Q Given **N points** on a 2D plane.
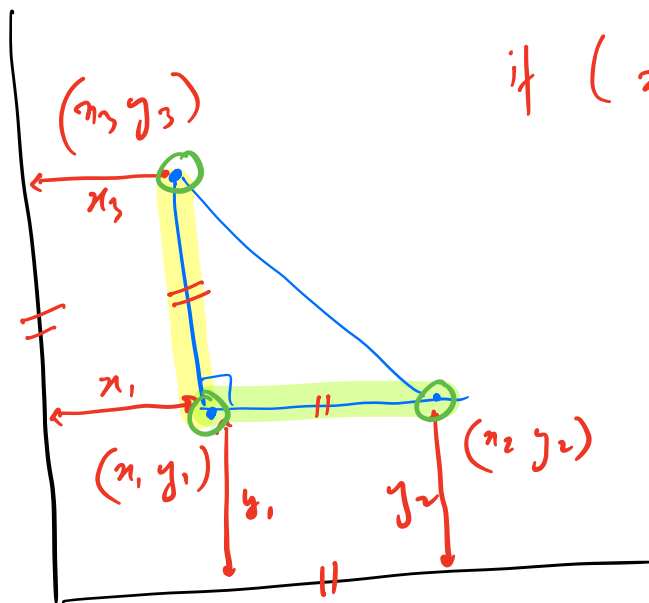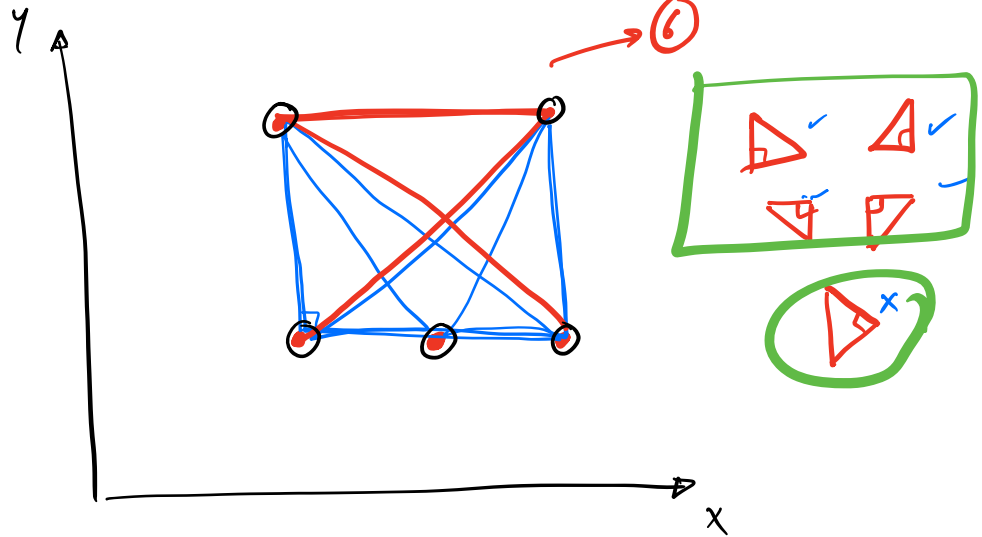Find the no. of right angled Δ s.t
  1 side is $\parallel$ to x-axis
  —— $\parallel$ — y-axis

(x_i, y_i)
$X[\ ], Y[\ ]$

if $(x_1 == x_3$ && && $y_1 == y_2)$

$\implies$ right angled Δ
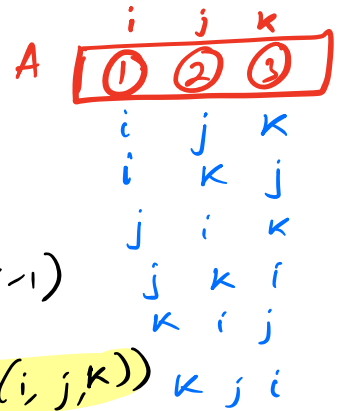with sides
$\parallel$ to x & y axis!

I) **BF**

$$f(i: 0 \longrightarrow N-1)$$
$$f(j: \cancel{0} \xrightarrow{i+1} N-1)$$
$$f(k: \cancel{0} \xrightarrow{j+1} N-1)$$
$$\text{if } (\text{chek }(i, j, K))$$
$$cnt++$$

$$\boxed{TC = O(N^3)}$$
$$\boxed{SC = O(1)}$$

A:

	i	j	K
	①	②	③

i	j	K
i	K	j
j	i	K
j	K	i
K	i	j
K	j	i

ret cnt;

⓪ 1 ② ③ 4

x[] : [5, 4, 6, 2, -1]
y[] : [4, 7, 3, -1, 4]
       i   j   k

(2, 7) ✔

II)

(x_1, y_2)

$(x_2 y_2)$ (5, 7)

(2, 3)

(x, y_1)

(x_2, y_1)

(5, 3) ✔

①		②
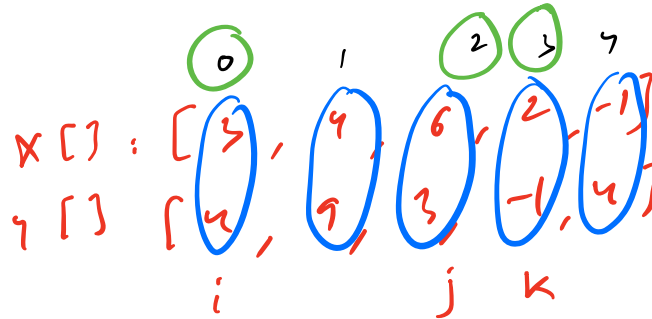
HashSet <pair <int, int>> hs;
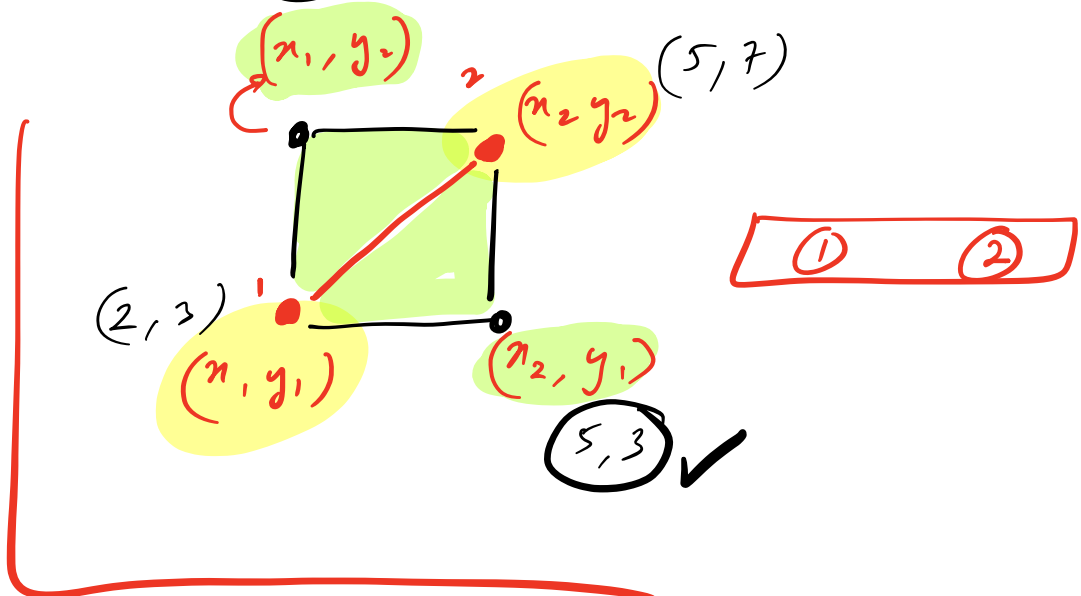
f (i: 0 ⟶ N-1) {
    hs. insert(X[i], Y[i]);
}   ⟶ O(N)

f (i: 0 ⟶ N-1) {   ⟶ N²
    f (j: 0 ^{i+1} ⟶ N-1) {
        if (hs. contains ({ X_i, Y_j}))   o
            cut ++;
        if (hs. contains ({ X_j, Y_i))
            cut ++;
    }
}

(m, o)

hf

n × 10⁵ + y

TC = O(N²)

SC = O(N)

Ⅲ

X : x_i :

y : y_i :

y_i

(x_i, y_i)

$\left(\, cnt(x_i) - 1 \,\right)$
$\times \left(\, cnt(y_i) - 1 \,\right)$

x_i

(0,0)
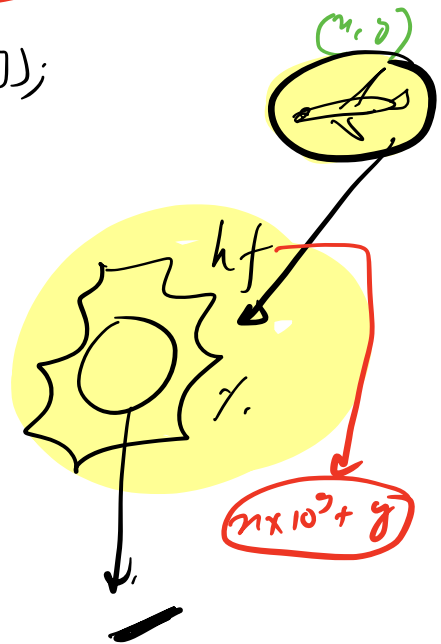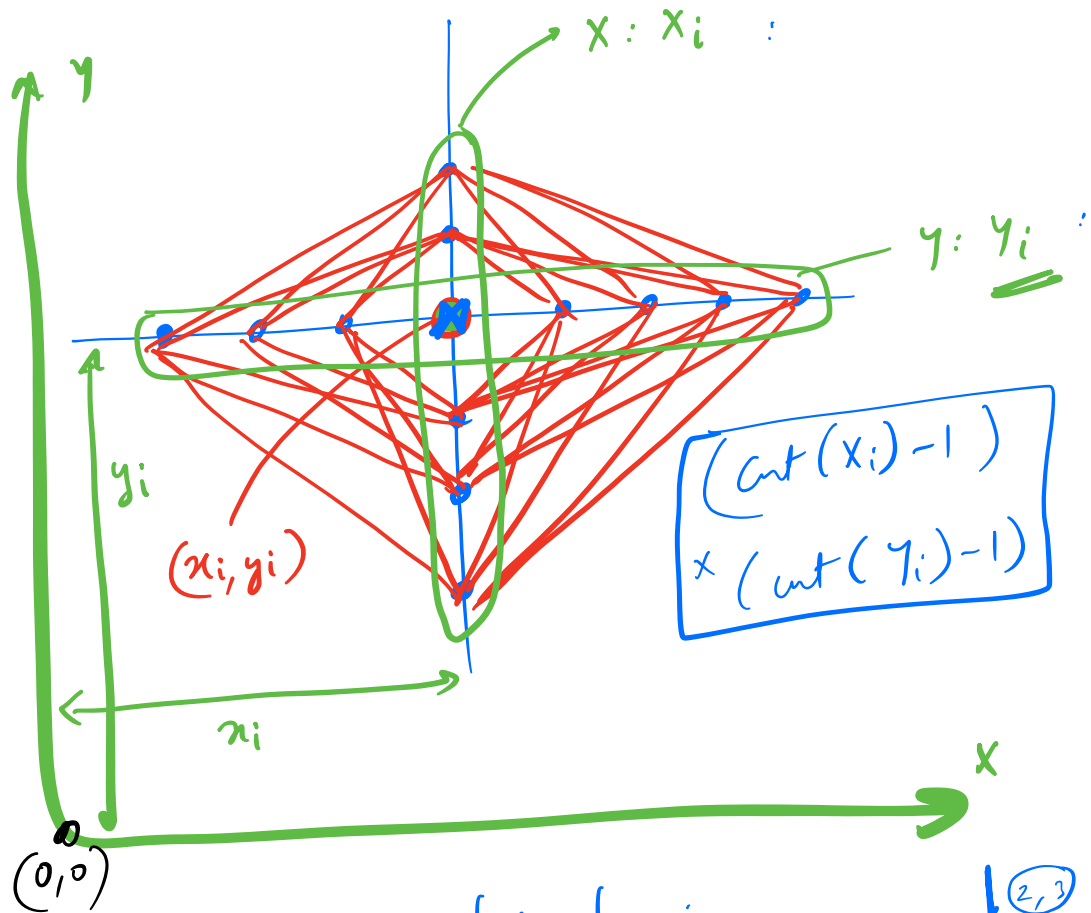
HashMap < int, int > f_x, f_y ;

(2, 3)

$f(i:0 \longrightarrow N-1)$? $\longrightarrow N$

$x[2, 3, 2]$
$y[5, 5, 3]$

     $f_x[x(i)]++;$
     $f_y[y(i)]++;$

}
ANS = 0 ;

$f(i:0 \longrightarrow N-1)$? $\longrightarrow N$

     ANS += $\left(f_x[x(i)] - 1\right) \times \left(f_y[y(i)] - 1\right);$

}
ret ANS ;

f_x : ⟨2, 2⟩, ⟨3, 1⟩

f_y : ⟨5, 2⟩, ⟨3, 1⟩
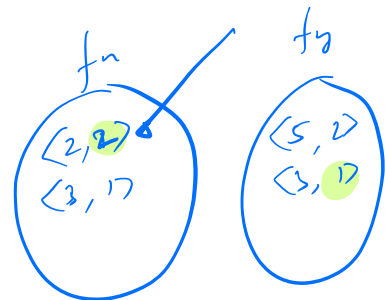
$TC = O(N)$

$SL = O(N)$

Q Give N points on a 2D plane
Find the no. of rectangles having sides
|| to x & y axis!
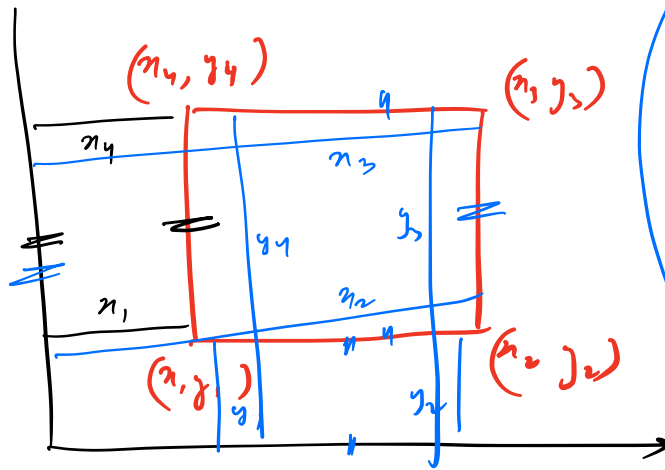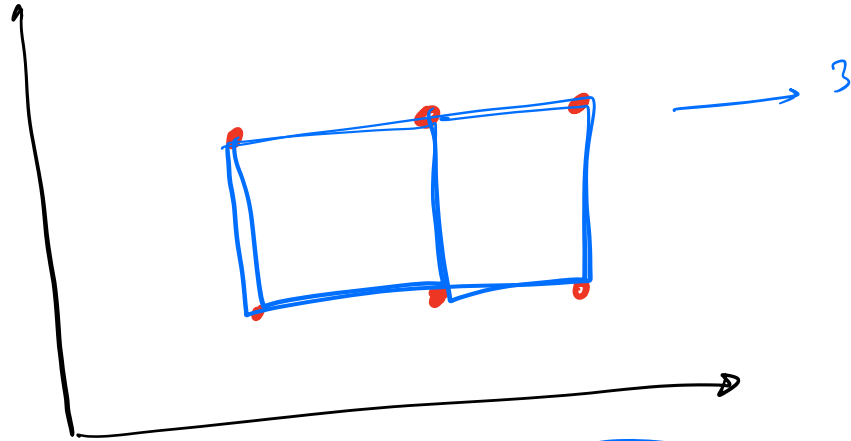
(x_4, y_4) (x_3, y_3)

(x_1, y_1) (x_2, y_2)

if ($x_1 == x_4$
&& $x_3 == x_2$
&& $y_1 == y_2$
&& $y_3 == y_4$)

1) <u>BF</u>

$$1 \to 2 \to 3 \to 4$$
$$i \quad j \quad k \quad l$$

$$f(i: 0 \longrightarrow N-1)$$
$$f(j: 0^{i+1} \longrightarrow N-1)$$
$$f(k: 0^{j+1} \longrightarrow N-1)$$
$$f(l: 0^{k+1} \longrightarrow N-1)$$
$$\quad if(chck(i,j,k,l))$$
$$\qquad cnt++;$$

$$\boxed{TC = O(N^4)}$$
$$\boxed{SC = O(1)}$$

II)

4
(x_1, y_2) 2 (x_2, y_2)

(x_1, y_1) (x_2, y_1)
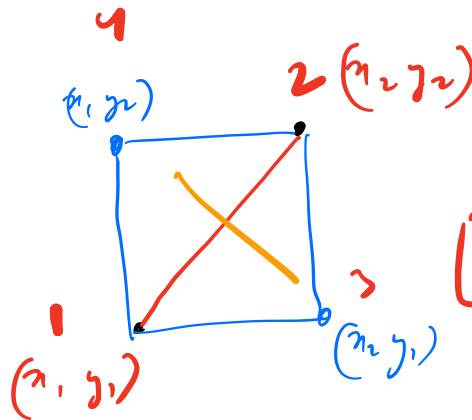
1	2	3	4

$i \quad j$

Idea: SAME AS $\triangle$ problem

(i,j): DIAGONALS

$$f(i: 0 \longrightarrow N-1)$$
$$f(j: i+1 \longrightarrow N-1)$$
$$if(hs.\ contains\ ((X_i, Y_j))\ \&\&$$
$$\qquad hs.\ contain\ ((X_j, Y_i)))$$
$$\qquad cnt++;$$
$$ret\ cnt/2;$$

$$\boxed{TC = O(N^2)}$$
$$\boxed{SC = O(N)}$$

Q Given 2 strings A & B.
Find the # of substrings of A which are
permutations of B.

A: N
B: M

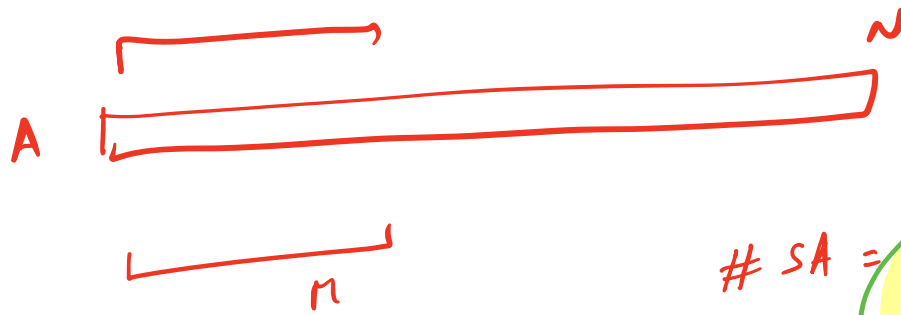$1 <= M <= N <= 10^5$

A: a b a x a b a z d c x x b a a → S⫽⫽

B: a b x a

x ✓

A: ⓐ b a x ⓐ b a z d c x x b a a

HM_A
a: ̶3̶ ̶2̶ 2
b: 1
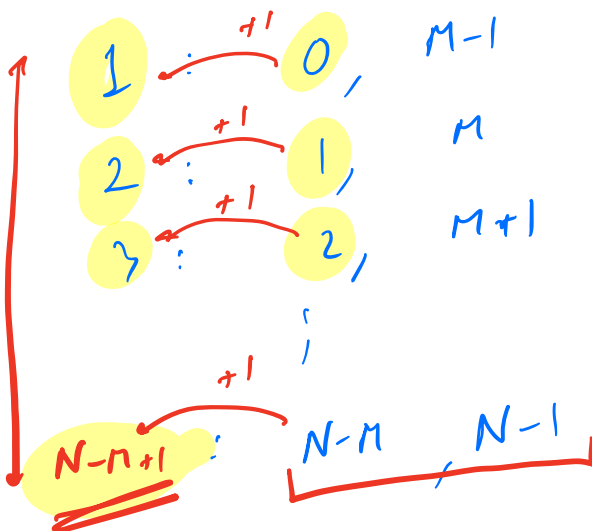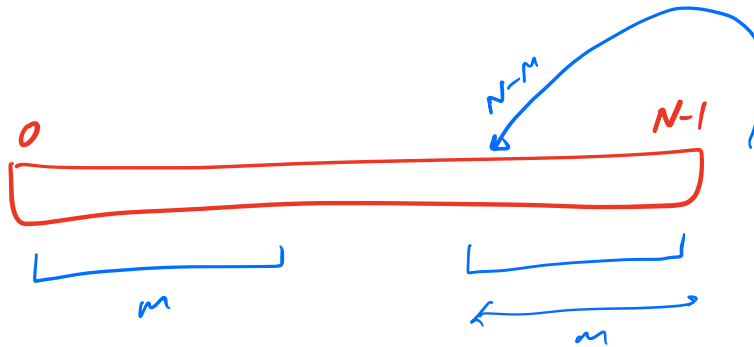x: 1

B: a b x a

HM_B
a: 2
b: 1
x: 1

A $\underset{\longleftarrow}{N}$

$\overline{}$ M

$\# SA = \dfrac{(N-M+1)}{\underset{K}{\downarrow}^{x}}$ (26)

$HM_B \longrightarrow$ $O(M)$

HM_A

$+$

$\downarrow$

TC

$SC : O(K)$

0 $\qquad$ N-1

$\overset{N-M}{\longrightarrow}$

m $\qquad$ m

1	$\overset{+1}{\longleftarrow}$	0,	M-1
2	$\overset{+1}{\longleftarrow}$	1	M
3	$\overset{+1}{\longleftarrow}$	2,	M+1
		:	
N-M+1	$\overset{+1}{\longleftarrow}$	N-M , N-1	

1 Given 2 strings A & B.
Find the length of the ==shortest== substring of A
which is having all characters of B.

A : a c x b d a

B : a b x a

A : a b d a x g a b a a d c x x f b a a

S

NK → 1st WINDOW

i j R

HM_A
a : 2
b : 1
d : 0
x : 1
g : 1

ANS = ~~∅~~ 5

HM_B
a : 2
b : 1
x : 1

$O(m)$

B : a b x a

$TC = O(NK + M)$

i → j →

i $O(1)$ j $O(1)$

$O(N)$

N

1	2	3	4	5	6	7	8	–	–	N
X	X	X	X	✓	✓	✓	✓	✓	✓	

N

NK

N_B

: $O(m)$

$\#it \rightarrow lg \, (N)$