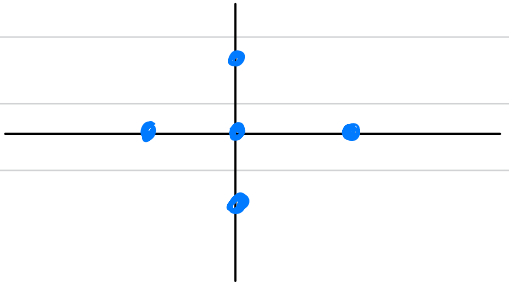
101

→ Qn You are given a 2D cartesian plane, with its center at (0,0).

find the no. of integer points such that they have the manhattan distance from the centre less than or equal to K (where K is an integer)

Manhattan dist → $|x_2 - x_1| + |y_2 - y_1|$



K = 1 → ans = (5)

(0,1)
(1,0)
(0,-1)
(-1,0)
→ ==1

(0,0) → ==0

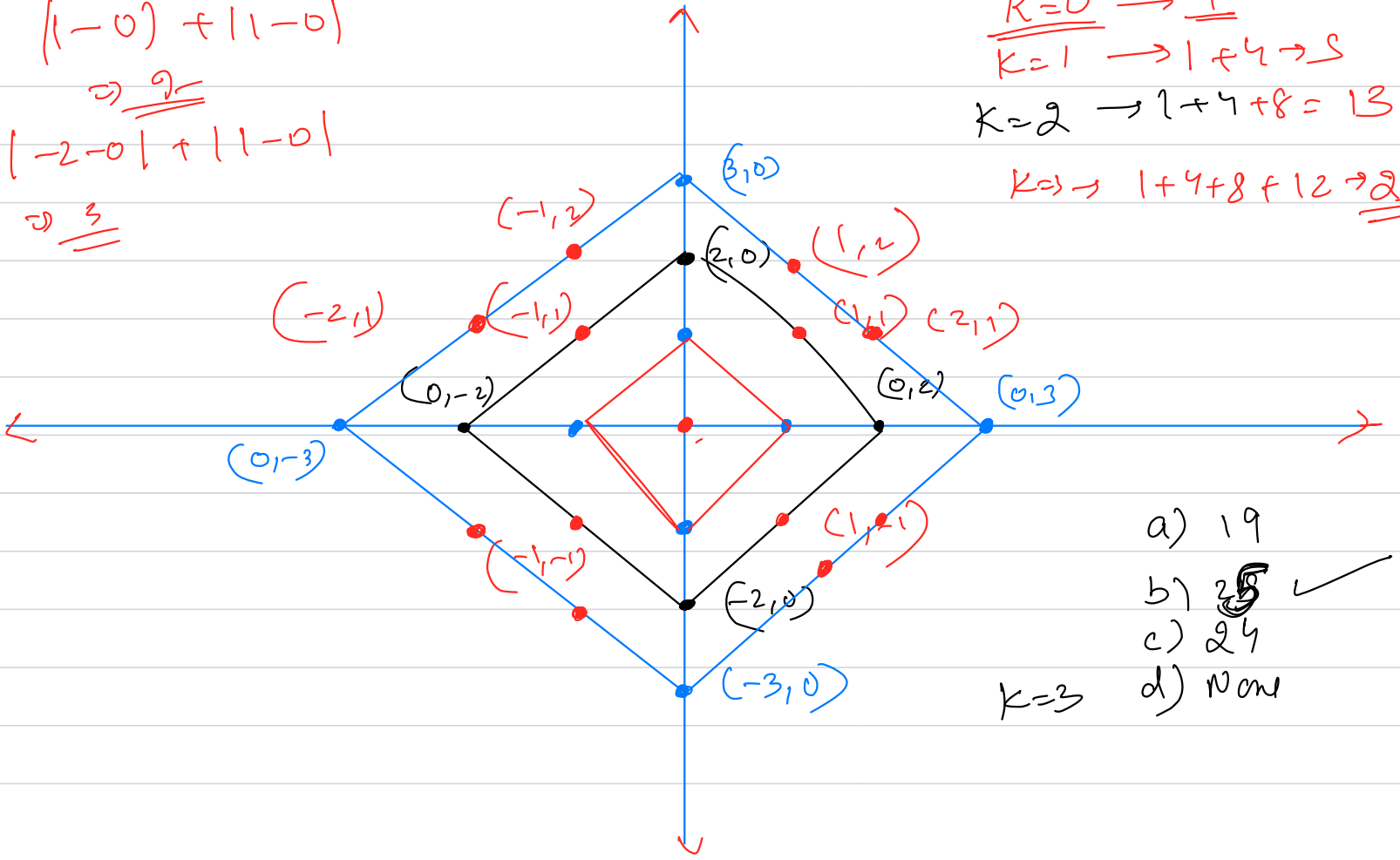
4+1 → 5

$|1-0| + |1-0|$

$\Rightarrow 2$

$|-2-0| + |1-0|$

$\Rightarrow 3$



$K=0 \rightarrow 1$

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

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

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

a) 19

b) 25 ✓

c) 24

d) None

$K=3$

$k = 10^8$

$k = 0 \rightarrow 1$

$k = 1 \rightarrow 1 + 4$

$k = 2 \rightarrow 1 + 4 + 8$

$k = 3 \rightarrow 1 + 4 + 8 + 12$

$k = 4 \rightarrow 1 + 4 + 8 + 12 + 16$

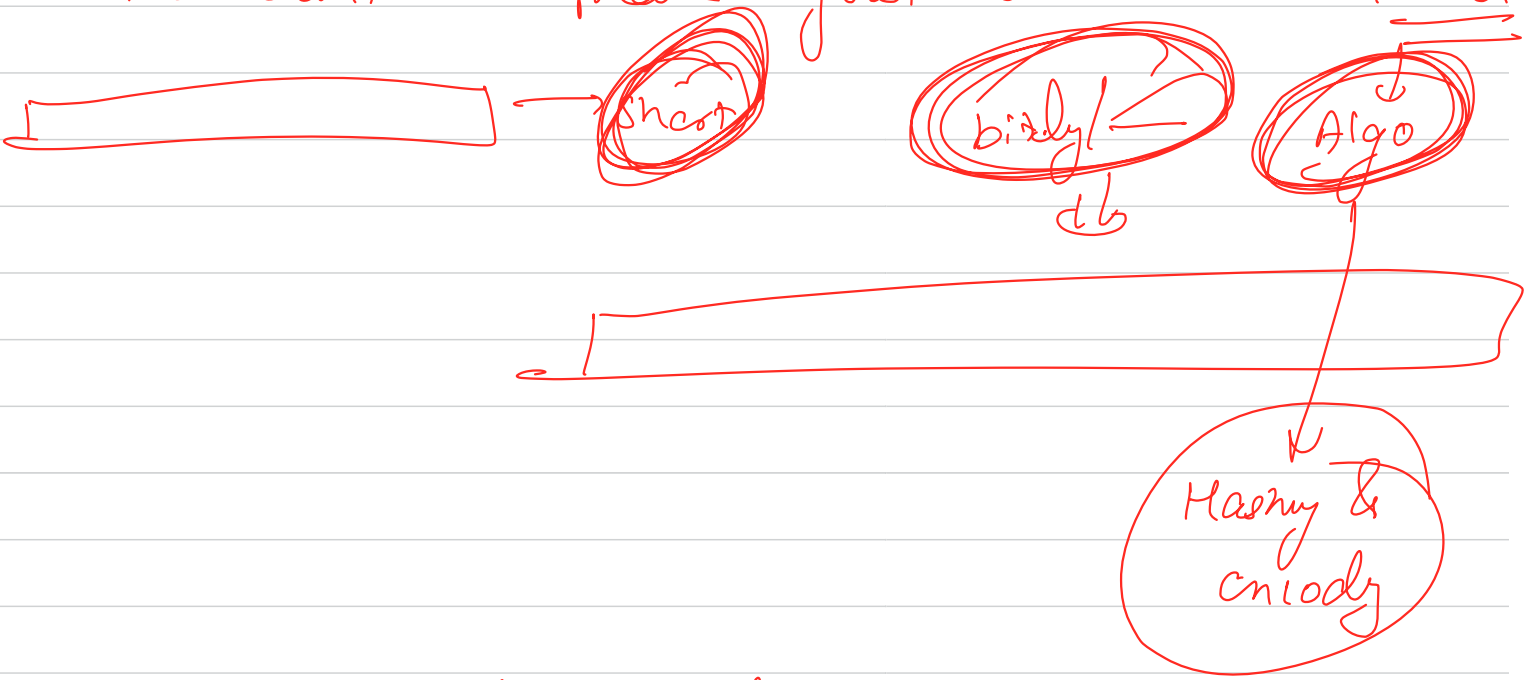
$k = n \rightarrow 1 + 4 + 8 + 12 \cdots\cdots 4n$

$\rightarrow 1 + 4(1 + 2 + 3 \cdots\cdots n)$

$1 + 4\frac{2}{x}(n)(n+1)$

$k = n \rightarrow 1 + 2(n)(n+1) \rightarrow$ const

↳ You want to make your own URL shortener



Make auto complete search → DS → Trie

DBMS → more no search speed → indexed

DS → B+Tree

↳ We want to calculate sum of product of all possible pairs of n numbers.

$n <= 10^7$

↳ (1, 2, 3) → Random

(11, 15, 1) n=3

1×2 + 2×3 + 1×3 → 2 + 6 + 3 → 11

↳ what is the no. of operations CPU can execute in 1sec

a) 10
b) 10^8
c) 10^{100}
d) Non

$10^7 C_2$

$\frac{10^7!}{2!\,(10^7-2)!}$

a) n^n
b) $2n$
c) $^nC_2$
d) Non

$$\frac{10^7!}{2 \times (10^7 - 2)!}$$

$$\frac{10^7!}{2 \times (9999998)!}$$

$10^7 \times 9999999 \longrightarrow 10^7$

2

$$\frac{10^{14}}{2} \approx 10^{14}$$

1 Sec $\longrightarrow$ 10^8 operation

10^{14} $\longrightarrow$ 1 operation $\longrightarrow$ $\frac{1}{10^8}$ Sec

10^4 operat $\longrightarrow$ $\frac{10^{14}}{10^8}$ Sec

10^6 Sec $\longrightarrow$ 12 days

↳ $(a+b+c)^2 \Rightarrow a^2+b^2+c^2+2(ab+bc+ca)$

$(a+b+c+d)^2 \Rightarrow a^2+b^2+c^2+d^2+2(ab+bc+cd\ldots$

$\ldots\ldots)$

$(a+b)^2 = a^2+b^2+2(ab)$

→ spend → 3-4 days in learning basic if else, loops, basic array

↳ start compeley in contest → 1 week (2-4 later)

↳ side by side learn concepts (2) (3)

- → Recursion
- → DNC → Find 1 ranges → Binary Search
- → sorting algo → bubble, insert, sele, quick, merge
- ↳ Base Data structure → Stacks, array, LL, Queue, Trees, Hash Map

↳ STL C++, Collection in Java

↳ Backtracking ← Recursion

↳ Intermediate DS → Heaps, Tries, graphs

↳ greedy algo

↳ DP (Dynamic Programming)

Number Theory, Maths

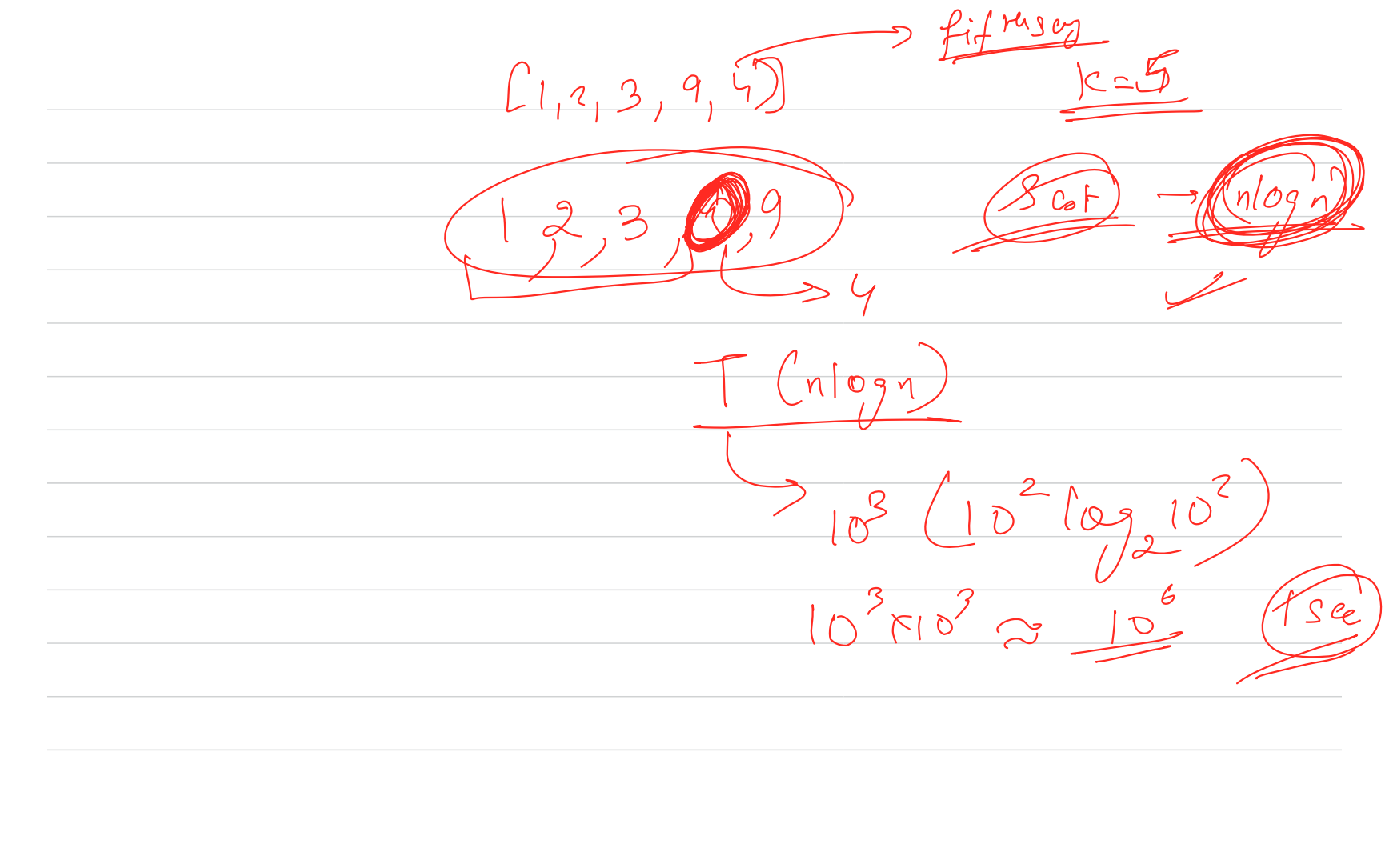
Advance DP

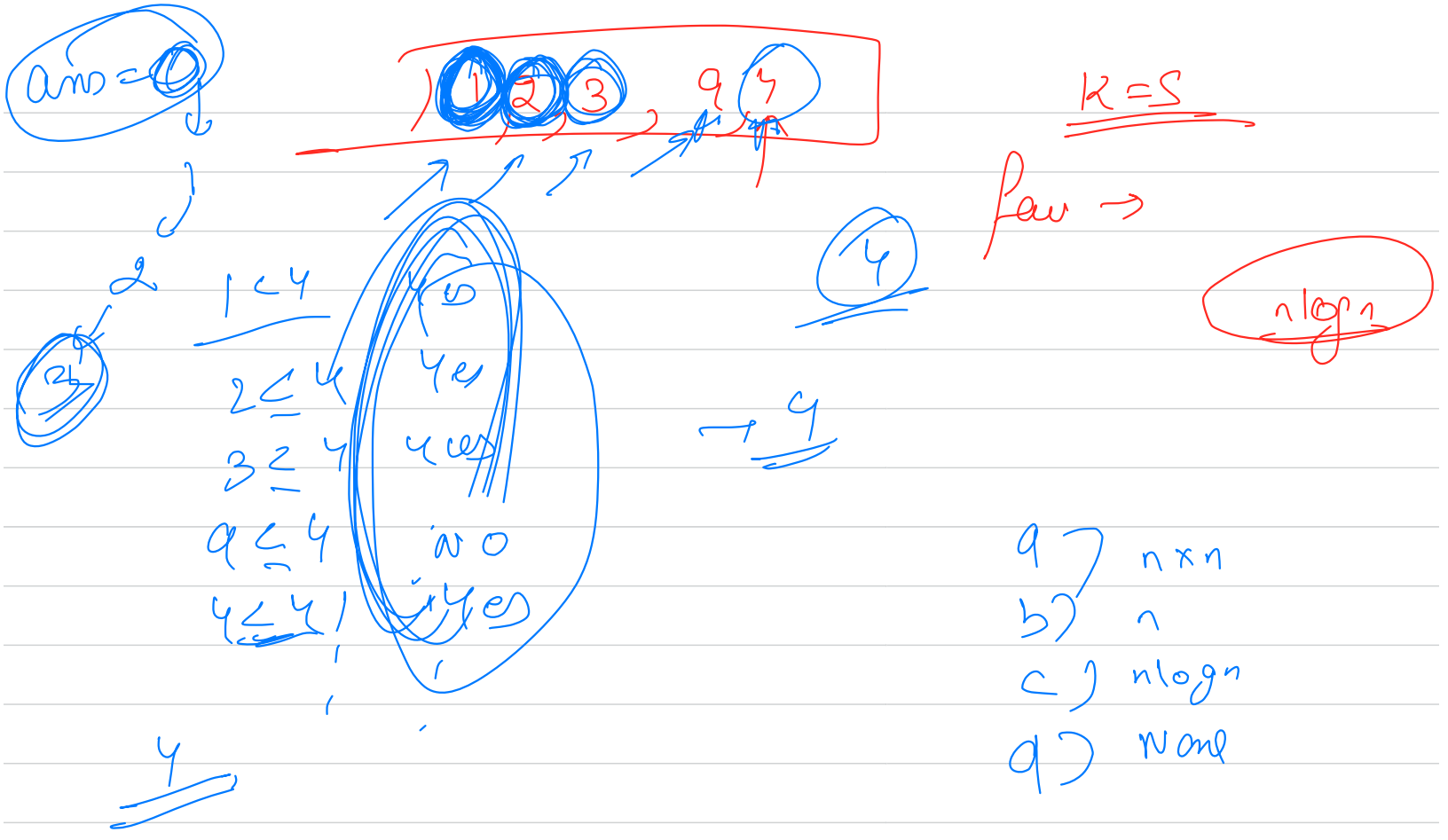
Range queries

DSU

Geometry

String algo...


[1, 2, 3, 9, 4]
Find nth
k=5
1 2 3 9
4
Sort
nlogn
T (nlogn)
$10^3 (10^2 \log_2 10^2)$
$10^3 \times 10^3 \approx 10^6$
1 sec


ans = 0
1 2 3 q 4
K = 5
Law →
nlogn
2
2
1 < 4
2 ≤ 4
3 ≤ 4
q ≤ 4
4 ≤ 4
yes
yes
no
yes
4
4
→ 4
4
a) n x n
b) n
c) nlogn
d) None