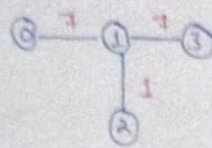


Day_11: DSA

Day-11: heavide: 3100 Minimum Cost Walk
in weighted graph

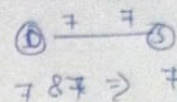
• Union find \rightarrow Method: TC $\rightarrow O(E + Q)$ DFS $\rightarrow O(V + E + Q)$



query: $[1, 3], [3, 4]$

\rightarrow It is walk: In this may visit the same edge or vertex more than once

\rightarrow Cost = Bitwise AND



class UnionFind:

def __init__(self, n: int):

self.id = list(range(n))

self.rank = [0] * n

$2^i - 1$ is the minimum number in the form $2^i - 1 \geq 10^5$

self.weight = [(1 < i < 17) - 1] * n

def unionByRank(self, u: int, v: int, w: int) \rightarrow None:

i = self._find(u)

j = self._find(v)

newWeight = self.weight[i] & self.weight[j] & w

self.weight[i] = newWeight

self.weight[j] = newWeight

if i == j:

return

if self.rank[i] < self.rank[j]:

self.id[i] = j

elif self.rank[i] > self.rank[j]:

self.id[j] = i

else:

self.id[i] = j

self.rank[j] += 1

def getMinCost(self, u: int, v: int) \rightarrow int:

if u == v:

return 0

i = self._find(u)

j = self._find(v)

return self.weight[i] if i == j else -1

SOE

• Program to create generate Pascal's Triangle

→ This problem has 3 variations.

Variation 1: Given row number and column number. Print the element at position (r, c) in Pascal's triangle

Variation 2: Given the row number. Print the n th row of Pascal's Triangle

Variation 3: Given the row number. Print the first n rows of Pascal's Triangle

eg.

1			
1	1		
1	2	1	
1	3	3	1

1			
1	1		
1	2	1	
1	3	3	1

• Variation 1: We have formula to find out the element $\binom{n-1}{c-1}$

code: def nCr(n, r):

res = 1

Calculating nCr:

for i in range(n):

res = res * (n - i)

res = res // (i + 1)

return res

def pascalTriangle(n, c):

element = nCr(n-1, c-1)

return element

Variation II:

def pascalTriangle(n):

printing the row

T.C. $O(n^2)$

for c in range(1, n+1)

print(nCr(n-1, c-1), end=" ")

print()

optimized:

def pascalTriangle(n):

ans = 1

print(ans, end=" ") # printing 1st Element

printing the rest of the part.


```

for i in range(1, n):
    ans = ans * (n - i)
    ans = ans // i
    print(ans, end=" ")
print()

```

T.C: $O(n)$

$$\text{current element} = \frac{\text{prevElement} * (\text{rowNumber} - \text{colIndex})}{\text{colIndex}}$$

Naive Solution

Variation: II

```
def nCr(n, r):
```

```
    res = 1
```

calculating nCr:

```
    for i in range(r):
```

```
        res = res * (n - i)
```

```
        res = res // (i + 1)
```

```
    return int(res)
```

T.C: $O(n * n * r)$
 $\sim O(n^3)$

```
def pascalTriangle(n)
```

```
    ans = []
```

Store the entire pascal's triangle

```
    for row in range(1, n + 1):
```

```
        templist = []
```

```
        for col in range(1, row + 1):
```

```
            templist.append(nCr(row - 1, col - 1))
```

```
        ans.append(templist)
```

```
    return ans
```

Optimal Sol:

```
def generateRow(row):
```

```
    ans = 1
```

```
    ansRow = [1] # inserting the 1st element
```

calculating rest of rows

```
    for col in range(1, row):
```

```
        ans *= (row - col)
```

```
        ans //= col
```

```
        ansRow.append(ans)
```

```
    return ansRow
```

```
def pascalTriangle(n)
    ans = []
```

```
    for row in range(1, n + 1):
```

```
        ans.append(generateRow(row))
```

```
    return ans
```

T.C: $O(n^2)$