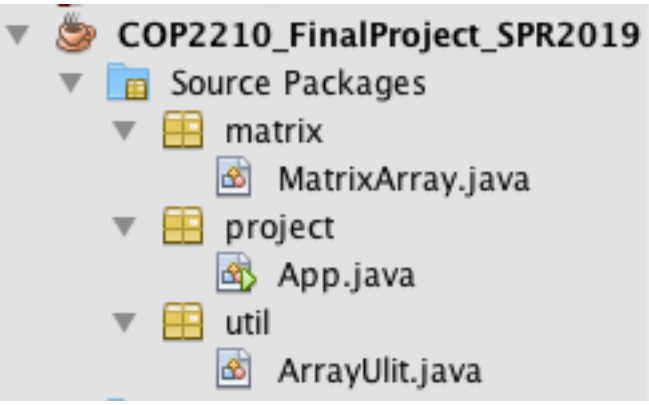
COP2210 Spring 2019 Final Project

0. This assignment is due on *Wednesday, November 28, 2018 midnight, and it is worth 15% of your grade. Note there is no extensions on the due date. So start early and see me if you get stuck.*

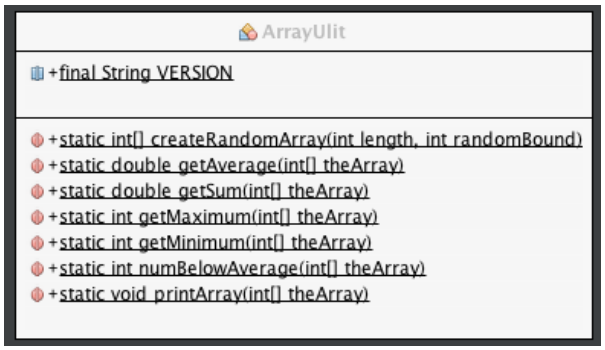
1. Create a new Netbeans Project call **COP2210_Final_Project** which has the following setup:
   - Package name **project** which contains the App.java file.
   - The **App.java** file contains the main method.
   - Package name **matrix** which contains the MatrixArray.java file.
   - Package name **ulit** which contains the ArrayUtil.java file.
   - After Netbeans has created the project add the needed file header on the top of the App.java file. Note, you will have 25% of the project score taken away if you do not do this step.



File Header below

```
//============================================================================
// PROGRAMMER:      Your name
// PANTHER ID:      Your panther ID
//
// CLASS:           COP2210
// SECTION:         Your class section: example U01
// SEMESTER:        The current semester: example Fall 2018
// CLASSTIME:       Your COP2210 course meeting time :example T/TH 9:00-10:15 am
//
// Project:         Put what this project is: example Lab 5 or Project 1
// DUE:
//
// CERTIFICATION: I certify that this work is my own and that
//                none of it is the work of any other person.
//============================================================================
```

2. Write the following code for the ArrayUlit sudo UML class diagram. Please note that version is a class final constant that you should set to “1.27”. (Hint: the code is: public static final String VERSION = “1.27”)



Method description:

- ***createRandomArray(int length, int randomBound)***
  - *this is a class method*
  - *this method creates a random array of integers of length equal to the method's parameter length and the integer have the range of the randomBound parameter.*
  - *the method returns an integer array*

- ***getAverage(int[] theArray)***
  - *this is a class method*
  - *this method calculates the average of all the values within the theArray parameter*
  - *it returns a double which is the average*

- ***getSum(int[] theArray)***
  - *this is a class method*
  - *this method calculates the sum of all values within the theArray parameter*
  - *it returns a double which is the sum*

- ***getMaximum(int[] theArray)***
  - *this is a class method*
  - *this method finds the maximum element of theArray*
  - *it returns an integer which is the maximum*

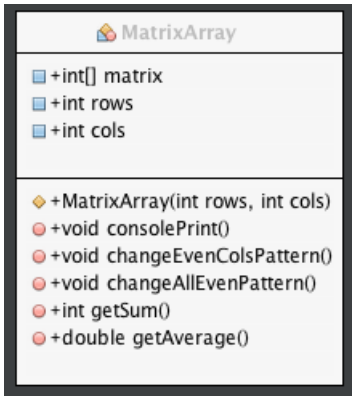
- ***getMinimum(int[] theArray)***
  - *this is a class method*
  - *this method finds the minimum element of theArray*
  - *it returns an integer which is the minimum*

- ***numBelowAverage(int[] theArray)***
  - *this is a class method*
  - *this method finds the number of how many random integers in theArray are below the average value of theArray*
  - *it returns an integer which is the number of elements in theArray below the average value*

- ***printArray(int[] theArray)***
  - *this is a class method*
  - *this method prints all the elements of the parameter theArray in the following format:*

{ 50, 23, 64, 13, 26, 31, 11, 82, 60, 93, 89, 75, 4, 15, 27 } ss

3. Write the following code for the MatrixArray sudo UML class diagram.
Hint: Do not use a double for loop. Everything is done with a single for loop and if and if else statements.



Method description:

- ***MatrixArray(int rows, int cols)***
  - *this method is a constructor that uses the rows and cols parameter to establish the matrix integer array length*
  - *it fills the matrix array with zeros*

```
0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0
0  0  0  0  0  0  0  0  0  0
```

- ***consolePrint()***
  - *this method prints the matrix to the console with the number of rows and columns of the output equal to the variables rows and cols*
  - *Use the escape combinations"\n" and "\t" in your System.out.print() to line up the output.*
  - *Hint: do not use a double for loop. All the printing is done with a single for loop and if, if else, and else statements and %, ==, != operators.*
  - **See the code output on the last page**

- ***changeEvenColsPattern()***
  - *this method changes the pattern of the matrix so every element with an even columns (in the console output) in the matrix array is equal to 0.*
  - *Hint: Do not use nested for loops. Use a single for loops one and the if, else statements and the %, == operators*

```
1	0	1	0	1	0	1	0	1	0
1	0	1	0	1	0	1	0	1	0
1	0	1	0	1	0	1	0	1	0
1	0	1	0	1	0	1	0	1	0
1	0	1	0	1	0	1	0	1	0
1	0	1	0	1	0	1	0	1	0
1	0	1	0	1	0	1	0	1	0
1	0	1	0	1	0	1	0	1	0
1	0	1	0	1	0	1	0	1	0
1	0	1	0	1	0	1	0	1	0
```

changeAllEvenPattern()

- *this method changes the pattern of the matrix to the below pattern*
- *Hint: Do not use nested for loops. Use two for loops one after another and if, else and if else statements and the %, &&, <=, > , == operators*

```
1	0	1	0	1	0	1	0	1	0
1	1	1	1	1	1	1	1	1	1
1	0	1	0	1	0	1	0	1	0
1	1	1	1	1	1	1	1	1	1
1	0	1	0	1	0	1	0	1	0
1	1	1	1	1	1	1	1	1	1
1	0	1	0	1	0	1	0	1	0
1	1	1	1	1	1	1	1	1	1
1	0	1	0	1	0	1	0	1	0
1	1	1	1	1	1	1	1	1	1
```

- ***getSum()***
  - *this method calculates the sum of all values within the matrix array*
  - *it returns a double which is the sum*

- ***getAverage()***
  - *this method calculates the average of all values within the matrix array*
  - *it returns a double which is the average*

continue on next page....

4. Use the code given below for your App.java file. Remember your imports.... `public class App {`

```
 public static void main(String[] args) {

        int[] rnds = ArrayUlit.createRandomArray(15,100);

        System.out.println("15 Elements of the random Array");
        System.out.println("-------------------------------------------------------------");
        ArrayUlit.printArray(rnds);
        System.out.println("-------------------------------------------------------------");
        System.out.println("");

        System.out.println("Array Sum = "  + ArrayUlit.getSum(rnds));
        System.out.println("Array Average = "  + ArrayUlit.getAverage(rnds));
        System.out.println("Array Elements below the Average = "  +
                                    ArrayUlit.numBelowAverage(rnds));
        System.out.println("Array Maximum = "  + ArrayUlit.getMaximum(rnds));
        System.out.println("Array Minimum = "  + ArrayUlit.getMinimum(rnds));

        System.out.println("\n\n");


        System.out.println("-------------------------------------------------------------");
        System.out.println("Elements of a 10x10 MatrixArray");
        System.out.println("-------------------------------------------------------------");


        MatrixArray matrixArray = new MatrixArray(10,10);
        matrixArray.consolePrint();
        System.out.println("Sum of Matrix = " + matrixArray.getSum());
        System.out.println("Average of Matrix = " + matrixArray.getAverage());
        System.out.println("-------------------------------------------------------------");
        System.out.println("\n");


        matrixArray.changeEvenColsPattern();
        matrixArray.consolePrint();
        System.out.println("Sum of Matrix = " + matrixArray.getSum());
        System.out.println("Average of Matrix = " + matrixArray.getAverage());
        System.out.println("-------------------------------------------------------------");
        System.out.println("\n");

        matrixArray.changeAllEvenPattern();
        matrixArray.consolePrint();
        System.out.println("Sum of Matrix = " + matrixArray.getSum());
        System.out.println("Average of Matrix = " + matrixArray.getAverage());
        System.out.println("-------------------------------------------------------------");
        System.out.println("\n");

    }//end main()
}//end App
```

5. Upload your ENTIRE ZIPPED Netbeans project to canvas via Project Assignment link before its due date. THERE WILL BE NO EXTENSION FOR THE PROJECT. Thank you for understanding.

continue on next page....

A sample of the project's console output is on the next page.

```
15 Elements of the random Array
-----------------------------------------------------------
90, 74, 79, 79, 42, 45, 71, 69, 33, 68, 47, 5, 88, 23, 64
-----------------------------------------------------------

Array Sum = 877.0
Array Average = 58.46666666666667
Array Elements below Avergae = 6
Array Maximum = 90
Array Minimum = 5

-------------------------------------------------------------------------------
Elements of a 10x10 MatrixArray
-------------------------------------------------------------------------------
0       0       0       0       0       0       0       0       0       0
0       0       0       0       0       0       0       0       0       0
0       0       0       0       0       0       0       0       0       0
0       0       0       0       0       0       0       0       0       0
0       0       0       0       0       0       0       0       0       0
0       0       0       0       0       0       0       0       0       0
0       0       0       0       0       0       0       0       0       0
0       0       0       0       0       0       0       0       0       0
0       0       0       0       0       0       0       0       0       0
0       0       0       0       0       0       0       0       0       0

Sum of Matrix = 0
Average of Matrix = 0.0
-------------------------------------------------------------------------------


1       0       1       0       1       0       1       0       1       0
1       0       1       0       1       0       1       0       1       0
1       0       1       0       1       0       1       0       1       0
1       0       1       0       1       0       1       0       1       0
1       0       1       0       1       0       1       0       1       0
1       0       1       0       1       0       1       0       1       0
1       0       1       0       1       0       1       0       1       0
1       0       1       0       1       0       1       0       1       0
1       0       1       0       1       0       1       0       1       0
1       0       1       0       1       0       1       0       1       0

Sum of Matrix = 50
Average of Matrix = 0.5
-------------------------------------------------------------------------------


1       0       1       0       1       0       1       0       1       0
1       1       1       1       1       1       1       1       1       1
1       0       1       0       1       0       1       0       1       0
1       1       1       1       1       1       1       1       1       1
1       0       1       0       1       0       1       0       1       0
1       1       1       1       1       1       1       1       1       1
1       0       1       0       1       0       1       0       1       0
1       1       1       1       1       1       1       1       1       1
1       0       1       0       1       0       1       0       1       0
1       1       1       1       1       1       1       1       1       1

Sum of Matrix = 75
Average of Matrix = 0.75
-------------------------------------------------------------------------------
```