

Q:- You have an array (unsorted).

Return the count of pairs, that follow these properties -

$$\boxed{\rightarrow \underline{i < j} \rightarrow a_i > a_j} \quad \underline{(a_i, a_j)}$$

$$(8, 4, 2, 1) \rightarrow \underline{6} \quad \leftarrow$$

$$(8, 4) \quad (8, 2) \quad (8, 1) \quad (4, 2) \quad (4, 1) \quad \underline{(2, 1)}$$

$[8, 5, 6, 3, 1]_n$

$[8, 5]$ $[6, 3, 1]$

sorted
version

$[5, 8]$

$[1, 3, 6]$

$[1, 2, 5, 9, 10]$, $[2, 6, 13, 22]$

x^1 x^2

$\underbrace{\hspace{1.5cm}}$

$$0 + 3 + 2$$

DNC

→ 1 + 2 + 2
+ 1 + 2
+ 1 + 1
+ 1

merge
sort

$[-1, 1, 2, 2, 3, 4, 5, 6]$

$[-1, 1, 2, 5]$

mid

$[2, 3, 4, 6]$

$(2, 5)$ $(-1, 1)$
 (2) (5) (-1) (1)

$(3, 6)$ $(2, 4)$
 (6) (3) (2) (4)

mid - 1

$O(n \log n)$

Inversion Count

Q → You are given arrival time and dept time of n guests, in 2 diff lists.

find the min hotel rooms reqd for

inculcating all the guests (24 hr format)

Arrival [9:00 , 9:40]

Dept - [9:10 , 12:00]

①
9:00 → 9:00

9:40 → 9:40

\Rightarrow arrival $\rightarrow [900, 940, 950, 1100, 1500, 1800]$
dept $\rightarrow [910, 1200, 1120, 1130, 1900, 2000]$

\rightarrow we just need to keep a track that
whether we have a dept before arrival
or not

Sort \rightarrow arrival
 \rightarrow dept

$[900, 940, 950, 1100, 1500, 1800]$ ²ⁱ ² //

→ $910, 1120, 1130, 1200, 1900, 2000$ ²²

rooms = $\emptyset \times \emptyset \times \emptyset \times \emptyset \times \emptyset \times \underline{\underline{2}}$

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maye 2 sorted
arrays

Qn You have an array, of integers.

i^{th} element represents the range of i^{th} soldier i.e., a soldier can attack

positions from $[i - a[i], i + a[i]]$

find min soldiers, to attack the whole

array.

$[-1, 2, 2, -1, 0, 0] \rightarrow \textcircled{2}$
 $\quad \quad \quad s_1 \quad \quad \quad s_2$

$$s_1 \rightarrow [2-2, 2+2] \\ (0, 4)$$

$$s_2 \rightarrow [5-0, 5+0] \\ s_2 \sim [s_1, s_1]$$

Sort by left side \rightarrow $\left[\begin{matrix} 0 & 1 & 2 & 3 & 4 & 5 \\ -1 & 2 & 2 & -1 & 0 & 0 \end{matrix} \right] \left[(1,3) \ (0,4) \ (4,4) \ (5,5) \right]$

\rightarrow negatives never make a valid range.

$(0,4) \ (1,3) \ (4,4) \ (5,5)$

count = 1

$\left. \begin{matrix} \text{maxRight} = 5 \\ \text{currmax} = 4 \end{matrix} \right] \rightarrow \text{right boundary}$

$\text{sol}[i+1].\text{left} \leq \text{maxRight}$
 $i++$

$\text{maxRight} \rightarrow$ represent first pos from
when we need soldiers

$\begin{matrix} 0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 2, & 3, & 4, & -1, & 2, & 0, & 0, & -1, & 0 \end{matrix}$
 $\downarrow \qquad \qquad \qquad \downarrow$
 $(-2, 2) \quad (-2, 4) \quad (-2, 6) \quad (2, 6) \quad (5, 5) \quad (6, 6) \quad (6, 7)$
?

$\text{count} = 0$ ~~$\times 2$~~

$\text{max Right} = 7$
 $\text{curr Right} = 6$

$(6, 7)$ ~~$\times \times \times$~~

→ Sort based on left range

→ count → mino. of soldiers

maxRight → rightmost boundary of soldier
↳ first pos for which we need a guard

→ curRight → Right boundary of current element

→ if ($v[i].left > \text{maxRight}$)

set - 1

$(v[i+1].left \leq \text{maxRight})$