Lab08 – Arrays and methods

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CPSC 1150
08/07/2023

Exercise 1

Program Arrays

File name: Arrays.java

Purpose: To allow the user to enter 5 double values and display the average of those values.

Packages: java.util.Scanner

Input: 5 double values, which are then stored in an array (*myArray*).

Output: A double value representing the average of the 5 input values.

Pseudocode:

```
Algorithm Arrays
START

(main)
Set double[ 5 ] myArray
Print "Enter 5 double values"
For i from 0 to 4 {
        Read myArray[ i ]
}
Print "Average = " + average(myArray)

(average, parameter(s): integer[ ] array)
Set integer sum = 0
For element in array {
        sum += element
}
Return sum / array.length

(average, parameter(s): double[ ] array)
Set double sum = 0
For element in array {
        sum += element
}
Return sum / array.length

END Arrays
```

Test run(s):

```
$ java Arrays.java
Enter 5 double values:
7.4
34.6
24.95
30.1
2.8
Average = 19.97
```

```
$ java Arrays.java
Enter 5 double values:
8
9
7
10
8
Average = 8.40
```

```
$ java Arrays.java
Enter 5 double values:
-20.5
22.75
-33.8
15
0
Average = -3.31
```

Exercise 2

Program Matrix

File name: Matrix.java

Purpose: To allow the user to create a randomly generated matrix, display it, multiply it by a number, and check whether is symmetric.

Packages: javax.swing.JOptionPane

Limitations: The program will create error messages if the values entered are invalid (not between 1 and 6 for the menu).

Bugs: The numbers of the matrix in the messages displayed don't follow the format specified.

Input: Integer values, depending on the part of the program, to choose an option, or to enter values that the program needs for its methods.

Output: Various messages with results of the program menu options, errors, input fields, and the menu itself.

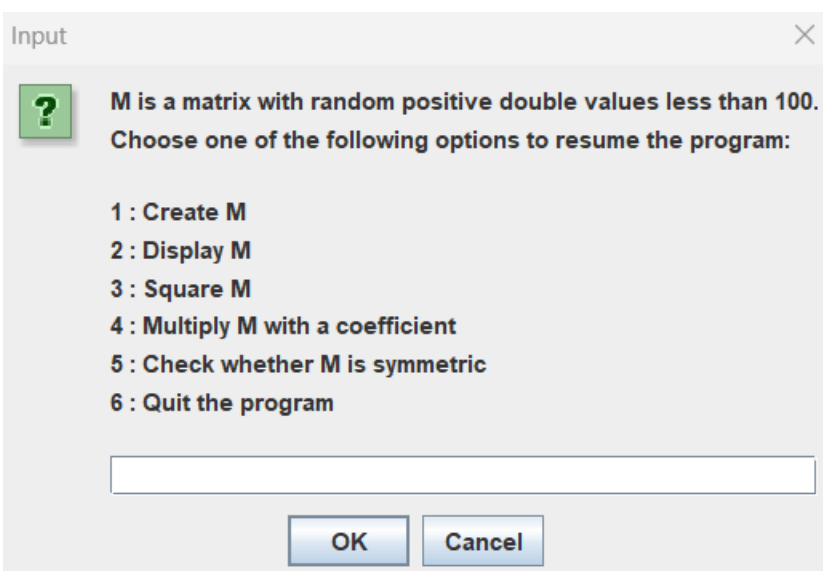
Pseudocode:

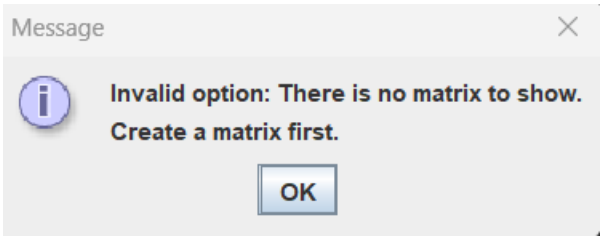
```
Algorithm Matrix
START

(main)
Set integer userInput = 0
Set double[0][0] matrix

While ( userInput != 6 ) {
        Read userInput

        Switch ( userInput ) {
                Case 1:
                        Read m
                        matrix = genMatrix( m )
                        Break
                Case 2:
                        If ( matrix.length = 0 ) {
```

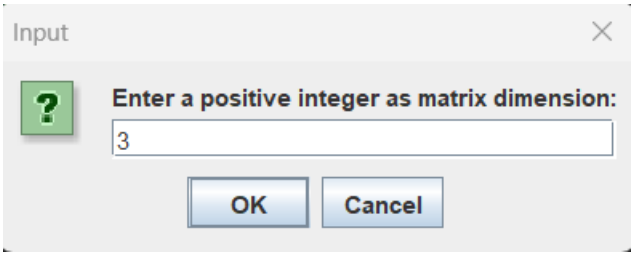
```
                        Print error message
                } else {
                        printMatrix( matrix )
                }
                Break
        Case 3:
                Print error message
                Break
        Case 4:
                If ( matrix.length = 0 ) {
                        Print error message
                } else {
                        Read c
                        Set matrix1 = Multiply(c, matrix)
                        printMatrix( matrix1 )
                }
                Break
        Case 5:
                If ( matrix.length = 0 ) {
                        Print error message
                } else {
                        Print isSymetric( matrix )
                }
                Break
        Case 6:
                Break
        Default:
                Print error message
    }
}

(getMatrix, parameters: m)
Set double[m][m] matrix
For ( i from 0 to m - 1 ) {
    For ( j from 0 to m - 1 ) {
        matrix[ i ][ j ] = random double between 0 and 100
    }
}
Return matrix

(printMatrix, parameters: matrix)
Set integer m = matrix.length
Set string elements = “”
For ( i from 0 to m - 1 ) {
    For ( element in matrix[ i ] ) {
        elements += element + space
    }
```

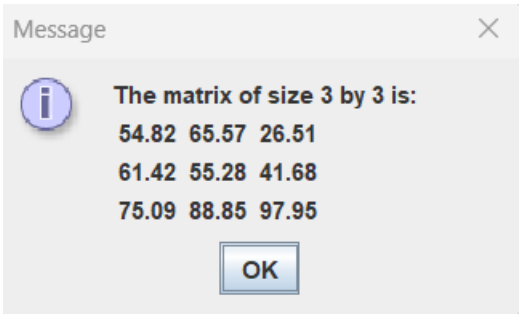
```
        Print new line
}
Print elements

(isSymmetric, parameters: matrix)
Set integer m = matrix.length
For ( i from 0 to m - 1 ) {
        For ( j from 0 to m - 1 ) {
                If ( matrix[ i ][ j ] != matrix[ j ][ i ] ) {
                        Return false
                }
        }
}
Return true

(Multiply, parameters: c, matrix1)
Set integer m = matrix1.length
Set double[m][m] matrix
For ( i from 0 to m - 1 ) {
        For ( j from 0 to m -1 ) {
                matrix[ i ][ j ] = c * matrix1[ i ][ j ]
        }
}
Return matrix

END Matrix
```

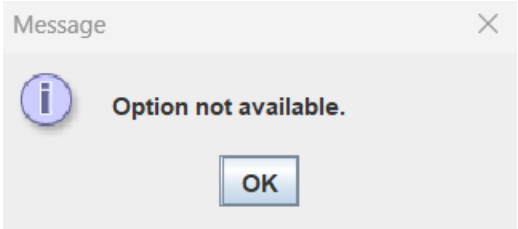
Test run(s):

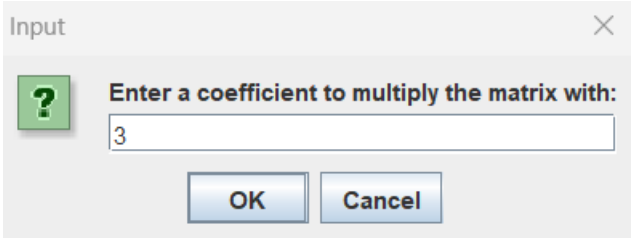


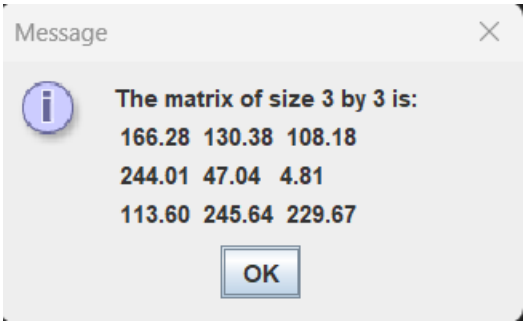

Message
Invalid option: There is no matrix to show.
Create a matrix first.
OK

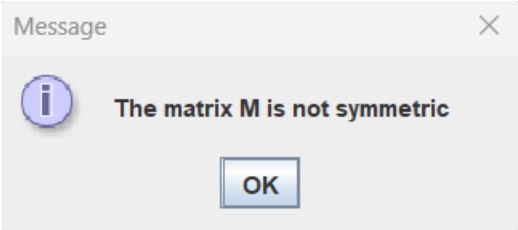

Input
Enter a positive integer as matrix dimension:
3
OK
Cancel


Message
The matrix of size 3 by 3 is:
54.82 65.57 26.51
61.42 55.28 41.68
75.09 88.85 97.95
OK


Message
Option not available.
OK


Input
Enter a coefficient to multiply the matrix with:
3
OK
Cancel


Message
The matrix of size 3 by 3 is:
166.28 130.38 108.18
244.01 47.04 4.81
113.60 245.64 229.67
OK


Message
The matrix M is not symmetric
OK