Java Exercise – Array

Question 1

Write a Scalaire.java program that calculates the scalar product of two vectors, implemented using one-dimensional arrays. Your program will have to use (among others) the following elements:

Declarations in the main () method:

- a variable nMax representing the maximum size of the vectors (needless to give it a value too high ... 10 is more than enough)
- two variables v1 and v2 : array of type real, size: nMax.

Methods:

- ask the user to enter n, the effective size of the vectors.
- check that n is between 1 and nMax and ask the user to enter a value again as long as this is not the case
  ask the user the components ($v1_0$ ... $v1_{n-1}$, $v2_0$ ... $v2_{n-1}$) of vectors v1 and v2.
- calculate the dot product of v1 and v2.
- Show result

Recall:
The scalar product of a by b is: $a \cdot b = a\ 1 * b1 + a2 * b2 + ... + a_n * b_n$

Example: a=(5,3,-1) b=(2,1,2) a·b=11

Question 2

We are looking here to write a program MulMat.java which calculates the multiplication of two matrices (recall below).

You will use an array of array of double to represent the matrix.

Declaration:

- In the main method, declare two matrices mat1 and mat2.

Process:

- Read from the keyboard the elements of each of the two matrices (after asking for their dimensions).
- Multiply both matrices and store the result in a new prod matrix.
- View the contents of this new matrix line by line.

Methods:

- Read from the keyboard the dimensions lines (number of lines) and columns (number of columns) of the first matrix mat1
- Read the contents of mat1.
- Similarly, read the dimensions and then the content of the second matrix mat2.
- Check that the number of mat2 rows is the same as the number of mat1 columns. If not, display an error message "Multiplication of matrices impossible!". (reminder: if we multiply two matrices M = M1 * M2, the dimensions of M are "number of lines of M1" and "number of columns of M2", and the element $M_{i,j}$ is defined by

$$M_{i,j} = \sum_{k=1}^{c1} M1_{i,k} \cdot M2_{k,j}$$

- display the result line by line.

Example:

```
Entering the 1st matrix:
Number of rows: 2
Number of columns: 3
M[1,1]=1.0
M[1,2]=2.0
M[1,3]=3.0
M[2,1]=4.0
M[2,2]=5.0
M[2,3]=6.0

Entering the 2nd matrix:
Number of rows: 3
Number of columns: 4
M[1,1]=1.0
M[1,2]=2.0
M[1,3]=3.0
M[1,4]=4.0
M[2,1]=5.0
M[2,2]=6.0
M[2,3]=7.0
M[2,4]=8.0
M[3,1]=9.0
M[3,2]=0.0
M[3,3]=1.0
M[3,4]=2.0
Result:
38.0 14.0 20.0 26.0
83.0 38.0 53.0 68.0
```