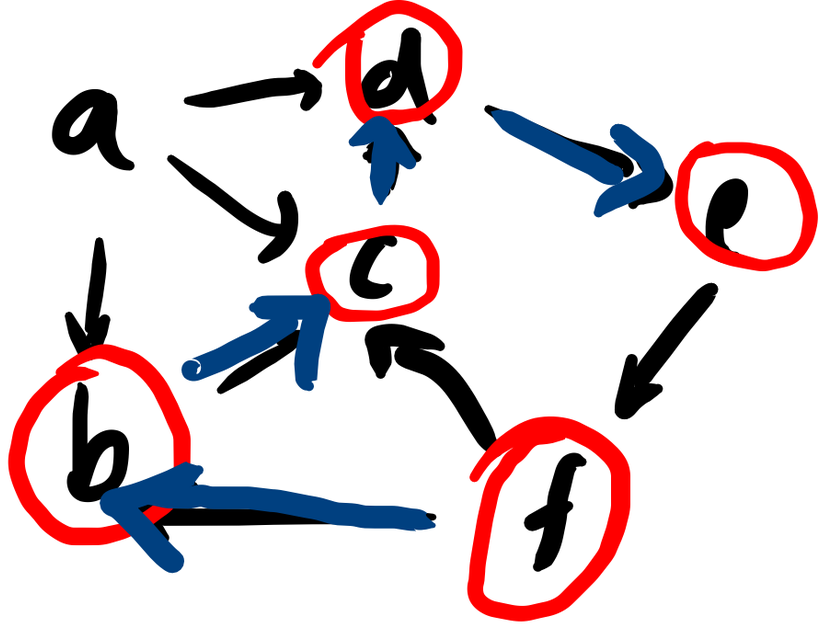


DFS starting from f

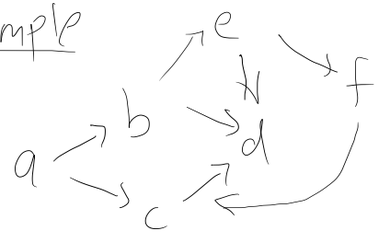
Obs. If there is a path from s to t in G, then DFS on G starting from s will find a path from s to t.

DFS

- Bottom-up analysis of graphs
  ex. computing optimal strategies for games.
- Path-finding in graphs.

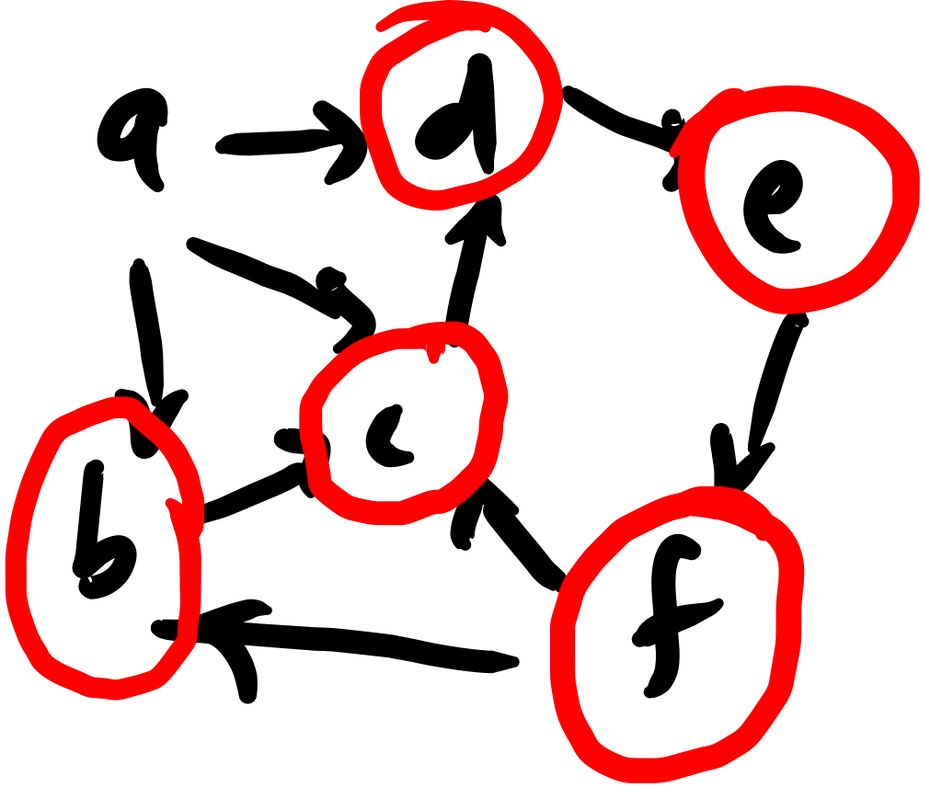
```
dfs(G,s)
    visited[v] ← false for all v ∈ V(G)
    stack ← {s}
    while stack ≠ ϕ
        v ← pop stack
        if visited[v] is false
            visited[v] ← true
            for each v → u in G
                if visited[u] is false
                    Push u into stack
```

Example

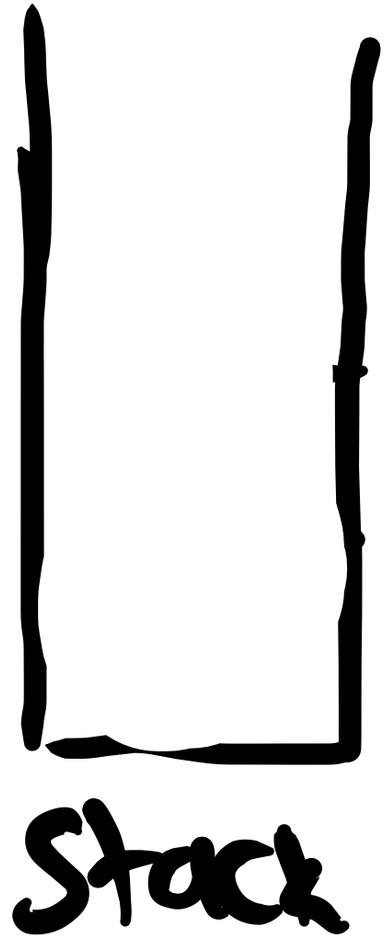


dfs(G,a)

Push a
visit a
Push c
Push b
visit b
Push e
Push d
Visit d
Visit e
Push f
Visit f



dfs (G, t)



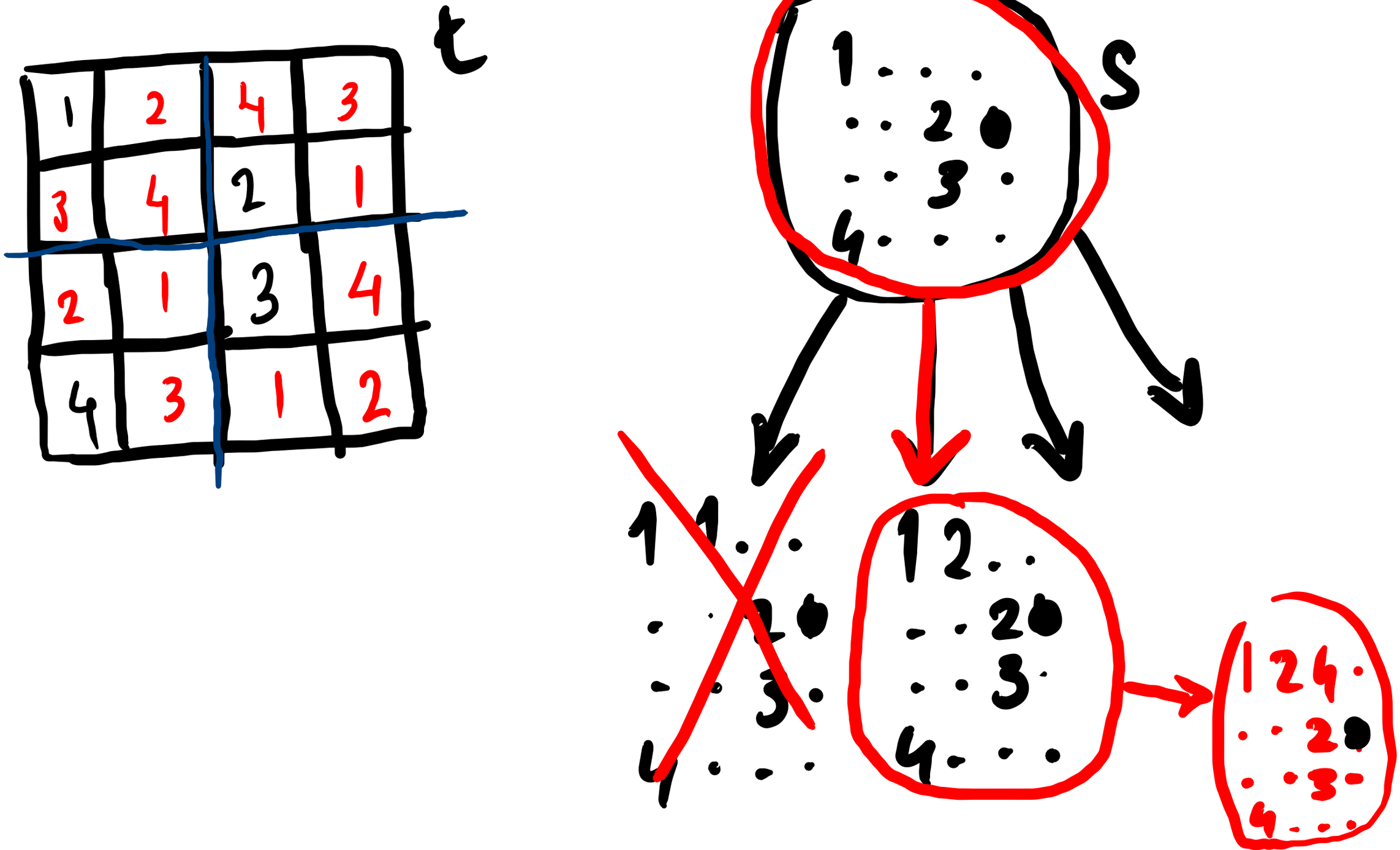
Sudoku

Path finding

(G, s, t)

Find a path in G from s to t.

What is G, s, t for Sudoku?

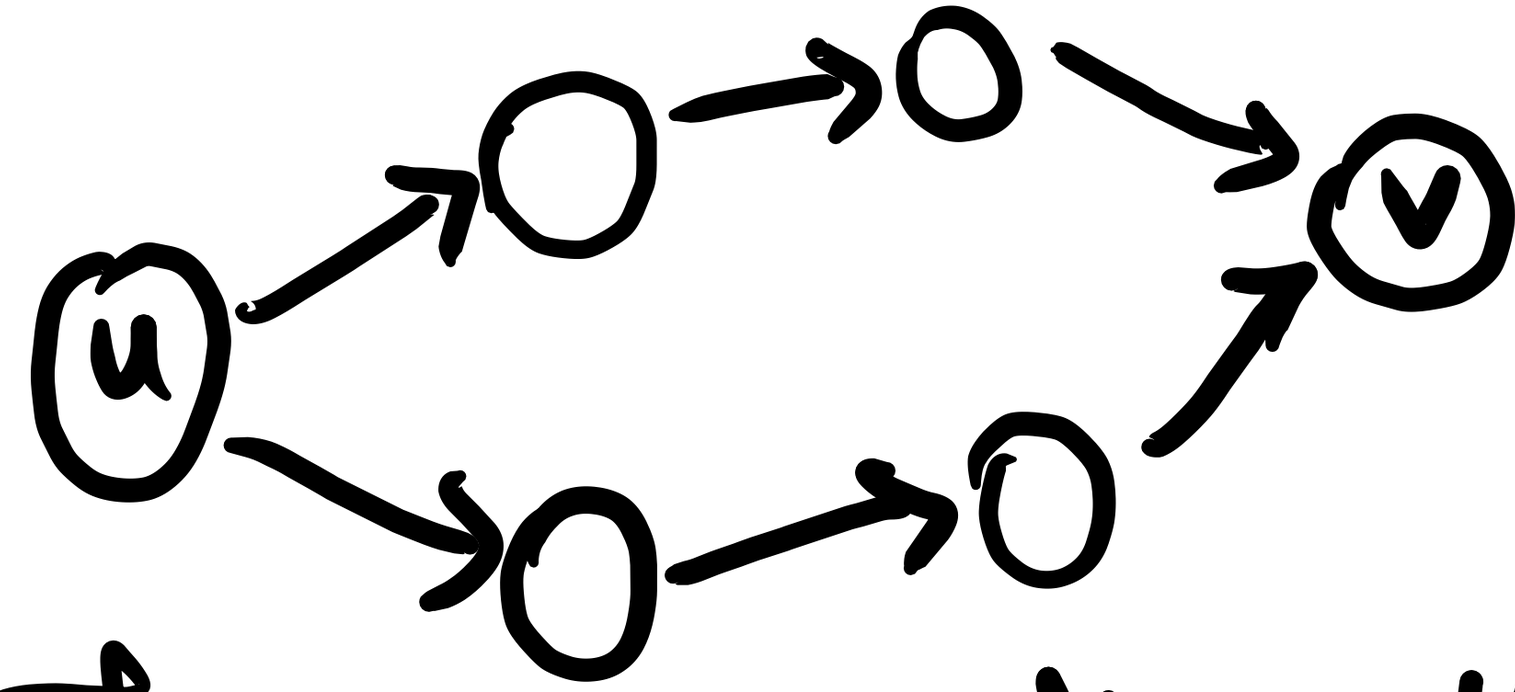

t
1 2 4 3
3 4 2 1
2 1 3 4
4 3 1 2
S
1 . . .
. . 2 .
. . 3 .
4 . . .
1 1 . .
. . 2 .
. . 3 .
4 . . .
1 2 . .
. . 2 .
. . 3 .
4 . . .
1 2 4 .
. . 2 .
. . 3 .
4 . . .

Neighbors of V

Take topmost, left most empty cell

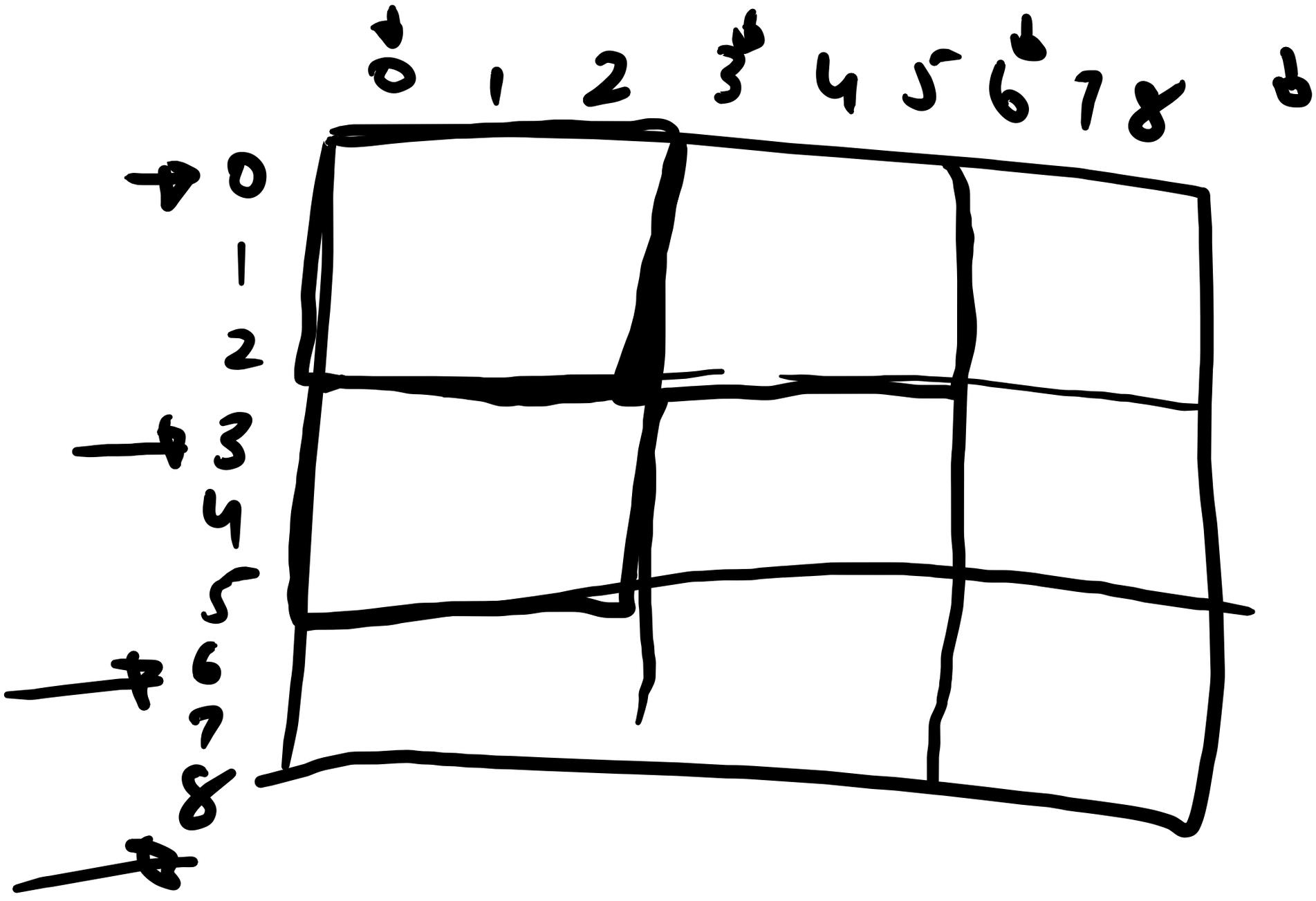
Fill all possible values on that cell.

In t++ graph



There are vertices u and v
s.t there are multiple paths from u to v.

In Sudoku graph
if there is a path from $s \rightsquigarrow v$
then this path is unique.
(Hw. Prove!)


0 1 2 3 4 5 6 7 8
0
1
2
3
4
5
6
7
8