

Example 1  
 $(0, 2)$   
 $(3, 3)$   
 $c_1$   
 $c_2$

2D Array

Problem Statement

0	1	1	1	1
1	1	1	1	1
2	1	1	1	1
3	1	1	1	1

4x4

Sum = 8

Sum = 4

Example 2

$(2, 2)$   
 $(3, 3)$   
 $c_1$   
 $c_2$

Brute force  
Approach

Example 3

$(0, 0)$   $(3, 3)$

Sum = 16

$m = 4, n = 4$

$O(m \times n)$

Sum = 0

for (i = 0; i < m; i++) {

for (j = 0; j < n; j++) {

Sum += arr[i][j];

}

}

return sum;

$O(m \times n)$

Sum = 0;

for (i = a1; i <= a2; i++)

for (j = c1; j <= c2; j++)

{

Sum += arr[i][j];

}

}

return sum;

a1 = 0, c1 = 2

a2 = 3, c2 = 3

0	1	2	3	
0	1	1	1	✓
1	1	1	1	✓
2	1	1	1	✓
3	1	1	1	✓

i = 0

j = 2 j = 3

arr[0][2] = 1, arr[0][3] = 1

Sum = ~~2~~

i = 1

j = 2 j = 3

arr[1][2] = 1, arr[1][3] = 1

Sum = ~~4~~

i = 2

j = 2 j = 3

arr[2][2] = 1, arr[2][3] = 1

Sum = ~~6~~

i = 3

j = 2 j = 3

arr[3][2] = 1

arr[3][3] = 1

Sum = 8

Query 1

$$\begin{cases} a_1 = 0 & c_1 = 2 \\ a_2 = 3 & c_2 = 3 \end{cases}$$

1000  $\{ (a_1, c_1) (a_2, c_2) \}$   
Queries 2 times for loop

$O(10^5 \times m \times n)$  very very huge

Objective  $\rightarrow$  Independent of  
the number of  
queries

$\hookrightarrow$  Prefix  
Sum