Lecture 48 | Hash Map

- `Hash-Map` : A data structure that stores <key, value> pairs.
- eg : `"Milind" : 4356, "Raj" : 1234, "Ravi" : 3456` (key-value pairs)
- Example problem : To find index of the key in array, arr = [1,2,3,4,5,6,7,8,9,10], key = 5 => index = 4 (index starts from 0)
- Lets say we need to find m elements in the array arr = [1,2,3,4,5,5,5,5,5,5] and key = 5, then we need to find the m elements in the array. => [5,5,5,5,5,5]
- Hashmap is an optimsation over normal traversal of array.
- Traversal of array is O(n) and hashmap/hashset is O(1)
- Searching in hashmap is O(1) (constant time) and insertion is O(1) (constant time) faster than array traversal.

Hashmap Operations

Operation	Time Complexity
Searching (value get...)	O(1) or O(Lambda)
Insertion (value put...)	O(1)
Check if present or not	O(1)

- Lambda : Hashing Constant

Hashmap / Hashtable (A deep dive into the topic)

- Hashmap is a data structure that stores key-value pairs. Lets take an example of a hashmap.

Country (key)	Population (value)
"India"	428
"China"	603
"USA"	400

- Hashmap combinations : <String, Integer>; <String, String>, <Integer, String>, <Integer, Integer>, <String, Double> ...
- Key is supposed to be unique.

Hashmap Operations in Java

`hm.put(key, value)` : Inserts the key-value pair into the hashmap. In O(1) time

```
hm.put("India", 428); hm.put("China", 603); hm.put("USA", 400);
```

key	value

key	value
India	428
China	603
USA	400

> hm.put("India", 200); hm.put("USA", 28); hm.put("Dubai", 530);

key	value
India	200 (get updated)
China	603
USA	28 (gets updated)
Dubai	530 (gets added)

- Important Points
    - When same key gets inserted, value gets updated.

`hm.get(key)` : Returns the value of the key. In O(1) time

> hm.get("India"); // Returns 200 hm.get("China"); // Returns 603 hm.get("USA"); // Returns 28
> hm.get("Dubai"); // Returns 530 hm.get("Canada"); // Returns null

- Important Points
    - If key is not present, returns null.

`hm.containsKey(key)` : Returns true if key is present in the hashmap. In O(1) time

> hm.containsKey("India"); // Returns true hm.containsKey("China"); // Returns true
> hm.containsKey("USA"); // Returns true hm.containsKey("Dubai"); // Returns true
> hm.containsKey("Canada"); // Returns false