Agenda → How to get started with competitive programming

→ Quick tour on what are algo Judges

→ Problem Solving

Real Life problems → algorithmic puzzles → sol → fast
→ accurate

→ recognition

→ helpful for interviews

DS/algo

Q) Given a list of numbers count the no. of pairs (A_i, A_j) such that —

$$\begin{cases} LCM(A_i, A_j) = 2\, GCD(A_i, A_j) \\ (A_i, A_j) = (A_j, A_i) \end{cases}$$

$len(list) \le 10^6$

$1 \le A_i \le 10^9$

2, 3, 4

↳ ans = 1

LCM → 4

GCD → 2

$^{10^6}C_2 \Rightarrow \frac{10^6!}{2!(10^6-1)!} = \approx 10^{12}$

a) almost → 10^{10}

b) almost → 10^{12} ✓

c) almost → 10^6

d) None

a) 10^{12}
b) 10^{10}
c) 10^{8} ✓
d) 10^{1-0}

$10^{8} \longrightarrow$ 1sec

$(\longrightarrow \frac{1}{10^{8}}$

$10^{12} \longrightarrow \frac{1}{(10^{8})} \times 10^{12} \rightarrow 10^{4}$ sec

1 min → 60 sec

1 sec → $\frac{1}{60}$ min

10^{4} sec → $\frac{10^{4}}{60} \rightarrow \frac{10^{3}}{6}$ mins

≈ 166.66 min

a) $\frac{LCM}{a_1 \times a_2} = gcd$

b) $LCM \times GCD = a_1 \times a_2$ ✓

c) $a_1 \times LCM = a_2 \times gcd$

d) None

$$LCM = \frac{a_1 a_2}{gcd} \qquad lcm = 2gcd$$

$$\frac{a_1 a_2}{gcd} = 2\,gcd$$

$$a_1 a_2 = 2gcd \times gcd \quad (1)$$

$a_1 = c_1 \times gcd(a, b)$ — (1)

$a_2 = c_2 \times gcd(a, b)$ — (2)

$c_1 \times gcd \times c_2 \times gcd = 2 \times gcd \times gcd$

$c_1, c_2 \geq 0$

$c_1 \times c_2 = 2$

if c_1 and c_2 are integers

$\rightarrow (c_1 = 1, c_2 = 2)$

$(c_1 = 2, c_2 = 1)$

$\frac{a_1}{a_2} = \frac{c_1}{c_2}$

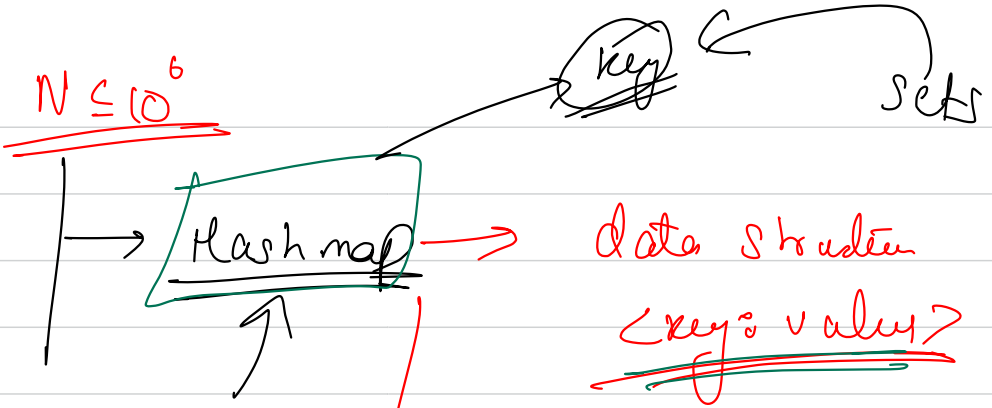
$\frac{a_1}{a_2} = \frac{1}{2} \Rightarrow 2a_1 = a_2$

or

$\frac{a_1}{a_2} = \frac{2}{1} \Rightarrow a_1 = 2a_2$

Search problem

$N \leq 10^6$



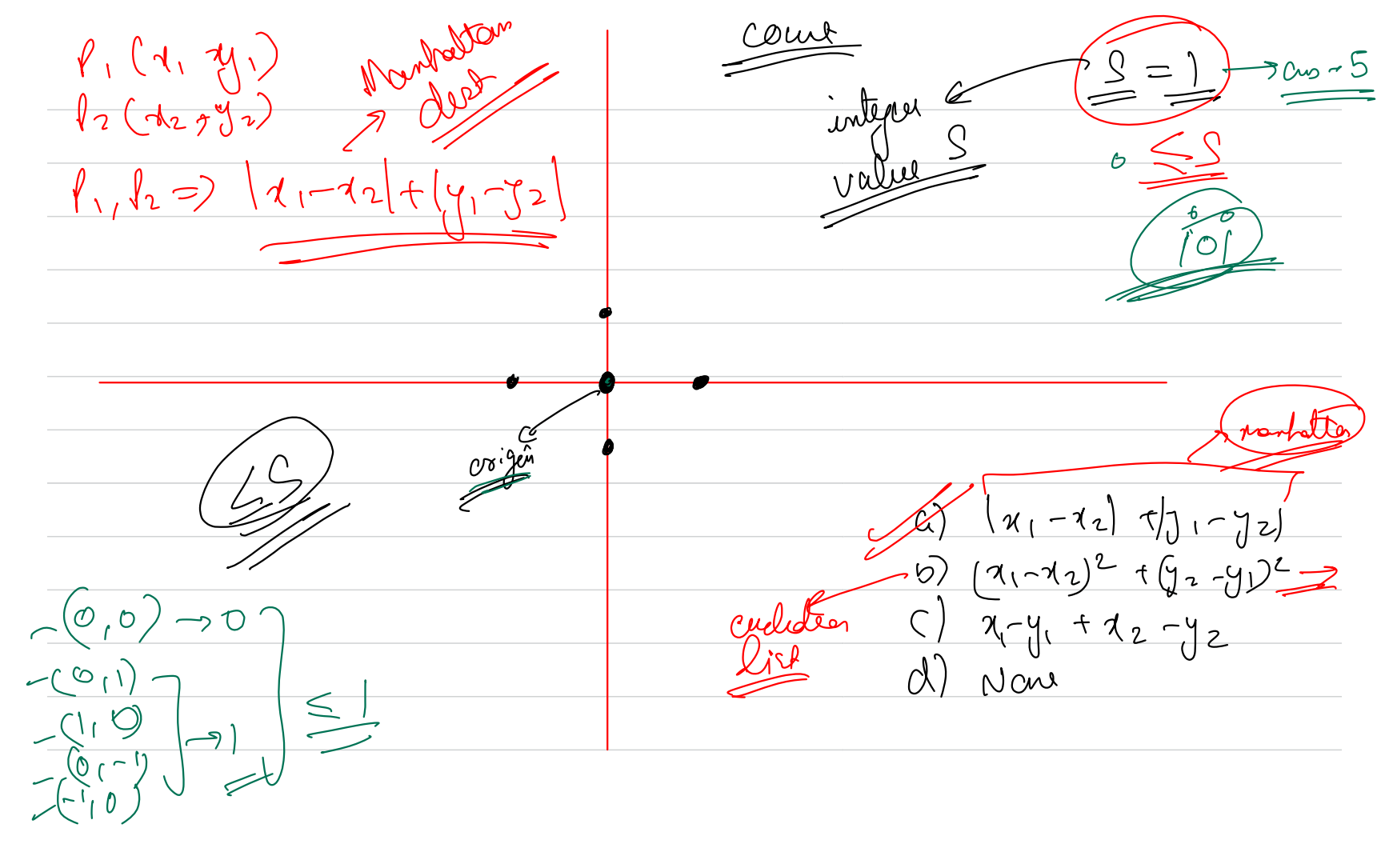
[2, 2, 3, 4, 4]

Lets my → key → value → frequency

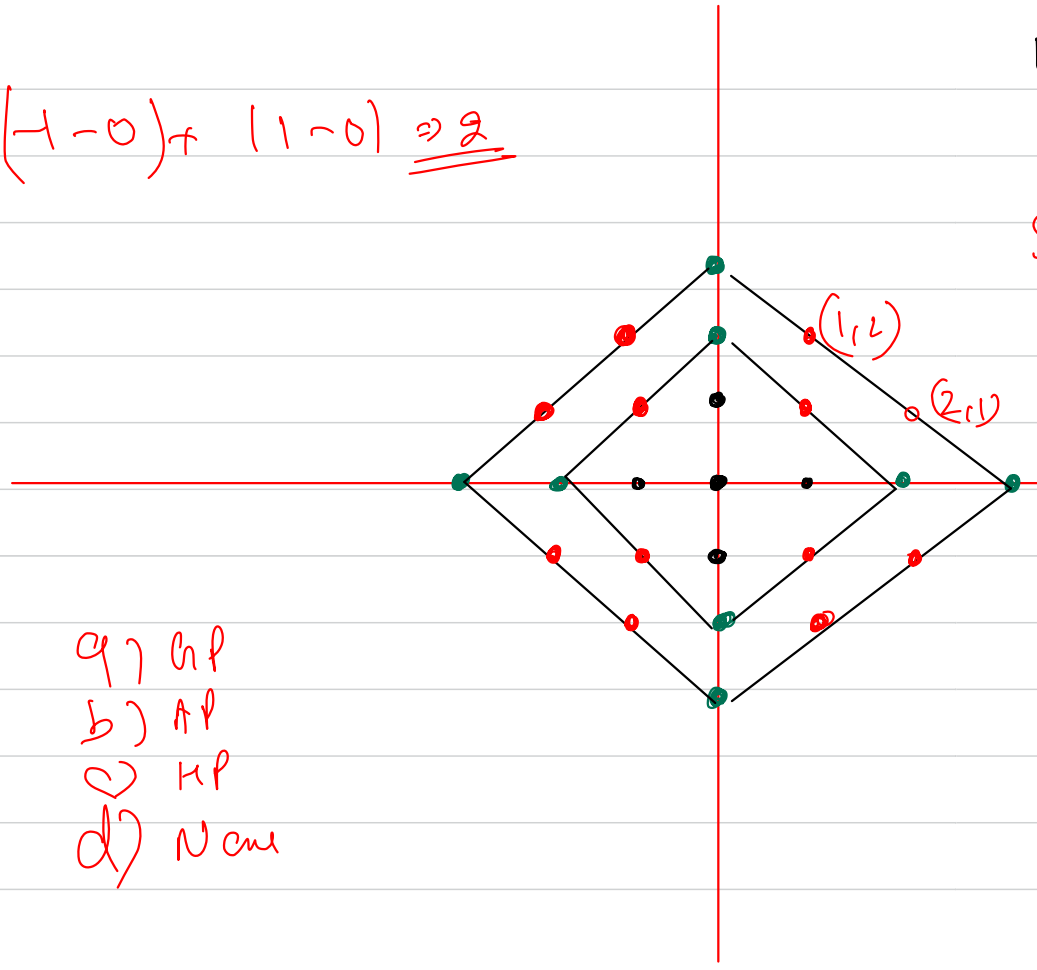
{ 2 : 2,
4 : 2,
3 : 1 }

ans = 4

my key value
2, 2
→ 2 x 2
→ 4


$P_1(x_1, y_1)$
$P_2(x_2, y_2)$
Manhattan dist
$P_1, P_2 \Rightarrow |x_1 - x_2| + |y_1 - y_2|$
count
integer value S
S = 1
cus - 5
$0 \leq S$
101
LS
origen
manhattan
a) $|x_1 - x_2| + |y_1 - y_2|$
b) $(x_1 - x_2)^2 + (y_2 - y_1)^2$
c) $x_1 - y_1 + x_2 - y_2$
d) None
cuidado list
(0,0) → 0
(0,1)
(1,0)
(0,-1)
(-1,0)
→ 1
≤ 1

$(4-0)+(1-0) \Rightarrow 2$



$S=0 \rightarrow 1 \rightarrow 1$

$S=1 \rightarrow 5 \rightarrow 1+4$

$S=2 \rightarrow 13 \rightarrow 1+4+8$

$S=3 \rightarrow 25 \rightarrow 1+4+8+12$

a) HP
b) AP
c) HP
d) None

$S=0 \rightarrow 1 \rightarrow 1$

$S=1 \rightarrow 5 \rightarrow 1+4(1)$

$S=2 \rightarrow 13 \rightarrow 1+1+8$

$25 \rightarrow 1+4+8+12$

for any random S →

$$1 + 4 + 8 + 12 \cdots\cdots 4S$$

$$1 + 4(1 + 2 + 3 + 4 \cdots\cdots S)$$

$$1 + 4^2 \times \frac{S \times (S+1)}{2}$$

$$\Rightarrow 1 + 2 \times S \times (S+1)$$