SEHH2042 Computer Programming

Individual Assignment 1
Submission deadline: 18:00, 21 Oct 2022 (Friday)

Expected Learning Outcomes

- Familiarize themselves with at least one high level language programming environment.
- Develop a structured and documented computer program.
- Apply the computer programming techniques to solve practical problems.

Introduction

This is an **individual assignment**.

You are given a C++ program template file called *A1Template.cpp*. You are required to **insert C++ codes into the template file** according to the given instructions. The final file (your submission) will be a complete C++ program, which can be compiled and executed successfully and is able to satisfy all the requirements in this specification.

Instruction

- To answer the questions, you need to insert codes into the functions *as specified in the template file*. E.g., to answer question 1, write your code in the scope of *Q1( )*. When the program is executed, enter the question number to run the code of a particular question.
- You may write user-defined functions to solve the questions. E.g., you may write a user-defined function for solving question 1, and call it in the given function *Q1( )*.
- You can include more header files in the template file if necessary. ***(refer to additional information on page 6)***
- Apart from inserting codes as mentioned above, you are **NOT** allowed to modify any given codes in the template file.
- You may assume that user always provides valid input. **NO error input checking** is required unless required by the question.
- You need to do **either odd or even version** of a question according to your student ID number, and follow **EXACTLY** the requirement and sample output format as stated in the questions. Note that **NO** prompt messages is required in all questions.
- **IMPORTANT**: Make sure that your file **CAN be opened**, and has **NO syntax error**. Check the correctness of your code by executing it before your submission.

ShowInfo (10%)

Insert your code in the showInfo function so that your personal particulars are displayed in the following format when the program executes:

Sample display:

```
Name       : XXX YYY ZZZ
Student ID: 22xxxxxxA
Class      : 101A
```

Question 1 (15%)

Write a program that accepts user's inputs: the height (1st input) and the radius (2nd input) of the base of a cylinder and outputs the volume or the surface area of the cylinder (either one, based on your Student ID). Format the output to **three decimal places**. Use $\pi = 3.1415926536$.

Useful formula:

Volume of the cylinder:
$V = \pi r^2 \ h$

Surface area of the cylinder:
$A = 2\pi rh + 2\pi r^2$

3rd digit of Student ID	Output
Odd	Volume
Even	Surface area

Sample display (for odd)

```
8.8
2.1
121.919
```

Sample display (for even)

```
8.8
2.1
143.822
```

IMPORTANT NOTE: For all questions, you need to follow all text and order as shown in the sample display. Be careful to match exactly the spacing and spelling. There should be no additional blank lines in the output.

Question 2 (20%)

Write a program to calculate the total charges for a buffet based on number of persons (adult, child or senior) according to Table 1. The program accepts 3 integers in order: the number of adults, the number of children, and the number of seniors. It then outputs the total charge.

If the number of people is more than 6, a 15% discount will be given. Otherwise, there will be no discount at all. The total charge is subject to 10% service charge (based on the **original** price). Format the output to **two decimal places**.

5th digit of Student ID	Adult	Child	Senior
Odd	$758	$468	$598
Even	$798	$488	$618

Sample display (for odd)
2
1
1
2840.20

Sample display (for even)
2
1
1
2972.20

Sample display (for odd)
4
3
2
5350.40

Sample display (for even)
4
3
2
5597.40

Question 3 (25%)

Write a program that reads a principal amount (1st input) and repayment period (year, 2nd input) to calculate the minimum monthly income requirement based on the debt-to-income ratio in property mortgage lending. (Debt to income ratio is set at 50% so the minimum monthly income requirement is equal to twice the monthly payment). The output should be **rounded to the nearest integer**.

Note: You should use repetition structure, with for/while loop, and NOT <*cmath*> library functions in this question.

Mortgage Formula:

$$M = P\frac{(1+r)^n}{(1+r)^n - 1}$$

Where M = Monthly payment, P= Principal amount,
r= monthly percentage rate, n = Number of repayments (months)

4th digit of Student ID	Annual Interest Rate
Odd	2.5%
Even	2.625%

Sample display (for odd)
5000000
30
39512

Sample display (for even)
5000000
30
40165

Question 4 (30%)

Print the pattern below according to the size (a positive integer) input by user.

If the input integer is 0, negative or an even number, then your program should print nothing.

Odd Version (odd 6th digit in student ID)

Sample display

9

```
*********
**       *
* *      *
*  *     *
*   *    *
*  *     *
* *      *
**       *
*********
```

Even Version (even 6th digit in student ID)

Sample display

9

```
*********
*       **
*      * *
*     *  *
*    *   *
*     *  *
*      * *
*       **
*********
```

More examples

Input	Output (Odd Version)	Output (Even Version)

5	`*****`
	`**  *`
	`* **`
	`**  *`
	`*****`
		`*****`
		`*  **`
		`* * *`
		`*  **`
		`*****`

3	`***` `***` `***`	`***` `***` `***`
1	`*`	`*`
4		

Note: There should be no blank line in the output. You should use repetition structure, with appropriate nested-loop, and NOT <*iomanip*> library functions in this question.

Submission

You are required to **insert your C++ code into the given template file**, and submit the **final** source file to Moodle before the deadline. Use your student ID and your name as the filename: ***StudentID_Name.cpp***. Remove all spaces, hyphens and other non-letter characters in the filename. A correct filename should look like: 12345678A_ChanTaiMan.cpp.

Grading

Your program (i.e. the template file with your answers) will be executed by script with different test cases in **Microsoft Visual Studio** using the **Release** setting. The tester will execute the program and enter the question number in "Program Selection Menu" to test a particular question. The program will be restarted for testing each question individually.

You need to follow **EXACTLY** the above input and output requirements. Any deviation from the requirement is considered as incorrect and **no mark** is given for that test case.

Late submission: 100% deduction. **No late submission is allowed**. Submit your work to Moodle some time ahead of the deadline. Late submissions due to slow internet speed will not be accepted.

Syntax error: 5% - 20% deduction depends on the seriousness of the syntax error. You will get **0 mark** if your program contains too many syntax errors. Check your final source file using Microsoft Visual Studio (not those online compliers) carefully before submission.

Runtime error: No mark for the particular test case that triggers the runtime error (e.g. infinite loop, divide by zero, etc.).

Logic error (bug): No mark for the particular test case that deviates from the requirement. Note that a logic error may lead to **failure in ALL test cases** of a question, e.g. displaying incorrect messages, incorrect spelling and spacing, incorrect number format, or incorrectly decide the odd/even version, etc.

Ensure the originality of your work. Plagiarism in any form is highly prohibited.

Additional Information

If you implement the questions in separated source files, you need to copy the program codes into the template file for assignment submission. Make sure to **test the final source file (i.e. template file with your answers)** in Microsoft Visual Studio before submission.

myQuestion1.cpp

```
#include <iostream>
#include <iomanip>
using namespace std;

void display(int n) {
    cout << "This is appendix\n";
    cout << "Display a number: " << setw(5) << n;
}

int main() {
    int number = 1234;
    display(number);
    return 0;
}
```

Template.cpp

```
// Insert more header files when necessary
#include <iostream>
#include <iomanip>
using namespace std;

void showInfo()
{
    // Insert your codes to display your personal particulars here
}

// Insert your function, class (if any) for Q1() here
void display(int n) {
    cout << "This is appendix\n";
    cout << "Display a number: " << setw(5) << n;
}

void Q1()
{
    // Insert your codes for Question 1 here
    int number = 1234;
    display(number);
}

// ... the rest of the template file ...
```

1. The **header files** included in your program should also be included in the template file.
2. The **user-defined function / class** for a question should be copied **before** the question.
3. The program **main body, except "return 0"**, should be copied to the function body of the corresponding question.

- End -