Hashing Data Structure   meaning
)
↓   (Key, value)
Dictionary

                         word
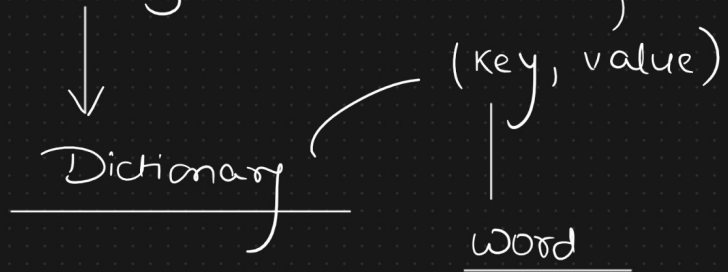
            unique
(key, value)

        Java
          └ HashMap
                      values

Hashtable   (Value = 9)   •9

Key	value
0	
1	1
2	
3	
4	4
5	
6	6
7	
8	8
9	9

9th
index   •8

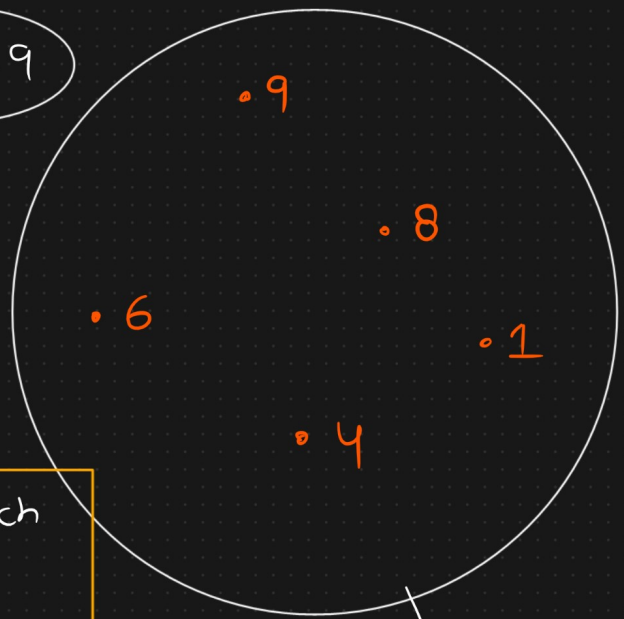   •6   °1

Search
  ⇓   •4
O(1) = constant

Direct addressing
      Table

$$\downarrow$$

$$value = 10^5$$

Hash functions

↳ Division-modulo hash function

$$hf(v) = v \% m$$

modulo operator

Size of hash table

value

to give the remainder

$$m = 10$$

Hash table

key	value
0	100
1	91
2	
3	
4	
5	
6	
7	
8	88
9	(9)

100

collision in Hashing

hash

function

89 100

9   88

91

88

9 89

$$hf(89) = 89 \% 10$$
$$= 9$$

key

$$hf(100) = 100 \% 10 = 0$$

$$hf(9) = 9 \% 10 = 9$$

$$hf(88) = 88 \% 10 = 8$$

$$hf(91) = 91 \% 10 = 1$$

2 values are having same key

⇓

Hash table

⇓

Collision ——— Resolution
                Techniques

Open addressing   Chaining

Linear   Double
Probing   Quadratic   Hashing
           Probing