

Hashing

Defination → It's a Procedural / Method to do all Operⁿ (insert, Delete, Search) in a effective manner.

Map
(DSA)

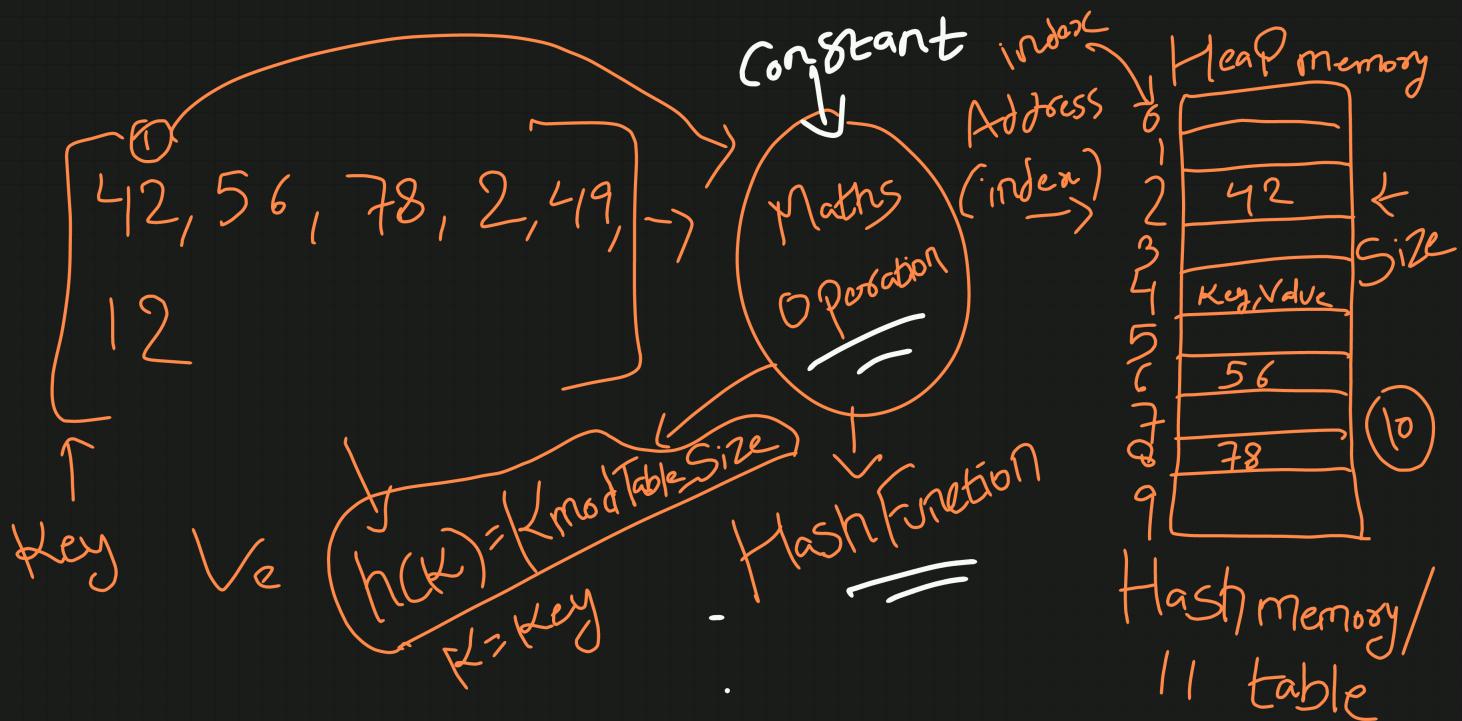
Time complexity

Highlights

For all Operⁿ it will be on an average

Syntax: Map < Datatype $\langle \text{Key}, \text{Value} \rangle$ obj;

-1-



-2-

Key = 42

Hashtable = 10

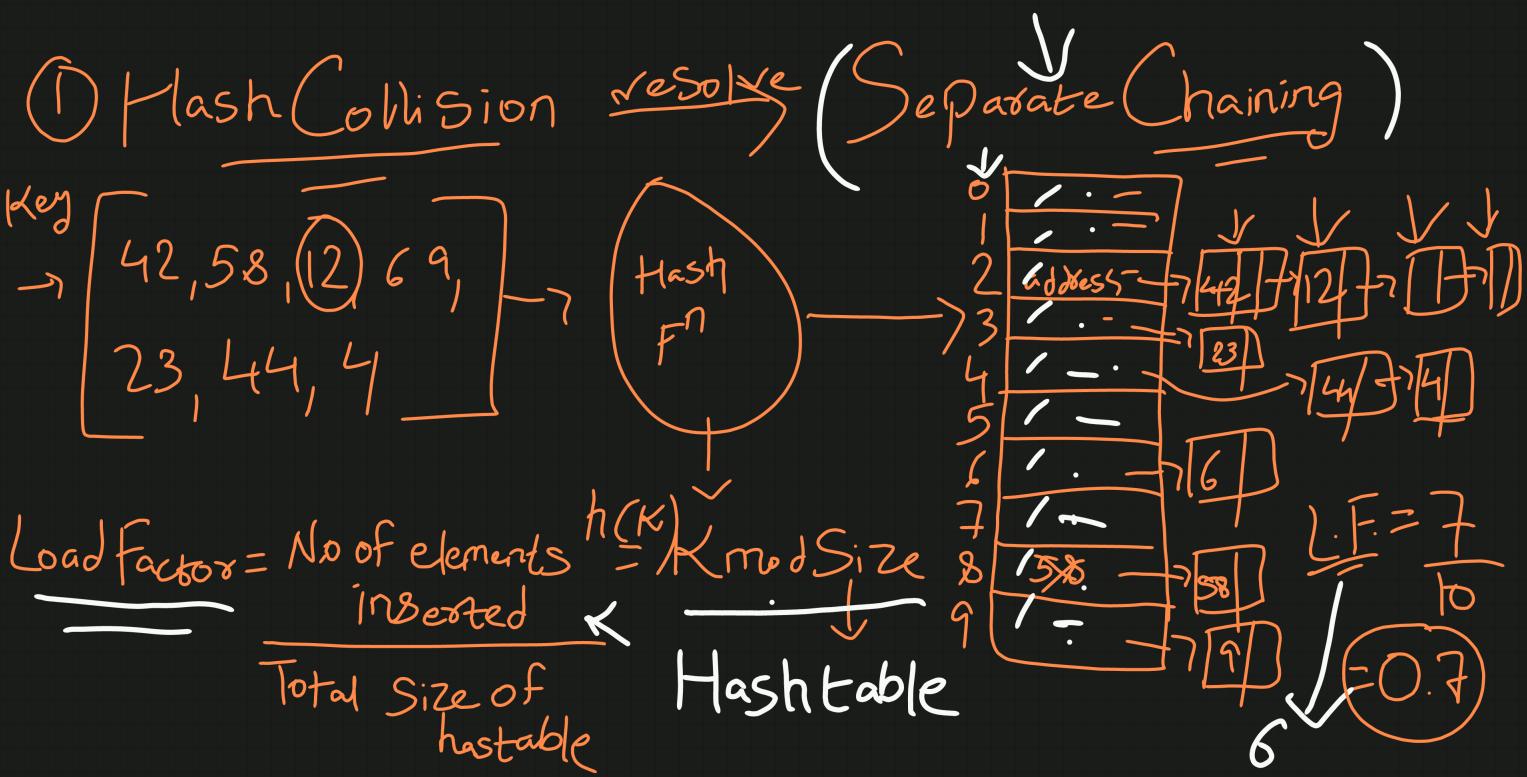
$$\begin{aligned} \text{Hash } F^n : H(K) &= K \bmod S \\ &= 2 \bmod 10 \\ &= \textcircled{2} - \text{index} \end{aligned}$$

space
↓
2

$2^{25 \times 10^8}$



-3-



-4-

② Search Operation $\xrightarrow{\text{Resolve}}$ Linear Probing
 $O(n)$

Operation $\rightarrow h(K) = (K + i) \bmod \text{Size}$

$$(2+1) \bmod 10$$

$$3 \bmod 10$$

$$= 3$$

↓

Case I $O(\text{default})$
 Case II $I^{(\text{Scene})}$ Increment

-5-

$$h(K) = (K + i) \bmod 10$$

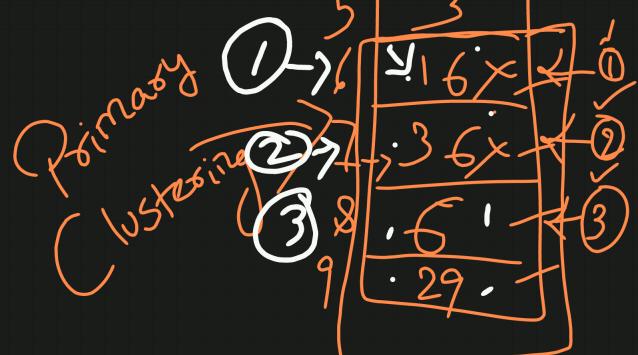
$$\left[\begin{matrix} 42, 13, 16, 12, \\ 3, 36, 6, 26, 7 \end{matrix} \right] \rightarrow (42+0) \% 10$$

= 2

Key

$$\rightarrow (3+2) \% 10$$

$$= 5$$



-6-

Quadratic Probing \leftarrow resolve Primary Clustering

$$\text{Linear} \rightarrow h(K) = (K + i) \bmod \text{size}$$

$$h(K) = (K + i^2) \bmod 10$$

↑
change
②

-7-

$$\begin{cases} 44, 28, 36, 14, \\ 64, 32 \end{cases} \rightarrow (K + i^2) \bmod 10$$

$$(64+0) \bmod 10 = 4$$

$$(64+4^2) \bmod 10 = 8$$

Key

0	32	
1	64	64
2	44	44
3	14	14
4	36	36
5	28	28
6		X
7		X
8		X
9		

① → 4
② → 8
③ → 2

-8-

* Double Hashing =

Formula $\rightarrow h(K) = K \bmod \text{Size} \rightarrow O(n)$

$\rightarrow h(K) = (K + i) \bmod \text{Size} \rightarrow O(n)$

$\rightarrow h(K) = (K + i^2) \bmod \text{Size} \rightarrow$

-9-

$$h(K) = \left(h(K) + (i * h(K)) \right) \bmod \text{Size}$$

linear Probing

① \downarrow ② \downarrow ③ \downarrow

$\Rightarrow h(K) + i * h(K) \bmod \text{Size}$

$\Rightarrow K \bmod \text{Size}$

↓
Used
Dankopos

$K \bmod 5$

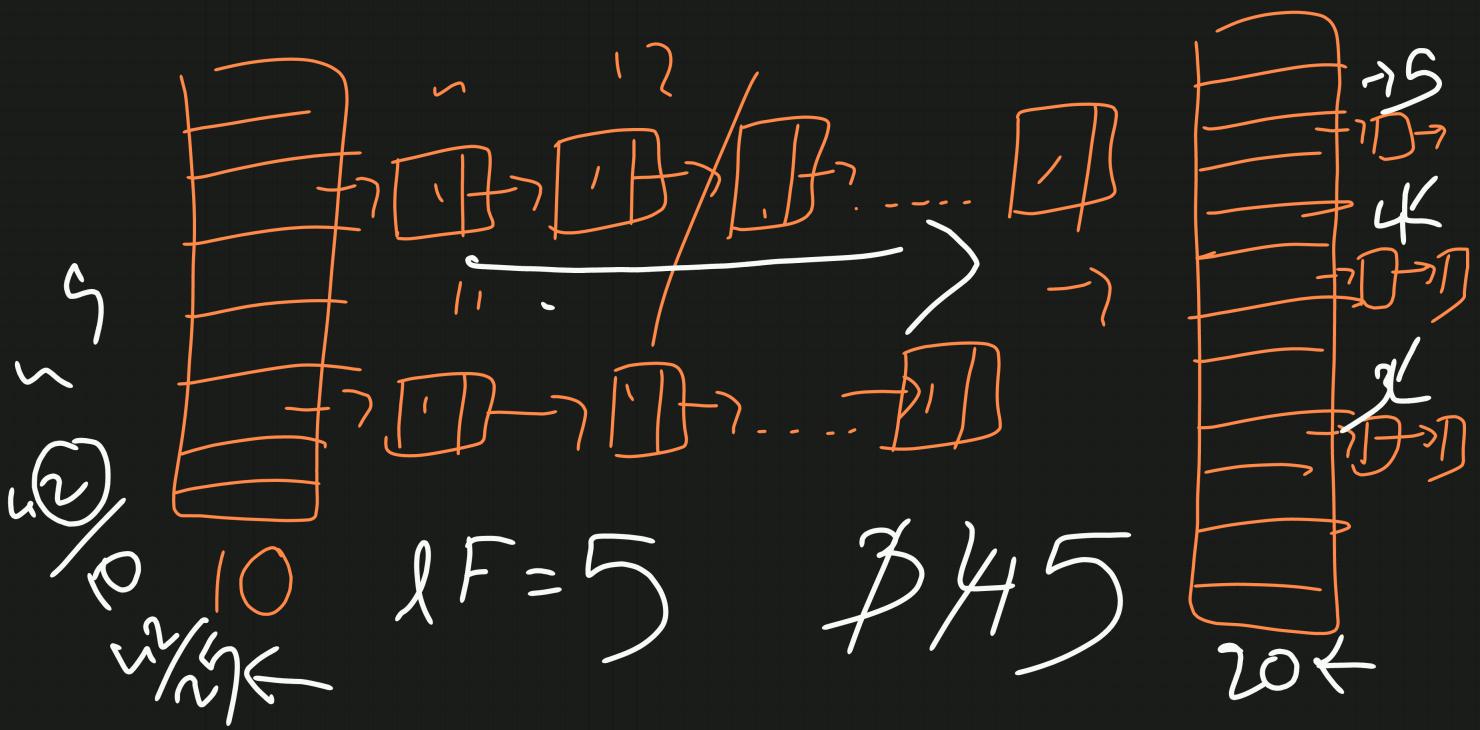
$\Rightarrow K \bmod 6$

↓
Size of
hash table

-10-

$$\begin{array}{c}
 \left[\begin{matrix} 44 & 16 & 4 & 14 \\ 68 & 91 \end{matrix} \right] \xrightarrow{\text{Complicated}} \left(\left(4 \bmod 5 \right) + \left(2 * 14 \bmod 6 \right) \right) \bmod 10 \\
 = \left((4) + (8) \right) \bmod 10 = 2
 \end{array}$$

-11-



-12-

$\begin{bmatrix} 42, 13, 18 \\ 2, 12, 17, 16 \\ 32, 62, 82, 92 \end{bmatrix}$

$$SP = 5$$

$$LF = 5$$

