Hashing

Approach 1

- N = [1, 2, 22, 30, 90, 100, 5]
- Q = [2, 3, 30]

Output = [True, False, True]

n = 100

Q = 100

For element in Q:

if @element Exists in N

- $O(n) \times O(n)$
- $10^4 \Rightarrow$ 1 ms

10^6

$n \leq 10$

Total operation

10^{12} if $10^{4} = 1$ ms

10^{8} ms $\equiv$ 10^{5} sec

$\frac{10^{5}}{60 \times 60 \times 24}$ days

1.15 days

10,00,000

Approach 2:

Binary Search

$n = 10^{6}$ $Q = 10^{6}$

Sort

$10^{6} \log(10^{6}) + 10^{6} \log 10^{6}$

$\Rightarrow 2 \times (10^6 \log 10^6)$

$\Rightarrow 2 \times 10^6 \times 20$

$\Rightarrow 4 \times 10^7 \Rightarrow 4 \times 10^3$ ms
[Operation]

$\Rightarrow 4s \Leftarrow$
$\longleftrightarrow$

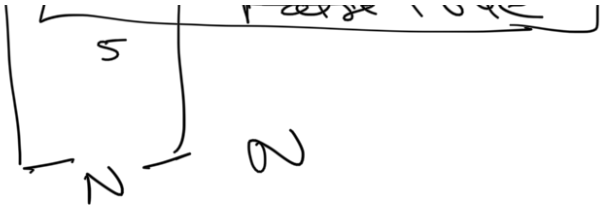
1 sec 0.1 ms

2 → 2.1

Approach 3

A =

0	False
1	False
2	~~False~~ True
3	False
4	[illegible]



CID = 4 % N =

N = 100 = 4

CID = 2 % 100 = 2

O = [2, 3, 5]

N_List = [F, F, T, F T ---- N]

2 % 100 = [2 ⇒ N_List [2]

O[1] Searching

O[1] Registering

⇒ O = 10^6 N = 10^6

⇒ 10^6(1) + 10^6 x 1

⇒ 10^6

10 ⇒ 0.1 sec

101, 102, 103

Function = (100 + CID)

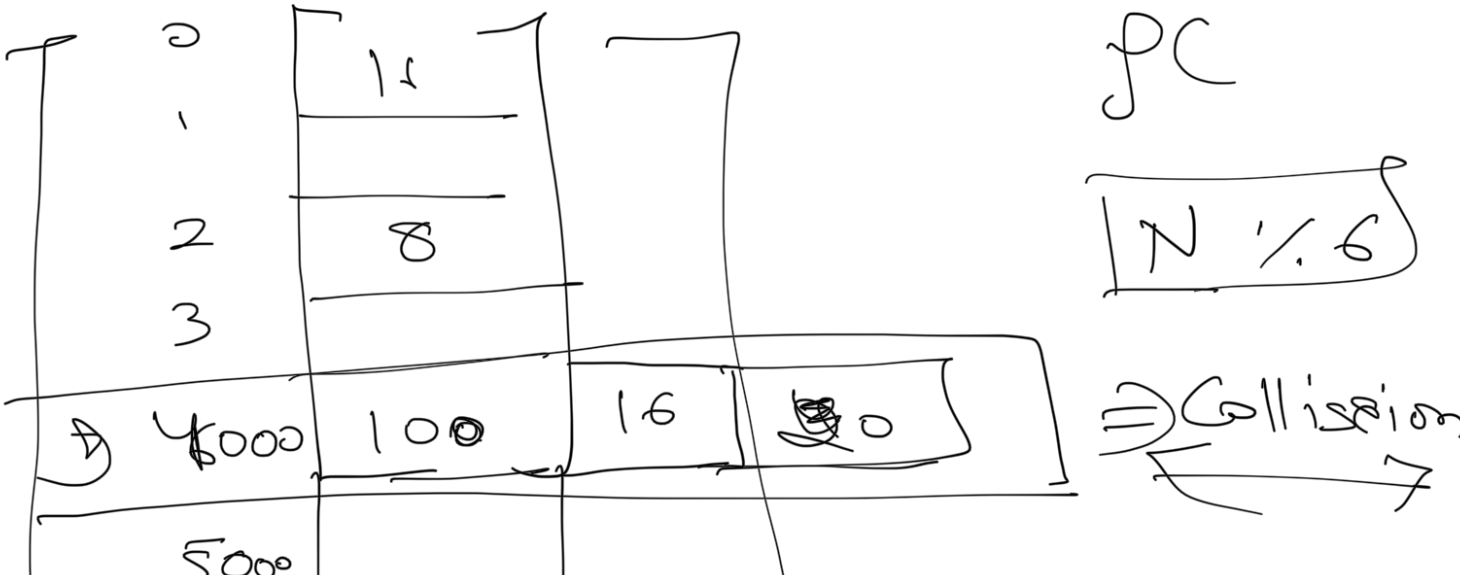
$f = (CID \% N)$

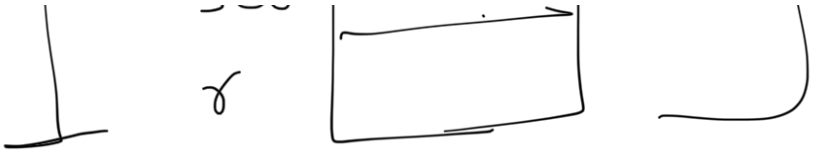
CID , Name

f(CID) , f(Name)

number

mds
SipHash





(8) % 6 ⇒

100 % 6 ⇒ 4

16 % 6 ⇒ 4

22 % ⇒ 4

22 ⇒ 3x0 (1 ⇒ 3

⇒ Hashing Algorithm

① Avoid Collisions

② Spread Values

⇒ Key

N ∋ 1000 ∌

Q = [2, 3, 4, 6]