# Exercise E

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# Problem explanation

- For each test case, find the minimum number of presses required to reach the final configurations from the initial configuration

- Conditions:

1. Avoid forbidden configurations
2. One press is equivalent to rotating one digit to the left or right

# Problem explanation

Input:
- N: number of test cases

Each test case:
- Initial configuration
- Final configuration
- n: number of forbidden configurations
- *n* forbidden configurations

** Each digit in a configuration is separated by a space*

# Problem explanation

Example Input:

1

8 0 5 6
6 5 0 8
5
8 0 5 7
8 0 4 7
5 5 0 8
7 5 0 8
6 4 0 8

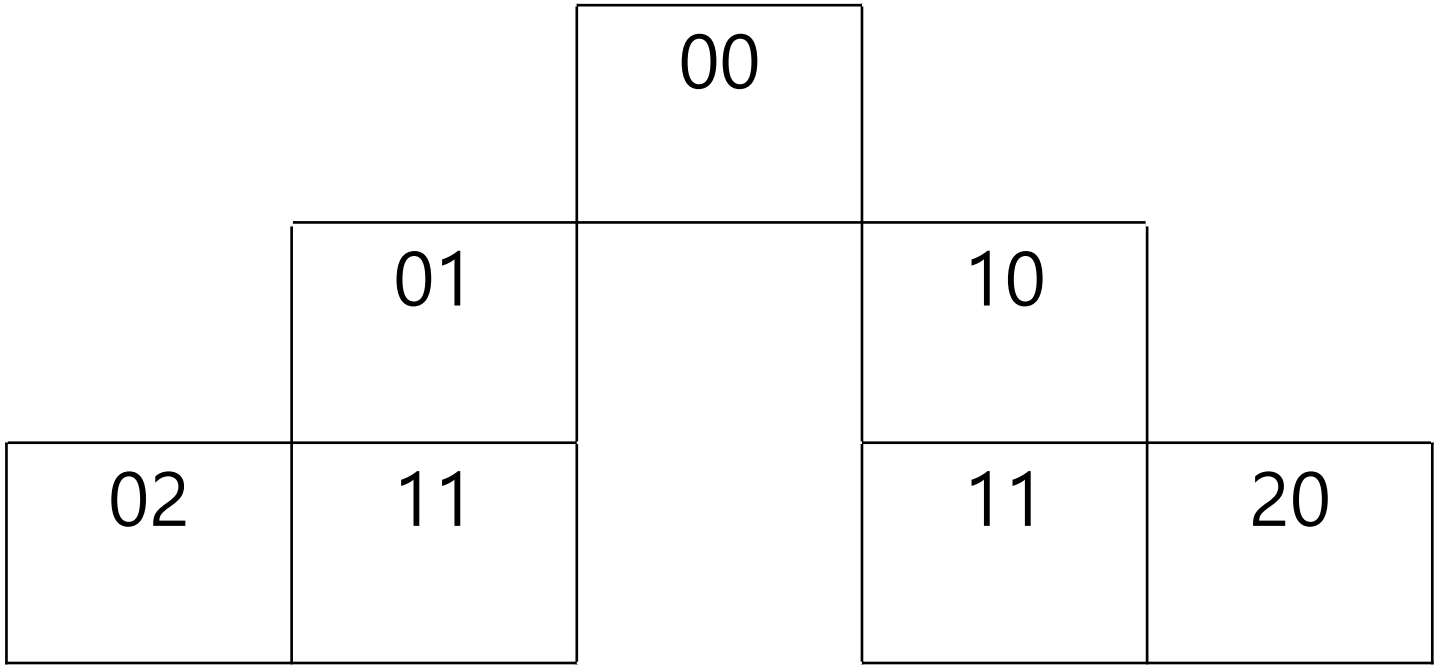
# Solution explanation

- First, consider cases without forbidden configurations:
- We can use BFS to find minimum path
- Every time a level is increased:
    1. Increase the path count by one
    2. Enqueue all the configurations in next level
- If final configuration is found, the path count / level is outputted

# Solution explanation

2 Digit Simple Example:

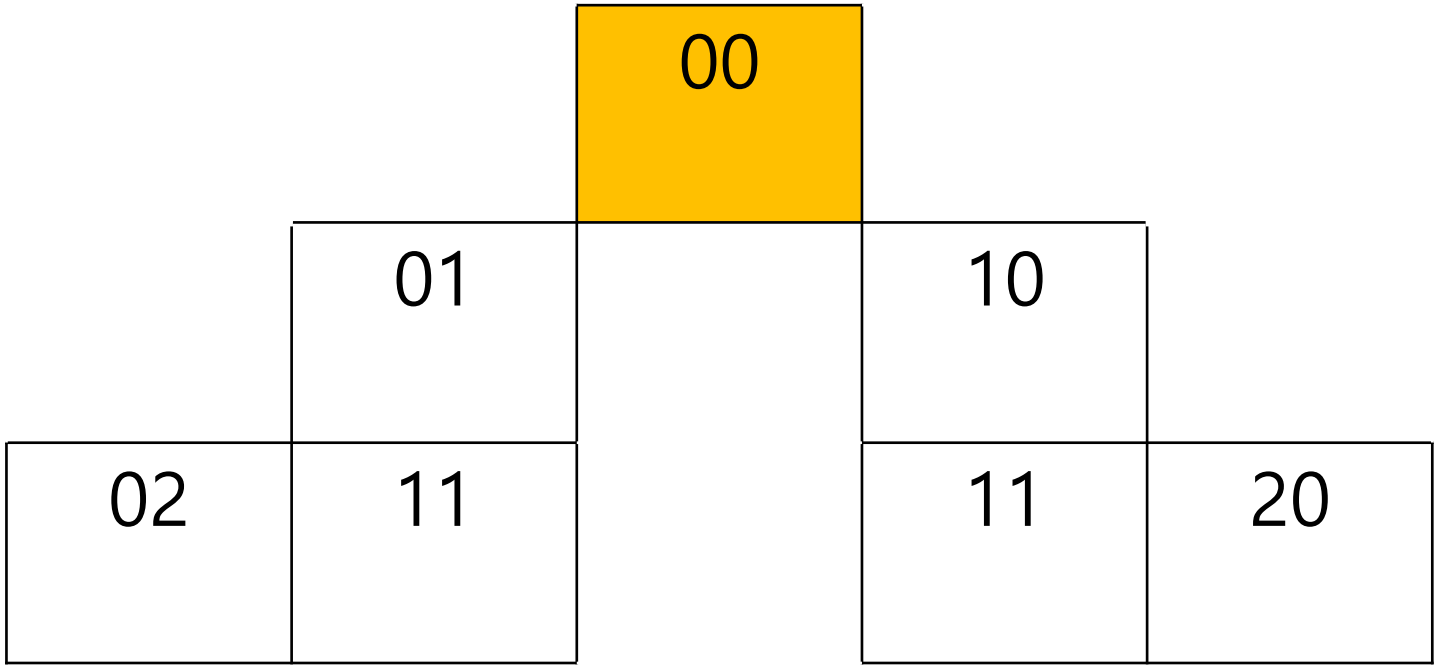
00 -> 02



# Solution explanation

2 Digit Simple Example:
00 -> 02

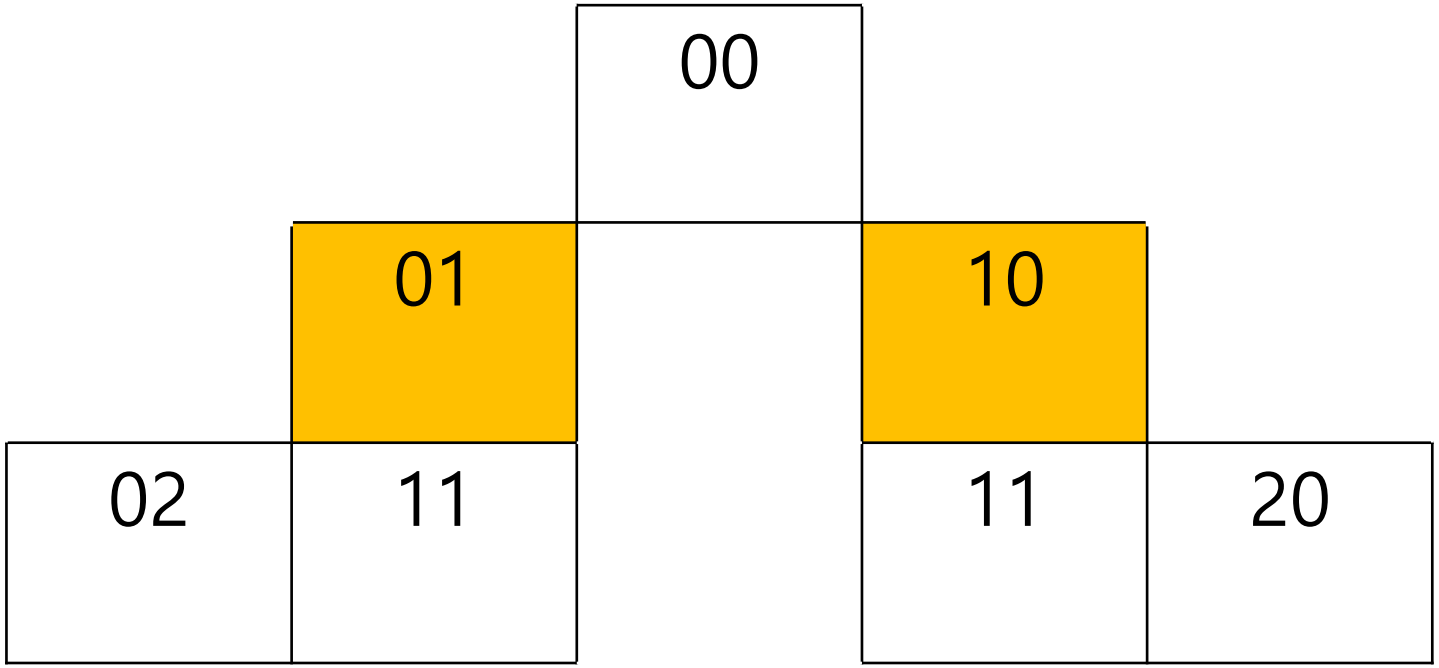
- Level 0: Q = {00}



# Solution explanation

2 Digit Simple Example:
00 -> 02

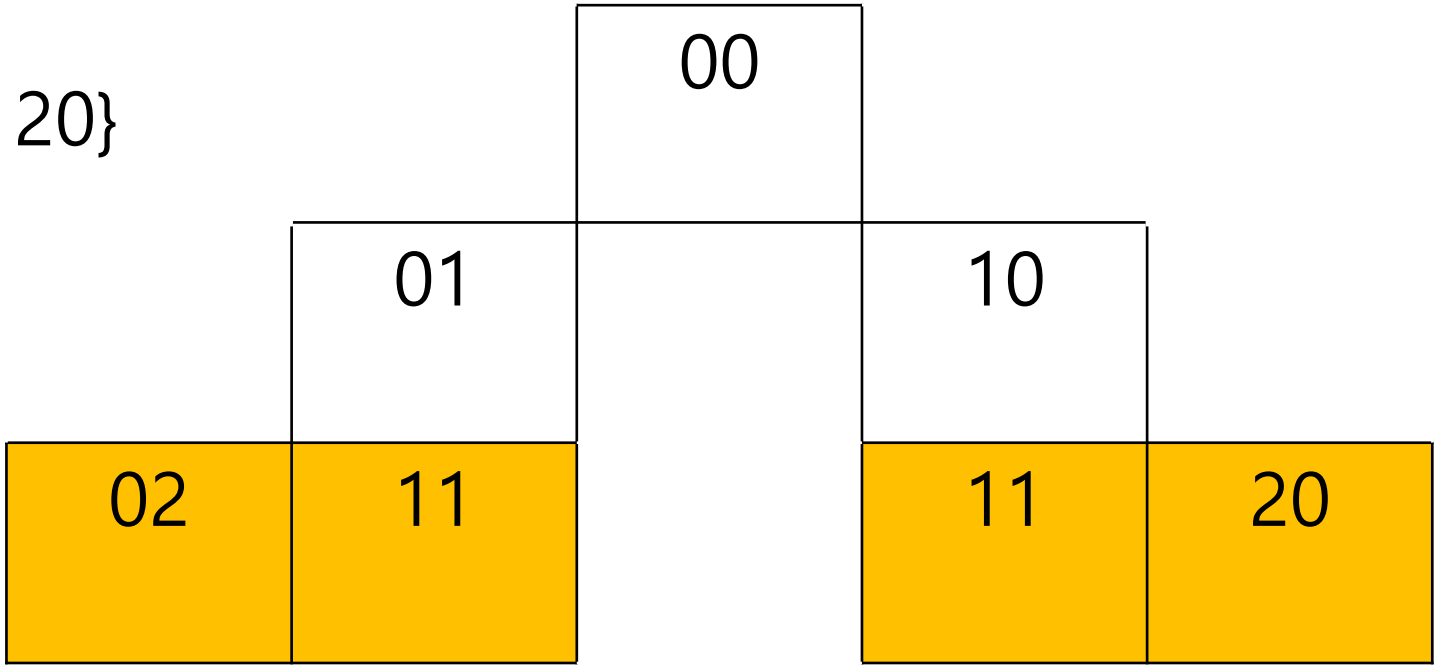
- Level 1: Q = {01, 10}



# Solution explanation

2 Digit Simple Example:
00 -> 02

- Level 2: Q = {02, 11, 11, 20}

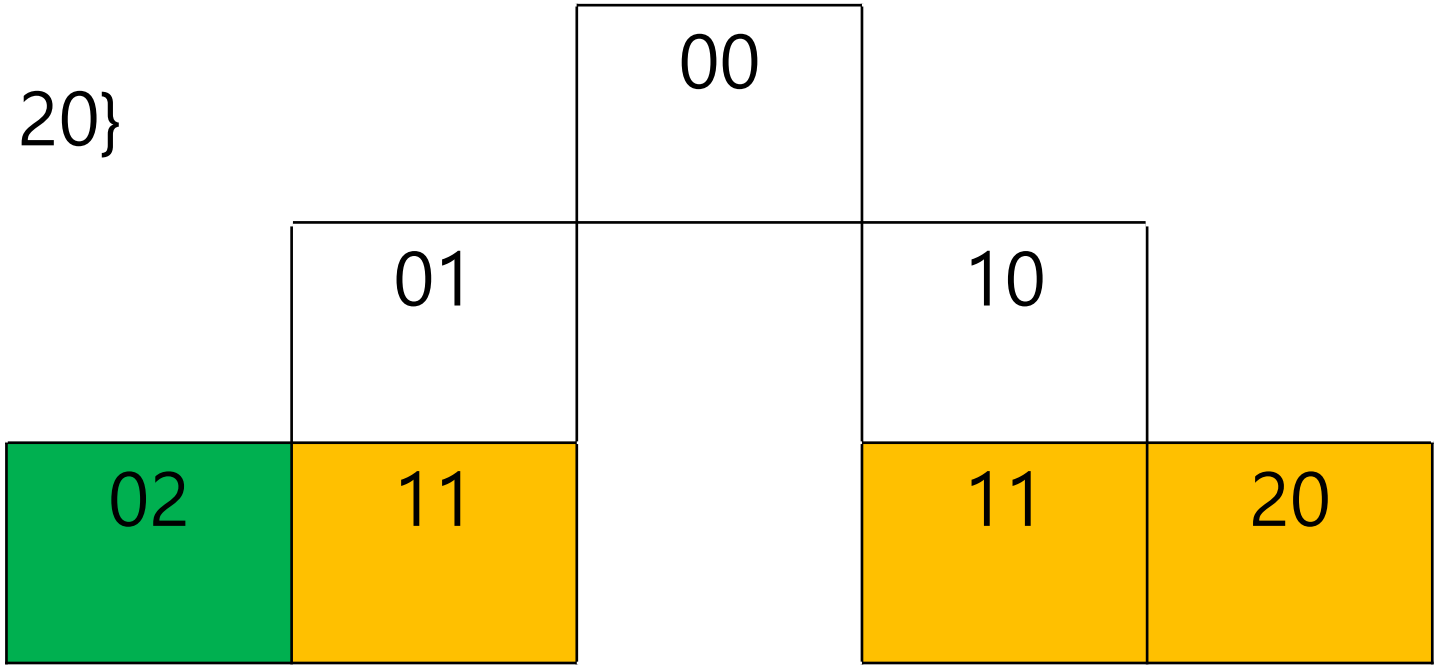


# Solution explanation

2 Digit Simple Example:
00 -> 02

- Level 2: Q = {**02**, 11, 11, 20}

Answer: 2



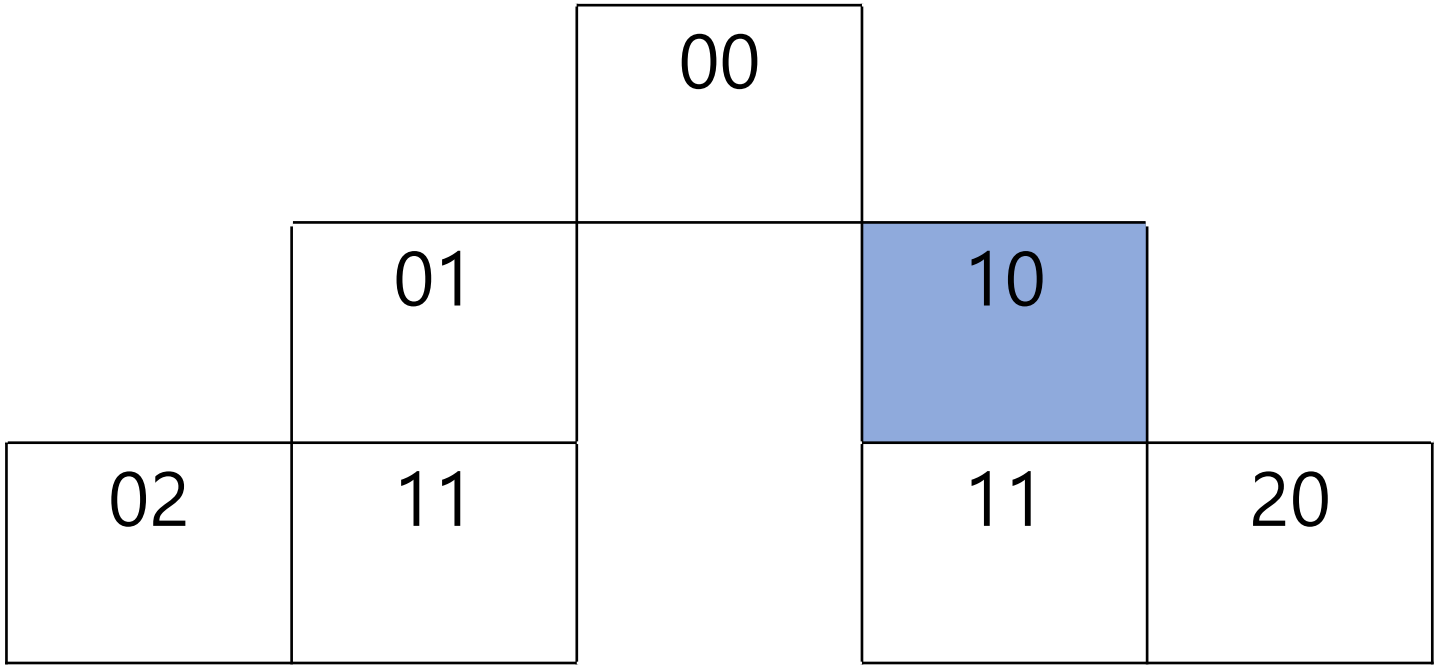
# Solution explanation

- From the BFS, consider the forbidden configurations
- We can add a 4d Boolean array to check whether a configuration was visited or not
- For all the forbidden configurations, set them as visited
- When program notices a visited configuration, do not add to queue

# Solution explanation

2 Digit Simple Example:

00 -> 02; Forbidden: 10

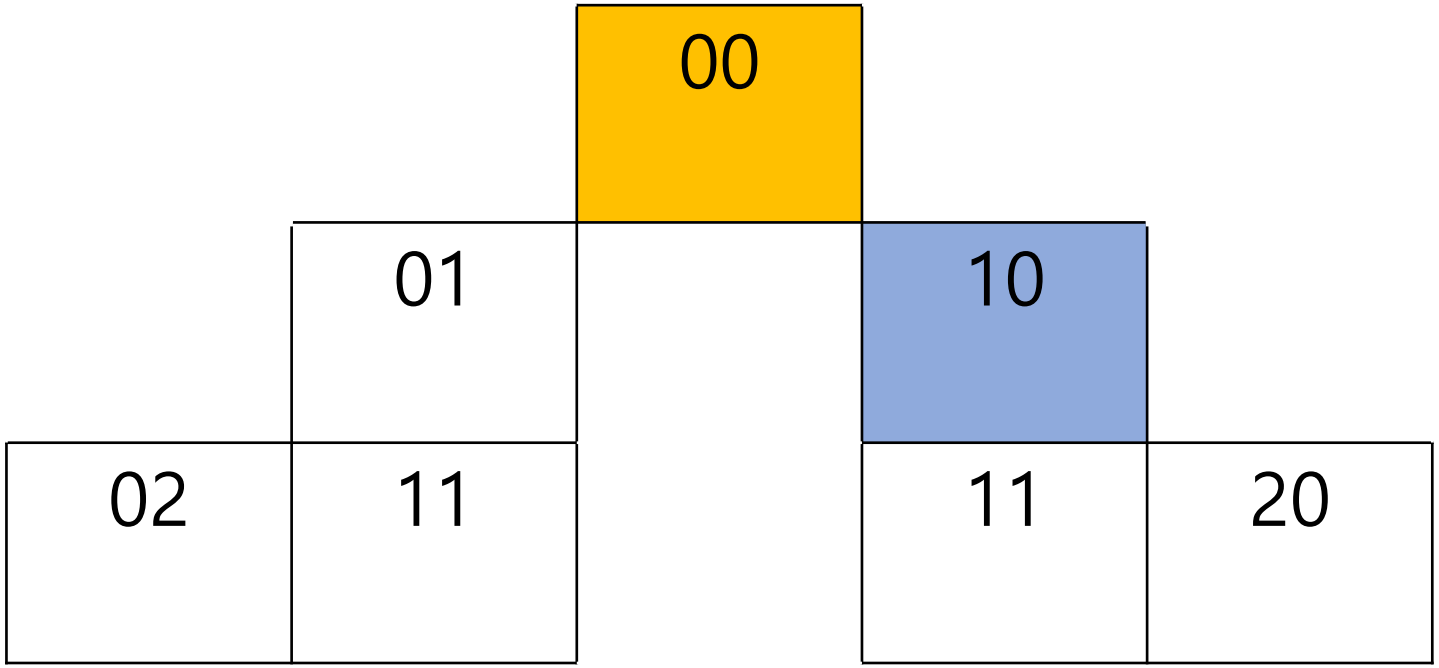


# Solution explanation

2 Digit Simple Example:

00 -> 02; Forbidden: 10

- Level 0: Q = {00}

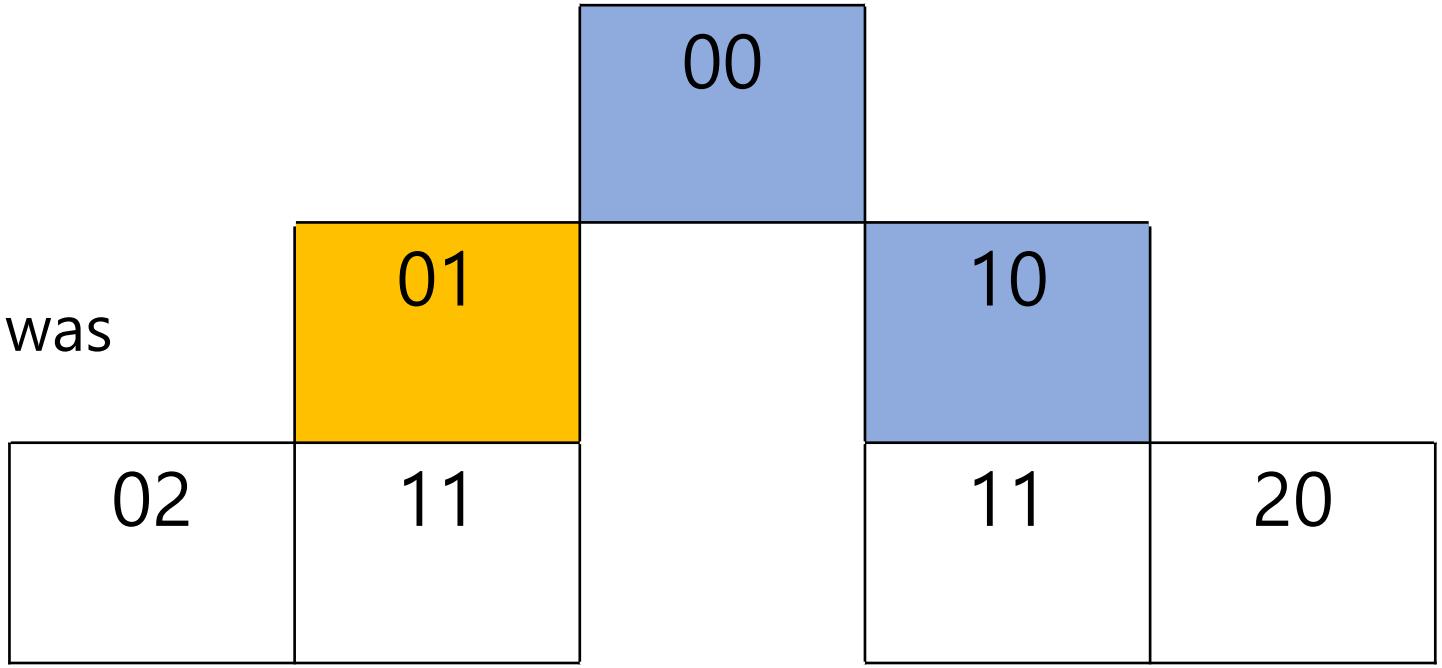


# Solution explanation

2 Digit Simple Example:
00 -> 02; Forbidden: 10

- Level 1: Q = {01}

- Since 10 already “visited”, it was not added to queue

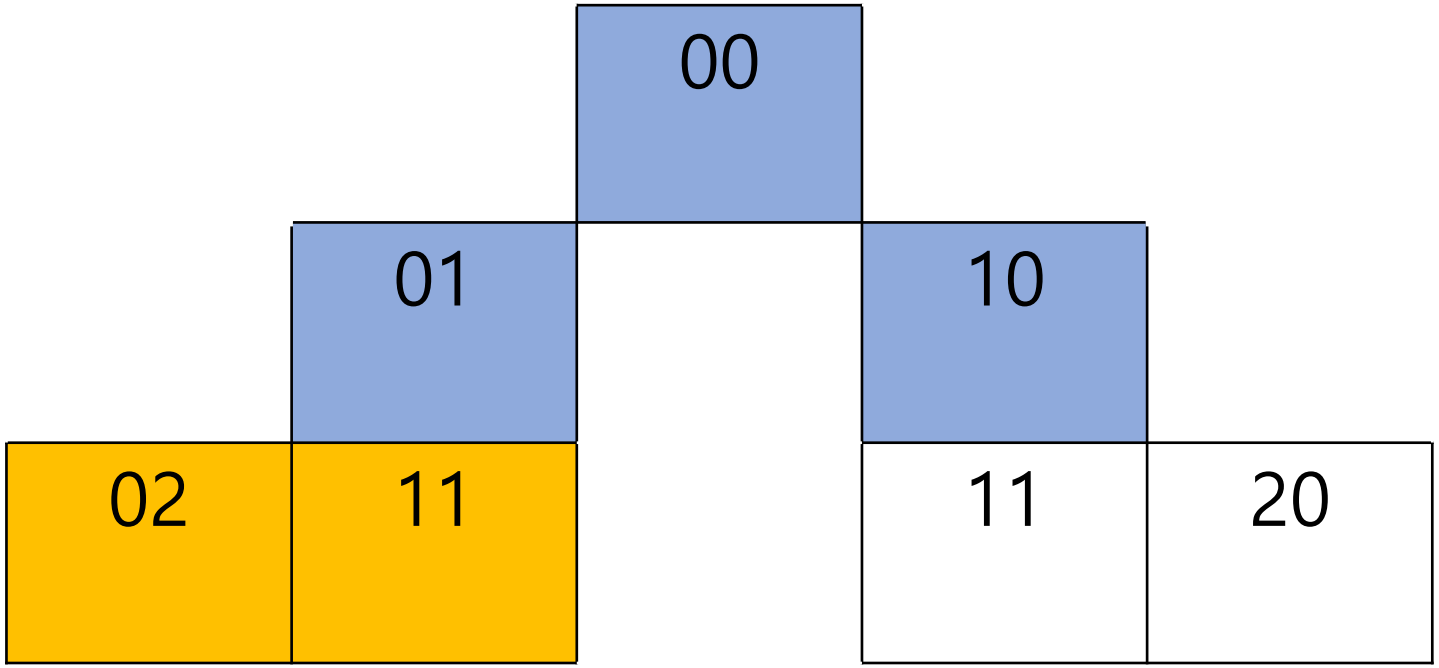


# Solution explanation

2 Digit Simple Example:

00 -> 02; Forbidden: 10

- Level 2: Q = {02, 11}



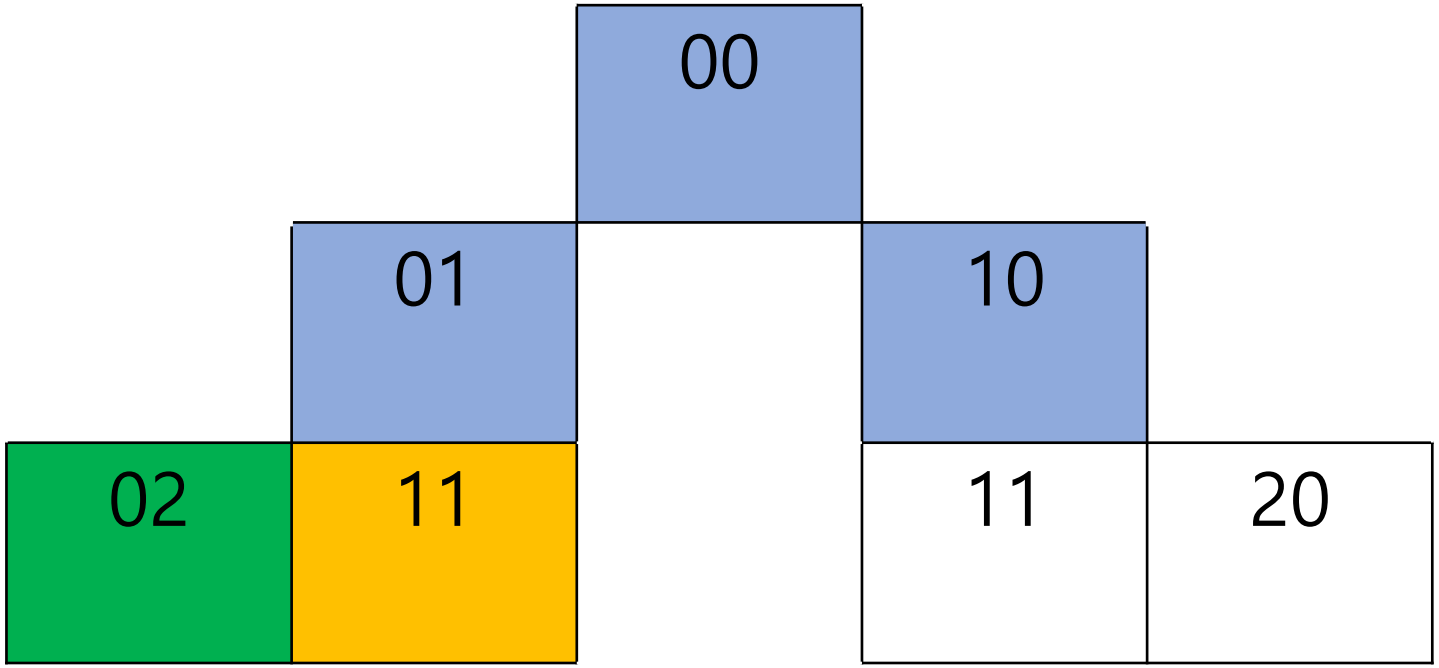
# Solution explanation

2 Digit Simple Example:

00 -> 02; Forbidden: 10

- Level 2: Q = {**02**, 11}

Answer: 2



# Solution explanation

- If BFS could not find the path to final configuration, meaning it never reached the final configuration and queue is empty

- Then print -1

# Solution analysis

Pros:

- Consistent
- Always considers all possible configurations

Cons:

- Not time-efficient with longer configurations

Thank you!