Tutorial 8

Array 2D and Array Processing 2D

Section A: Self-test

1. Which statement is used to declare and create a two-dimensional array of size 4*4.

   a) `int[][] matrix;`
   b) `matrix = new int[4][4];`
   c) `int[][] matrix = new int[4][4];`
   d) `int[][] table = {{1,2,3},{4,5,6},{7,8,9},{10,11,12}};`

2. Consider the following declaration.

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

   The value for `x.length` is _____

   a) `3`
   b) `4`
   c) `12`

3. Consider the following declaration.

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

   The value for `x[0].length` is _____

   a) `3`
   b) `4`
   c) `12`

Section B: Hand Tracing

Consider the following declaration:

```
int N = 5;
int [][] arr2 = {{11, 12, 13, 14, 15},
                 {21, 22, 23, 24, 25},
                 {31, 32, 33, 34, 35},
                 {41, 42, 43, 44, 45},
                 {51, 52, 53, 54, 55}
                };
```

1. Answer the following questions:

a) What is the value of `arr2[1][1]`, `arr2[2][2]`, `arr2[3][4]`?

arr2[1][1] = 22
arr2[2][2] = 33
arr2[3][4] = 45

b) What is the index of the element that stores value `35`?

arr2 [2][4]

c) What is the value of `arr2.length`?

5

2. What is the output of the following code segment? If N=5.

a)
```
int sum = 0;
for(int i = 0; i < N; i++) {
   for(int j = 0; j < N; j++) {
         sum = sum + arr2[i][j];
   }
   System.out.println(sum);
 }
```

65
180
345
560
825

b)
```
for(int i = 0; i < N; i++) {
     int sum = 0;
     for(int j = 0; j < N; j++) {
           sum = sum + arr2[i][j];
     }
     System.out.println(sum);
}
```

65
115
165
215
265

c)
```
int sum = 0;
     for(int i = 0; i < N; i++) {
           for(int j = 0; j <= i; j++) {
                 sum = sum + arr2[i][j];
     }
     System.out.println(sum);
}
```

11
54
150
320
585

d)
```
int [] sum = {0, 0, 0, 0, 0};
    for(int i = 0; i < N; i++) {
        for(int j = 0; j < N; j++) {
            sum[i] = sum[i] + arr2[i][j];
        }
    }
    for(int i = 0; i < N; i++) {
        System.out.println(i + ": " + sum[i]);
}
```

```
0: 65
1: 115
2: 165
3: 215
4: 265
```

3. Consider the following declaration:

```
int N = 5;
int[][] a2 = new int[N][N];
```

Trace the code segment to determine the value stored in array `a2`.

a)
```
for(int i=0; i<N; i++) {
    for(int j=0; j<N; j++) {
        if ((i == j) || (i + j) > 5)
            a2[i][j] = i + j;
        else
            a2[i][j] = j - i;
    }
}
```

b)
```
for(int i = 0; i < N; i++) {
    for(int j = 0; j < N; j++) {
        if ((i == j) || (i + j) > 5)
            a2[i][j] = 1;
        else
            a2[i][j] = 0;
    }
}
```

Section C: Write Code Segments

1. Write a code segment to read and print an array of size 3x3. The sample input and output are as follows.

Sample Input	Sample Output
2 7 6 9 5 1 4 3 8	2 7 6 9 5 1 4 3 8

```
public class Satu {
    public static void main (String[] args) {
        Scanner sc = new Scanner (System.in);
        // declare and create an array
        int[][] square = new int[3][3];
        // read an array
```

```
//read an array
for (int i=0 ; i<square.length ; i++ )
{
    for (int j=0 ; j<square.length ; j++)
    {
        square[i][j] = sc.nextInt();
    }
}
```

```
        // print an array
```

```
//print an array
for (int i=0 ; i<square.length ; i++ )
{
    for (int j=0 ; j<square.length ; j++)
    {
        System.out.print(square[i][j]+" ");
    }
    System.out.println();
```

```
    }
}
```

2. Write a code segment to sum all elements of the array. The sample input and output are as follows.

Sample Input	Sample Output
2 7 6 9 5 1 4 3 8	sum of all elements is 45

```
public class Dua {
    public static void main (String[] args) {
        Scanner sc = new Scanner (System.in);
        // declare and create an array
        int[][] square = new int[3][3];
        // read an array
        :
        // find sum of all elements in an array
```

```
int sum = 0;

// sum of all element
for (int i=0 ; i<square.length ; i++ )
{
    for (int j=0 ; j<square.length ; j++)
    {
        sum = sum + square[i][j];
    }
}

System.out.println("sum of all elements is " + sum);
```

```
    }
}
```

3. Write code segments to sum the elements of the array by rows. The sample input and output are as follows.

Sample Input	Sample Output
2 7 6 9 5 1 4 3 8	Sum for row 1 is 15 Sum for row 2 is 15 Sum for row 3 is 15

```
public class Tiga{
    public static void main (String[] args) {
        Scanner sc = new Scanner (System.in);
        // declare and create an array
        int[][] square = new int[3][3];
        // read an array
        :
        // find sum the elements in an array by rows
```

```
int sum = 0;
int counter = 0;

// sum of all element by row
for (int i=0 ; i<square.length ; i++ )
{
    for (int j=0 ; j<square.length ; j++)
    {
        sum = sum + square[i][j];

    }

    counter++;
    System.out.println("Sum for row "+ counter + " is " + sum);
    sum = 0;
}
```

```
    }
}
```

4. Write code segments to find the row with largest sum. The sample input and output are as follows.

Sample Input	Sample Output
2 7 6 9 5 1 5 3 8	Row 3 has the maximum sum of 16

```
public class Empat{
    public static void main (String[] args) {
        Scanner sc = new Scanner (System.in);
        // declare and create an array
        int[][] square = new int[3][3];
        // read an array
        :
        // find the row with largest sum
```

```
    }
}
```

5. Write code segments to sum the elements of the array by column. The sample input and output are as follows.

Sample Input	Sample Output
2 9 6 9 5 1 5 3 8	Sum for column 1 is 16 Sum for column 2 is 17 Sum for column 3 is 15

```
public class Lima{
    public static void main (String[] args) {
        Scanner sc = new Scanner (System.in);
        // declare and create an array
        int[][] square = new int[3][3];
        // read an array
        :
        // find sum the elements in an array by column
```

```
    }
}
```

6. Write code segments to find the column with largest sum. The sample input and output are as follows.

Sample Input	Sample Output
2 9 6 9 5 1 5 3 8	Col 2 has the maximum sum of 17

```
public class Enam{
    public static void main (String[] args) {
        // declare and create an array
        int[][] square = new int[3][3];
        // read an array
        :
        // find the column with largest sum
```

```
    }
}
```

7. Write code segments to read an integer ***N*** that indicates the size array, then read ***N*N*** data to store in the array, and print the array ***N*N***. Sample input and output are as follows.

Sample Input	Sample Output
8 1 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 0 0 0 1 1 0 1 0 0 0 0 1 1 1 1 0 0 1 0 1 1 0 0 0 0 0 0 1 1 0 0 1 1 0 0 1 0 1 0 0 0 0 0 0 4 1 1 1 1 1 1 0 1 1 0 0 1 1 1 1 1 0	Case #1: 1 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 0 0 0 1 1 0 1 0 0 0 0 1 1 1 1 0 0 1 0 1 1 0 0 0 0 0 0 1 1 0 0 1 1 0 0 1 0 1 0 0 0 0 0 0 Case #2: 1 1 1 1 1 1 0 1 1 0 0 1 1 1 1 1

```
public class Tujuh{
    public static void main (String[] args) {
        Scanner sc = new Scanner (System.in);
```

```
        int n = sc.nextInt();
        int arr [][] = new int [n][n];

        //read array
        for (int i=0 ; i<n ; i++)
        {
            for (int j=0 ; j<n ; j++)
            {
                arr [i][j] = sc.nextInt();
            }

        }

        //print array
        for (int i=0 ; i<n ; i++)
        {
            for (int j=0 ; j<n; j++)
            {
                System.out.print(arr[i][j]+" ");

            }
            System.out.println();

        }
```

```
    }
}
```

Section D: Code Zinger practice 9.6 [Mode Soda]

Problem Description

Mode Soda is a soda manufacturer. They introduced four new flavors and held a taste test to see how people liked them. The manufacturer got a few people to try each new flavor and give it a 1 to 5, where 1 equals poor, and 5 equals excellent. The table below shows the result of the survey with ten respondents. Write a program that reads the test result, calculates and prints the average responses for each Soda.

	Soda-1	Soda-2	Soda-3	Soda-4
Respondent-1	3	2	3	1
Respondent-2	4	4	5	1
Respondent-3	5	3	4	1
Respondent-4	2	4	5	1
Respondent-5	1	3	5	3
Respondent-6	4	3	3	2
Respondent-7	3	2	2	1
Respondent-8	2	1	5	3
Respondent-9	4	2	5	2
Respondent-10	4	2	5	3

Input

The first input line is a positive integer N ($N \leq 100$) which indicates the number of respondents. The following input contains four integers that represent the score S ($1 \leq S \leq 5$).

Output

The output should contain the Soda's numbers and follow by the average score for each Soda.

Test Case

Default	
10 3 2 3 1 4 4 5 1 5 3 4 1 2 4 5 1 1 3 5 3 4 3 3 2 3 2 2 1 2 1 5 3 4 2 5 2 4 2 5 3	Soda-1: 3.20 Soda-2: 2.60 Soda-3: 4.20 Soda-4: 1.80
Standard Case 1	
5 1 1 4 3 3 5 1 3 1 4 4 3 1 2 3 5 3 3 5 4	Soda-1: 1.80 Soda-2: 3.00 Soda-3: 3.40 Soda-4: 3.60
Standard Case 2	
2 4 1 5 1 4 4 1 2	Soda-1: 4.00 Soda-2: 2.50 Soda-3: 3.00 Soda-4: 1.50

Question:

Based on the structure solution from the problem given, complete the codes from (a) to (i):

```
1  // add header 1 for scanner (a)
2  // add header 2 for decimal (b)
3
4  public class Soda{
5          public static void main (String[] args) {
6          // add Scanner class (c)
7          // add Decimal class with two decimal zero (d)
8
9          int N = sc.nextInt();
10         int x = 1;
11
12                 // declare array 2D name vote with size [N] [4] (e)
13                 for (int i=0;i<N;i++) {
14                         for (int j=0;j<vote[0].length;j++) {
15                                 //read input for element in array 2D name vote (f)
16                                 }
17                 }
18                 for (int j=0; j< vote[0].length; j++){
19                         //initial total to zero (g)
20                         for (int i=0; i<vote.length; i++) {
21                                 //sum total with for each row (h)
22                         }
23                         //calculate average of the total by divide with the N value (i)
24                         System.out.println("Soda-" + (j+1) + ": "+ df.format(ave) + " ");
25                 }
26
27         }
28 }
29
30
```