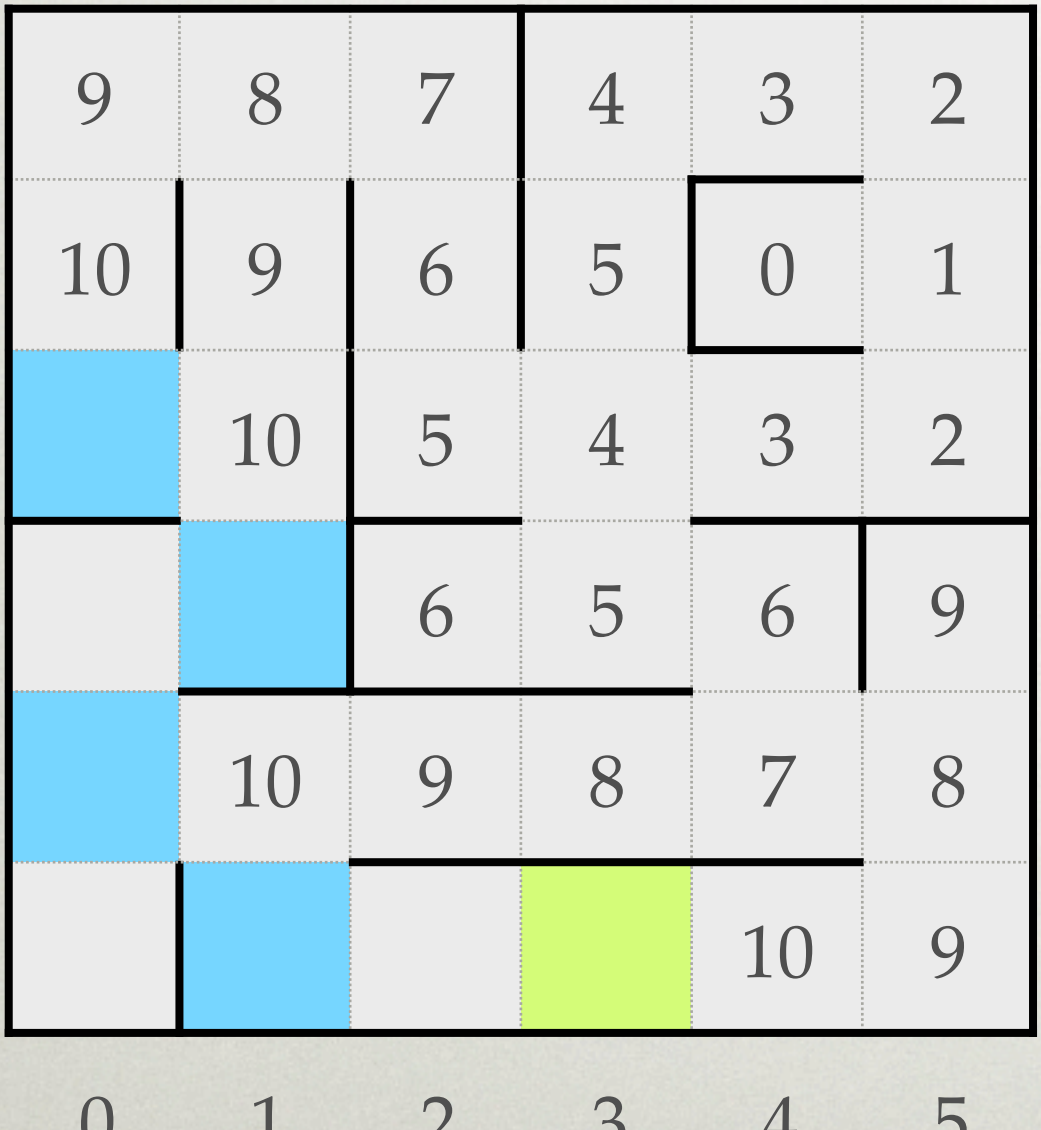


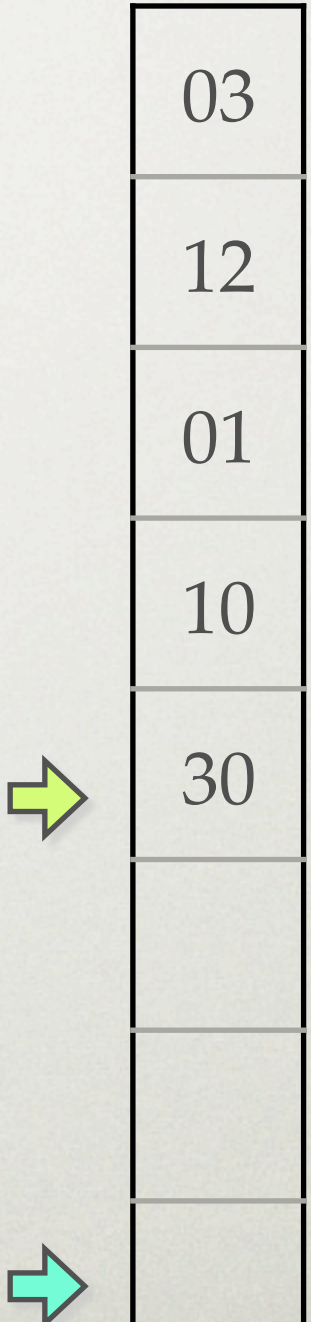


FULL STEP

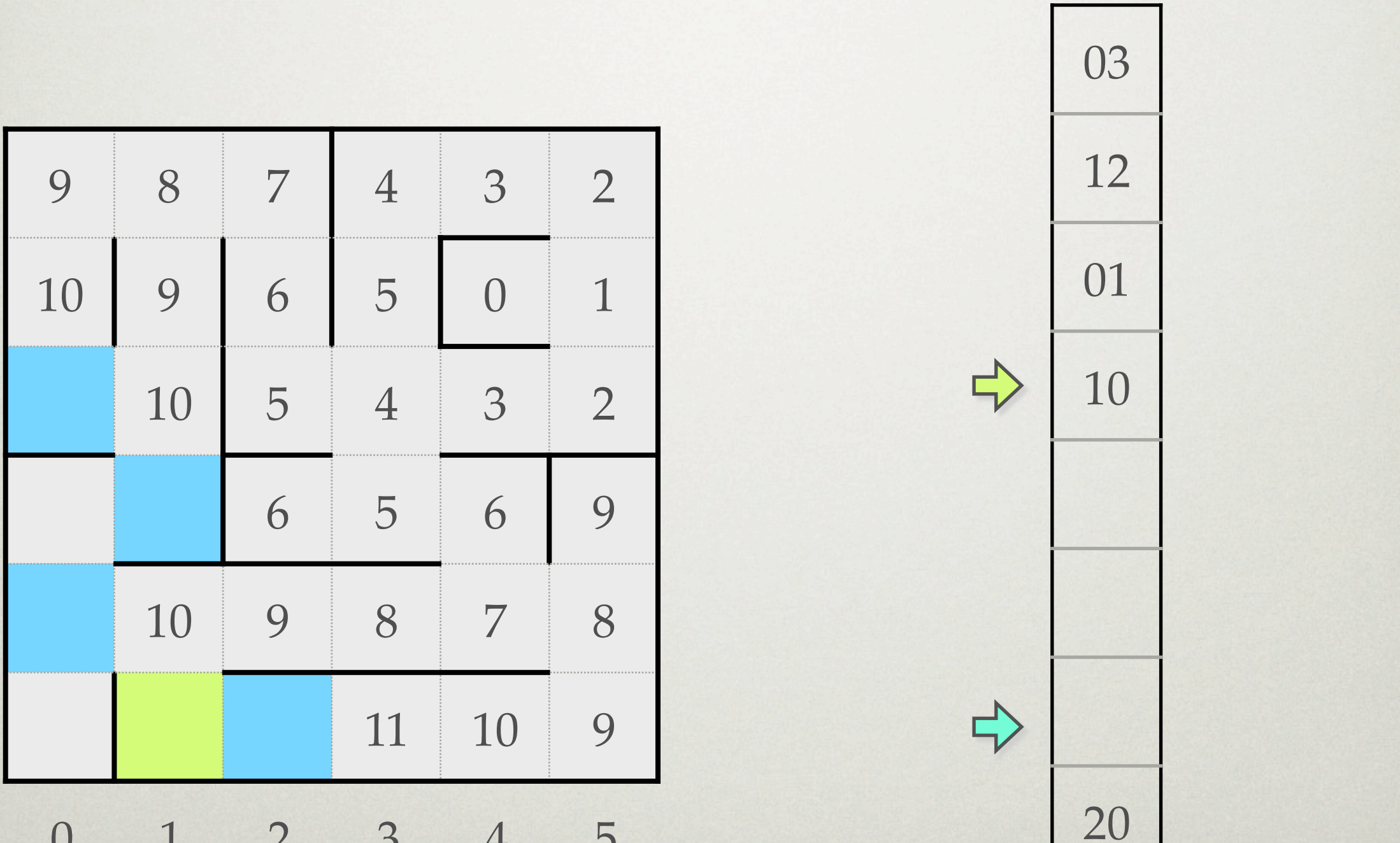


FULL STEP

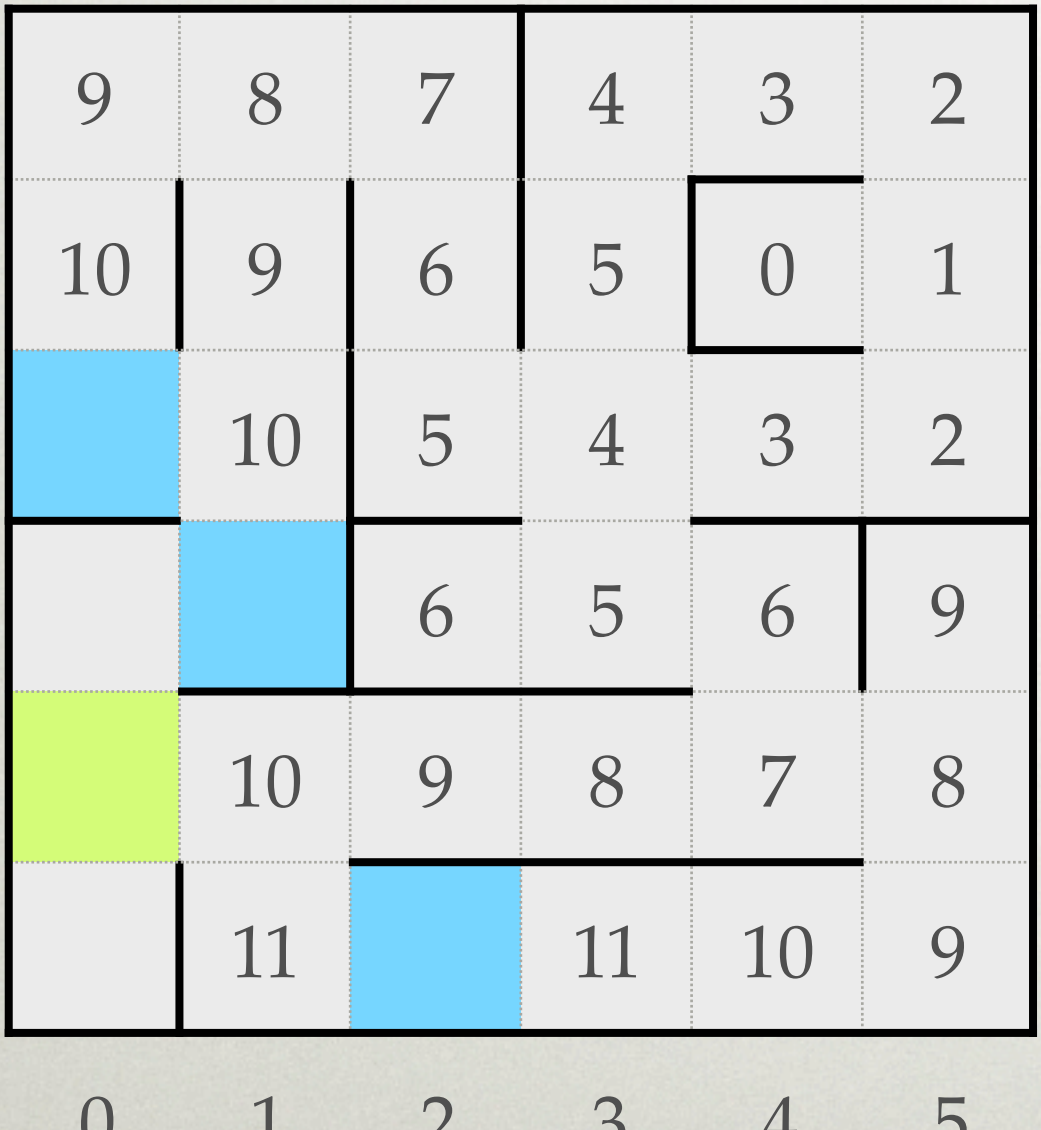




FULL STEP

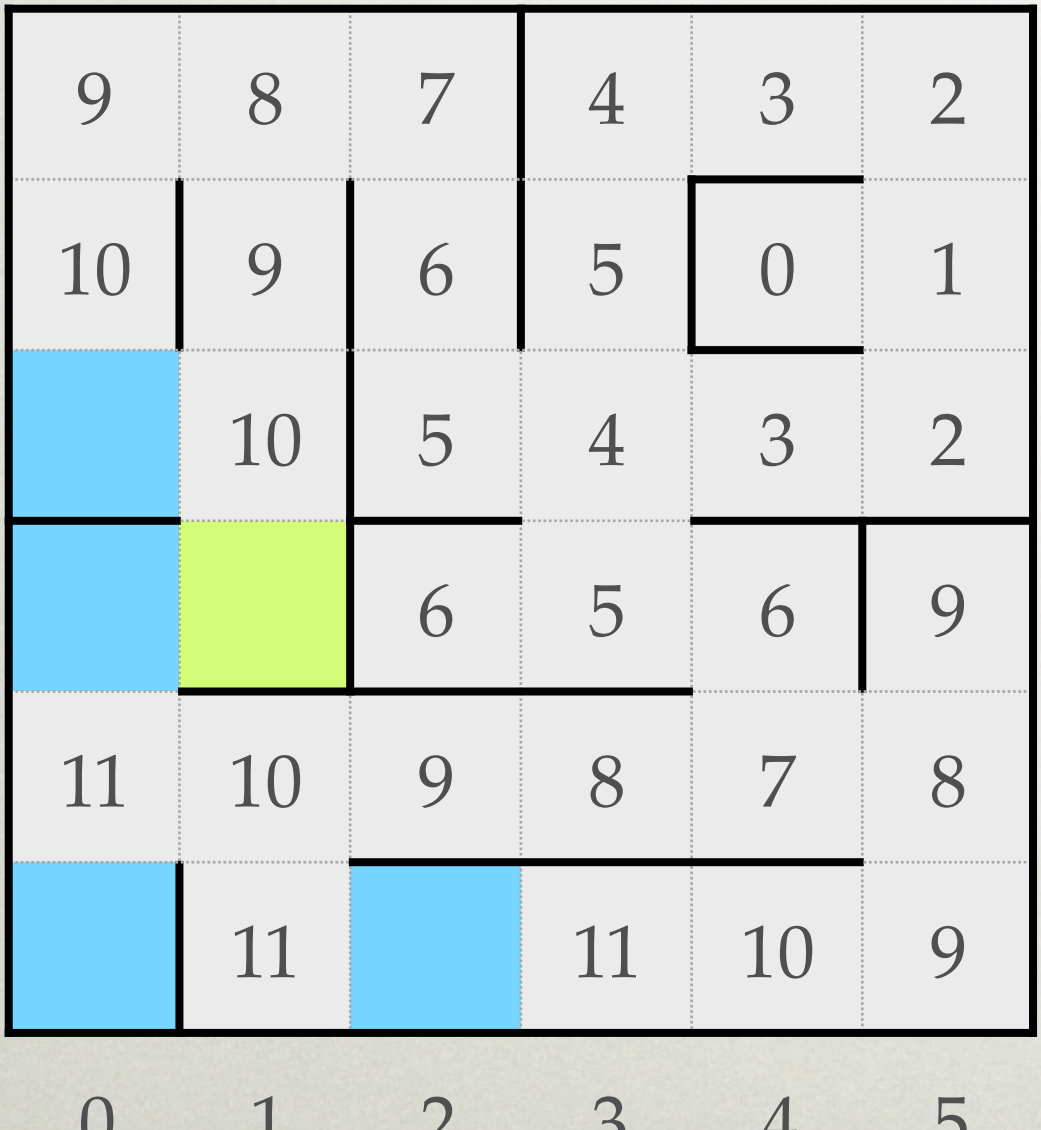

9 8 7 4 3 2
10 9 6 5 0 1
10 5 4 3 2
6 5 6 9
10 9 8 7 8
11 10 9
0 1 2 3 4 5
03
12
01
10
20

FULL STEP


9 8 7 4 3 2
10 9 6 5 0 1
10 5 4 3 2
6 5 6 9
10 9 8 7 8
11 11 10 9
0 1 2 3 4 5

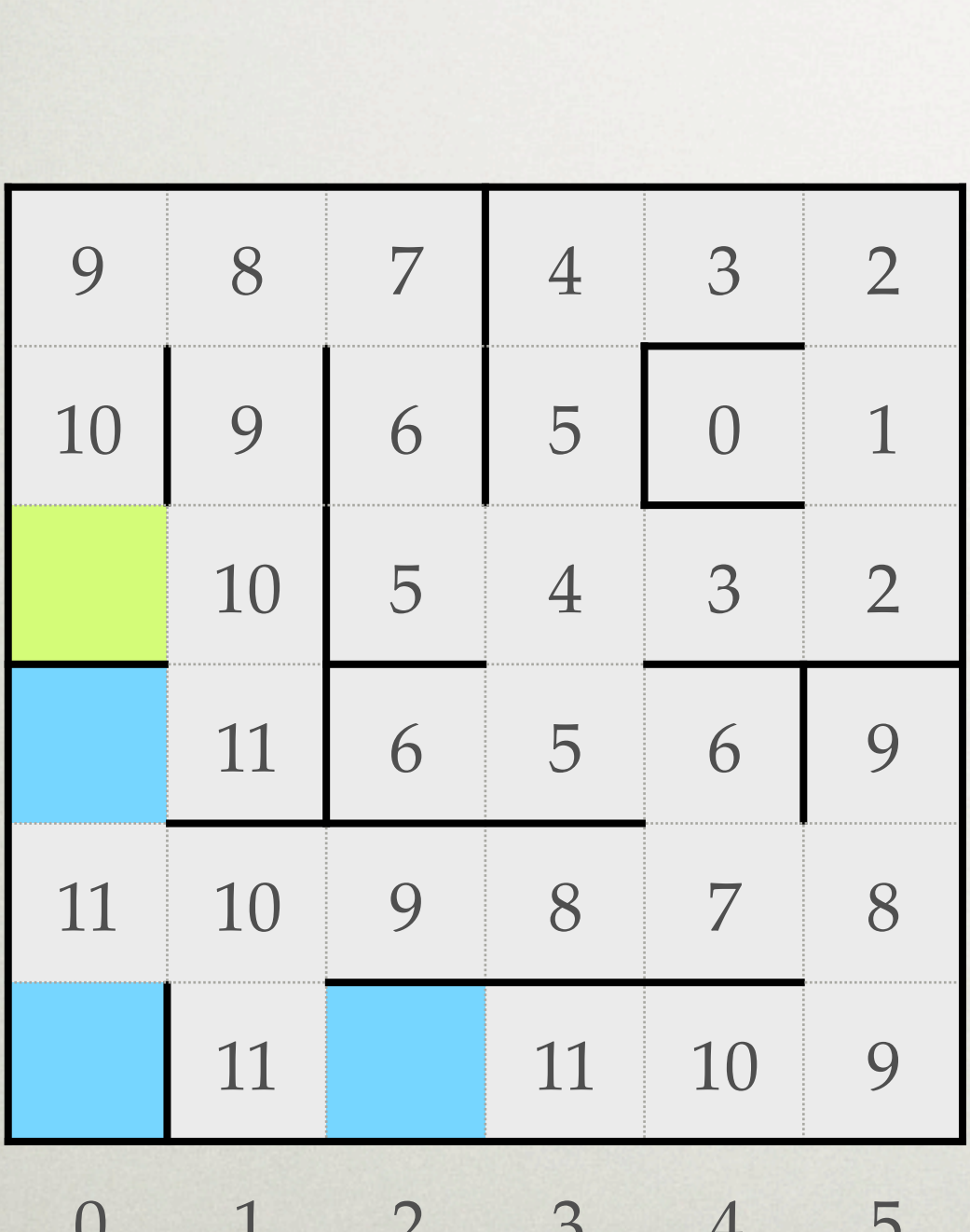

03
12
01
20

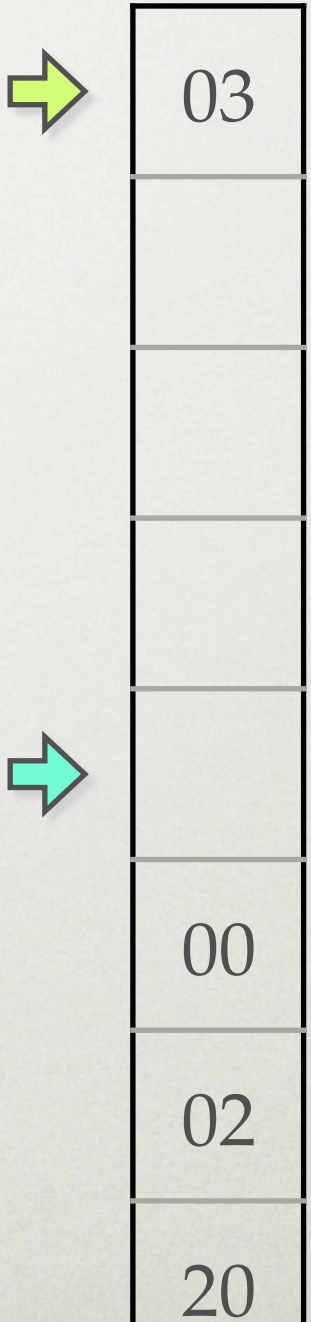
FULL STEP


9 8 7 4 3 2
10 9 6 5 0 1
10 5 4 3 2
6 5 6 9
11 10 9 8 7 8
11 11 10 9
0 1 2 3 4 5

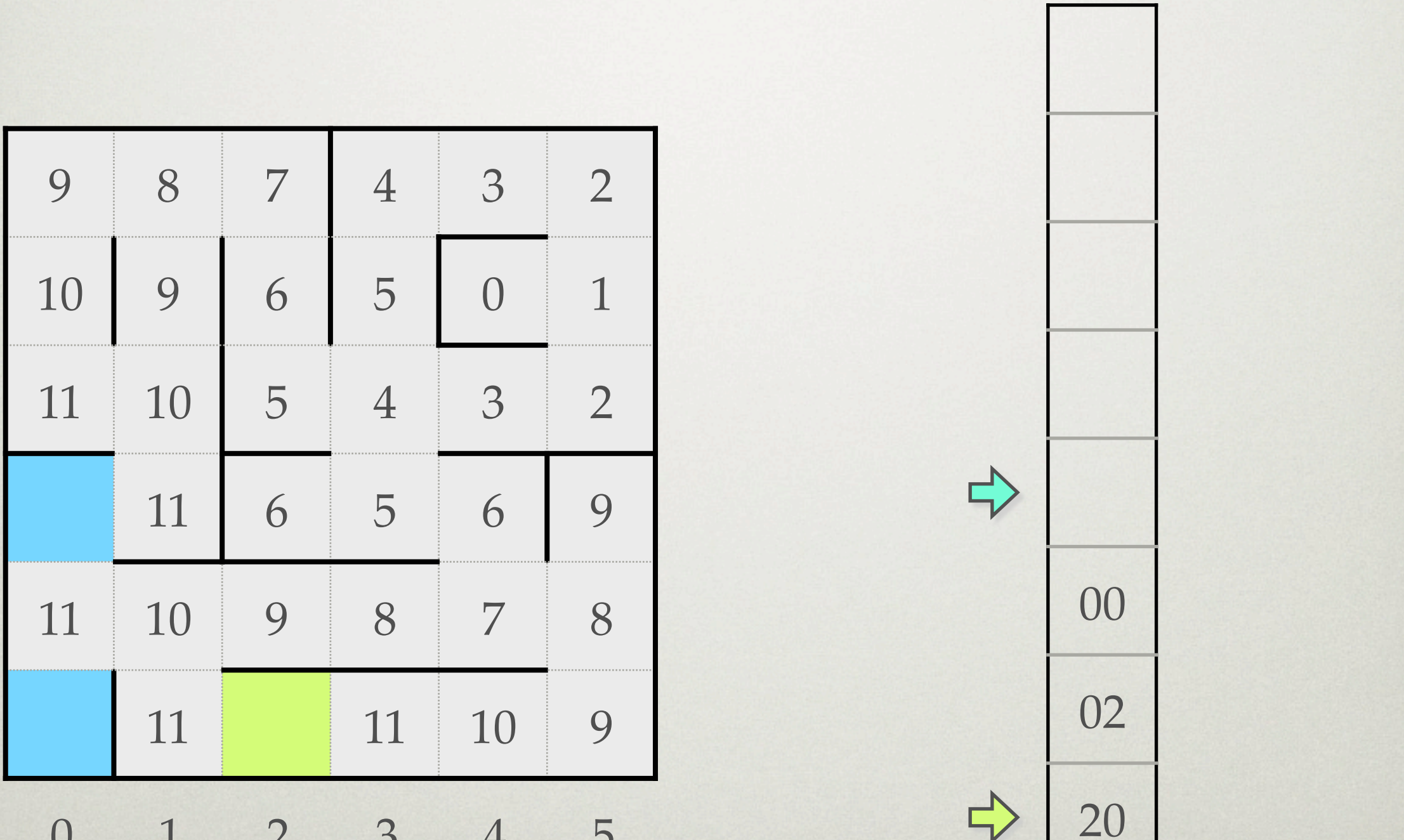

03
12
00
02
20

FULL STEP

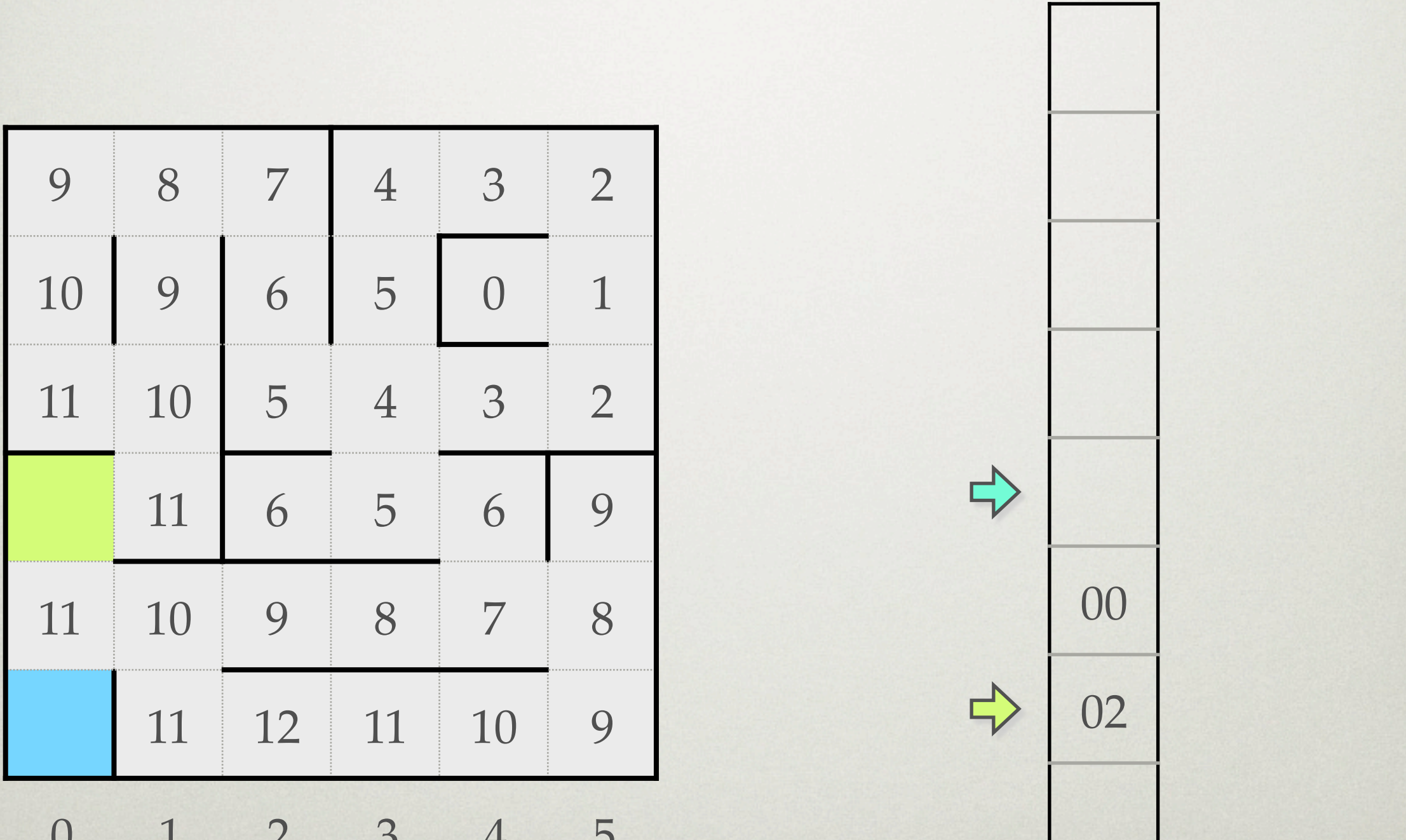

9 8 7 4 3 2
10 9 6 5 0 1
10 5 4 3 2
11 6 5 6 9
11 10 9 8 7 8
11 11 10 9
0 1 2 3 4 5


03
00
02
20

FULL STEP


9 8 7 4 3 2
10 9 6 5 0 1
11 10 5 4 3 2
11 6 5 6 9
11 10 9 8 7 8
11 11 11 10 9
0 1 2 3 4 5
00
02
20

FULL STEP

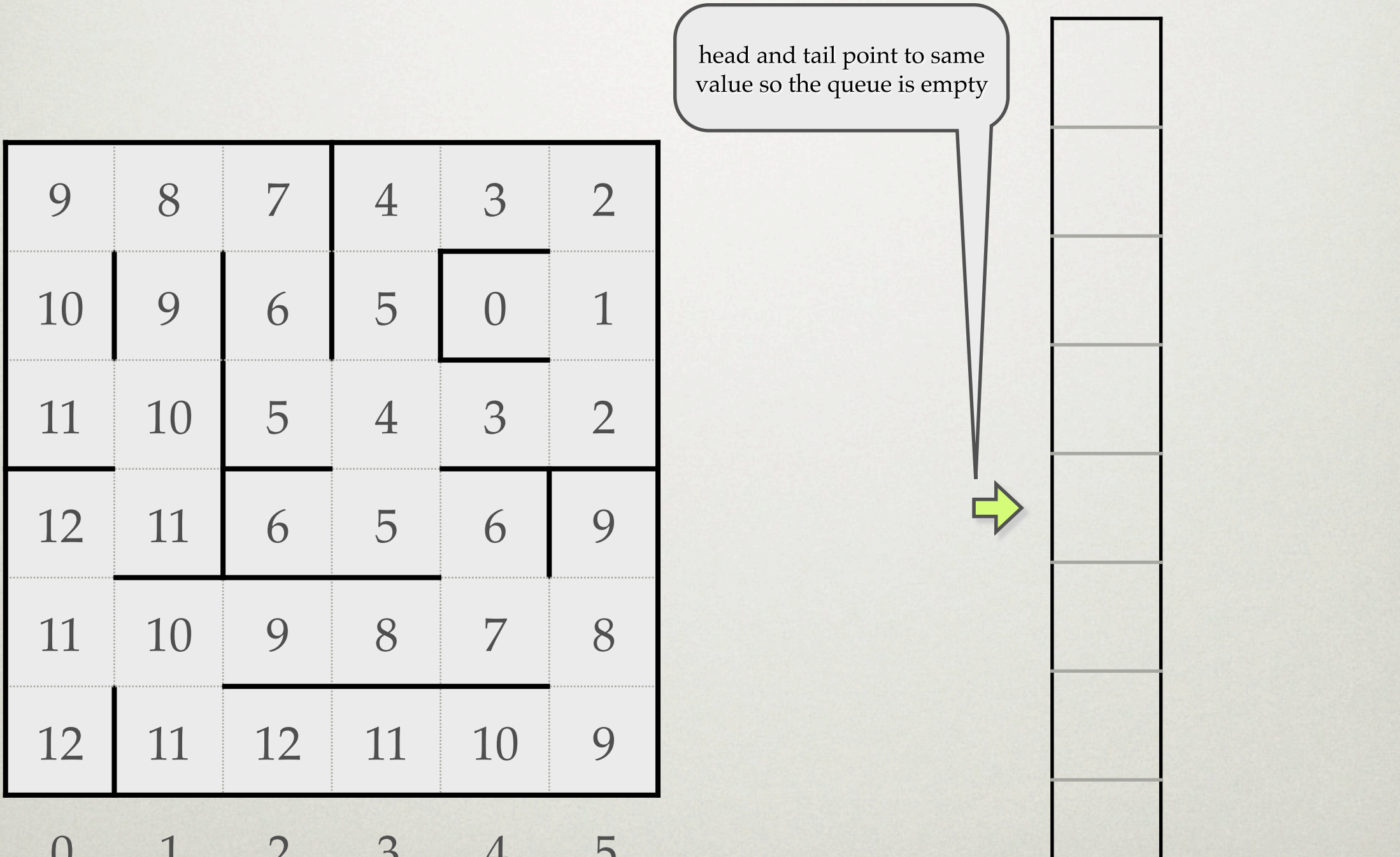

9 8 7 4 3 2
10 9 6 5 0 1
11 10 5 4 3 2
11 6 5 6 9
11 10 9 8 7 8
11 12 11 10 9
0 1 2 3 4 5
00
02

FULL STEP


9 8 7 4 3 2
10 9 6 5 0 1
11 10 5 4 3 2
12 11 6 5 6 9
11 10 9 8 7 8
11 12 11 10 9
0 1 2 3 4 5

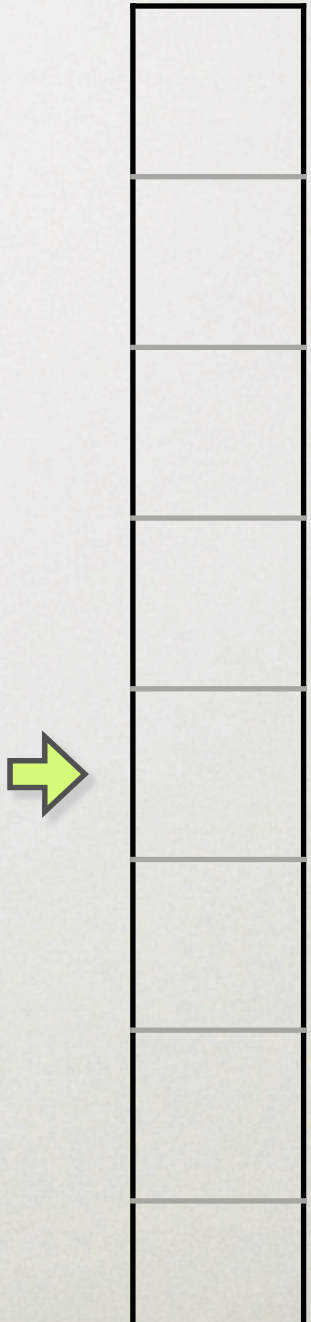

00

SOLVED


head and tail point to same value so the queue is empty
9 8 7 4 3 2
10 9 6 5 0 1
11 10 5 4 3 2
12 11 6 5 6 9
11 10 9 8 7 8
12 11 12 11 10 9
0 1 2 3 4 5

ROUTE TRACED

9	8	7	4	3	2
10	9	6	5	0	1
11	10	5	4	3	2
12	11	6	5	6	9
11	10	9	8	7	8
12	11	12	11	10	9



How fast is that?

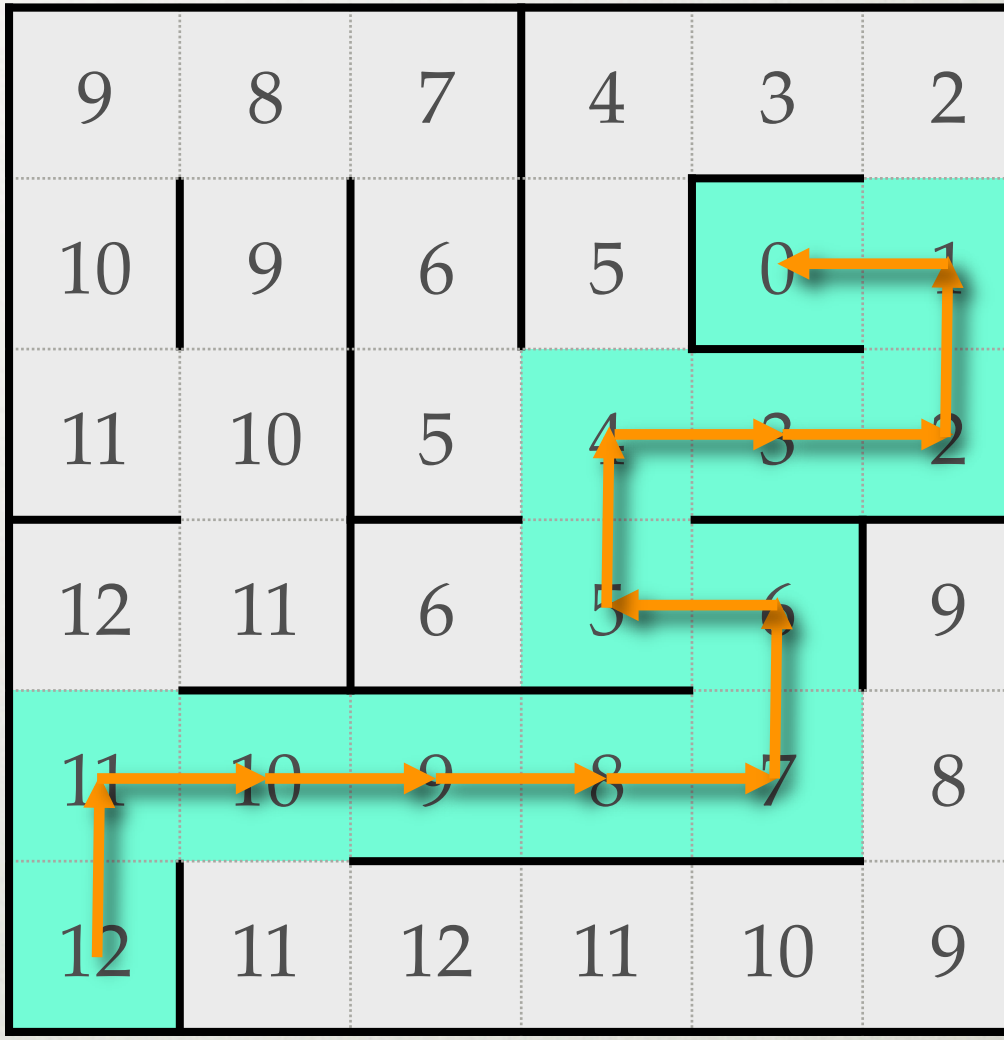
- dsPIC30F4011 @ 32MHz, C30
- Japan 2007 maze
- No optimisation
  - Simple flood: 41.91ms
  - Fast flood: 3.75ms, 139 words
- Optimisation O1
  - Simple flood: 24.19ms
  - Fast flood: 1.74ms, 63 words

How fast is that?

- PIC18F4525 @ 32MHz, C18
- Japan 2007 maze
- No optimisation
  - Simple flood: 46.9ms, 291 words
  - Fast flood: 5.95ms, 374 words
- Optimisation - full
  - Simple flood: 52.8ms, 166 words
  - Fast flood: 7.6ms, 196 words

CREATING THE PATH

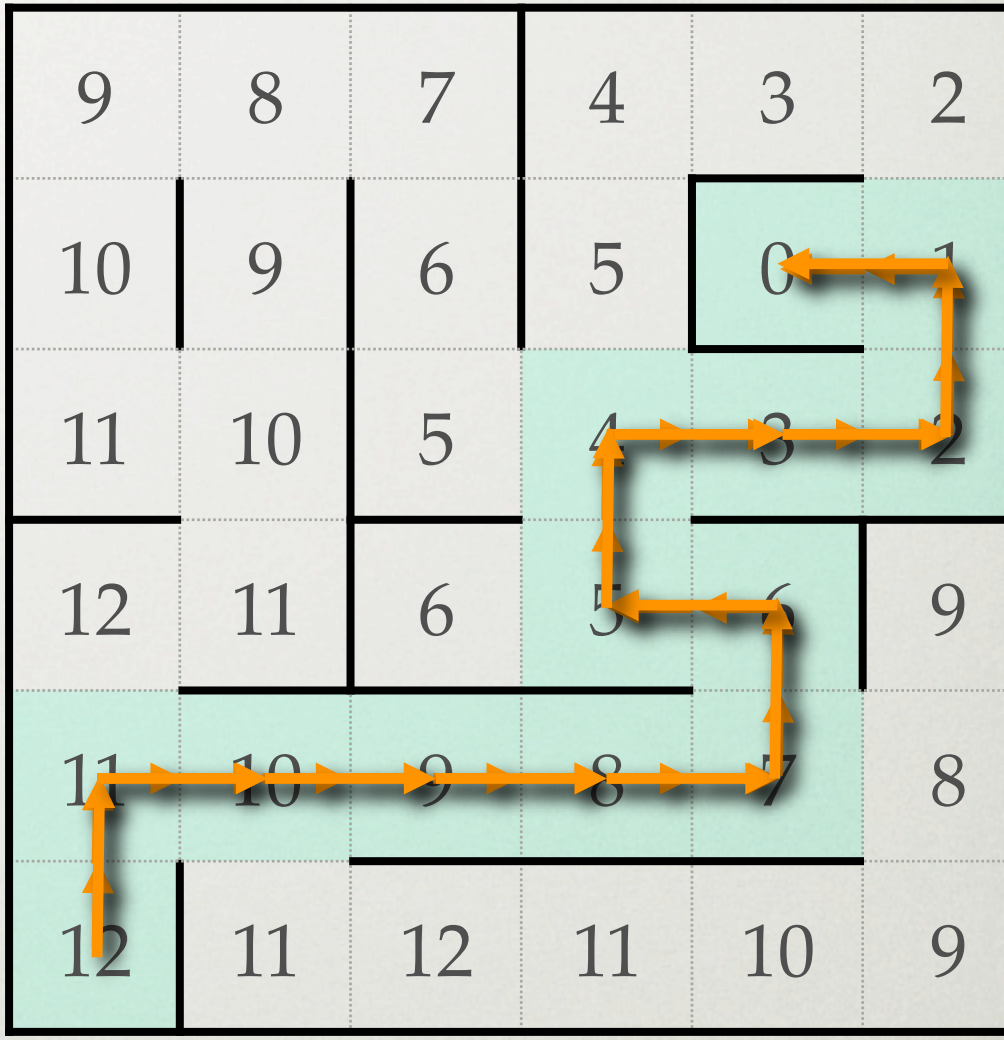
- Walk downhill
- Run length encode result



F RFFFF LF LF RF RFF LF LF
1R4L1L1R1R2L1L1

CREATING DIAGONALS

- Still downhill
- Pattern matching
- 19 patterns/rules
- 7 cell look-ahead
- messy at best
- Make more - do less
- Use half-cells?

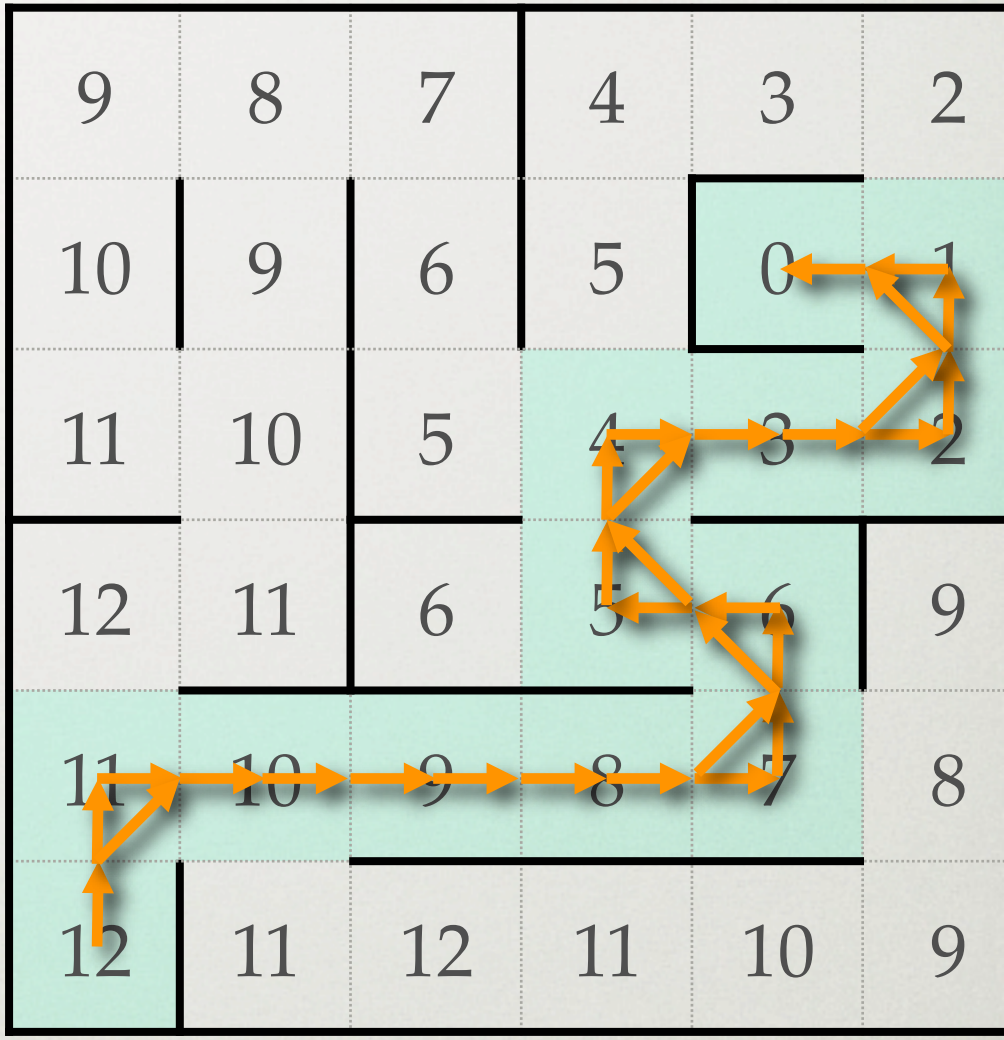


HHRHHHHHHHHLHHLHHRHHRHHHHHLHHLHH

1R4L1L1R1R2L1L1

CREATING DIAGONALS

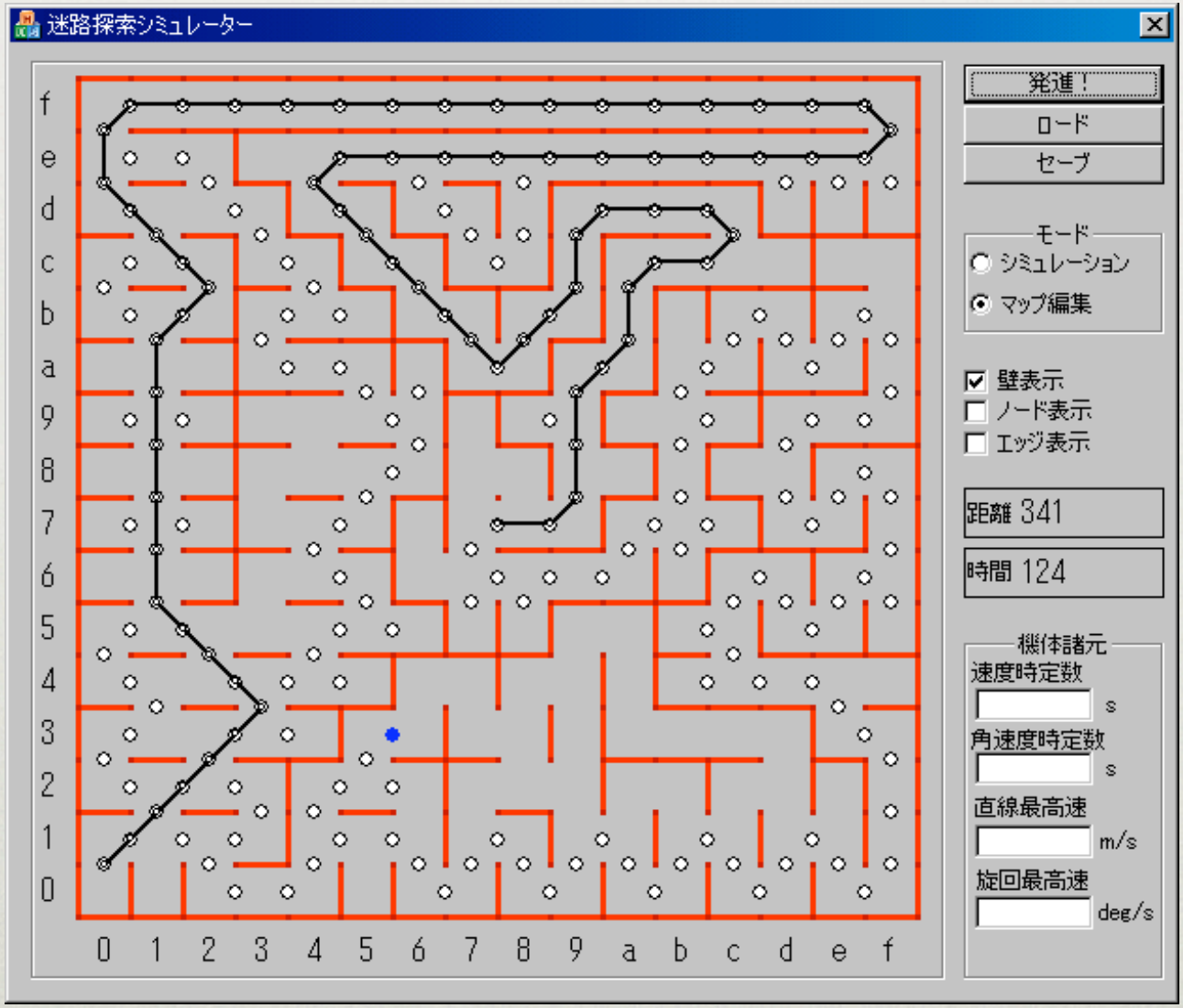
- Still pattern matching
- 7 patterns
- 6 cell look-ahead
- Turns are left as an exercise for the reader (this is not a good example)

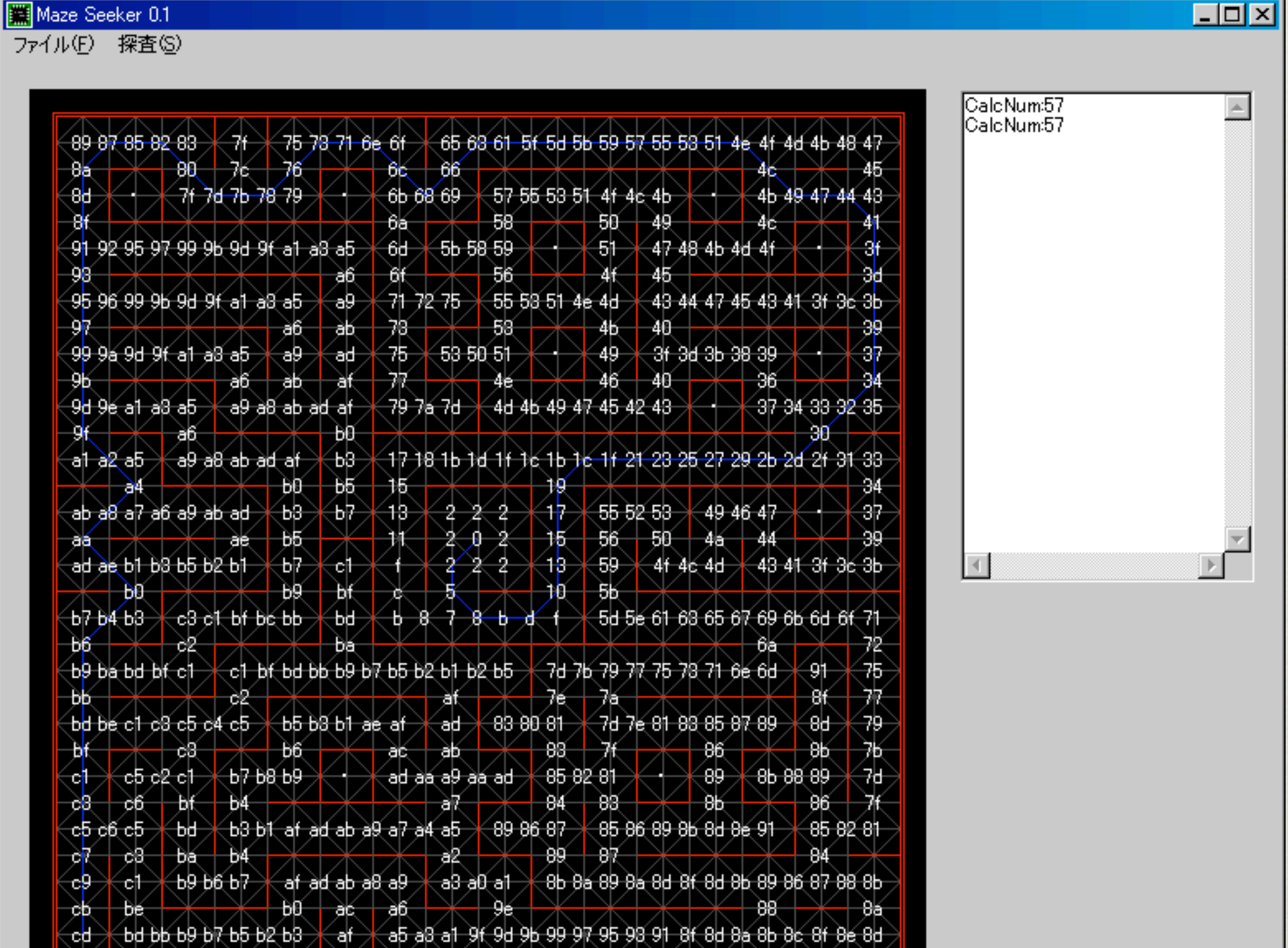


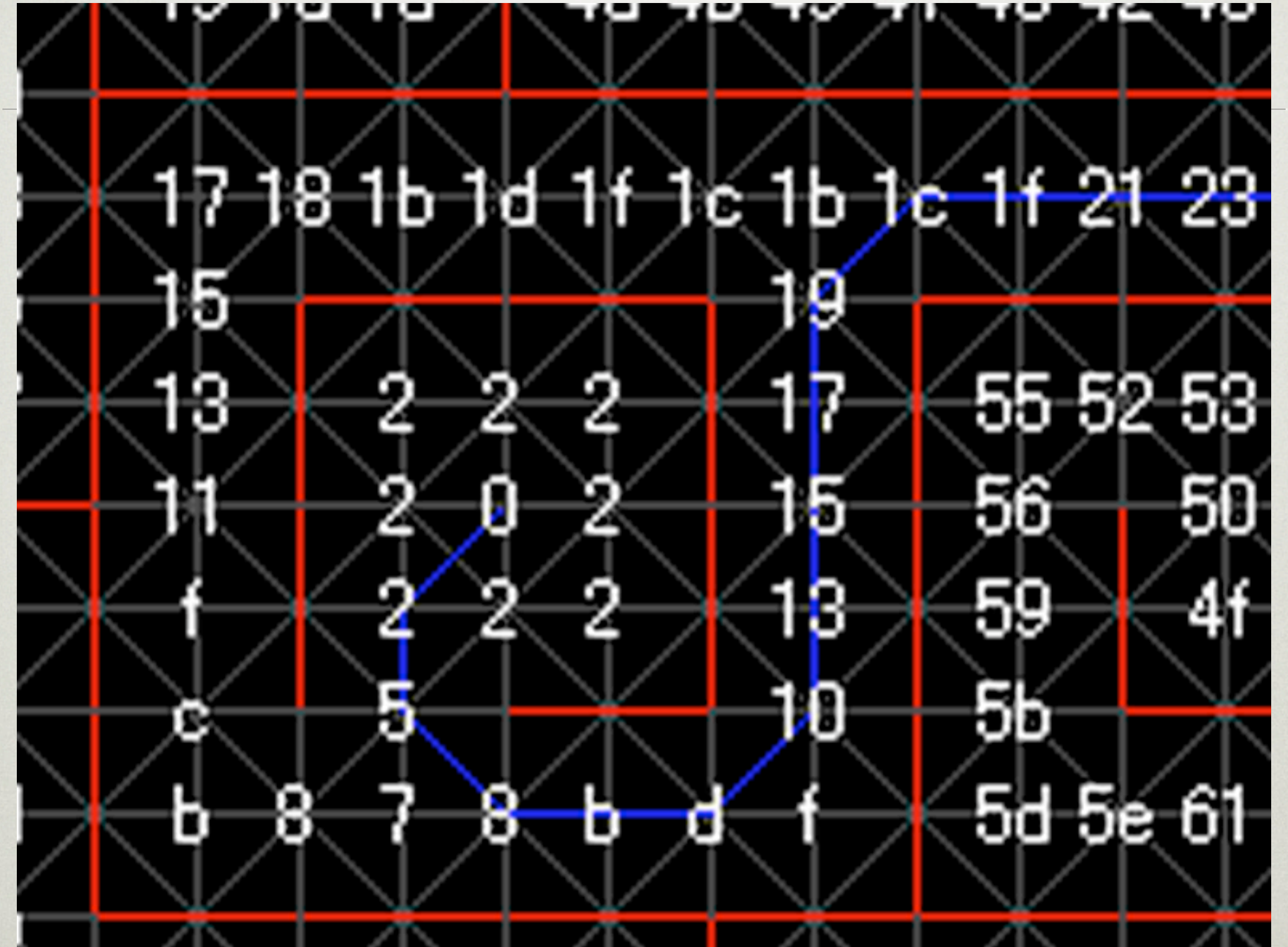
H HRH HHHHHH HLH HLH HRH HRH HH HLH HLH H
H TDT HHHHHH TDT TDDT TDT HH TDT TDT H

HALF-CELL GRIDS

- It may be easier to work on a half-cell grid in the first place



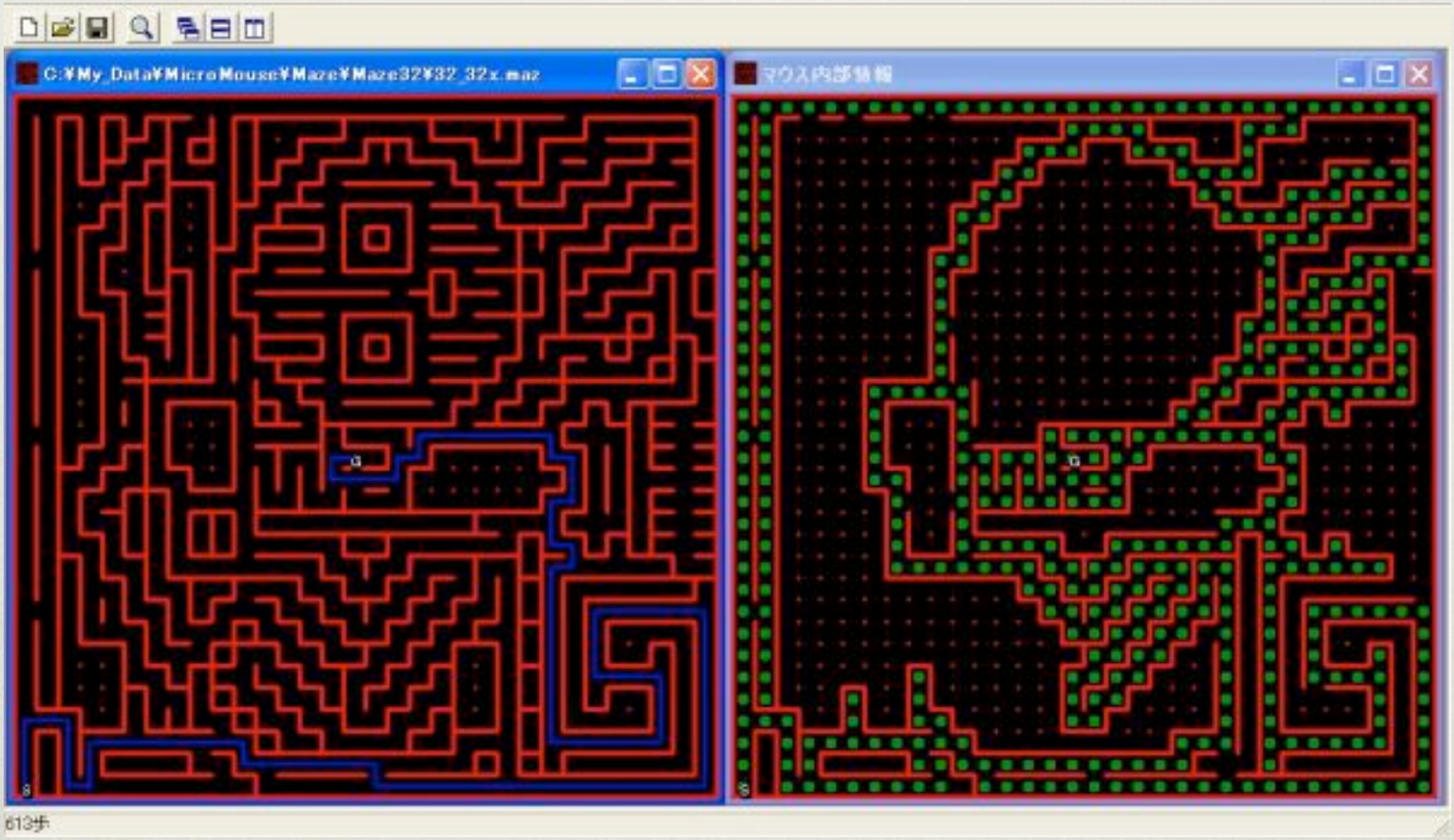

Maze Seeker 0.1
ファイル(F)　探査(S)
CalcNum:57
CalcNum:57


17 18 1b 1d 1f 1c 1b 1c 1f 21 23
15
19
13 2 2 2 17 55 52 53
11 2 0 2 15 56 50
f 2 2 2 13 59 4f
c 5 10 5b
b 8 7 8 b d f 5d 5e 61

FOUR TIMES AS BIG

http://www24.atwiki.jp/mm3sakusya/pages/28.html

FOUR TIMES AS BIG



http://www24.atwiki.jp/mm3sakusya/pages/28.html

Thank you

Peter Harrison

www.micromouseonline.com