Q" Given an array of n integers (positive) Calculate the sum of product of elements of all possible subsets. (ans % 10^9+7)

$n \le 10^5$

$a_i \le 10^7$

2, 3, 5

(2) (3) (5)

(2, 3) (3, 5) (2, 5)

(2, 3, 5)

71 ans

$= 2 + 3 + 5 + 6 + 10 + 15 + 30$

$a \longrightarrow a$

$ab \longrightarrow a + b + ab \rightarrow a(1+b)+b$

$\rightarrow a(1+b)+b+1-1 \Rightarrow (1+b)(1+a)-1$

$abc \rightarrow a+b+c+ab+bc+ac+abc$

$a(1+c)+b(1+c)+ab(1+c)+c+1-1$

$(a+b+ab+1)(1+c)-1$

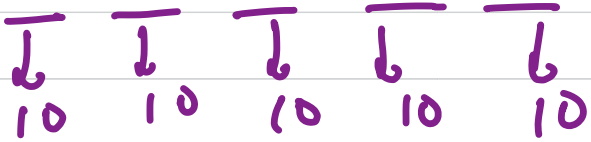
$(a(1+b)+b-1)(1+c)-1$

$(1+a)(1+b)(1+c)-1$

$$am \rightarrow \left(\prod_{i=0}^{n-1} (1 + a_i) \right) - 1$$

Q. How many distinct values can be represented with 5 decimal digits?

0, 1, 2 9



10^5 digits

Combinatorics

Q →

Cakewalk

16 :)

1	1
1	1

$m \times n$ → grid of integers

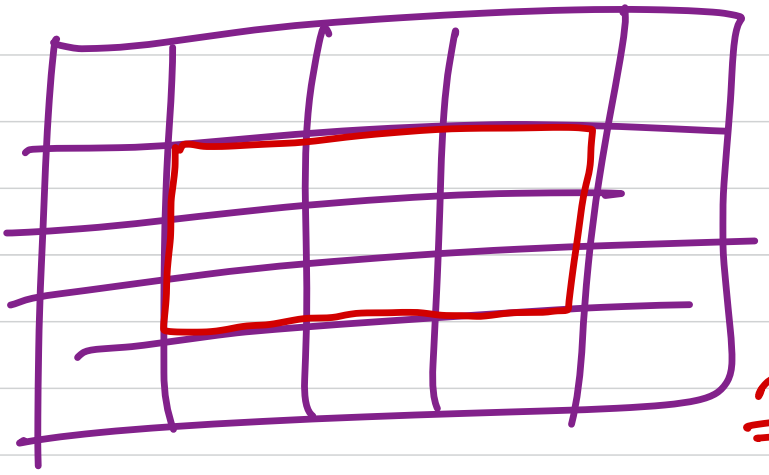
$m \leq 10^3$

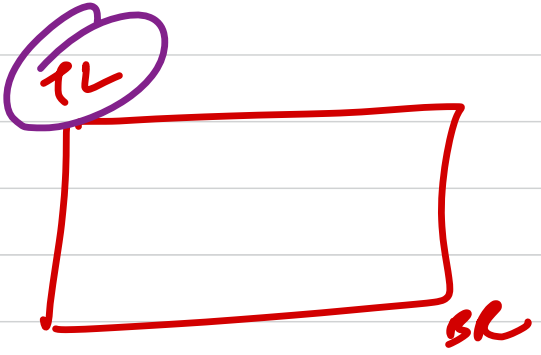
$n \leq 10^3$

Calculate sum of all submatrices.

$1+1+1+1 + 2*2 + 2 + 2$ 4

Brute force → Calc all possible Submatri-
and add them.





$n^2 \times n^2 \times n^2 \rightarrow O(n^6)$

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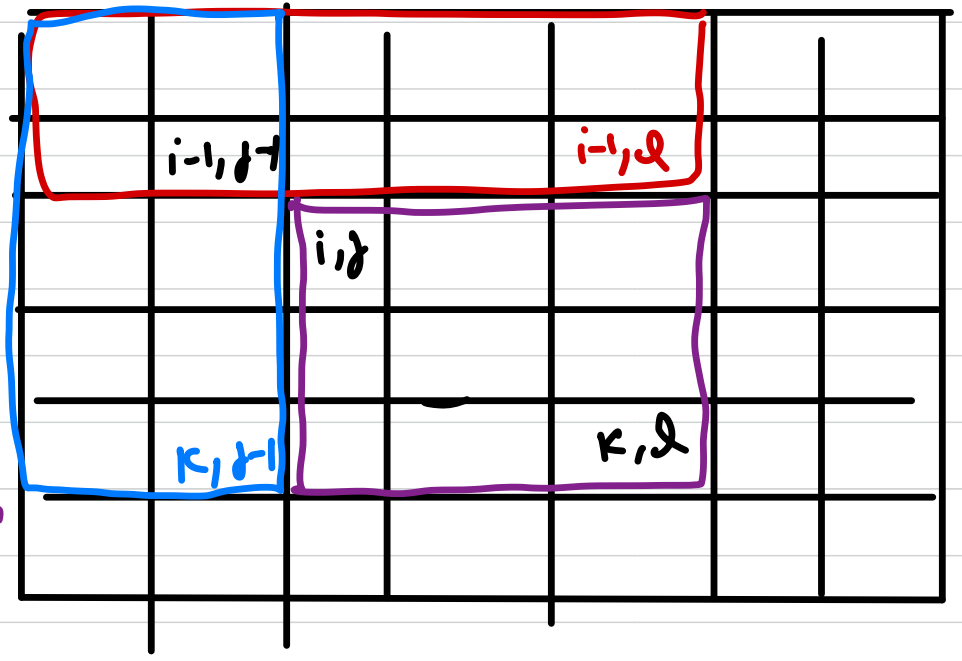
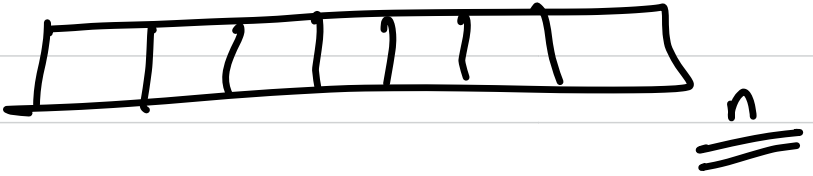
for(i=0; i<n; i++)
    for(j=0; j<n; j++)
        for(k=i; k<n ; k++)
            for(l=j; l<n; l++)
                for(m=i; m<=k; m++)
                    for(n=j; n<=l; n++)
                        Sum += a[m][n]
```

Sum(i,j,k,l) → p(k,l) − p(i−1,l) − p(k,j−1) + p(i−1,j−1)



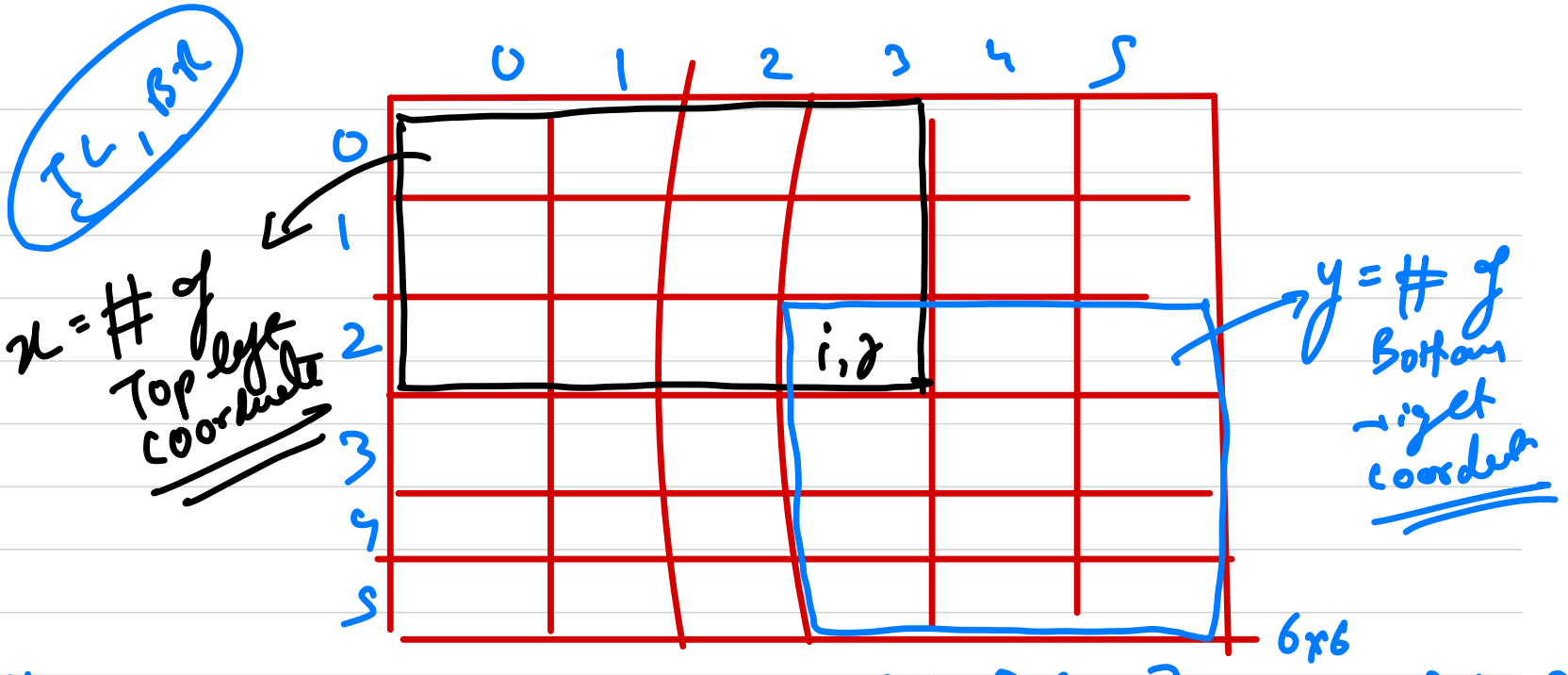
p

p(i,j) → it store sum of elements of submatrix with top left @ (0,0) & BR @ (i,j)



prefix sum →

$$s[l, r] = p[r] - p[l-1]$$



# of submatrix → x × y x → (i+1)(j+1) y → (n-i)(m-j)

value of cell → (mat[i][j] × (i+1)(j+1)(n-i)(m-j))

Contri → value × no. of submatrices it is a part of

Q → You have N (N-types) balls (and we have infinite supply of each ball type). Count the no. of ways to choose K balls with repetition allowed.

$N = 3$

$K = 2$

A A	B B
A B	B C
A C	C C

6

$N = 3$

$K = 3$

→ 10

$3+3-1 C_{3-1}$

$5C_2 \rightarrow 10$

n-1 partition

N = 4

A A | B | C C C | D D D D

A A ... A

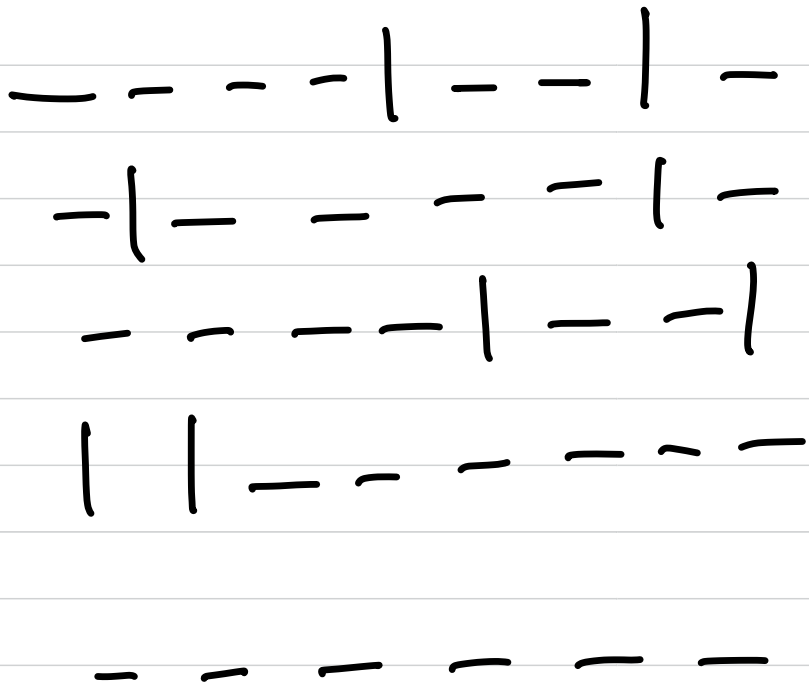
B ... R

| B B | C C | D D

to put n-1 partition

$N = 3$

$K = 6$



$$(K+n-1)C_{n-1}$$

$K = 10$

$N = 5$