Assignment 02 Sample Algorithmic Design Document

Make a copy before you begin (File -> Make a copy). Add the Assignment # above and complete the sections below BEFORE you begin to code. The sections will expand as you type. When you are finished, download this document as a PDF (File -> Download -> PDF) and submit it to D2L.

This document contains an interactive checklist. To mark an item as complete, click on the box.

Planning your program before you start coding is part of the development process. In this document, you will:

- Step 1: Write a detailed description of your program, at least two complete sentences
- Step 2: Design a sample run with test input and output
- Step 3: Algorithm design
  - ☐ Identify the program inputs and their data types
  - ☐ Identify the program outputs and their data types
  - ☐ Identify any calculations or formulas needed
  - ☐ Write the algorithmic steps as pseudocode or a flowchart. Look at the Pseudocode syntax at the bottom of this document. Tools for flowchart - Draw.io - Diagrams.net

Video

Watch the video for this sample assignment. The video uses repl.it as the IDE, but you can use IDLE or Pycharm to code your assignment.

Program SampleA02.py

Notes

- You cannot use the comma operator (,) for concatenation (string building). If you want to build a string up, use the plus operator (+). The sample will show you how to do this.

1. Program Description

In the box below, describe the purpose of the program. You must include a detailed description with at least two complete sentences.

Program description:
Develop a program that will calculate Simple Interest or Auto Loan based on user input. The program will take an option, and make a choice. If the choice is Simple interest, it will read the principal amount, rate and period and output the interest amount and total amount.

If the option is Auto Loan, it will read the price of the car, rate, and number of monthly payments and output the monthly payment.

2. Sample Run

If you are designing your own program, you will start with a sample run. Imagine a user is running your program - what will they see? What inputs do you expect, and what will be the outputs from the given inputs? Choose test data you will use to test your program. Calculate and show the expected outputs. Use the sample run to test your program.

Sample run:

Sample #1 (User input in blue)

```
Welcome to my Multi-Option Calculator!

Please pick an option from below:
(S) Simple Interest
(A) Auto Loan

>>s

Enter the principal amount: $300
Enter the rate in percentage: 3.75
Enter the period: 10

Your interest accrued is $112.50
Your total amount with interest is $ 412.50

Thank you for using my interest calculator!!
```

Sample #2 (User input in blue)

```
Welcome to my Multi-Option Calculator!

Please pick an option from below:
(S) Simple Interest
(A) Auto Loan
(Q) Quit
>>S

Enter the principal amount: $5500
Enter the rate in percentage: 2.5
Enter the period: 5

Your interest accrued is $687.50
Your total amount with interest is $ 6187.50

Thank you for using my interest calculator!!
```

Sample #3 (User input in blue)

```
Welcome to my Multi-Option Calculator!

Please pick an option from below:
(S) Simple Interest
(A) Auto Loan
(Q) Quit
>>j

Invalid option!! Please try again later!!
```

Sample #4 (User input in blue)

```
Welcome to my Multi-Option Calculator!

Please pick an option from below:
(S) Simple Interest
(A) Auto Loan
(Q) Quit
>>A

Enter the price of the car: $75000
Enter the rate in percentage: 2.75
Enter the number of months: 60

Your total monthly payment is $ 1339.34

Thank you for using my Auto Loan calculator!!
```

3. Algorithmic Design

Before you begin coding, **you must first plan out the logic** and think about what data you will use to test your program for correctness. All programmers plan before coding - this saves a lot of time and frustration! Use the steps below to identify the inputs and outputs, calculations, and steps needed to solve the problem.

Algorithmic design:
a. Identify and list all of the user input and their data types.
• option as a string • principal as float (for both Simple Interest and Auto Loan) • rate as float (for both Simple Interest and Auto Loan) • period as int (for Simple Interest) • numMonths as int (for Auto Loan)
b. Identify and list all of the user output and their data types.
• interest as float

- totalAmount as float
- monthlyPayment as float

c. What calculations do you need to do to transform inputs into outputs? List all formulas needed, if applicable. If there are no calculations needed, state there are no calculations for this algorithm.

Calculations for simple interest

- interest = principal * (1 +((rate / 100) * period)) - principal
- totalAmount = principal + interest

Calculations for Auto Loan

- monthlyPayment = (principal * (rate / 12)) / (1 - (1 + rate / 12)^(-1 * numMonths))

d. Design the logic of your program using pseudocode or flowcharts. Here is where you would use conditionals, loops or functions (if applicable) and list the steps in transforming inputs into outputs. Walk through your logic steps with the test data from the assignment document or the sample run above.

1. DISPLAY Welcome Message.
2. DECLARE variable option as string
3. DECLARE variables principal, rate, interest, totalAmount, monthlyPayment as float
4. DECLARE variables period, numMonths as integers
5. DISPLAY message for calculator options
6. INPUT into option
7. SET option to uppercase option
8. IF option is S THEN
    a. DISPLAY prompt - Enter the principal amount: $
    b. INPUT into principal
    c. DISPLAY prompt - Enter the rate in percentage:
    d. INPUT into rate
    e. DISPLAY prompt - Enter the period in years:
    f. INPUT into period
    g. SET interest = principal * (1 +((rate / 100) * period)) - principal
    h. SET totalAmount = principal + interest
    i. DISPLAY interest and totalAmount appropriately for money
9. ELSE IF option is A THEN
    a. DISPLAY prompt - Enter the price of the car: $
    b. INPUT into principal
    c. DISPLAY prompt - Enter the rate in percentage:
    d. INPUT into rate
    e. DISPLAY prompt - Enter the number of monthly payments:

    f. INPUT into numMonths
    g. SET monthlyPayment = (principal * (rate / 12)) / (1 - (1 + rate / 12)^(-1 * numMonths))
    h. DISPLAY monthlyPayment appropriately for money
10. ELSE
    a. DISPLAY Invalid option, error message.
11. END IF
12. DISPLAY Thank you message and END program