• Arrays and arraylist :-

An array is a collection of items of same data types. Stored at contiguous memory location.

⇒ Syntax :-

```
datatype [] variable_name = new datatype[];
```

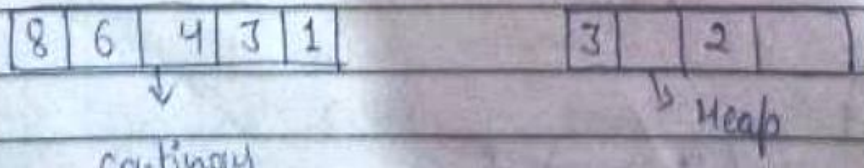
used to create and object

```
int [] arr = new int [10];
```

- `int []` → Datatype
- `arr` → Refrence Variable
- `new int [10];` → Creating the object in heap memory.

i) arrays objects are stored in java and heap ~~memories~~ objects are not continous.

ii) In cpp it will be allocated for continous block. But in java it is not necessary. Depends on JVM



- index starts from 0.
- Example program for arrays :-

```
import java.util.*;
public class Arrays
{
public static void main(String[] args)
{
Scanner sc = new Scanner(System.in);
int[] naws = new int[10];
sout(naws[6]); // will print 0 by default.

// or directly -
int[] naws2 = {215, 206, 210, 212, 202};
}
}
```

Q→ why we need array?
A→ Array help maintaining large sets of data under a single variable name to avoid confusion that can occur when using several

- W.A.P. for taking user input in array.

Arrays.toString :- will print array in the form of string.

```
* import java.util.*;
  import java.util.Arrays;
  public class arrayinput
  {
     public static void main (String[] args)
     {
        Scanner sc = new Scanner (System.in);
        int[] arr = new int[10];

        for (i=0; i<=arr.length; i++)
        {
            arr[i] = sc.nextInt ();
        }
        for(
        Sout (Arrays.toString [arr]);
     }
  }
```

- W.A.P. to change the value of perticular index using function. Take the input from user.

```
import java.util.*;
import java.util.Arrays;
public class Main
{
   public static void main (String[] args);
   {
      Scanner sc = new Scanner (Sys.in);
```

```
int [] arr = new int [5];
for (int i=0 ; i <= arr.length ; i++)
{
    arr [i] = sc.nextInt ();
}
Sout (Arrays.toString (arr));

Change (arr);
Sout (arr);
}
public Static void Change (int [] nums)
{
    nums [2] = 1010;
}
}
```

⇒ Same for string but instead of int [] we should use String.

Q⇒ Take an array as input from the user, search for the given no x and print the index on which it occurs.

```
import java.util.*;
import java.util.Arrays;
public class main
{
    public Static void main (String [] args)
    {
```

```
Scanner sc = new Scanner (System.in);
int[] arr = new int[5];
for (int i = 0; i < arr.length ; i++)
{
    arr[i] = sc.nextInt ();
}
for (i=0; i < arr.length ; i++)
{
    if (arr[i] = 5)
    {
        Sout (" Element found at index: " + i);
    }
}
}}
```

- **Multi dimensional array :-**

A multi dimensional array is an array of arrays. It's useful when we want to store the data in tabular form.

⇒ {{1,2}, {4,5,7}}

arr[0] ⇒ [1,2]
arr[1] ⇒ [4,5,7]

and arr[0][1] ⇒ 2

(0] → for array
[1] → This is for element index.

• 2D array :-

2D arrays are declared by defining a data type followed by two sets of square bracket.

Syntax :-

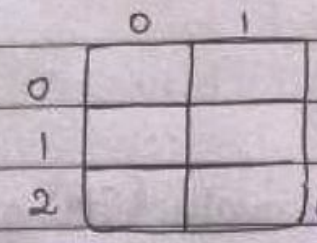
datatype [][] var-name = new datatype [row size] [Colo-size];

or

datatype [][] var_name = {{a1}, {a2}, {a3}};

* we do not need to give the size of columns because in 2D array each array contains a sub-array. That's why it can be of any length.

Ex → arr[][] = {[1,2], [3,4,5], [6,7,8,9]}
2 cd 3cd 4cd.




```
for (i=0; i<=arr.length; i++)
{
    for (j=0; j<= arr[i].length; j++)
    {}
}
```

* i is for row and j is for column.

* First we are iterating row so - it's starts from 0. Then it will go in col loop.

So → [0,0] and [0,1]

again for 1 → [1,0] and [1,1]

and so on.

- **User input in 2D array :-**

```
for (int i=0 ; i< arr.length ; i++)
{
  for (int j=0 ; j< arr[i].length ; j++)
  {
    arr[i][j] = sc.nextInt();
  }
}
Sout (Arrays.toString (arr));
}
```

* **Programs :-**

i) W.A.P. to find peak element which is not smaller than it's neighbour.

```
import java.util.*;
public class Main
{
public static void main (String [] args)
{
  int [] arr = {10, 5, 9, 6, 8, 4};
  for (int i = 0 ; i< arr.length ; i++)
  {
    if (arr[i] > arr[i+1] && arr[i] > arr[i-1])
    {
      Sout (arr[i]);
    }
  }
}
}
```

ii) W.A.P. to Swap the values of index using function.

```
import java.util.*;
import java.util.Arrays;
public class Main
{
    public static void main (String [] args)
    {
        Scanner sc = new scanner (System.in);
        int [] arr = new int [10];
        for (int i=0 ; i< arr.length ; i++)
        {
            arr [i] = sc.nextInt ();
        }
        Sout (Arrays.toString (arr));
        swap (arr, 6 ; 9);
        Sout (Arrays.toString (arr));
    }
    Static void swap (int[] arr, int I1, int I2)
    {
        int temp = arr[index 1];
        arr [index 1] = arr [index 2];
        arr [index 2] = temp;
    }
}
```

iii) Find the Max and Min element of an array :-

→ →

```
import java.util.*;
public class Main {
    public static void main(String[] args)
{
    int[] arr = {10, 5, 16, 12, 3};
    int max = arr[0];
    int min = arr[0];

    for (int i=0; i<arr.length; i++)
{
    if (arr[i] > max)
{
    max = arr[i];
}
    if (arr[i] < min)
{
    min = arr[i];
}
}
    Sout (max);
    Sout (min);
}
}
```

• Array list :-

The array list class is a resizble array. Built in array cannot be modified but we can modify arraylist whenever we want. we can take as many input as we want.

* Syntax :-

```
Arraylist <Integer> list = new Arraylist <> ();
```

* Example program :-

```
import java.util.*;
public class Main
{
public static void main (String [] args)
{
Arraylist <Integer> list = new Arraylist <> (10);
    list.add (40);
    list.add (60);
    list.add (10);
  Sout (list);
}
}
```

* user input program in arraylist :-

```
Scanner SC = new Scanner (System.in);
for (int
ArrayList <Integer> list = new ArrayList <> (10);
for (int i=0 ; i<10 ; i++)
{
    list.add (SC.nextInt());
}
Sout (list);
}
}
```

* In arraylist we can take as many inputs as we want but the logic behind this is :- In the above program we have taken 10 as initial capacity so when the array gets 50% full it'll double the size of the array means 10 will be converted in 20. then 40 and so on.

- **Multidimensional Arraylist :-**

Arraylist of arraylist is known as multidimensional arraylist.

* Example Program :-

→ →

```
import java.util.*;
public class main
{
    public static void main (String[] args)
    {
        Scanner sc = new Scanner (System.in);
ArrayList<ArrayList<Integer>> list = new ArrayList<>(10);
// define how many arraylist
        for (int i=0; i<3; i++)
        {
            list.add (new ArrayList<>());
        }
        for (int i=0; i<3; i++) //adding elements
        {
            for (int j=0; j<3; j++)
            {
                list.get(i).add (sc.nextInt());
            }
            Sout (list);
        }
    }
}
```