Hash Set & Hash Map

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HashSet —— Collection of unique elements

set there y no order

A[] = [1 3 -2 7 1 1 -2]

set1 = { 3, 1, 2 }

set2 = { 1, 3, 2 }

1	-2
3	7

Real world

- username.
- emails
- id in office.

Syntax

```
HashSet <Type> hs = new HashSet<>();
```

Basic Operations

How to add elements to hs ? hs.add(element);

How to check if hs contains a certain element ?

hs.contains(element); → return true or false

How to check size of hs ? hs.size()

How to remove an element from hs ? hs.remove(elem);

How to print the contents of hs ? sop(hs);

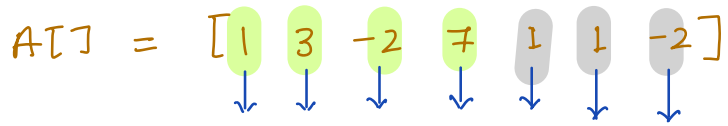
Demo

```java
public class Main {
    public static void main(String[] args) {
        HashSet<Integer> hs = new HashSet<>();
        // HashSet<int> hs = new HashSet<>(); Do not do this
        // Type argument cannot be of primitive type

        // hs doesn't contain duplicate values
        hs.add(100);
        hs.add(2);
        hs.add(4);
        hs.add(100);

        System.out.println("HashSet contains 100 or not: " + hs.contains(100));
        hs.remove( o: 100);
        System.out.println("HashSet contains 100 or not: " + hs.contains(100));

        // Print the hashset step by step
        // For Each loop
        // {2, 4}
        //     ^
        for (Integer val : hs) {
            System.out.println(val);
        }

    }
}
```

Difference b/w ArrayList and HashSet

Duplicate	Allowed	Ignored
Order	Order of insertion is maintained	Random order
looping strategy	foreach loop, for loop with index	foreach

Q> Given A[] as input. Add it elements to hashset and return the hashset.



1	-2
3	7

Try till 22:54
Type done once done

```java
import java.util.*;

public class Main {

  static HashSet<Integer> formHS(int[] A){
    HashSet<Integer> hs = new HashSet<>();

    for(int i = 0; i < A.length; i++){
      hs.add(A[i]);
    }
    return hs;
  }
  public static void main(String[] args) {
    int[] A = {1, 3, -2, 7, 1, 1, -2};

    System.out.println(formHS(A));
  }
}
```

Q> Given two hashsets as input. Print their common elements.

hs1 : { 0, -2, 4, 10 }
hs2 : { 1, -2, 3, 5, 4 }

Output ⟶ -2 4

Try till 22:10
Type done if correct output is achieved.

hs1 : { 1 2 3 }
hs2 : { 6 1 4 2 3 9 }

Output ⟶ 1 2 3

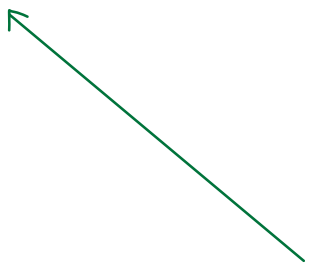
Break : 22:30

Idea Iterate over HS2 and find the elements of HS2 are present in HS1.

```
import java.util.*;

public class Main {
  static void intersect(HashSet<Integer> hs1, HashSet<Integer> hs2){
    for(Integer ele2 : hs2){
      if(hs1.contains(ele2)){
        System.out.print(ele2 + " ");
      }
    }
  }
  public static void main(String[] args) {
      HashSet<Integer> hs1 = new HashSet<>();
      hs1.add(0);hs1.add(-2);hs1.add(4);hs1.add(10);
      HashSet<Integer> hs2 = new HashSet<>();
      hs2.add(1);hs2.add(-2);hs2.add(3);hs2.add(5);hs2.add(4);
      intersect(hs1, hs2);
  }
}
```

HashMap — HashMap contains key-value pairs.

Key	Value
States	Population
Punjab	15
Haryana	18
UP	20
Delhi	18



Tell me the population of punjab ——

Syntax

```
                key , value
HashMap < KeyType , ValueType > hm = new HashMap<>();
          String , Long
```

How to add a key, value pair inside HM ?

```
hm.put ( key , value ) ;
hm.put ("punjab" , (5) ;
```

How to get the value against a key in HM ?

```
hm.get (key) ;
hm.get ("punjab") ;  ——→ return 15
```

Can there be duplicate values in HM ? yes

Can there be duplicate keys in HM ? NO

Features of HashMap

Duplicate values are allowed

Duplicate keys are not allowed

Order of key, value ⟶ random

```
public class Main {
    public static void main(String[] args) {
        HashMap<String, Integer> hm = new HashMap<>();
        hm.put("Delhi", 18);
        hm.put("Punjab", 20);
        hm.put("Haryana", 18);
        hm.put("Goa", 5);
        hm.put("Goa", 4); // Update the value against a key
        hm.put("MH", 40);
        // Print the HM
        System.out.println(hm + " size : " + hm.size());
        System.out.println("Population of Punjab " + hm.get("Punjab"));
        // hs contains
        // hm containsKey
        if (hm.containsKey("MH")) { // Always check first before you get.
            System.out.println(hm.get("MH"));
        }

        // Remove any key, value pair in HM
        hm.remove( key: "Goa");
        System.out.println("Get " + hm.get("Goa"));

        for (String key : hm.keySet()) {
            System.out.println("key-value " + key + " " + hm.get(key));
        }
    }
}
```

Q) Given A[] as input. Return the freq of array as key, value pair

A[] = { 1, 3, 2, -1, 1, 1, 3 }

Output = { 1 = 3, 3 = 2, 2 = 1, -1 = 1 }

freq map.

Try till 23 : 12

A[] = { 1, 3, 2, -1, 1, 1, 3 }

HM

1 : ~~1 2~~ 3 3 : ~~1~~ 2 2 : 1

-1 : 1

```java
import java.util.*;

public class Main {
  static HashMap<Integer, Integer> makeFreqMap(int[] A){
    HashMap<Integer, Integer> hm = new HashMap<>();

    for(int key : A){ // for each -> iterates over the values
      if(!hm.containsKey(key)){ // hm doesn't contain the key
        hm.put(key, 1);
      } else { // key already exists
        int value = hm.get(key);
        hm.put(key, value + 1);
      }
    }

    return hm;
  }
  public static void main(String[] args) {
      int[] A = {1, 4, 3, -2, 1, 1, 4, 5, 3};

      System.out.println(makeFreqMap(A));
  }
}
```