Maze Difficulty Sorting

HW5

Data Structures 2020

NTHU EECS

https://acm.cs.nthu.edu.tw/problem/12816/

Mazes are not all Equal

- We are developing a computer game, and we need to sort mazes according to their difficulty
  - So, game levels can begin from easy mazes to difficult mazes and achieve a good game experience
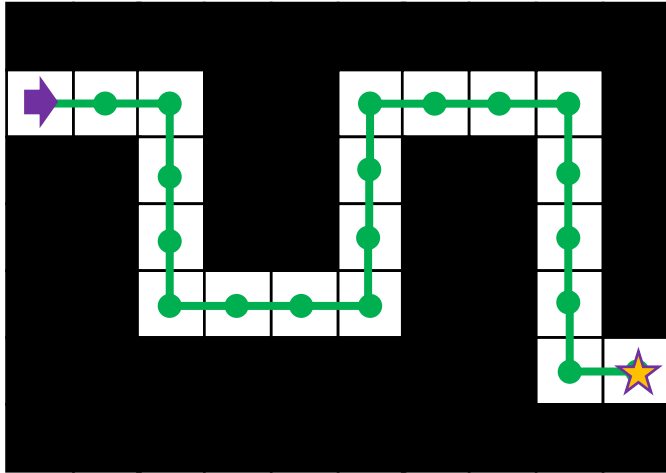- Let's develop a program to do so!

Sort Mazes According to Difficulties

- Difficulty factors (larger is better)*
  - N1: Number of forks along the correct path
  - N2: Number of dead ends
  - L1: Length of the correct path
  - L2: Medium length of incorrect paths **apart from the correct path**
    - For a even number of incorrect paths, take the average of the medium two
- Overall difficulty
  - $((N1 + N2) * (L1 + L2))$
- Tie breaker
  - N1 → N2 → L1 → L2 → Larger serial number is more difficult

*https://puzzling.stackexchange.com/questions/5919/whats-the-best-way-to-rate-how-difficult-a-maze-is
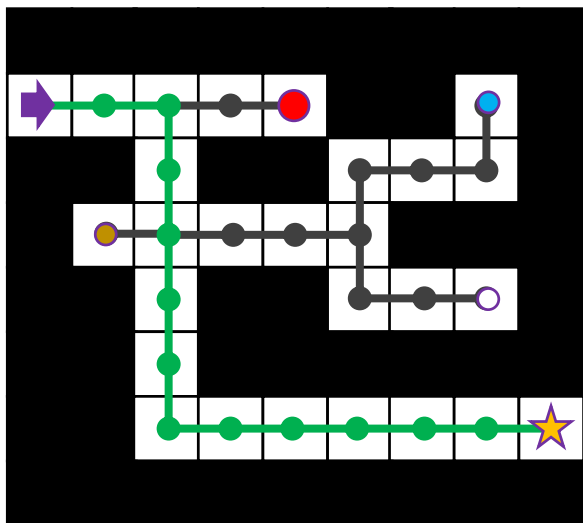
Example 1

Overall Difficulty		**0**
N1	Number of forks **along the correct path**	**0**
N2	Number of dead ends	**0**
L1	Length of the correct path	**19**
L2	Medium length of incorrect paths **apart from the correct path**	**0**

len. = 19
target

4

Example 2

Note here two forks are along the correct path

len. = 2 dead end

len. = 1 dead end

len. = 6 dead end

len. = 7 dead end

len. = 13 target
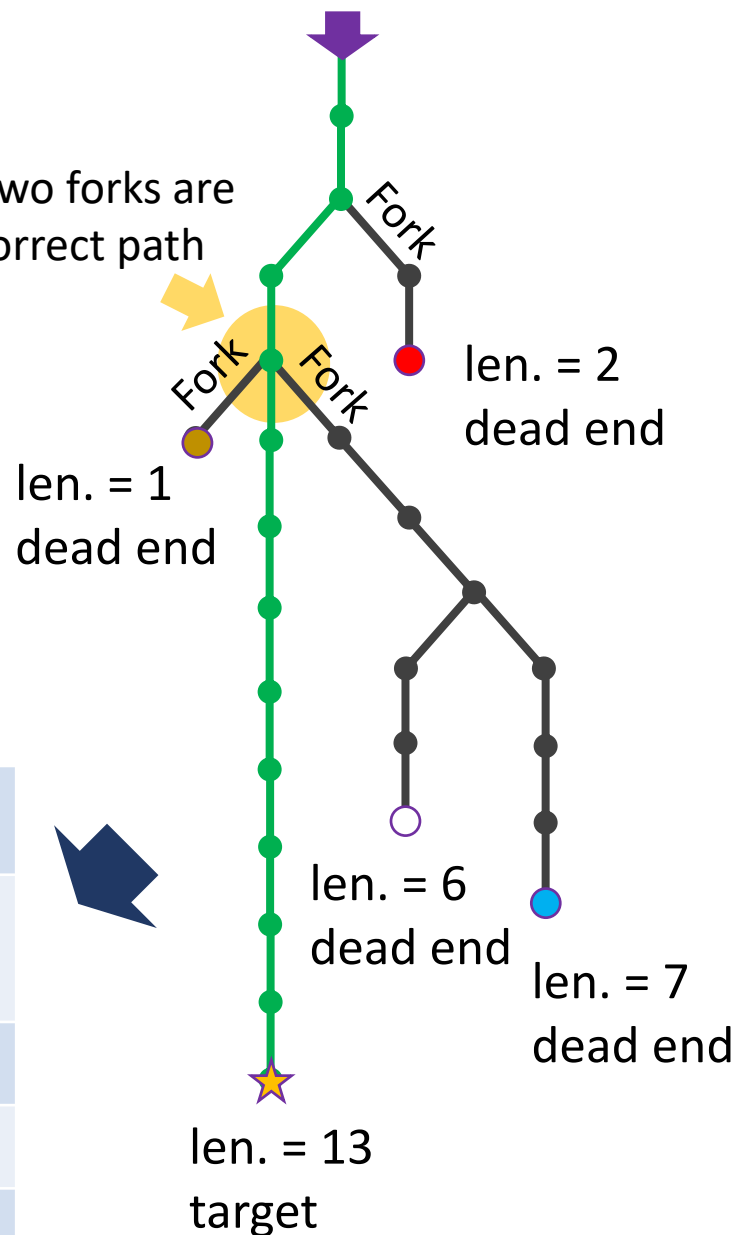
Fork

Fork

Fork

Overall Difficulty		119
N1	Number of forks **along the correct path**	3
N2	Number of dead ends	4
L1	Length of the correct path	13
L2	Medium length of incorrect paths **apart from the correct path**	4

Input

Number of mazes (≥ 1)

Serial number of each maze
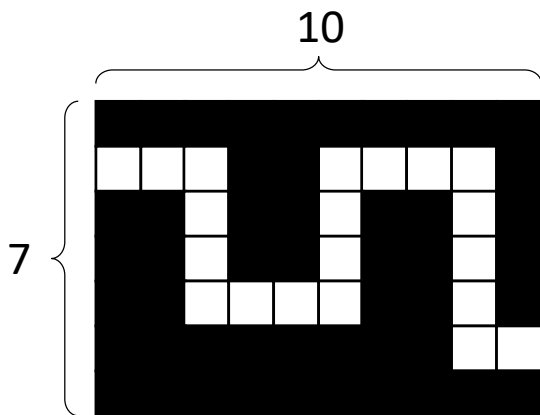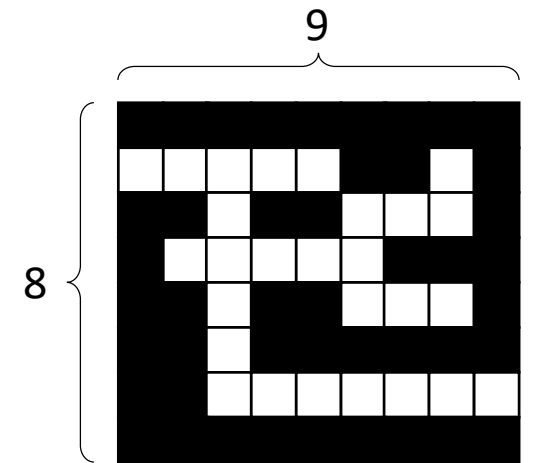
Width and height

```
2
1
9  8
NNNNNNNNN
.....NN.N
NN.NN...N
N.....NNN
NN.NN...N
NN.NNNNNN
NN.......
NNNNNNNNN
2
10 7
NNNNNNNNNN
...NN....N
NN.NN.NN.N
NN.NN.NN.N
NN....NN.N
NNNNNNNN..
NNNNNNNNNN
```

9

8

10

7

Rules of each maze
- Four valid moving directions, up, down, left, and right
- Characters 'N' are walls, and characters '.' are paths.
- No cycle
- Entry is at (0, 1) and the target is at (width-1, height-2)
- Surrounded by walls excepting the entry and target

Output

Serial number

Overall difficulty, N1, N2, L1, L2

```
2↵
0 0 0 19 0↵
1↵
119 3 4 13 4↵
```

Ascending order according to the difficulties

Regarding Quiz (上機考）

- Quiz will focuses on sorting things, especially sorting vectors with tie-breaking rules
- Quiz may have a similar input format but will not require students to solve mazes or generate trees