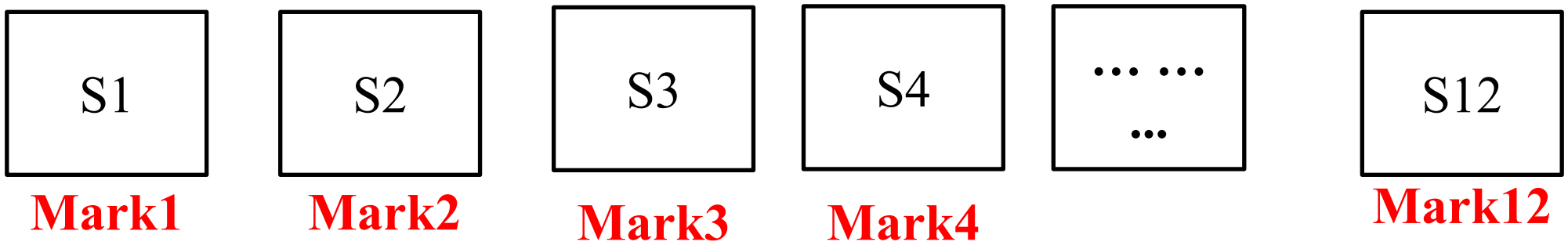
Arrays

Real-Time Problem

Ramesh is a Teacher. He needs to store marks of 12 students in his class.

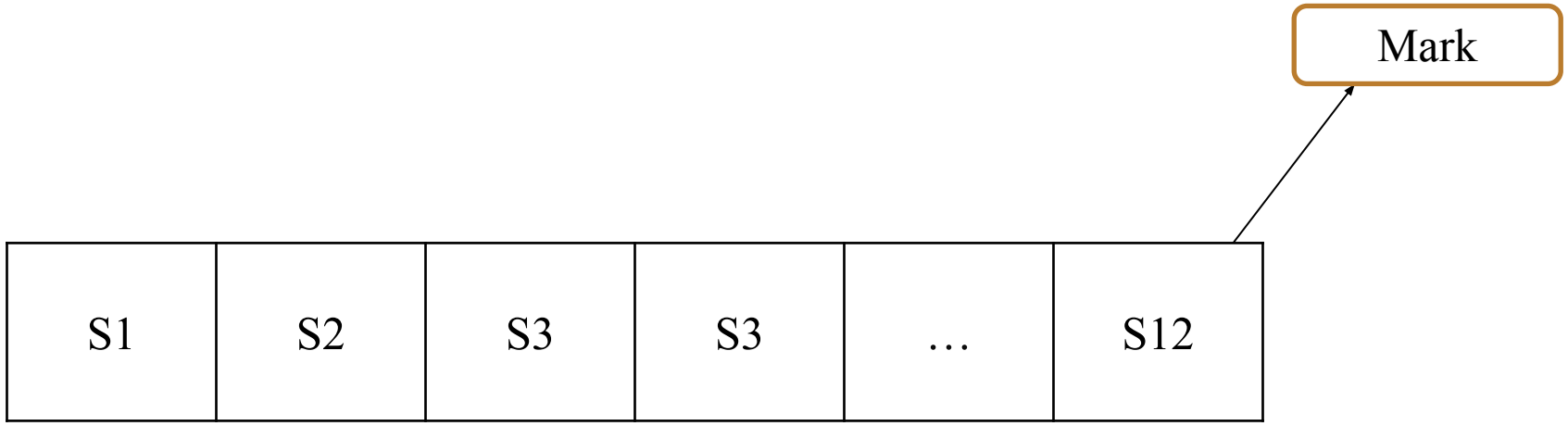
SOLUTION: 01

Ramesh can create twelve set of variables to store marks of twelve students.



SOLUTION: 02

He can create one variable called mark in that mark he can store marks of twelve Students



ARRAYS

1. Array is a **fixed-length** data structure having **zero-based indexing**
2. All **elements** of array of **same type**
3. The elements of an array are stored in a **contiguous memory** location.
4. Array in java is created as **Object using new operator**.
5. Once array is created, individual elements can be **accessed using index number** enclosed in square brackets.

ARRAY - TYPES

1. Single Dimensional Array.
2. Multidimensional Array.

ARRAY - DECLARATION

dataType[] arrayName;

1D ARRAY:

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

(or)

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

1D ARRAY - TYPES

1. **Static 1D array:**

   int arr[]={1,2,3,4,5}; // array is declared and initialized in the same statement

   (or)

   int arr[] = new int[5];

2. **Dynamic 1D array:**

   int arr[]=new int[n];

ARRAY - INDEX

int data[]=new int[5];

Last element

First element

data[0]	**data[1]**	**data[2]**	**data[3]**	**data[4]**
1	2	3	4	5
0	1	2	3	4

Index

Array data of length 5

1D ARRAY - EXAMPLE

```
import java.util.*;
public class Main
{
    public static void main(String[] args)
    {
            int [] arr = {12, 4, 5, 2, 5};
            for (int i = 0; i < arr.length; i++)
            {
                System.out.print(arr[i] + " ");
            }
    }
}
```

1D ARRAY – Using Enhanced for loop

```
import java.util.*;
public class Main
{
    public static void main(String[] args)
    {
            int [] arr = {12, 4, 5, 2, 5};
            for (int i : arr){              {
                System.out.print(i);
            }
    }
}
```

Real-Time Problem

In a class, David obtained 76, 55, 82, 67 marks, Michael scored 87, 36, 73, 89 marks, kajal scored 75, 45, 96, 32 marks and Salini scored 52, 95, 64, 88 marks (out of 100) in four different subjects.

Consider the situation, you need to store the marks obtained by David , Michael, Kajal and Salini.

SOLUTION: 01

We can use four individual arrays to get the marks scored by David, Michael, Kajal and Salini.

Marks scored by David	76	55	82	67
Marks scored by Michael	87	36	73	89
Marks scored by Kajal	75	45	96	32
Marks scored by Salini	52	95	64	88

Problem

- Usage of too many Array

Expectation

- Should get all the inputs
- Number of arrays should be less

HOW?

ARRAY - DECLARATION

dataType arrayName[] [] = new Date_Type[row_size][column_size];

2D ARRAY:

int twoDim [][] = new int[4][5]; (OR) int num[ ][ ];
num = new[3][4];

It is an Array of Arrays

Example:

```
marks[ ][ ] = { {5, 12, 7},
                {13, 4, 15} }
```

2D ARRAY

1. Two subscripts[ ][ ]

2. Represents tabular data (rows and columns)

```
int marks[ ][ ]=new int[2][3];
```

3 columns

2 rows

Index	[0]	[1]	[2]
[0]	5	12	7
[1]	13	4	15

2D ARRAY - EXAMPLE

```
public class Main{
    public static void main(String args[])
    {
        int arr[][]={{1,2,3},{2,4,5},{4,4,5}};
        for(int i=0;i<3;i++)
        {
            for(int j=0;j<3;j++)
            {
                System.out.print(arr[i][j]+" ");
            }
            System.out.println();
        }
    }
}
```

2D ARRAY - EXAMPLE

```
class Main{
  public static void printing_2D(int mat[][])
  {
    for (int i = 0; i < mat.length; i++){
      for (int j = 0; j < mat[i].length; j++){
        System.out.print(mat[i][j] + " ");
      }
      System.out.println();
    }
  }
  public static void main(String args[])
  {
    int mat[][] = { { 1, 2, 3, 4 },
                    { 5, 6, 7, 8 },
                    { 9, 10, 11, 12 } };
    printing_2D(mat);
  }
}
```

PREDICT THE OUTPUT

```
import java.util.Scanner;
public class Main
{
    public static void main(String args[])
    {
        int arr[] = {10, 20, 30, 40, 50};
        System.out.print(arr[2]);
    }
}
```

A. No output
B. ArrayIndexOutOfBoundsException
C. 40
D. 30

ANS : D

PREDICT THE OUTPUT

```
import java.util.Scanner;
class Main
{
  public static void main (String[] args)
  {
    int arr[] = {10, 20, 30, 40};
    int a = 50;
    call(a,arr);
    System.out.println(a);
    System.out.println(arr[0]);
    System.out.println(arr[1]);
  }
  public static void call(int a, int arr[])
  {
    a = a + 2;
    arr[0] = 100;
    arr[1] = 200;
  }
}
```

A) 50
100
200

B) 52
100
200

C) 50
10
20

D) 52
10
20

ANS : A

PREDICT THE OUTPUT

```
import java.util.Scanner;
public class Main
{
    public static void main(String args[])
    {
     int arr[2];
     System.out.println(arr[0]);
     System.out.println(arr[1]);
    }
}
```

A. Garbage value
   Garbage value
B. ArrayIndexOutOfBoundsException
C. Compilation error
D. 0
   0

ANS : C

PREDICT THE OUTPUT

```
public class Main{
  public static void main(String args[])
  {
int array[][] ={{42,2,23},{5,60,12},{19,10,1}};
    function(array);
  }
  public static void function(int array[][])
  {
    for (int i = 0; i < 3; i++)
    {
      for (int j = 0; j < 3; j++)
      {
        System.out.print(array[j][i] + " ");
      }
      System.out.println();
    }
  } }
```

A. 42 5 19
2 60 10
23 12 1

B. 42 2 23
5 60 12
19 10 1

ANS : A

PROGRAM: 01

Write a Java code to search a given number in an array. If the element is found then print Found, else print Not Found

Sample Input:

arr_size = 5
arr[] = {23, 82, 57, 45, 38}
search_elem = 45

Sample Output:

Found

SOLUTION: 01

```
import java.util.Scanner;
public class MyClass {
    public static void main(String
args[]){
     Scanner sc = new Scanner(System.in);
        int arr_size = sc.nextInt();
        int arr[] = new int[arr_size];
        int i;
        for(i = 0; i < arr_size; i++)
        {
            arr[i] = sc.nextInt();
        }
        int search_elem = sc.nextInt();
        int is_matched = 0;
        for(i = 0; i < arr_size; i++)
        {
if(arr[i] == search_elem)
                    {
                        is_matched = 1;
                        break;
                    }  }
if(is_matched == 1)
            {
System.out.print("Found");
            }
            else
            {
   System.out.print("Not Found");
            }
     }
}
```

PROGRAM: 02

Write a Java code to find the number of occurrences of a given number in an array.

Sample Input:

arr_size = 6
arr[] = {3, 82, 57, 45, 3,
8}
search_elem = 3

Sample Output:

2

SOLUTION: 02

```
import java.util.Scanner;
public class MyClass
{
    public static void main(String args[])
{
        Scanner sc = new Scanner(System.in);
        int arr_size = sc.nextInt();
        int arr[] = new int[arr_size];
        int i;
        for(i = 0; i < arr_size; i++)
  {
            arr[i] = sc.nextInt();
        }
        int search_elem = sc.nextInt();
        int count = 0;
 for(i = 0; i < arr_size; i++)
{
  if(arr[i] == search_elem)
            {
                count++;
            }
        }
        System.out.print(count);
    }
}
```

PROGRAM: 03

Write a Java code to find the largest number in an array.

Sample Input:

arr_size = 5
arr[] = {1, 7, 3, 4, 5}

Sample Output:

7

SOLUTION: 03

```
import java.util.*;
public class Main{
    public static void main(String
args[]){
      Scanner sc = new Scanner(System.in);
      int a = sc.nextInt();
      int arr[]=new int[a];
      for(int i = 0; i < a; i++)
      {
        arr[i] = sc.nextInt();
      }
      int max = 0;
      for(int i = 0; i < a; i++)
      {
```

```
if(arr[i] > max)
          {
              max = arr[i];
          }
        }
        System.out.print(max);
    }
}
```

PREDICT THE OUTPUT

```
// Predict the output
public class Main{
  public static void main(String args[])
  {
     int array[][] = { { 1, 2, 3, 4},
                       { 5, 6, 7, 8},
                       { 9, 10, 11, 12},
                       {13, 14, 15, 16}
                     };
     System.out.print(array[4][4] + " ");
  }
}
```

A) 16

B) Exception

C) Error

ANS : B

PREDICT THE OUTPUT

```
public class Main{
   public static void main(String[] args){
       int arr[][] = new int[2][];
       arr[0] = new int[3];
       arr[1] = new int[2];
       int count = 0;
       for (int i=0; i<arr.length; i++){
           for(int j=0; j<arr[i].length; j++){
               arr[i][j] = count++;
           }
       }
       for (int i=0; i<arr.length; i++)
       {
           for (int j=0; j<arr[i].length; j++){
               System.out.print(arr[i][j] + " ");
           }
           System.out.println();
       }
   }
}
```

A) 0 0 0
0 0

B) 1 2
3 4 5

C) 0 1
2 3 4

D) 0 1 2
3 4

ANS : D

PREDICT THE OUTPUT

In Java arrays are

A. Objects

B. Object references

C. Primitive data type

D. None of the above

Answer : A

PREDICT THE OUTPUT

What will the output of following program

```
public class AllDimensionArrays {
    public static void main(String[] args)
 {
        int[] a1d = {};
        int[] b1d = {1, 3};
        int[][] a2d = {};
        int[][] b2d = {{}};
        int[][] c2d = {{1, 2}, {5}};
   System.out.print(a1d.length + " " + b1d.length + "
");
System.out.print(a2d.length + " " + a2d[0].length + "
" + b2d.length + " " + b2d[0].length + " ");
System.out.print(c2d.length + " " + c2d[0].length + "
" + c2d[1].length);
    }
}
```

A. 0 2 0 0 1 0 2 2 1
B. 0 2 0 0 0 0 2 2 1
C. Some other output
D. ArrayIndexOutOfBoundsException

Answer : D

PREDICT THE OUTPUT

What will be the output of the following program?

```
public class Main
{
public static void main(String[] args)
{
int[] print = new int[]{0, 1, 2, 3, 4, 5};
System.out.print("\"Prints = ");
System.out.print(print[0] + print[5] + print[2] + "\"");
}
}
```

A. "Prints = 052“
B. "Prints = 7“
C. \"Prints = 7\“
D. Compilation Error

Answer : B

PREDICT THE OUTPUT

What will be the output of the following program

```
class ForEachLoop
{
    public static void main(String args[])
    {
        int[] scores = new int[10];
        scores = new int[3];
        scores = {215, 234, 218, 189, 221, 290};

        for(int score : scores)
        {
            System.out.print(score + "  ");
        }
    }
}
```

A. Compilation error
B. 215 234 213 189
C. Exception
D. None of the above

Answer : C

PROGRAM: 04

Java program to interchange elements of first and last row in 3*3 matrix.

Input :
1 2 3
4 5 6
7 8 9

Output:
7 8 9
4 5 6
1 2 3

SOLUTION: 04

```
public static void main(String[] args) {
	Scanner sc=new Scanner(System.in);
	int a[][]=new int[3][3];
	System.out.println("enter the elements");
for(int i=0; i<a.length;i++)
{for(int j=0; j<a.length;j++) {
a[i][j]=sc.nextInt();
	}}
for(int i=0; i<a.length;i++)
{
	for(int j=0; j<a.length;j++)
	{
System.out.print(a[i][j] + " ");
	}
	System.out.println();
}
for(int i=0; i<a.length;i++)
{
	int t=a[0][i];
	a[0][i]=a[2][i];
	a[2][i]=t;
}
System.out.println("matrix after swapping ");
for(int i=0; i<a.length;i++)
{
	for(int j=0; j<a.length;j++)
	{
System.out.print(a[i][j] + " ");
	}
	System.out.println();}}
}
```

PROGRAM: 05

Write a program to find out total marks obtained by a student if the student gets 3 marks for the correct answer and -1 for the wrong answer

Input:
1,0,1,1,1,0,0
Output:
9

SOLUTION: 05

```
public class Main
{
public static void main(String[] args) {
int arr[]= {1,0,1,1,1,0,0};
int sum=0;
for(int i=0;i<arr.length;i++)
{
if(arr[i]==1)
sum=sum+3;
else
sum=sum-1;
}
System.out.println("Total Marks Obtained :"+ sum);
} }
```