Lecture 11

Arrays

Function Call Stack Example

```
class Main {

   public static void main(String[] args) {
       int age = 33;
       changeAge(age);

       double salary = 14.00;
       changeSalary(salary);

       String name ="Ishan";
       changeName(name);
   }

   public static void changeAge(int age) {
       System.out.println("Age passed is " + age);
       age = 14;
   }

   public static void changeSalary(double salary) {
       System.out.println("salary passed is " + salary);
       salary = 5;
   }

   public static void changeName(String name) {
       System.out.println("Name passed is " + name);
       name = "Piyush";
   }
}
```

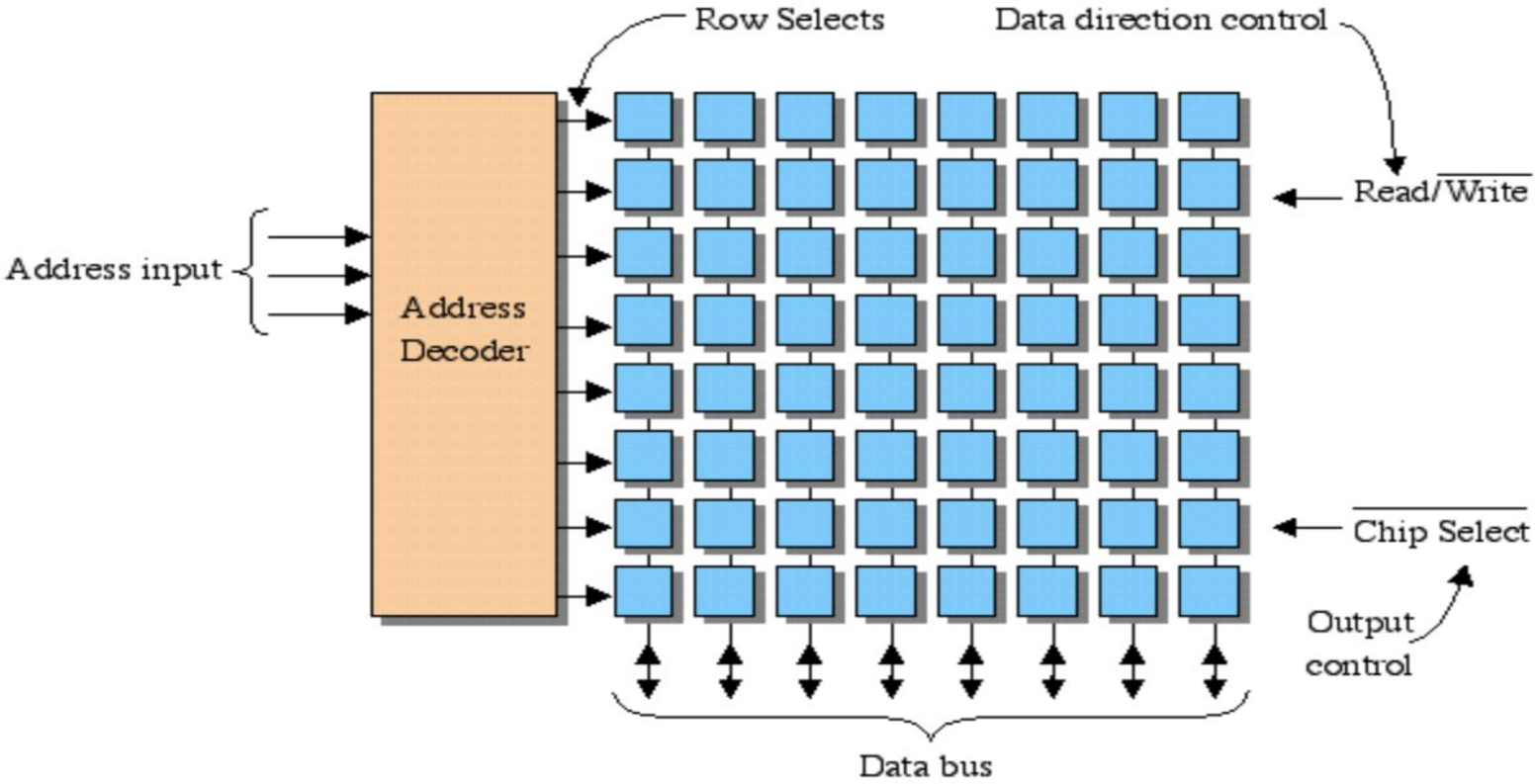
Function Call stack

```
/**
   main:4
   main:5
   changeAge:15
   changeAge:16
   main:6
   main:7
   main:8
   changeSalary:20
   changeSalary:21
   main:9
   main:10
   main:11
   changeName:25
   changeName:26
```

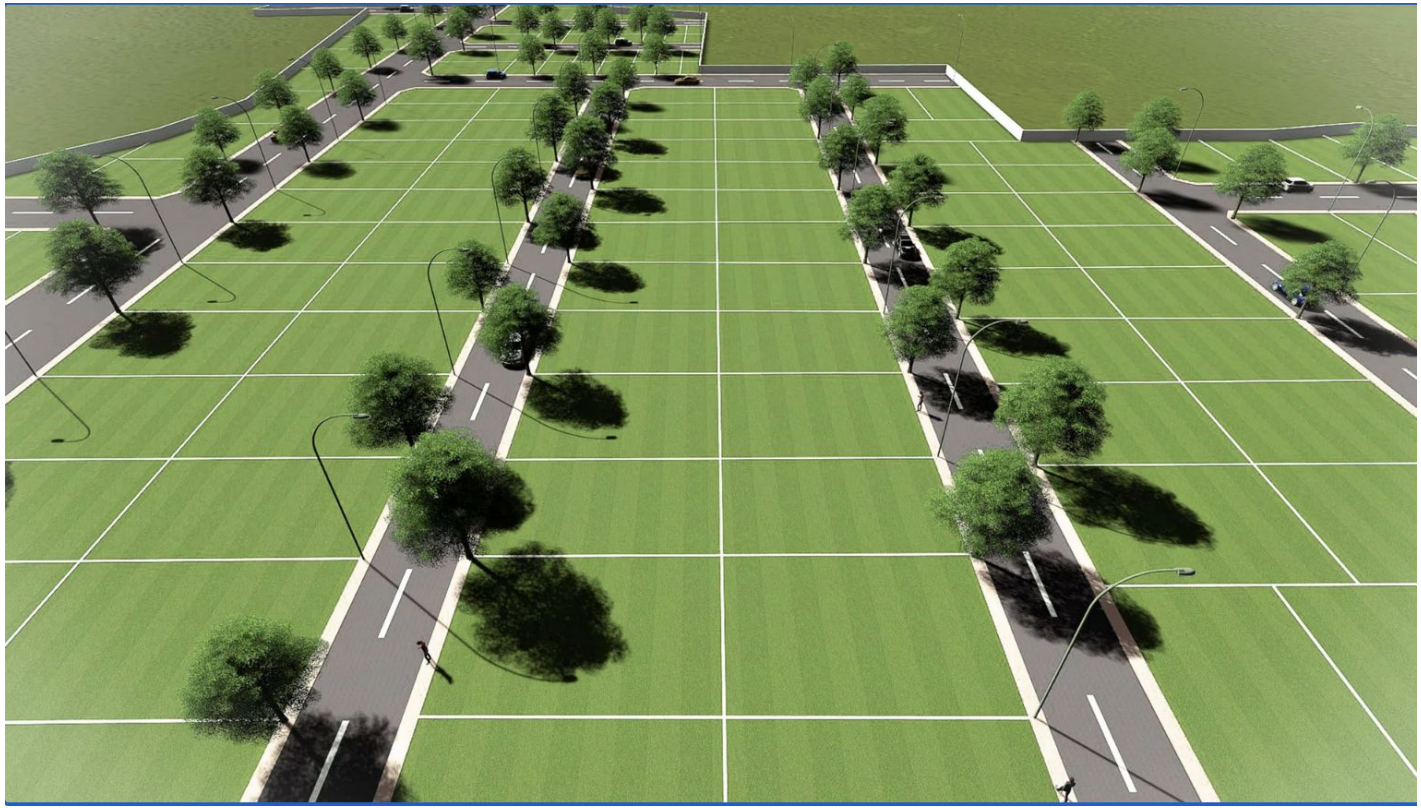
What will we learn today?

- Data Structures
- Arrays

RAM has addresses



Plot of land has Address also



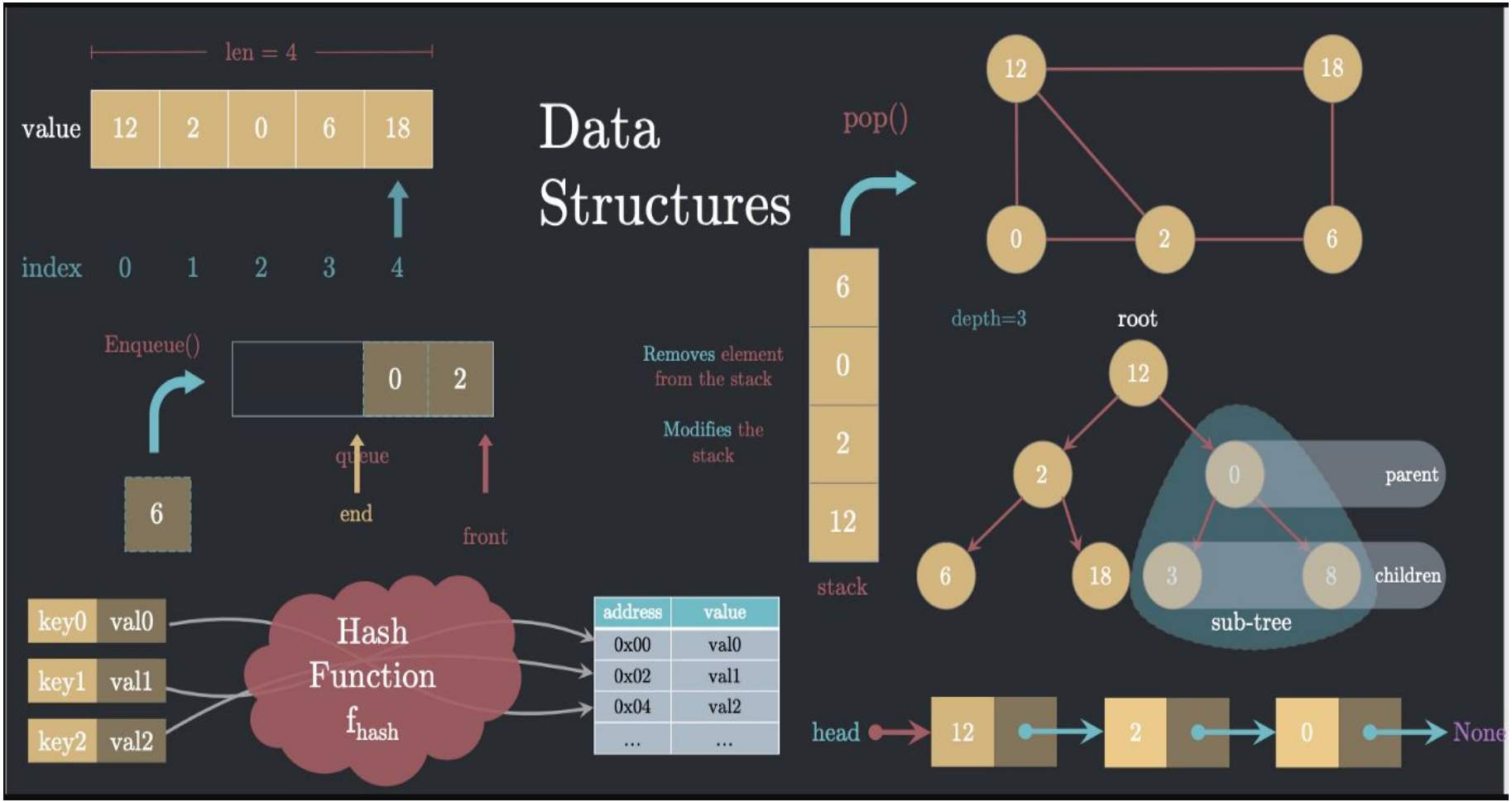
Data structure

Data structure is a storage that is used to store and organize data. It is a way of arranging data on a computer so that it can be accessed and updated efficiently.

There are different types of data structures based on 2 things:

- Data that you want to store
- How do you want to access this stored data

Food Storage Containers


len = 4
value
12
2
0
6
18
index
0
1
2
3
4
Data Structures
pop()
12
18
0
2
6
depth=3
root
Enqueue()
0
2
queue
end
front
6
Removes element from the stack
Modifies the stack
6
0
2
12
stack
parent
children
sub-tree
key0
val0
key1
val1
key2
val2
Hash Function
f_{hash}
address
value
0x00
val0
0x02
val1
0x04
val2
...
...
head
12
2
0
None

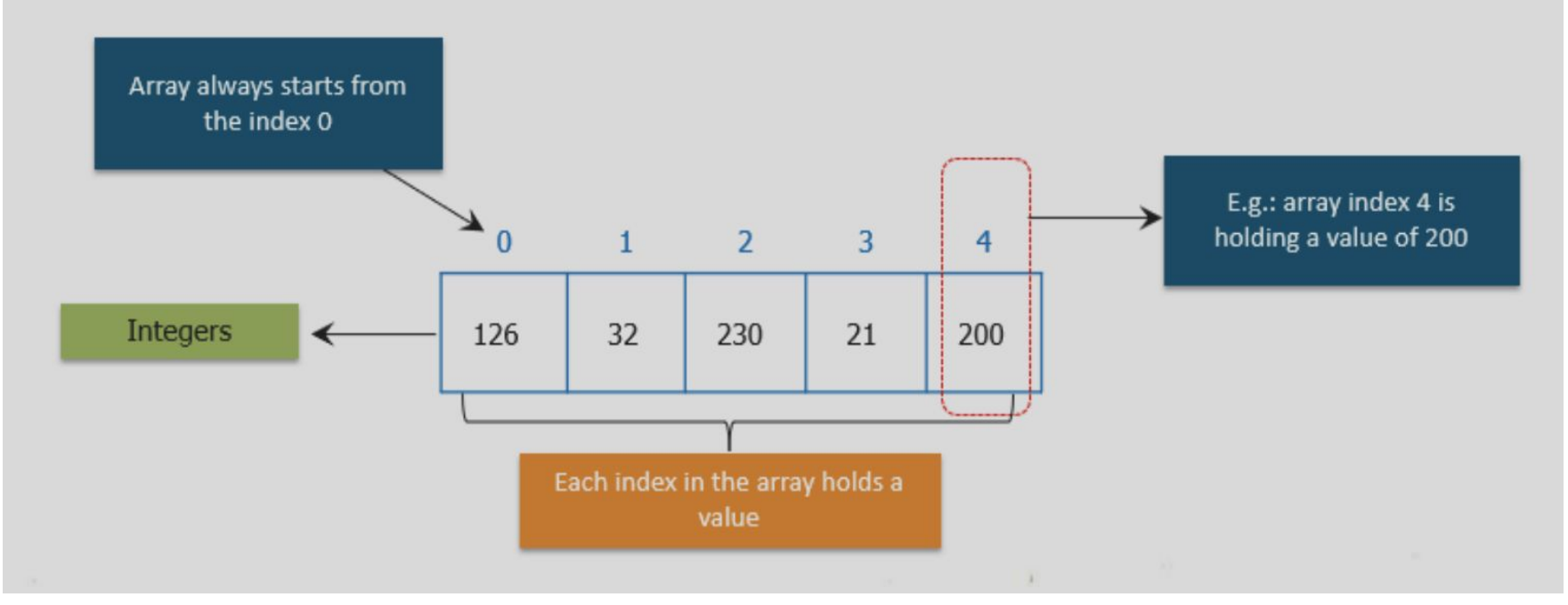
Roll Numbers in a Class

Roll Number	Student Name	Class	Section
2101	AADESH.V	II	B
2102	AAKASH.A	II	B
2103	AJAY DURAI.K	II	B
2104	AMEERUDEEN.S	II	B
2105	ANIRUDHRAM	II	B
2106	DINESH KUMAR.S	II	B
2107	HAREESHWARAN .T	II	B
2108	JEEVITH	II	B
2109	KAMALESHWAR	II	B
2110	KETHEN VIGNESH.N.S	II	B
2111	KRISHNA B.T	II	B
2112	LOKESH SHEKAR M.S	II	B
2113	MD.SHAHID FARAZ.M	II	B
2114	NAVJITH ROSHAN T	II	B
2115	V PAWAN NARAYAN	II	B
2116	PRITHVI	II	B
2117	ROHIT	II	B
2118	SANJAY.G	II	B
2119	SARVESH AAKASH	II	B
2120	SASVANTH	II	B
2121	SHAIK ALRUDEEN	II	B
2122	SREEVARSHAN	II	B
2123	JITHESH KUMAR	II	B
2124	VIJAYANATH	II	B
2125	YASHWAA.S	II	B
2126	YUVAN SHANKAR	II	B
2127	AKSHITHA	II	B
2128	ANANDHITHA	II	B
2129	ANUSHREE	II	B
2130	BHARGAVI.J.K	II	B
2131	DEEKSHITHA.R	II	B
2132	DEEPTHI.A	II	B
2133	DIVYA	II	B
2134	HARSHITHA	II	B

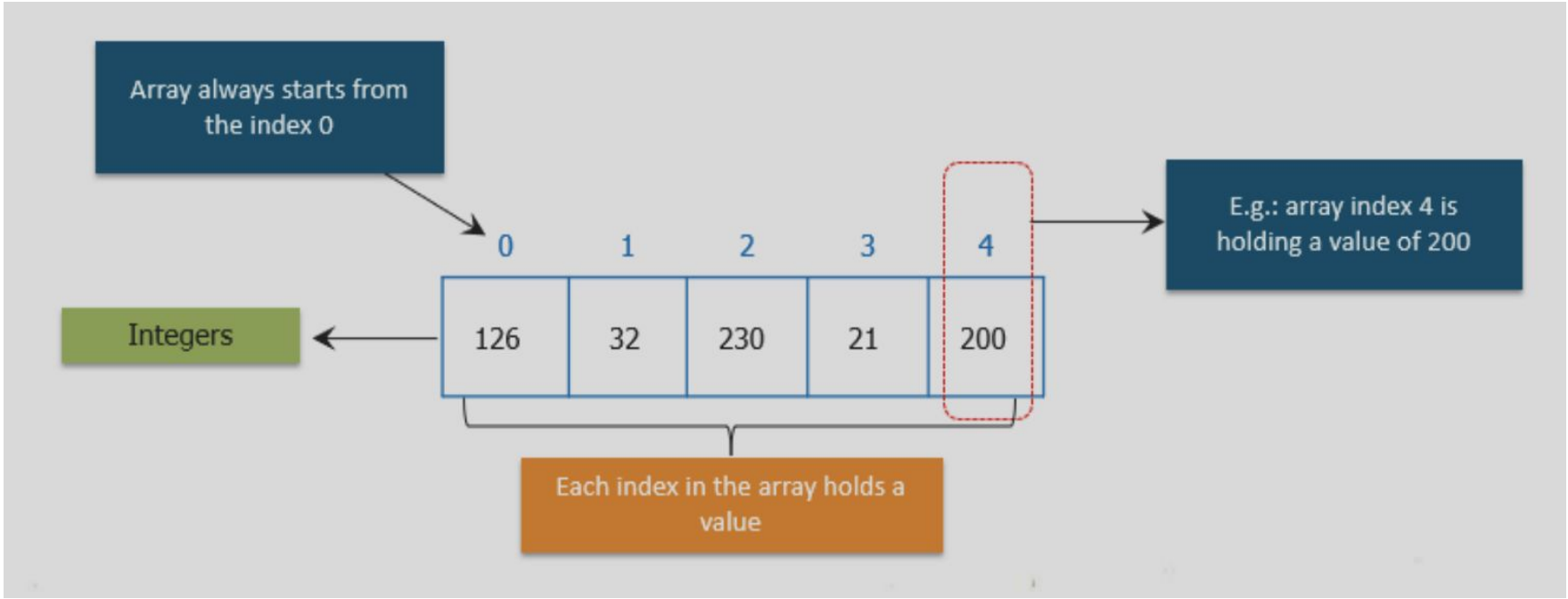
Seats in a Movie Hall

Arrays

Array: An array is a collection of similar data elements stored at contiguous memory locations.



```
int[] intArr = new int[5];
intArr[0] = 126;
intArr[1] = 32;
intArr[2] = 230;
intArr[3] = 21;
intArr[4] = 200;
```



Array Operations

- `String[] cars; // declares a array variable of type cars`
- `int[] intArr = new int[10]; // creates an array of size 10 which can only store int values`
- `String[] strArr = new String[5]; // creates an array of size 5 which can only store String values`
- `float[] floatArr = new float[7]; // creates an array of size 7 which can only store float values`

Arrays

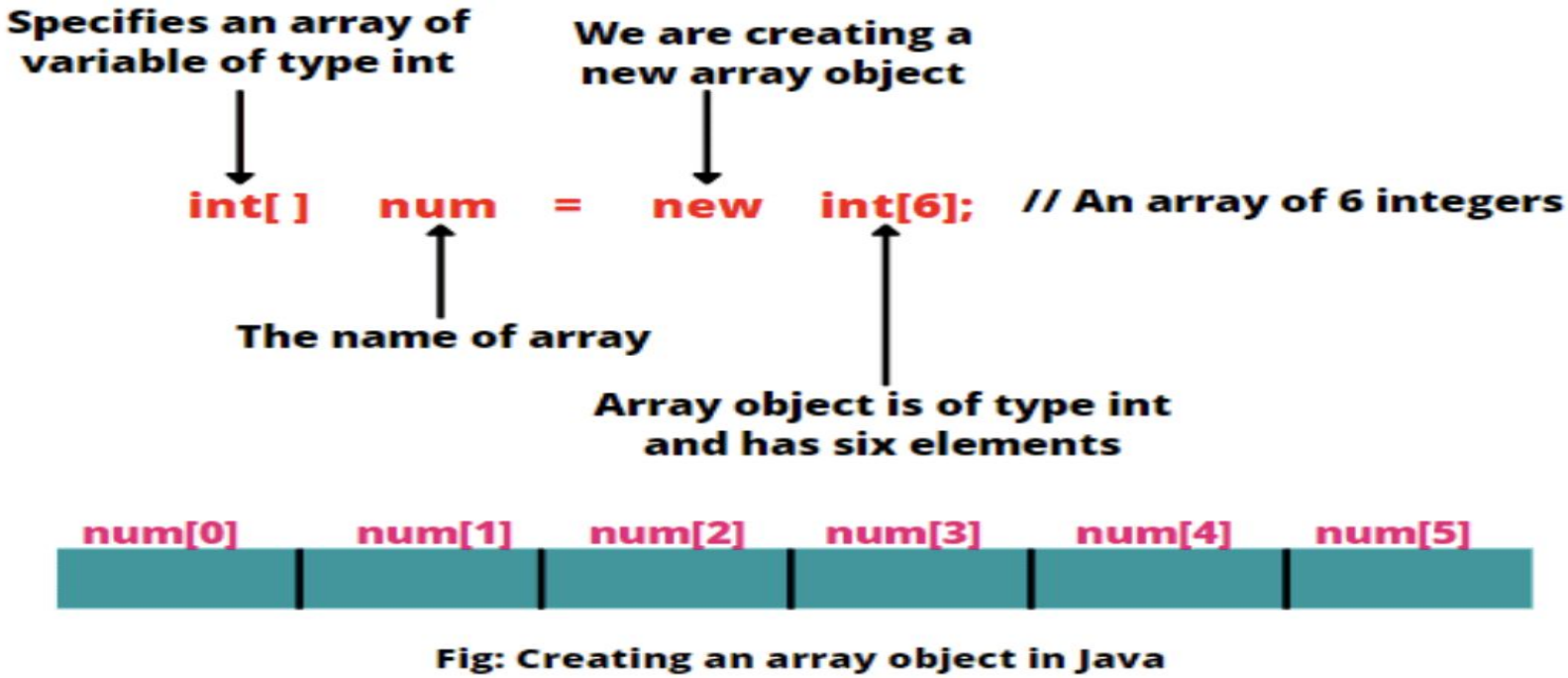


Fig: Creating an array object in Java

Array Initialization

```
// Initialize the array during declaration
String[4] strArr = {"Ishan", "Piyush", "Varun", "Sandeep"};

// initialize the array after declaration
String[] strArr = new String[4];
strArr[0] = "Ishan";
strArr[1] = "Piyush";
strArr[2] = "Varun";
strArr[3] = "Sandeep";
```

```
public static void main(String[] args) {
    // This creates an array of size 3 which will store string values
    String[] studentNames = {"Ishan", "Piyush", "Shubham"};

    System.out.println("Student name with rollNumber 0 is " + studentNames[0]);
    System.out.println("Student name with rollNumber 1 is " + studentNames[1]);
    System.out.println("Student name with rollNumber 2 is " + studentNames[2]);
}
```

Array Properties

- You can access a random array index
  - By access we mean either read or write

```
String[] plotOfLand =  new String[6];
plotOfLand[ 0] = "Father";
plotOfLand[ 1] = "Ishan";
plotOfLand[ 2] = "Brother"
plotofLand[ 5] = "Uncle";

plotOfLand[ 0] = "Uncle"; // random write
plotOfLand[ 5] = "Father";

System.out.pritln( "Who lives in plot with index 1" );
System.out.pritln( "Plot of land with index 1 is owned by "   + plotOfLand[ 1]); // random read
```

Loop through an Array

```
String[] cars = {"Volvo", "BMW", "Ford", "Mazda"};

// Using the old for loop
for (int i = 0; i < cars.length; i++) {
    System.out.println(cars[i]);
}

// Using the new loop for a collection
for(String car : cars) {
    System.out.println(car);
}
```

Looping through an array

```
public static void main(String[] args) {
    // This creates an array of size 8 which will store int values
    // First Index = 0;
    // Last Index = 7;
    int[] arr = {10, 15, 20, 30, 25, 55, 45, 60};
    System.out.println("Size of the array is " + arr.length);

    for(int i = 0; i < arr.length; i++ ) {
        System.out.println("Value at index " + i + " is " + arr[i]);
    }

    System.out.println("Iterating using new for loop");

    for(int value : arr) {
        System.out.println("Value is " + value);
    }

}
```

Arrays and Memory

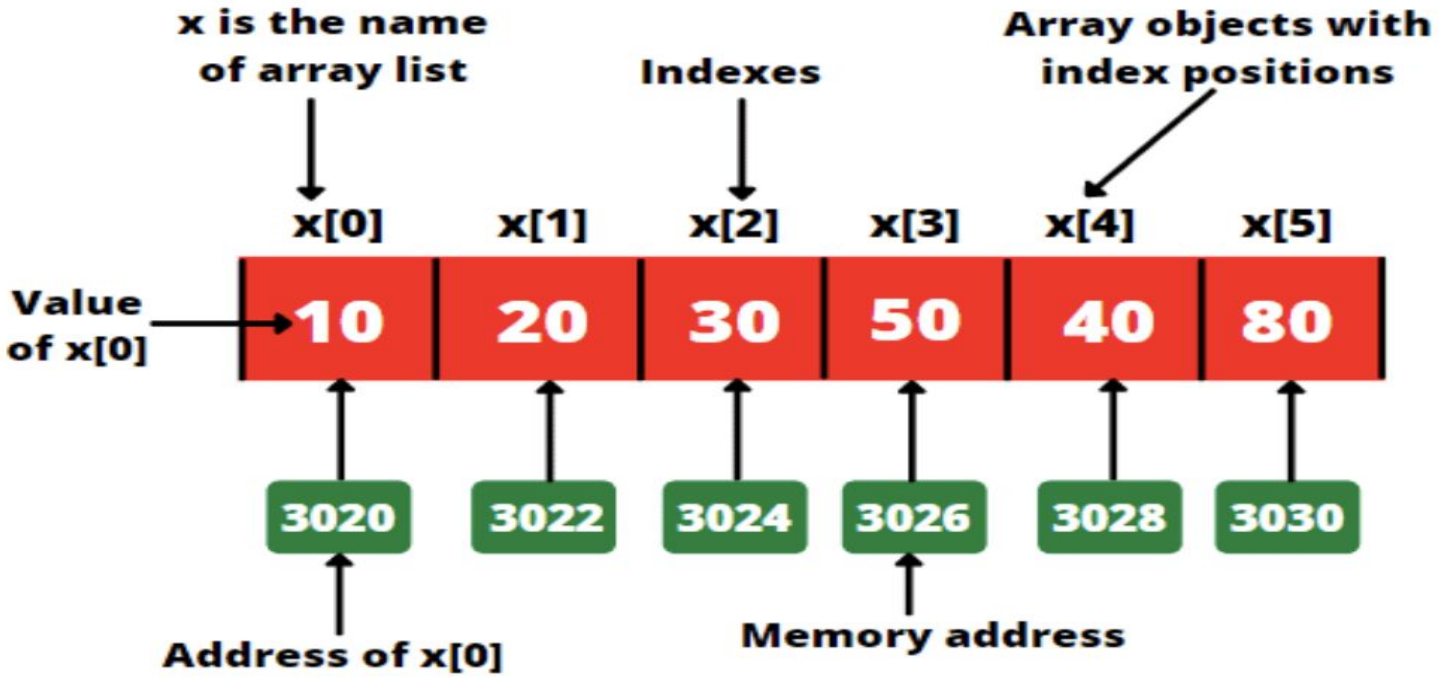


Fig: Memory address for array x