CSC600 Advanced Programming

Week 2 - Assignment

1. Write a Java FX GUI program to maintain an array of arbitrary size. Use a starting default of size 20 and populate it with random data (numbers) initialized into the array. The GUI should be such that users can select and perform the actions listed below. Write methods and select appropriate GUI mechanisms to do the following:

    a) Display the contents of the array
    b) Add a, or a group of numbers to the array at any position.
    c) Delete a number from the array at any position.
    d) Sort the array and display the original and sorted forms.
    e) Display the size of the array.
    f) Search for a number and its occurrences in the array and flag that numbers position(s) by highlighting it in the display.

2. The First National Bank of San Diego has tasked you to write a mortgage analyzer library for its loan officers to use. For this lab you are only required to create a set of Java objects that represent the applications business logic.

No GUI is required for this assignment. The next lab will then ask you to add a GUI over this library. Using the following simple use cases implement a set of Java classes and interfaces for the following actions:

a) The user can enter the amount of the loan, the annual rate of interest, and the duration of the loan in months.
b) The user can run a verification check on the information that was entered to make sure it is reasonable.
c) If bad or anomalous data was entered in setting up details of the loan the user should advised and allowed to correct the input data.
d) Once the data is verified to be correct or reasonable the user can click a button to get the following example information using one or a series of API calls:

Amount of Loan	- $140000
Annual Interest Rate	- 8.00%
Duration of loan in months	- 360
Monthly payment	- $1027.27
Total interest paid	- $229,817.20

The formula for the monthly payment is:

$$payment = p * r * (1 + r)^n / ((1 + r)^n - 1)$$

where p is the principal amount of the loan, r is the monthly interest rate (annual rate divided by 12) given as a number between 0 (for 0 percent) and 1 (for 100 percent), and n is the duration of the loan (number of pay periods e.g., 360). The formula for the total interest paid is:

$$Total\ interest = n * payment - p$$

e) Also create a unit test for your library, and as an example the following data can be used to test your program:

Input:

Amount of Loan	- $140000
Annual Interest Rate	- 8.00%
Duration of loan in months	- 360

Output:

Monthly payment	- $1027.27
Total interest paid	- $229,817.20

3. The First National Bank of San Diego has tasked you to write a GUI interface for their mortgage analyzer library from Lab#1 for its loan officers to use. For this lab you are only required to create a Java FX GUI that provides the correct set of controls and layout for the loan officer to be able to do their work. Create a GUI that enables the loan officer to:

   a) Enters the amount of the loan, the annual rate of interest, and the duration of the loan in months.
   b) Run a verification check on the information that the user entered to make sure it is correct, and the numbers are reasonable.
   c) If bad or anomalous data was entered in setting up details of the loan the user should be advised and allowed to correct the input data.
   d) Once the data is verified to be correct the user can click a button to display the following information nicely aligned and formatted:

Amount of Loan	$...
Annual Interest Rate	… %
Duration of loan in months	…
Monthly payment	$...
Total interest paid	$...

   Do not perform business logic actions or calculations in the GUI, keep things for the loan in a separate loan calculator class – instantiate appropriate interface or loan related objects and use those APIs to populate or drive GUI elements.