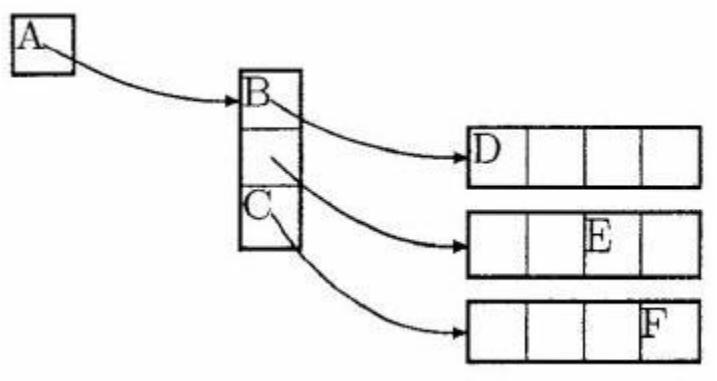
ICS4UO - Exercise – Multi-Dimensional Arrays

1. **The diagram shows an array declared by the statement**

```
int[][] a = new int[3][4];
```

State the identifier of each cell marked by a letter.



- `A [0][0]`
- `B [0][1]`
- `C [2][1]`
- `D [0][2]`
- `E [2][4]`
- `F [4][5]`

2. **How many elements would there be in each of the arrays created by the following declarations?**

(a) `double[][] first = new double[25][40];`

(b) `boolean[][][] second = new boolean[3][6][50];`

(c) `char[][] third = new char[60][40]`

(d) `long[][][] fourth = new long[5][10][20];`

Answers:

a) 25 x 40 = 1000
b) 3 x 6 x 50 = 900
c) 60 x 40 = 2400
d) 5 x 10 x 20 = 1000

3. **Suppose that the following declarations have been made:**

```
int a[][] = {{4,2,7},
             {3,9,1}};
int i,j;
```

Determine what would be printed by each fragment.

a.
```
for(i = 0; i < a.length; i++)
{
  for(j = 0; j < a[0].length; j++)
    System.out.print(a[i][j]);
  System.out.println();
}
```

b.
```
for(i = 0; i < a[0].length; i++)
{
  for(j = 0; j < a.length; j++)
    System.out.print(a[j][i]);
    System.out.println();
}
```

c.
```
for(i = a.length - 1; i >= 0; i--)
{
  for(j = 0; j < a[0].length; j++)
    System.out.print(a[i][j]);
  System.out.println();
}
```

Answers:

a) 427
   391

b) 43
   29
   71

c) 391
   427

4. For the array given in the previous question, write a fragment that would print the elements of the array in the form

```
17
92
34
```

Answer:

```
int a[][] = {{4,2,7},
             {3,9,1}};
```

```
            int i,j;

            for (i = a[0].length-1; i >= 0; i--) {
                  for (j = a.length-1; j >= 0; j--)
                        System.out.print(a[j][i]);
                  System.out.println();
            }
```

5. **Write a method sum having one `double[][]` parameter. The method should return the sum of the elements of the array passed to it. You may assume that the array is rectangular.**

   Code:

```
      double a[][] = {{4,2,7},
                      {3,9,1}};

            double sum = Sum(a);
            System.out.println("The sum of the elements of the
array is " + sum);


      }

      /*
       * This method calculates the sum of the elements of the
array passed to it.
       * pre: 2D array of the type double
       * post: returns sum
      */
      public static double Sum (double [][] a) {
            double sum = 0;
            for (int x=0; x < a.length; x++) {
                  for (int y=0; y<a[0].length; y++)
                        sum = sum + a[x][y];
            }
            return sum;
      }
```

6. **Write a method `max` that will return the maximum value of the elements in a two-dimensional array of int values. Do *not* assume that the array is rectangular.**

```
            int a[][] = {{4,2,7},
                         {3,9,1}};
```

```
            int max = Max (a);
            System.out.println("the maximum value of the elements
in the array is " + max);


      }

      /*
       * This method will return the maximum value of the
       * elements in a two-dimensional array of int values
       * pre: 2D array of the type int
       * post: returns max
      */
      public static int Max (int [][] a) {
            int max = a[0][0];
            for (int x = 0; x < a.length; x++) {
                  for (int y = 0; y<a[0].length; y++) {
                        if (max<a[x][y])
                              max = a[x][y];
                  }
            }
            return max;
      }
```

7. **Write a method `print` that could be used to print a two-dimensional array of `int` values. Each row of elements should be printed on its own line with one blank between each element.**

   Code:

```
            int a[][] = {{4,2,7},
                         {3,9,1}};

            Print (a);

      }

      /*
       * This method will print each row of of an 2D array
       * on its own line with one blank between each element.
       * pre: 2D array of the type int
       * post: Prints each row of array
      */
      public static void Print (int [][] a) {
            for (int x = 0; x <= a[0].length-1; x++) {
                  for (int y = 0; y <= a.length-1; y++ )
                        System.out.print(a[y][x] + " ");
                  System.out.println();
            }
      }
```