	Arrays	D. Arrays	LL	Stacks	Queues	Hash tables
Insert	X	O(1)*	O(1)**	O(1)	O(1)	O(1)
Delete	X	O(n)	O(1)**	O(1)	O(1)	O(1)
Lookup	O(1)	O(1)	O(n)	O(1)	O(1)	O(1)

* At the end, amortized

** At head or tail

LIFO FIFO

data =

{

K

V

"nombre": "p"

llave : valor

}

data.set(k, v)

data.remove(k)

data.get(k)

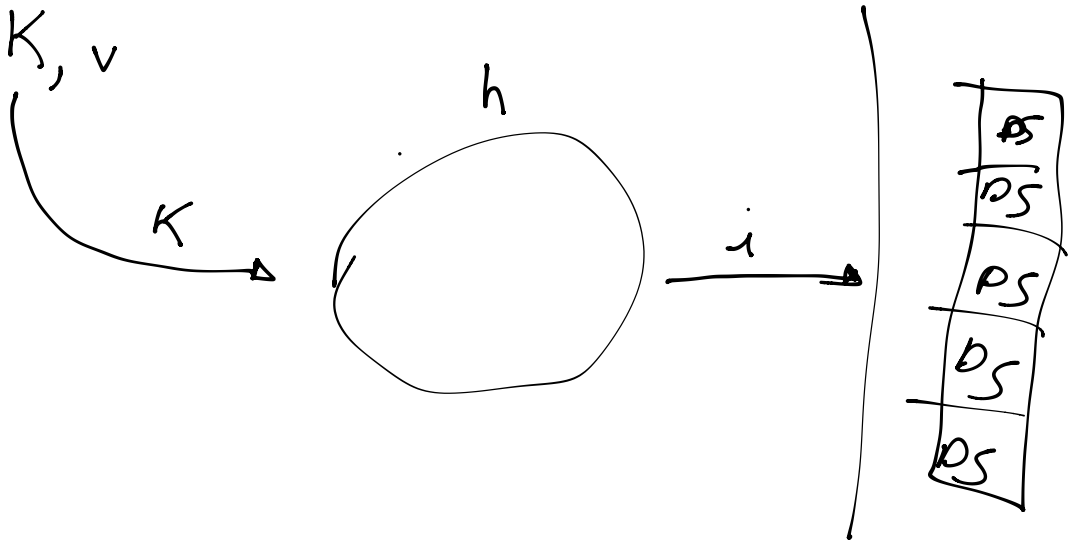
data[k]

map<T_1, T_2>

int

strings

{1, 2, 3}



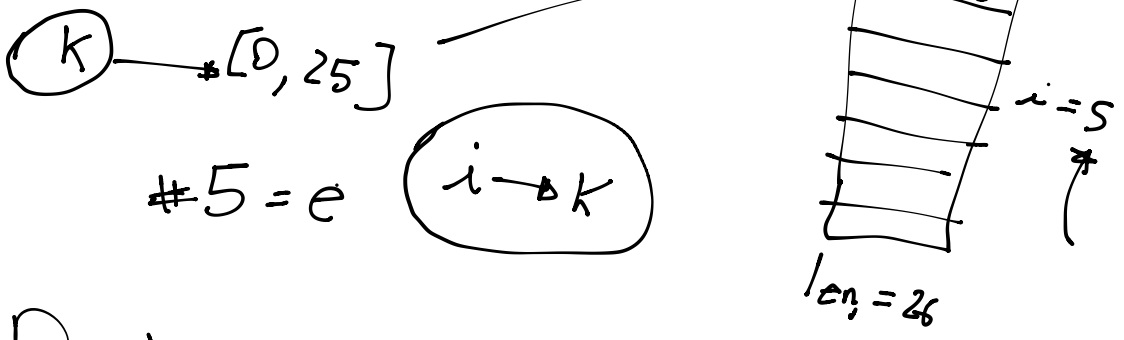
$U = \{$ todos los substrings de "....." $\}$

$U = \{$ todas las letras del alfabeto $\Sigma\}$

$k \xrightarrow{h} i$

$h: K \to \mathbb{N}$

$U = \{a, b, c \ldots, z\}$, $|U| = 26$



Direct Addressing Table

$U = \{A, B, \ldots\}$

A → 0
B → 1

$U = \{200, 210, 300, 400, 500\}$

0 1 2 5 4

$U = \{U_{sa}(1), U_{sa}(2), U_{sa}(3)\}$

0 1 2

K (mem adr) → Memory address

Para universos sup. pequeños,

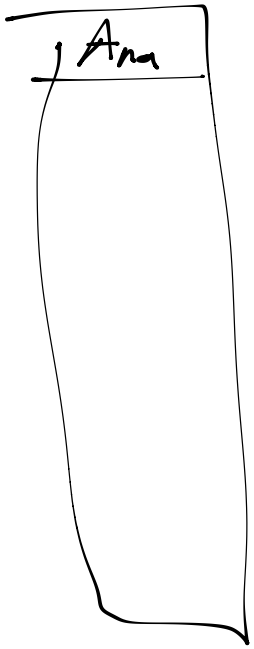
$len_m(T) = |U|$

$h: U \to \{0, 1, \ldots m-1\}$

U no es pequeño

- Libros
- $[1, 10^9]$
- $\mathbb{N}$
- Nombres de personas
- Productos del sup
- Usernames
- Ciudades

T =



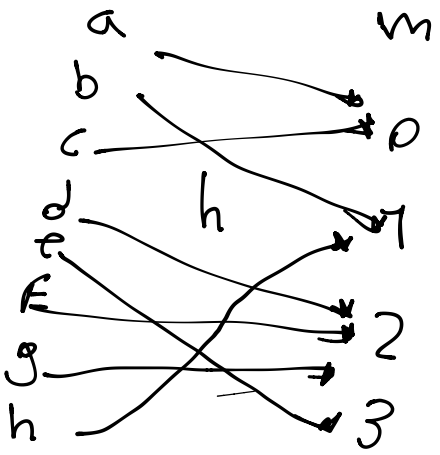
$|U|$ m $h: U \longrightarrow \{0, 1, \ldots, m-1\}$

$|U|$ ↓ tamaño U — m ↓ tamaño T

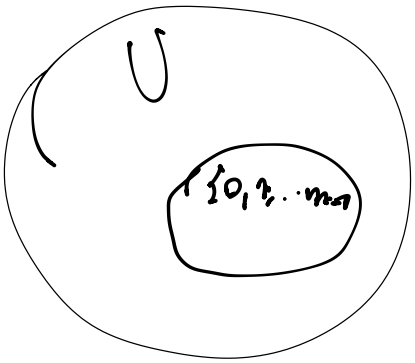
$|U| > m$ U

$|U| = 8$

$m = 4$



Colision



$|U| = 8$

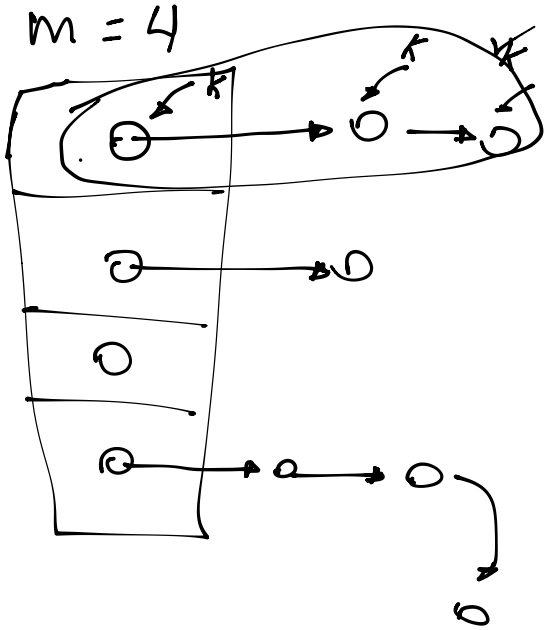
"pablo"

"edward"

"nico"

$m = 4$

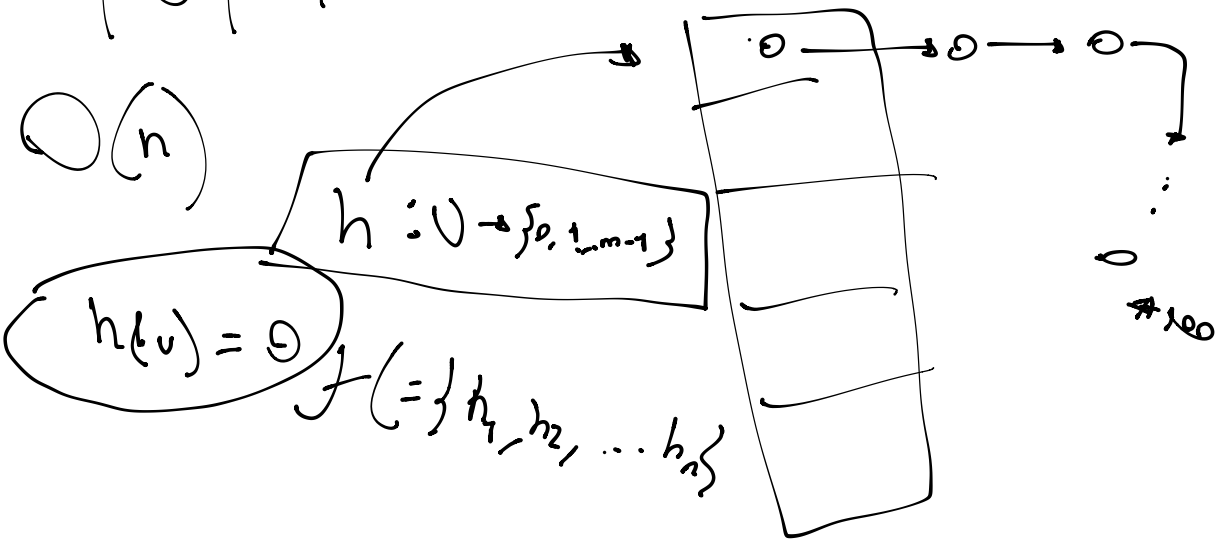
$O(n)$



$|U| = 100$

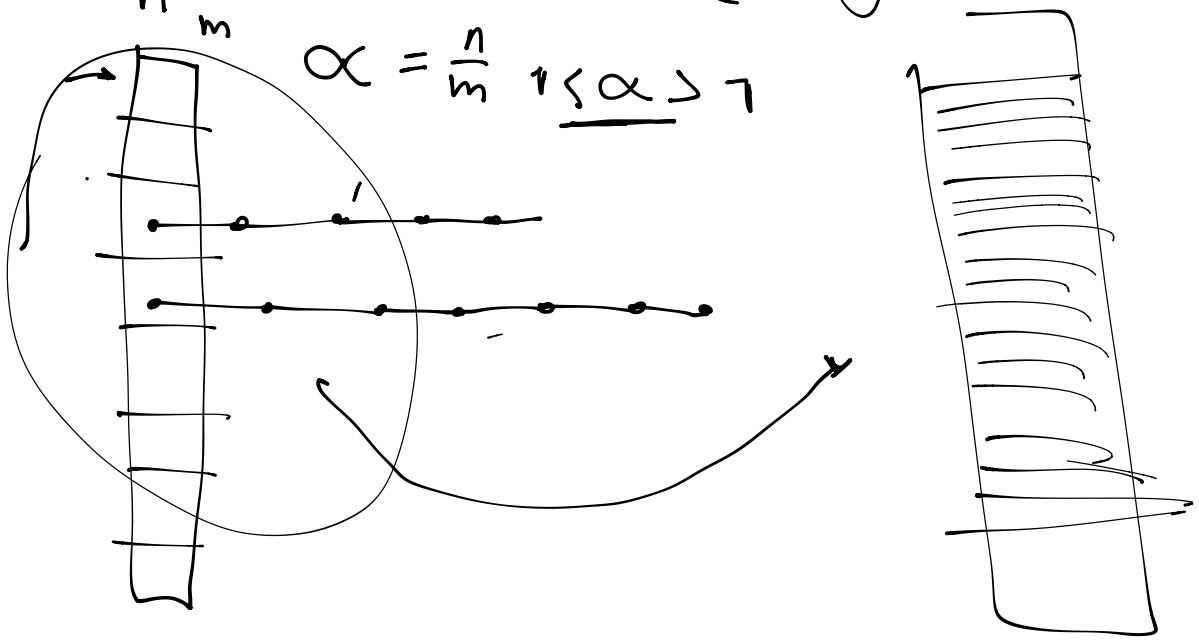
$m = 99$

$O(n)$



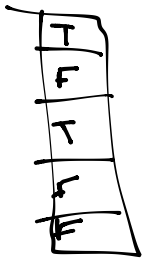
h conoce NADA sobre U

n m $\alpha = \frac{n}{m}$ $1 \leq \alpha \geq 7$

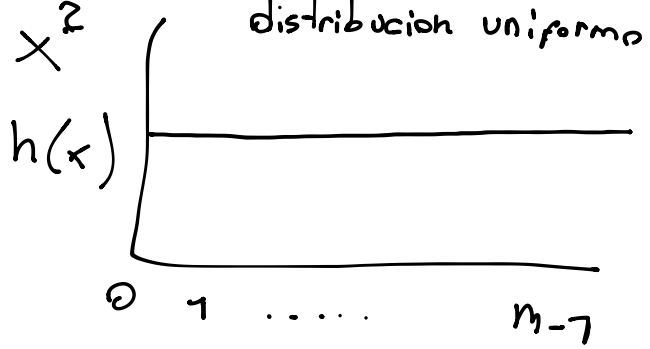


$h : U \longrightarrow \{0, 1, \ldots, m-1\}$

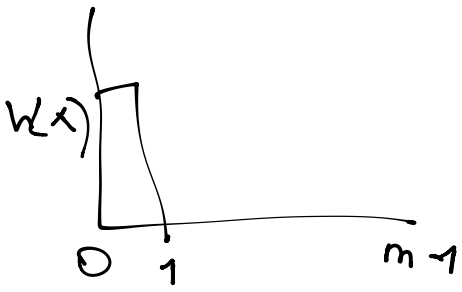
set



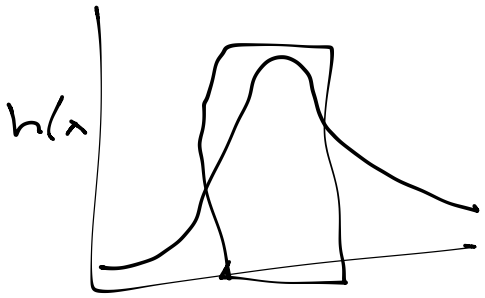
$h(x) = x^2$



$h(x) = 0$



$h(x)$



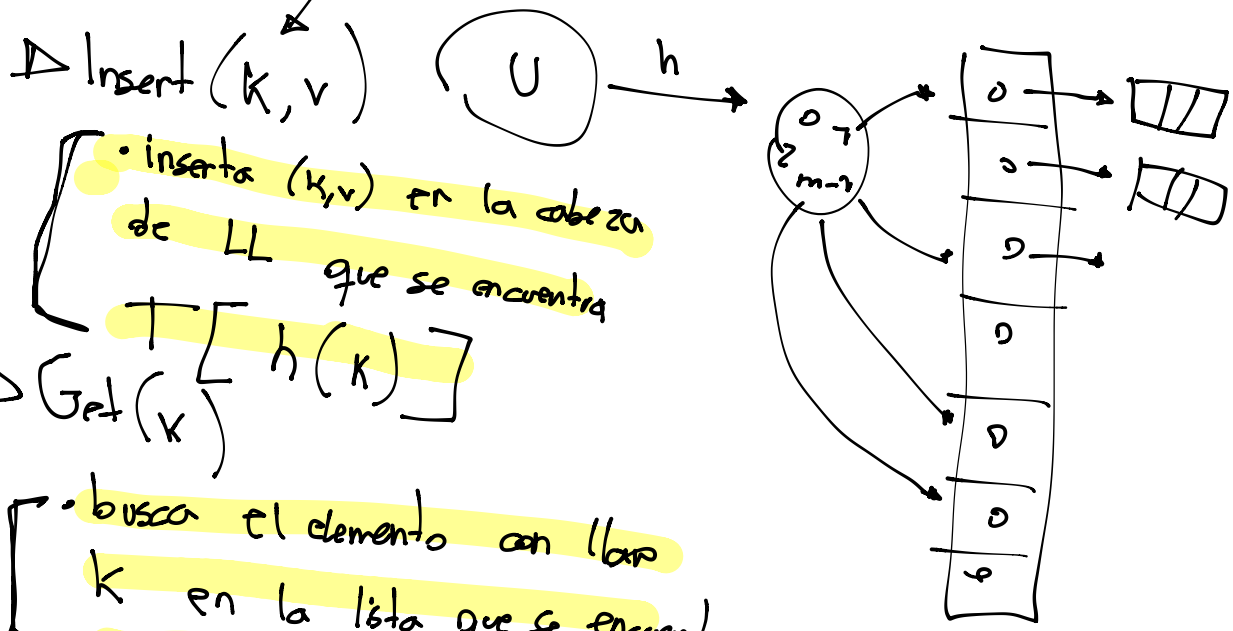
$h(x)$: magic

▷ Insert (K, V)

- inserta (k,v) en la cabeza de LL que se encuentra $T[h(K)]$

▷ Get (K)

- busca el elemento con llave k en la lista que se encuentra $T[h(K)]$



$O(1+\alpha)$ → $O(1)$ Insertion, Deletion, Lookups

$\alpha = \frac{n}{m}$

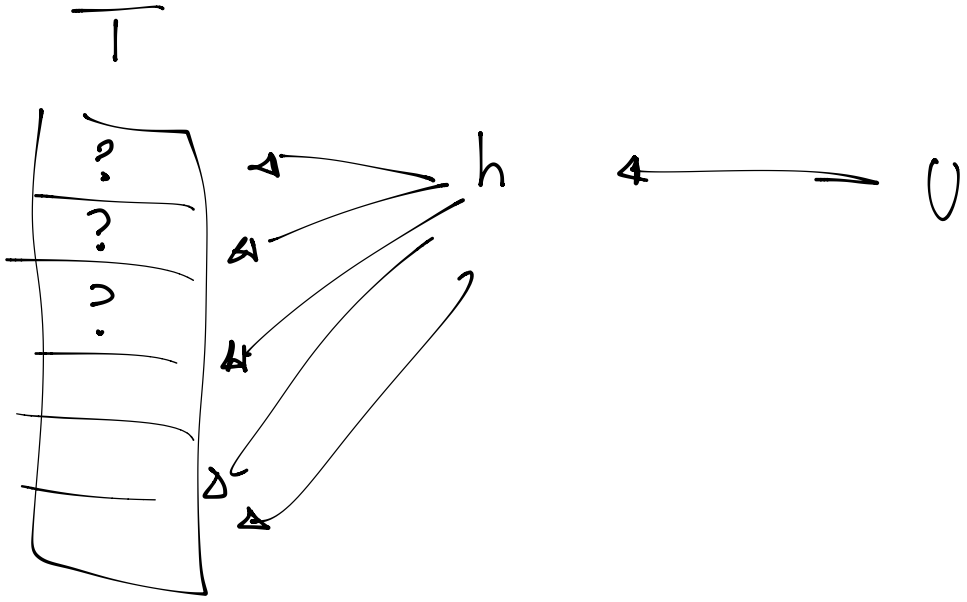
n: total de elementos

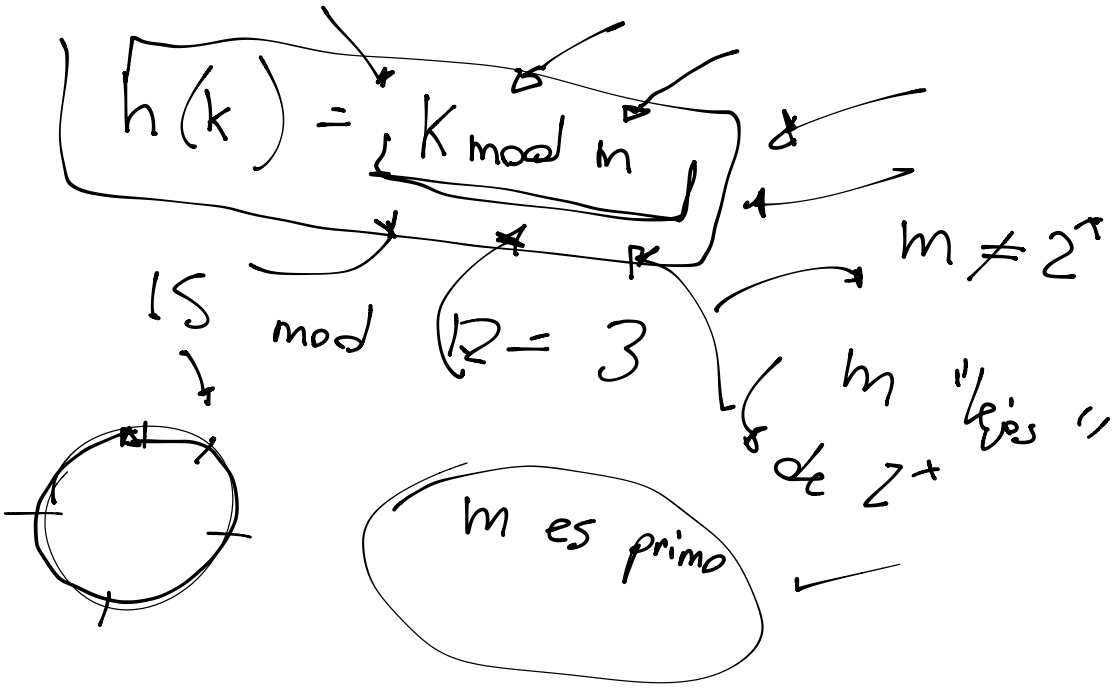
m: total de slots en T

1. Convertir k a un indice ← h

2. Agregar, leer, modificar, eliminar el elemento en el indice

Depende DS dentro del slot





1. multiplica k por una constante $A \in (0,1)$
2. obtenemos la parte fraccional de kA.
3. multiplicamos por m.
4. Tomamos el suelo de

$$h(k) = \lfloor m(kA \bmod 1) \rfloor$$

→ $A \approx (\sqrt{5}-1)/2 \approx 0.6180339887$

Knuth ↑

$h(k) = k \bmod m$

$k \,\%\, m$

$m = 105$

$h(90) = 90$

$h(105) = 0$

$h(108) = 3$

$h(k) = \lfloor m(kA \bmod 1) \rfloor$

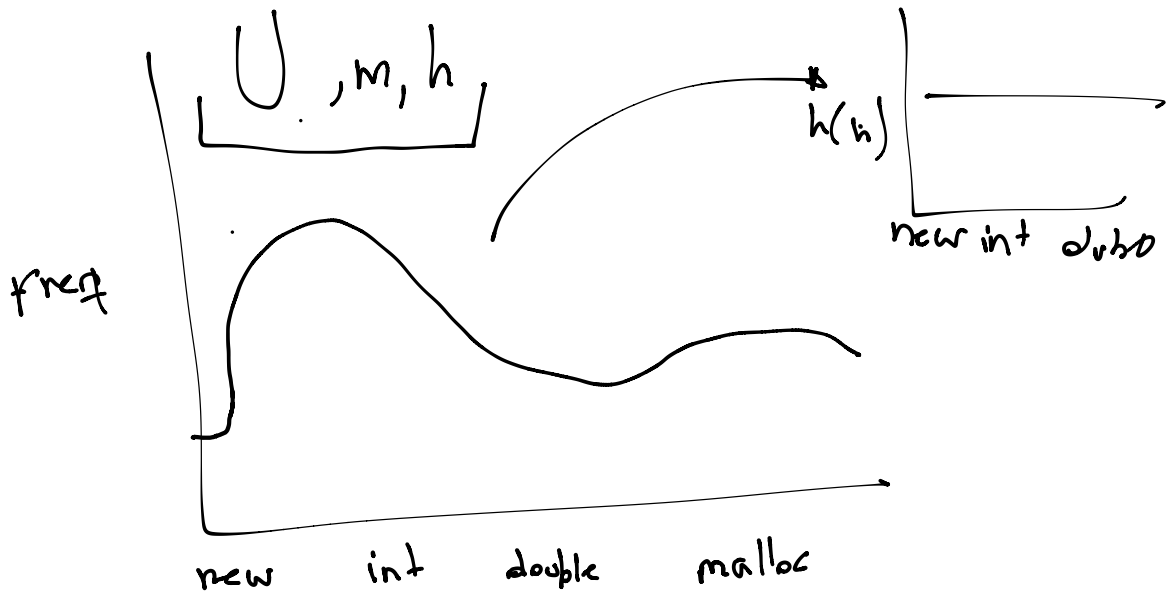
$m = 100$

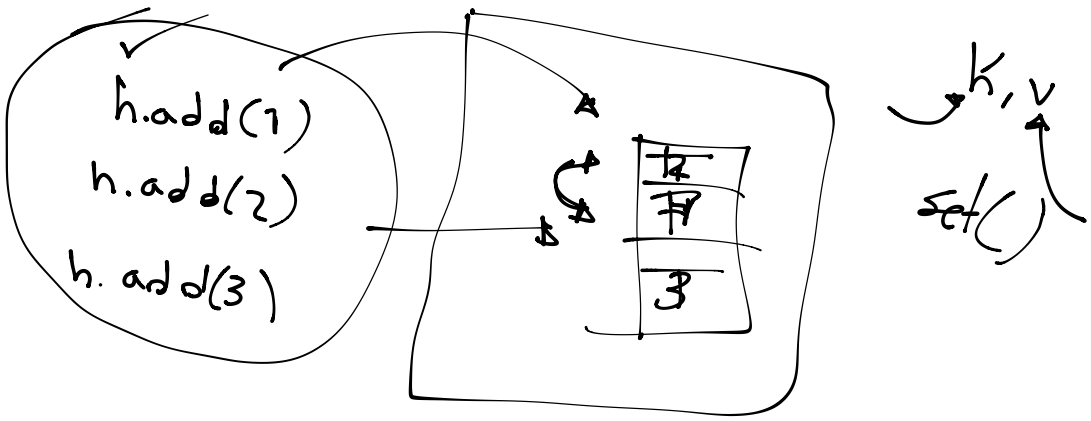
$A = 0.5$

$h(90) = \lfloor 100 \left(\frac{90}{2} \bmod 1\right) \rfloor$

$h(90) = \lfloor 100 (45 \bmod 1) \rfloor$

$h(90) = \lfloor 100 (0) \rfloor = 0$




h.add(1)
h.add(2)
h.add(3)
k
v
3
k, v
set()