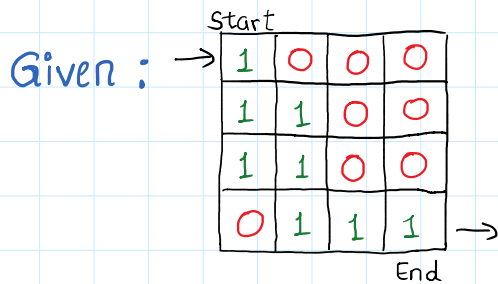


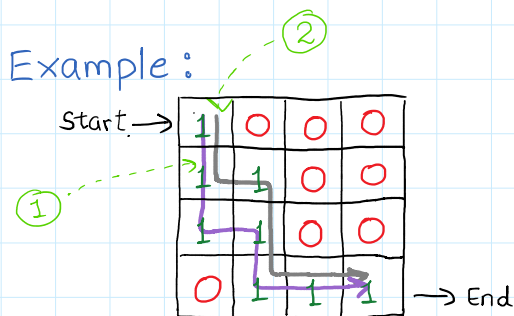
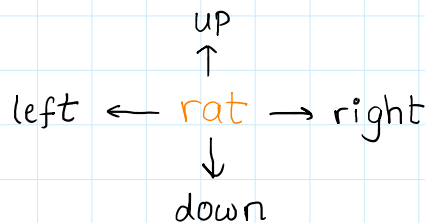


PROBLEM LINK : [Click Here](#)



where : 1 - we can come to this cell
0 - we cannot come to this cell.

Aim is to output all possible ways to reach the End $(n-1, n-1)$ from the Start $(0,0)$. The rat can move in all the 4 directions up, down, left, right.



1. DDRDRR
2. DRDDRR

APPROACH :



At any point, we have 4 choices - up, down, left or right.

For each position, check if you can go U/D/L/R keeping in mind the following constraints :

- ① Don't go out of bounds. $(0 \leq i < n, 0 \leq j < n)$
- ② Don't go to an already visited position.
- ③ Don't go to a position marked 0.

③ Don't go to a position marked 0.

For point ②, maintain a 2-D array 'visited' which keeps track of all the visited positions. (n x n size)

Once you reach (n-1, n-1), you can print the string showing the path you took and then make all cells of the 'visited' matrix as False.

Thus, when you move, you will make visited[i][j] (if you moved to m[i][j]) and you will append your string with D, U, L or R according to your movement.

CODE: To check if a position is legit, we discussed some conditions above.

```
bool isSafe(int x, int y, int n, vector<vector<int>> visited, vector<vector<int>> &m) {  
    if( (x>=0 && x<n) && (y>=0 && y<n) && visited[x][y] == 0 && m[x][y] == 1) {  
        return true;  
    }  
    else {  
        return false;  
    }  
}
```

In our main 'solve' function, we will first check if we have reached the end of the maze.

```
void solve(vector<vector<int>> &m, int n, vector<string> &ans, int x,  
           int y, vector<vector<int>> visited, string path) {  
    //you have reached x,y here  
    //base case  
    if( x == n-1 && y == n-1){  
        ans.push_back(path);  
        return;  
    }  
}
```

For the position (x,y), mark visited[i][j] = 1 (or true)

```
visited[x][y] = 1;
```

Now, for each direction (U,D,L,R) make newX & newY and make a move if going in that direction is safe.

if path is safe, then append the move in the path string.

```
if(isSafe(newx, newy, n, visited, m)) {  
    path.push_back('D');  
    solve(m,n,ans,newx,newy,visited,path);  
    path.pop_back();  
}
```

Call for the new position

After the recursion call returns, remove this move to make way for the next option. (U/D/L/R)

This gets called 4 times :

- ① newx = x , newy = y-1
- ② newx = x-1 , newy = y
- ③ newx = x , newy = y+1
- ④ newx = x+1 , newy = y.

```
int newx = x+1;  
int newy = y;  
if(isSafe(newx, newy, n, visited, m)) {  
    path.push_back('D');  
    solve(m,n,ans,newx,newy,visited,path);  
    path.pop_back();  
}  
  
//left  
newx = x;  
newy = y-1;  
if(isSafe(newx, newy, n, visited, m)) {  
    path.push_back('L');  
    solve(m,n,ans,newx,newy,visited,path);  
    path.pop_back();  
}  
  
//Right  
newx = x;  
newy = y+1;  
if(isSafe(newx, newy, n, visited, m)) {  
    path.push_back('R');  
    solve(m,n,ans,newx,newy,visited,path);  
    path.pop_back();  
}  
  
//UP  
newx = x-1;  
newy = y;  
if(isSafe(newx, newy, n, visited, m)) {  
    path.push_back('U');  
    solve(m,n,ans,newx,newy,visited,path);  
    path.pop_back();  
}
```

After this, we have covered all possible paths from (x,y) to (n-1,n-1). So, we will now backtrack and make `visited[x][y] = 0` (or False)

```
visited[x][y] = 0;
```