Concordia University
COMP 248 – Winter 2021
Assignment 3

Due Date:	By 11:55 PM, March 19, 2021
Evaluation:	5% of final mark (see marking rubric at the end of handout)
Late Submission:	none accepted
Purpose:	The purpose of this assignment is to help you learn Java arrays
CEAB/CIPS ATTRIBUTES:	Design/Problem analysis/Communication Skills

General Guidelines When Writing Programs:
Refer to assignment #1 handout.

Question 1: Magic Matrix

Magic square is an $n \times n$ matrix that is filled with the numbers $1,2,3,\ldots\ldots,n^2$ is a magic square if the sum of the elements in each row, in each column, and in the two diagonals is the same value.

6	1	8
7	5	3
2	9	4

Write a Java code to randomly generate a `3X3` matrix and check if the matrix is the magic square. In your code you must test two features:

a. Does each of the numbers 1,2,3,….9 occur in the matrix?
b. Are the sums of the rows, columns, and diagonals equal to each other?

Sample Output could be as follows:

Sample 1:

```
The randomly generated matrix is:
        4       3       8
        9       5       1
        2       7       6
```

Sample 2:

```
The randomly generated matrix is:
        4       9       2
        3       5       7
        8       1       6
```

Question 2: Image Quantization

Use a one-dimensional array to solve the following problem: You want to eventually perform some basic compression on an image. Assume that you will only be operating on a single row of the image, and that pixel colors are represented as simple numbers in the array. You are required to quantize the values of the pixels in the row. In other words, any pixel values appearing in a range will assume a value in that range as indicated below. This creates redundancy that can lead to better compression.
Overwrite the original values in the array as follows:

Pixel value	Quantized value
0 to 20	10
21 to 40	30
41 to 60	50
61 to 80	70
81 to 100	90
101 to 120	110
121 to 140	130
141 to 160	150
161 to 180	170
More than 180	190

In your output you must print the array with the new, quantized values.

Sample Output could be as follows:

Sample 1:

```
Please input pixel values :
pixel 1 : 17
pixel 2 : 32
pixel 3 : 47
pixel 4 : 78
pixel 5 : 93
pixel 6 : 112
pixel 7 : 134
```

```
pixel 8 : 154
pixel 9 : 177
pixel 10 : 215
Quantized pixel values :
10 30 50 70 90 110 130 150 170 190
```

Sample 2:

```
Please input pixel values :
pixel 1 : 34
pixel 2 : 26
pixel 3 : 89
pixel 4 : 90
pixel 5 : 123
pixel 6 : 453
pixel 7 : 88
pixel 8 : 59
pixel 9 : 179
pixel 10 : 15
Quantized pixel values :
30 30 90 90 130 190 90 50 170 10
```

Submitting Assignment 3

What to submit:

Zip the 2 source codes (the .java files only please, **not** the entire project) of this assignment as a .ZIP file (**NOT** .RAR) using the following naming convention:
a#_studentID, where # is the number of the assignment and *studentID* is your student ID number. For example, for this second assignment, student 123456 would submit a zip file named a2_123456.zip

Evaluation Criteria for Assignment 3	
Source Code	
Comments for all 2 questions (3 pts.)	
Description of the program (authors, date, purpose)	1 pt.
Description of variable and constants	1 pt.
Description of the algorithm	1 pt.
Programming styles for all 2 questions (3 pts.)	
Use of significant names for identifiers	1 pt.
Indentation and readability	1 pt.
Welcome Banner/Closing message	1 pt.
Question 1 (8 pts.)	
The usage of the 2D array	2 pts.
The algorithm used to identify the magic matrix	4 pts.
The correctness of displaying the magic matrix.	2 pts.
Question 2 (6 pts.)	
The usage of the array	2 pts.
Implementation of code to quantize the image	3 pts.
The correctness of displaying the result	1 pts.
TOTAL	**20 pts.**