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Java 10: Arrays & Arraylists

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What is an array?

- It is used to store multible values or objects in a single variable
- Example
    - String [] cars = { "VW", "BMW", "Audi" }
    - Int[] myNums = { 1, 2, 3, 4, 5 }
- To access one value our of the array, you add the index into "[]"
    - The index starts at 0 in every array
    - Example: cars[0] = "VW" Or myNums[4] = "5"
- You can also overwrite values of certain indexes
    - Old => "String [] cars = { "VW", "BMW", "Audi" }"
    - cars[0] = "Mercedes"
    - New => "cars = { "Mercedes", "BMW", "Audi" }"
- The length methods gives you the size of an array
    - cars.length = 5
- Array-length is static and can not dynamically grow
    - Either define length directly => int[] numberArray = new int[8]
    - Or define indirectly => int[] numberArray = {1, 2, 3 }

Loop throw an array

- You can use our known "for"- loop for that

```java
String[] cars = { "VW", "BMW", "Audi" };
for (int i = 0; i < cars.length; i++) {
    System.out.println(cars[i]);
}
```

- You can also use a "for each" – loop for that (commonly used in

```java
for (String i : cars) {
    System.out.println(i);
}
```

What is an ArrayList?

- Normal Arrays have the shortage, that they cannot grow dynamically therefore we got Arraylist
  - int[] kuhherde = new int[5] kann nur 5 Kühe aufnehmen

- Import `import` `java.util.ArrayList;`

- To create one "Arraylist<Type of content for instance cow> kuhherde = new Arraylist< Type of content for instance cow >();

```java
3   public class ListAndMap {
    Run | Debug
4     public static void main(String[] args) {
5       ArrayList<String> cars = new ArrayList<String>();
6       cars.add(e:"Volvo");
7       cars.add(e:"BMW");
8       cars.add(e:"Ford");
9
10      cars.add(index:0, element:"Mazda"); // Insert element at the beginning of the list (index 0)
11
12
13      //What is correct to remove "BMW"
14      cars.remove(o:"BMW"); //or
15      cars.remove(index:2);
16
17      //What is correct to get the first value of the array?
18      System.out.println(cars.get(index:0));
19      System.out.println(cars.get(index:"Mazda"));
20
21      //We got add/remove/get what do you think size() is doing
22      System.out.println(cars.size());
23
24      System.out.println(cars);
25  }
```

What is a HashMap?

- Like ArrayList it also grows dynamically
- Difference: instead of an integer you can define any Key you want
- Import `import java.util.HashMap;`
- To create one "HashMap<Type of Key, Type of content for instance cow> kuhherde = new HashMap < Type of Key, Type of content for instance cow >();

```java
//------------------------------------------------------------
//HashMap
//------------------------------------------------------------

HashMap<String, String> capitalCities = new HashMap<String, String>();
capitalCities.put(key:"England", value:"London");
capitalCities.put(key:"India", value:"New Dehli");
capitalCities.put(key:"Austria", value:"Wien");

//What is correct?
capitalCities.remove(key:"India");
capitalCities.remove(key:"New Dehli");

//Do both work?
System.out.println(capitalCities.get(key:"England"));
System.out.println(capitalCities.get(key:"New Dehli"));

// Use containsKey to check for a specific key
String keyToCheck = "England";
if (capitalCities.containsKey(keyToCheck)) {
    System.out.println("The map contains the key: " + keyToCheck);
} else {
    System.out.println("The map does not contain the key: " + keyToCheck);
}

// Use keySet to iterate over all keys in the map
Set<String> keys = capitalCities.keySet();
System.out.println(x:"Keys in the map:");
for (String key : keys) {
    System.out.println(key + " - Capital: " + capitalCities.get(key));
}

System.out.println(capitalCities);
```

Exercise ArrayList, HashMap

In this exersize you create an ArrayList with Names to organize all the names of you fellow students.

- Create any Class-Name you want

- You only need a static void main method

- Here create an ArrayList to store all the names of your class mates
  - Add the names of you 5 best friends (index 0 your best friend and index 4 your least best friend) and print them out afterwards

- One of your friends was gossiping about you. Remove him out of your list and print the list again

- Your mom wants to know the name of your second best friend. Get the name and print it out.

- In order to double check print out the total length of your ArrayList

- Once you finished, repeat the exercise for a HashMap