

POT D - 2 Sep

Find the Number of ways to place people - (I)

$$24 = n \leq 50 \quad E(T.C) = \underline{\underline{N^3}}$$

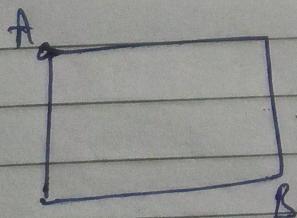
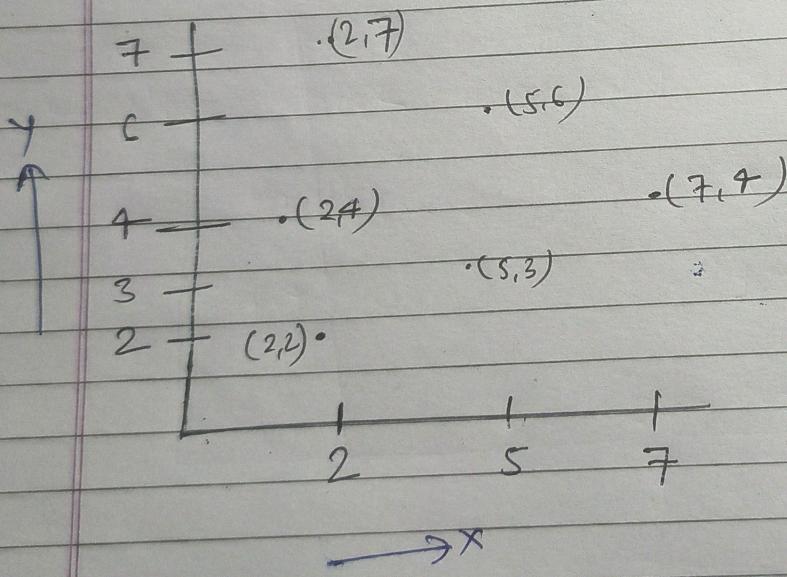
$$\Rightarrow 5^3 \times 10^3$$

$$= 125 \times 10^3$$

$$\approx 1.25 \times 10^5 \quad \leq \leq 10^8$$

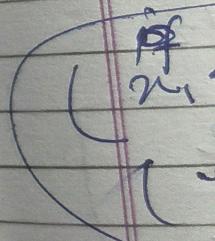
path

Brute force



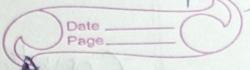
so Now
Jyoti
circ
40°
PO

A

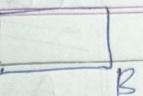


so

$B_x \rightarrow$ x coordinate of B $\rightarrow A_x (x \text{ coordinate of } A)$



Let $A = (2, 7)$ $B = (2, 4)$



$A \rightarrow$
 \downarrow
 B

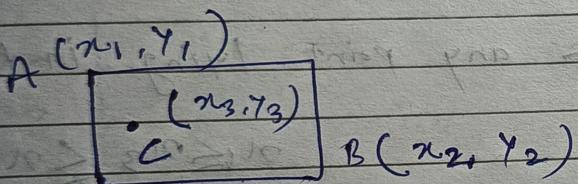
so $B_x \geq A_x$

$B_y \leq A_y$

$$\begin{array}{l} 2 \geq 2 \rightarrow \checkmark \\ 4 \leq 7 \rightarrow \checkmark \end{array} \left. \begin{array}{l} \text{valid} \\ \text{valid} \end{array} \right\} (2, 4) \in A$$

So now how to check \rightarrow is there any point lying between A & B rectangle OR circumference of A & B

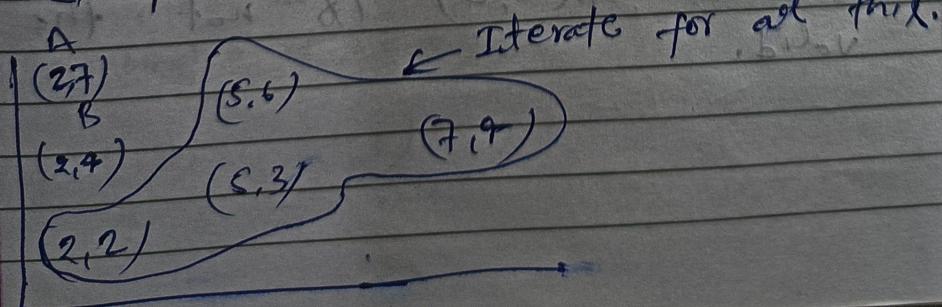
\rightarrow you have to iterate for all the points except for A & B.



$$\begin{array}{l} x_1 \leq x_3 \leq x_2 \\ y_1 \leq y_3 \leq y_2 \end{array}$$

so these two condition is satisfying then point C is inside the rectangle.

So check these condition for all other points except A & B.



~~Count = 0~~ \times^2

$A(2,7) \frac{B}{(2,4)}$ is ~~not~~ valid.

Now pick up with next combination.

$A(2,7)$ & $B(2,2)$

check 1 \Rightarrow valid top left

$$\begin{array}{l} Bx_2 \geq Ax \\ By \leq Ay \end{array} \rightarrow \text{True}$$

check 2 Now checks any point lying in the circle.

$(2,7) A$

$$x \leq x_3 \leq x_2$$

$(2,4) C$

$$y_1 \leq y_3 \leq y_2$$

$(2,2) B$

$$2 \leq 2 \leq 2$$

$$2 \leq 4 \leq 2$$

$\downarrow p$

Condition fails

So this $A(2,7)$, $B(2,2)$ is not the valid.

Now check with the Another Combination \Rightarrow

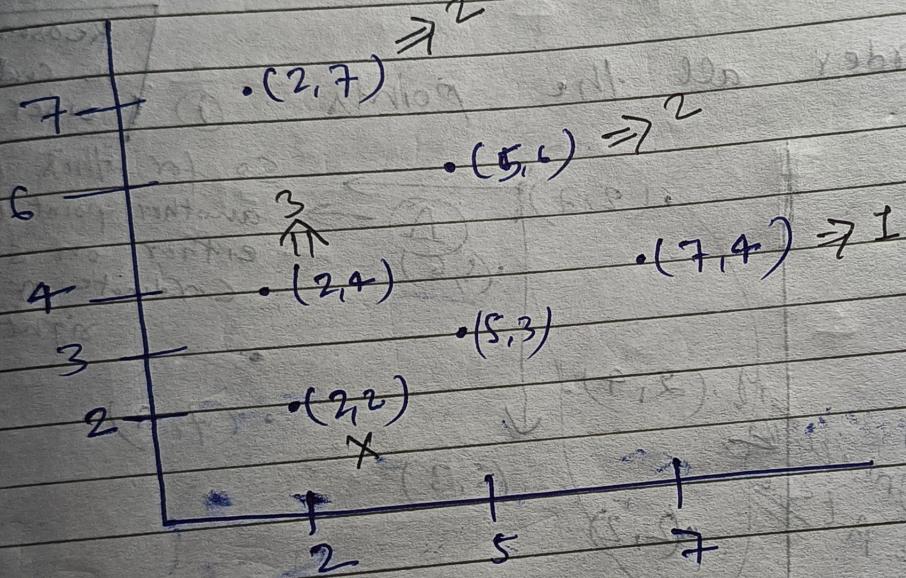
A (2,7)

B (5,6)

Check with all other points that it is valid. Between A & B, you can see in the image, this is valid.

for point -A \rightarrow 2 contribution.
 $(2,7)$

Count = $\cancel{0} \pm 2$



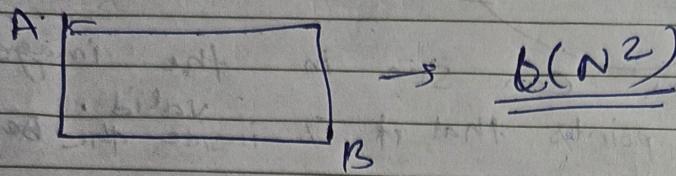
Count = 7

$$T.C \Rightarrow \frac{N^2}{\cancel{I}} \times N \Rightarrow O(N^3)$$

(To check all the combinations of A & B) To check the interference for all the points

$$S.C \Rightarrow O(1)$$

Optimization : \rightarrow

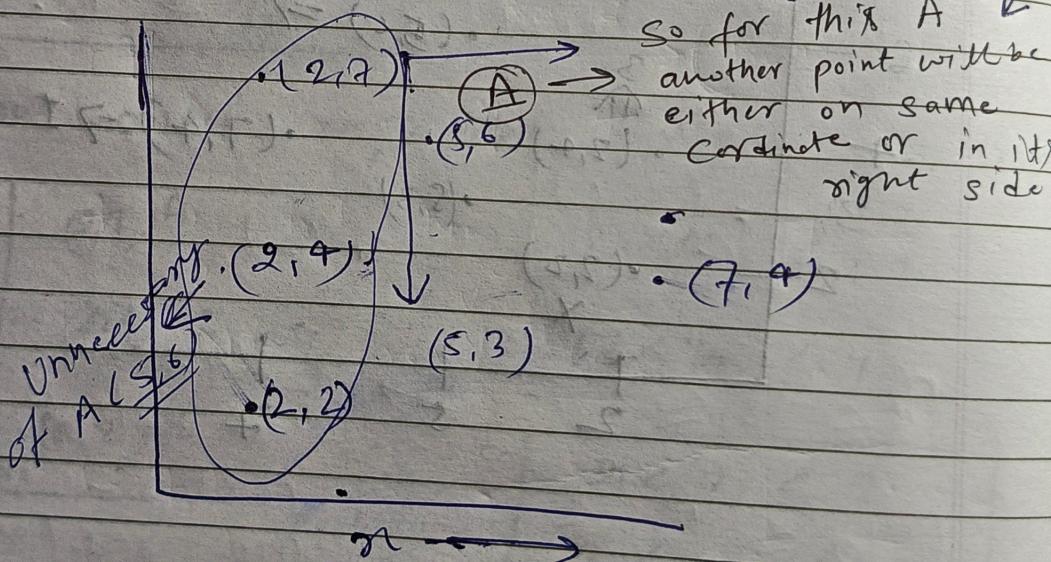


We can not avoid this.

how to check point C inside the rectangle? (Here optimization can be happen)

\rightarrow order all the points

Reason for sorting
is coord. in increasing order.



sort on the basis of x coordinate.

$A_1 \dots A_n$

$A_{1n} \leq A_{2n}$

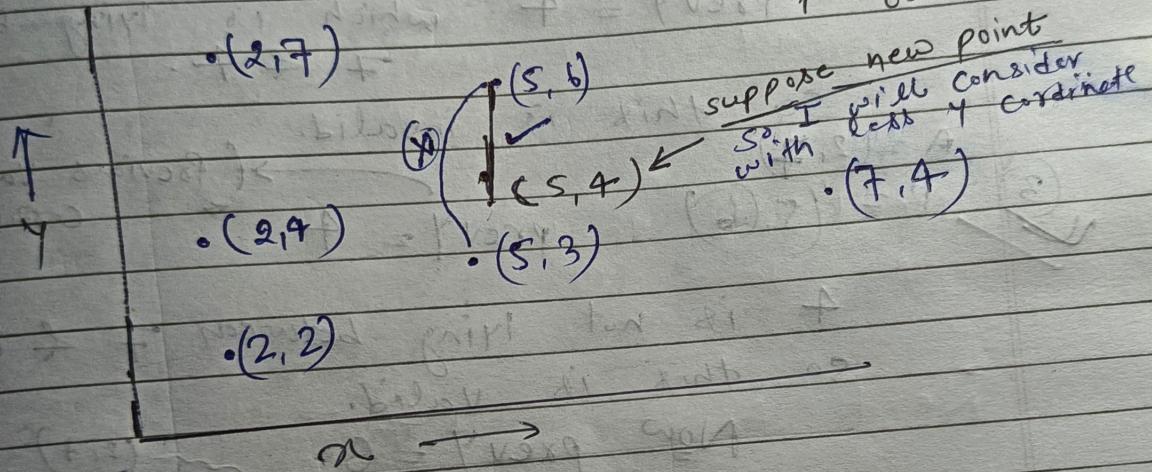
if two point have same x coordinate then

then I will be checking for the
y coordinate so I will arrange
each of y coordinate in decreasing
y coordinate.

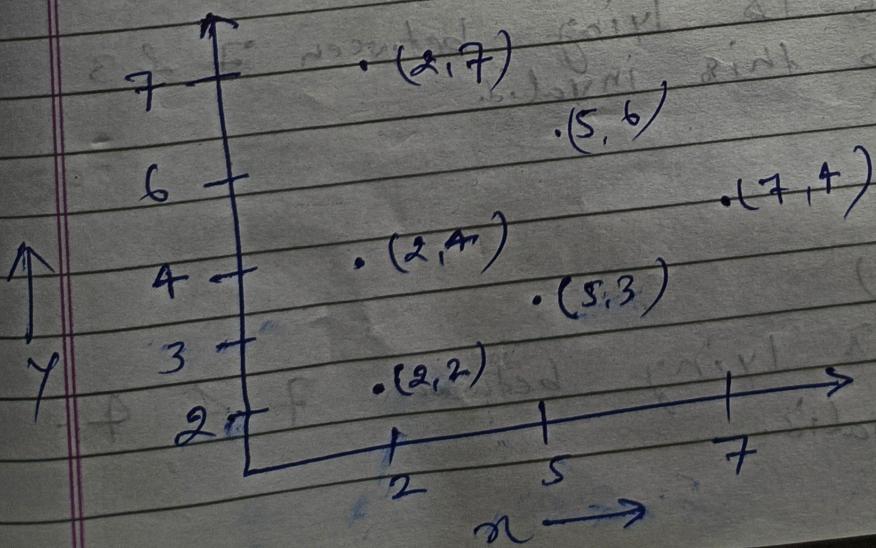
$$\text{so } A_{1n} = A_{2n}$$

$$\text{then } (A_{1y} \leq A_{2y})$$

- (2) If no coordinate is same.
(Reason for sorting
of coordinate in decreasing
order.)



Let's dry sum from the start :-



Alt



Home

PgUp

End

PgDn

Date _____
Page _____

Now imagine that all points on n axis
 sorted in increasing order and y axis
 is sorted in decreasing order if x
 coordinate is same.

$$A = (2, 7)$$

$$\text{prev } y = -\infty \neq$$

~~$B = (2, 4)$~~

~~$\text{Count} = 0$~~

~~$② B = (2, 2)$~~

~~8867~~

$\text{prev } y = 4$ which is lying between
~~7 & 4~~.

so this is invalid.

~~$A = (2, 7)$~~

\rightarrow (Previous Valid y
 coordinate)

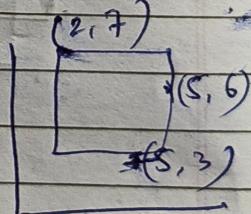
~~$B = (5, 6)$~~

$$\text{prev } y = 4$$

4 is not lying between 7 & 6.

so this is valid.

$$\text{Now } \underline{\text{prev } y = 6}$$



~~$A = (2, 7)$~~

~~$④ B = (5, 3)$~~

$\text{prev } y = 6$ is lying between 7 & 3
 so this is invalid.

~~$⑤ A = (2, 7)$~~

~~$B = (7, 4)$~~

$\text{prev } y = 6$ is lying between 7 & 4.
 invalid.

Now next A value $\rightarrow (2, 4)$
 $\text{prevy} = -\infty$

$$A = (2, 4)$$

$$\checkmark \textcircled{1} B = (2, 2)$$

$-\infty$ not lying between 4 & 2 so
this valid. so now prevy = 2

$$\textcircled{2} A = (2, 4)$$

$$B = (5, 6) \rightarrow$$

This will not be consider because
(2, 4) is not the bottom right corner.

674 - X

$$A = (2, 4)$$

$$B = (5, 3)$$

$\text{prevy} = 2$ is not lying between 4 & 3
this valid so prevy = 3

$$\textcircled{4} A = (2, 4)$$

$$B = (7, 4)$$

$\text{prevy} = 3$ it not lying between 4 & 4.
So this is valid \checkmark $\text{prevy} = 4$

so Next A value = (2, 2)

there is no valid B. Because all
the p, y are larger.

Next 8) A value = $(5, 6)$

$$\text{prevy} = -\infty$$

①

$$B = (5, 3)$$

$-\infty$ is not lying between $(5, 3)$
 $\therefore \text{prevy} = 3$. valid

②

$$A = (5, 6)$$

$$B = (7, 4)$$

prevy 3 is not lying between 6 & 4
valid

Next A value = $(5, 3)$

No Valid

Next A value = $(7, 4) \rightarrow$ you don't even need to try.

Total Count = 7

Sorting $\rightarrow O(N \log N)$

$O(N^2) \rightarrow$ each combination

T.C = $O(N^L)$

S.C = $O(1)$

```

int numberOfPairs (vector<vector<int>> & points)
{
    int n = points.size();
}

```

```

sort (points.begin(), points.end(),
      [] (const vector<int> & p1, const
           vector<int> & p2) {

```

```

return p1[0] == p2[0] ? p1[1] > p2[1] :
               p1[0] < p2[0];
}

```

```

});

```

```

int count = 0;

```

```

for (int A = 0; A < n - 1; A++)
{

```

```

    int bottom_right_y = INT_MIN;

```

```

    for (int B = A + 1; B < N; B++)
    {

```

```

        if (points[B][1] <= points[A][1]
            and
            points[B][1] > bottom_right_y)

```

```

    {

```

```

        count++;

```

```

        bottom_right_y = points[B][1];
    }
}

```

```

}

```

```

return count;
}

```