EX-1.14

Title :

Find the number of unique paths for a robot moving from the top-left to bottom-right corner in a m x n grid, moving only down or right.

Aim:

To design and implement a Python program to find the total number of unique paths a robot can take in a grid from the top-left cell to the bottom-right cell moving only down or right.

Procedure:

1. Read input integers `m` (rows) and n (columns).
2. Use combinatorial approach or dynamic programming to count unique paths:
    - The robot must move exactly `(m-1)` times down and `(n-1)` times right, in any order.
    - Number of unique paths = Combination (m−1m+n−2) or (n−1m+n−2).
3. Alternatively, use dynamic programming:
    - Create a 2D DP array `dp` of size `m x n`.
    - Initialize first row and first column to 1 (only one way to reach those cells).
    - For each other cell `(i, j)`, `dp[i][j]` = `dp[i-1][j]` + `dp[i][j-1]`.
4. Print the number of unique paths from `dp[m-1][n-1]`.

Algorithm:

1. Start
2. Input `m`, n
3. Create DP array `dp[m][n]`
4. Set `dp[i] = 1` for all `i` in `[0, m-1]`
5. Set `dp[j] = 1` for all `j` in `[0, n-1]`
6. For each `i` from 1 to `m-1`:
    - For each `j` from 1 to `n-1`:
        - `dp[i][j] = dp[i-1][j] + dp[i][j-1]`
7. Print `dp[m-1][n-1]`
8. Stop

Input:

7 3

3 2

Output:

28

3

Program :

```
def uniquePaths(m, n):
    dp = [[1] * n for _ in range(m)]

    for i in range(1, m):
        for j in range(1, n):
            dp[i][j] = dp[i - 1][j] + dp[i][j - 1]

    return dp[m - 1][n - 1]

m, n = map(int, input("Enter m and n: ").split())

result = uniquePaths(m, n)
print(result)
```

Performance Analysis:

Time Complexity: O(m*n)

Space Complexity: O(m*n)

program output:

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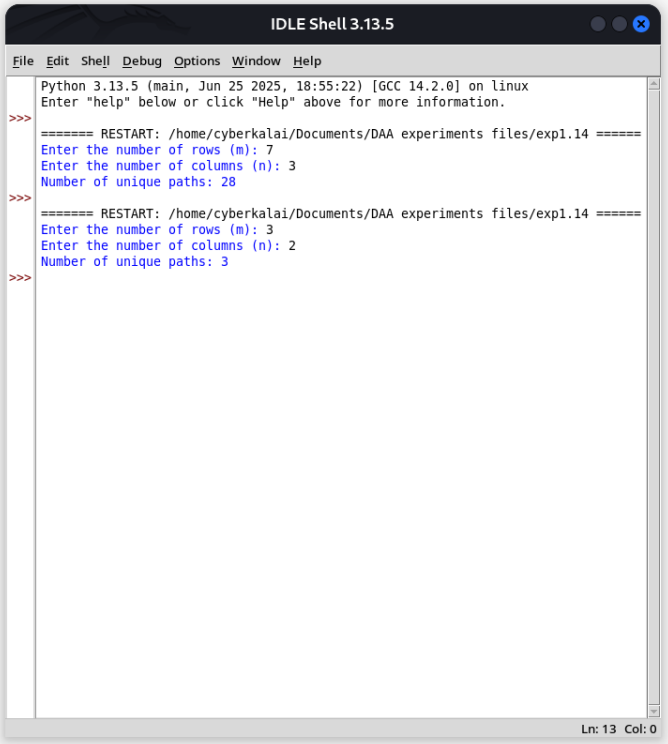
```
def unique_paths(m, n):
    dp = [[0] * n for _ in range(m)]

    for i in range(m):
        dp[i][0] = 1

    for j in range(n):
        dp[0][j] = 1

    for i in range(1, m):
        for j in range(1, n):
            dp[i][j] = dp[i-1][j] + dp[i][j-1]

    return dp[m-1][n-1]

m = int(input("Enter the number of rows (m): "))
n = int(input("Enter the number of columns (n): "))

result = unique_paths(m, n)
print("Number of unique paths:", result)
```



Result :

Thus the given program Unique Paths is executed and got output successfully.