UNIVERSITY OF KWAZULU-NATAL

COMP102: Compute Programming

Practical 6: Object-Oriented Programming

Thursday, 22 September 2022

Question 1: Square Matrix

Create a class that represents a square matrix (2D array) of integers. The class should have only a single attribute:

- A 2D integer array

The class must have the following methods:

- A **constructor** with two parameters: one for the number of rows, another for the number of columns. This constructor should then initialise the 2D integer array attribute with an array of the size specified by the parameters, using random values between 0 and 20. You need to ensure that the number or rows and columns passed to the constructor isn't negative
- A method which displays the square matrix on the console without returning any value
- A method which finds the row with the greatest sum and returns it as a 1D array
- A method which finds the column with the least sum and returns it as a 1D array

Finally, create a class called **TestSquareMatrix** which will test all the **SquareMatrix** methods using at least three objects.

Question 2: Loan Class

Create a class that represents a loan that one may secure from a bank. The class should have the following attributes:

- The initial amount borrowed
- The rate of interest per year
- The term of the loan in number of years

The following methods should be implemented:

- A **constructor** that initialised the attributes of the class appropriately. Note that we cannot borrow negative amounts of money, nor can the interest rate or loan term be negative

- A method that returns the total amount that must be paid back if **simple** interest is used
- A method that returns the total amount that must be paid back if **compound** interest is used. This method must receive a value which indicates the number of times interest is applied per year
- A method which returns the monthly instalments on the loan if **simple** interest is used
- A method which returns the monthly instalments on the loan if **compound** interest is used. This method must receive a value which indicates the number of times interest is applied per year

Finally, create a class called **TestLoan** which will test all the **Loan** class methods using at least three objects.

Question 3: Rectangle

Create a class named **Rectangle** that represents a 2D rectangle. It should contain the following attributes:

- Length
- Breath

Implement the following set of methods for the **Rectangle** class:

- A **constructor** that allows for the safe construction of a **Rectangle** object. For example, we should not be allowed to create a rectangle with a length or breath that is negative or equal to 0
- A method that returns the perimeter of the **Rectangle** object
- A method that returns the area of the **Rectangle** object

Finally, create a class called **TestRectangle** that tests all of the methods of the **Rectangle** class.

Question 4: String Comparator

Create a class named **StringComparator** that has the following attributes:

- A first string
- A second string

This class must have the following methods:

- A **constructor** to initialise the values of the two string attributes. Note that both strings should be converted to all lowercase letters if they are not already so
- A method which returns the string with the greater number of vowels. If both strings contain the same number of vowels, the string “tie” should be returned
- A method which returns the string that would appear first in a dictionary
- A method which accepts a letter of the alphabet, and returns the string with a greater count of that letter. If there is a tie, the string “tie” should be returned

Write another class called **TestStringComparator** which will test all of the methods of the **StringComparator** class using at least three objects.

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