CL-118
Programming
Fundamentals Lab # 16

Objectives:

- Practice and understanding on basic c++ programs
- Arrays
- Pre-Defined Functions
- User Defined functions

Note: Carefully read the following instructions (*Each instruction contains a weightage*)

1. Use proper **font family (Calibri or Times New Roman)** and **font size** of the **title (16 points), heading (14 points), subheading (12 points),** and **normal text (10 points)**.
2. First think about the problem statement and then write/draw your logic on paper.
3. **Microsoft Visual Studio** should be used to make c++ programs. Programs made with any other software would not be accepted.
4. For each task in the manual create a new C++ program with the naming convention as follows:
   TASK-NO
5. **Mention what is happening in each line of code using comments**.
6. Write all codes one by one with proper numbering and also paste screen shot of each problem using the **snipping tool** (default screen capture software in windows) on **Microsoft word file.**
7. Please submit your file with this naming convention **ROLLNO_SECTION_GROUPNO_LABNO**.
8. Do not copy from any source otherwise, you will be penalized with zero marks.
9. Submit your lab on **Google Classroom**.

Problem: 1 | Pre-defined function

Determine the value of each of the following expressions.

1. abs(-4)
2. fabs(10.8)
3. fabs(-2.5)
4. pow(3.2, 2)
5. pow(2.5, 3)
6. sqrt(25.0)
7. sqrt(6.25)
8. pow(3.0, 4.0) / abs(-9)
9. floor(28.95)
10. ceil(35.2)

Problem: 2 | Pre-defined function

Using the functions described in **Table 6-1 in DS Malik**, write each of the following as a C++ expression. (The expression in (e) denotes the absolute value of x + 2.5.)

a. $2.0^{5.2}$ b. $\sqrt{x+y}$ c. u^{v-3} d. $\frac{-b+\sqrt{b^2-4ac}}{2a}$ e. $|x+2.5|$

Problem: 3 | User-defined function

Write a function that displays at the left margin of the screen a solid square of any character whose side is specified in integer and character parameter. For example, if side is 4 and character is *, the function displays the following

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

Problem: 4 | User-defined function

Write a function that takes an integer value and returns the number with its digits reversed. For example, given the number 7631, the function should return 1367.

Problem: 5 | User-defined function

Write a function multiple that determines for a pair of integers whether the second is a multiple of the first. The function should take two integer arguments and return true if the second is a multiple of the first, false otherwise. Use this function in a program that inputs a series of pairs of integers.

Problem: 6 | User-defined function

Write a value-returning function, isVowel that returns the value true if a given character is a vowel and otherwise returns false.

Problem: 7 | User-defined function

Write a program that will take an integer value as an argument in function cube and return cube of that number. Use only a single statement in function.

Problem: 8 | User-defined function

An integer is said to be a perfect number if the sum of its divisors, including 1 (but not the number itself), is equal to the number. For example, 6 is a perfect number, because 6=1 +2+ 3. Write a function isPerfect that determines whether parameter number is a perfect number. Use this function in a program that determines and prints all the perfect numbers between 1 and 1000. Print the divisors of each perfect number to confirm that the number is indeed perfect.

Problem: 9 | User-defined function

Write a function qualityPoints that inputs a student's average and returns 4 if a student's average is 90–100, 3 if the average is 80–89, 2 if the average is 70–79, 1 if the average is 60–69 and 0 if the average is lower than 60.

Problem: 10 | User-defined function

Write a program that simulates coin tossing. For each toss of the coin, the program should print Heads or Tails. Let the program toss the coin 100 times and count the number of times each side of the coin appears. Print the results. The program should call a separate function flip that takes no arguments and returns 0 for tails and 1 for heads.

Problem: 11 | User-defined function

Write a complete C++ program with the two alternate functions specified below, each of which simply triples the variable count defined in main. Then compare and contrast the two approaches. These two functions are

a) function tripleByValue that passes a copy of count by value, triples the copy and returns the new value and

b) function tripleByReference that passes count by reference via a reference parameter and triples the original value of count through its alias (i.e., the reference parameter).

Problem: 12 | User-defined function

Write a program that swap three number using pass by reference function technique

Problem: 13 | User-defined function

Write a program to make a calculator which perform 4 operations +,-,* and /. Input two integer values and pass these values with operator and return result of selected operation.

Problem: 14 | User-defined function

Explain line by line in comments what happened in this program

Hint: Read chapter number 7 from book DS Malik

```
#include <iostream>
using namespace std;
void addFirst(int& first, int& second);
void doubleFirst(int one, int two);
void squareFirst(int& ref, int val);
int main()
{
	int num = 5;
	cout << "Line 1: Inside main: num = " << num
		<< endl; //Line 1
	addFirst(num, num); //Line 2
	cout << "Line 3: Inside main after addFirst:"
		<< " num = " << num << endl; //Line 3
	doubleFirst(num, num); //Line 4
	cout << "Line 5: Inside main after "
		<< "doubleFirst: num = " << num << endl; //Line 5
	squareFirst(num, num); //Line 6
	cout << "Line 7: Inside main after "
		<< "squareFirst: num = " << num << endl; //Line 7
	return 0;
}
void addFirst(int& first, int& second)
{
	cout << "Line 8: Inside addFirst: first = "
		<< first << ", second = " << second << endl; //Line 8

	first = first + 2; //Line 9

	cout << "Line 10: Inside addFirst: first = "
		<< first << ", second = " << second << endl; //Line 10
		second = second * 2; //Line 11
	cout << "Line 12: Inside addFirst: first = "
		<< first << ", second = " << second << endl; //Line 12
}
void doubleFirst(int one, int two)
```

```
{
	cout << "Line 13: Inside doubleFirst: one = "
		<< one << ", two = " << two << endl; //Line 13
	one = one * 2; //Line 14
	cout << "Line 15: Inside doubleFirst: one = "
		<< one << ", two = " << two << endl; //Line 15
	two = two + 2; //Line 16
	cout << "Line 17: Inside doubleFirst: one = "
		<< one << ", two = " << two << endl; //Line 17
}
void squareFirst(int& ref, int val)
{
	cout << "Line 18: Inside squareFirst: ref = "
		<< ref << ", val = " << val << endl; //Line 18
	ref = ref * ref; //Line 19
	cout << "Line 20: Inside squareFirst: ref = "
		<< ref << ", val = " << val << endl; //Line 20
	val = val + 2; //Line 21
	cout << "Line 22: Inside squareFirst: ref = "
		<< ref << ", val = " << val << endl; //Line 22
 }
```

Problem: 15 | User-defined function

Write a program to convert the time from 24-hour notation to 12-hour notation and vice versa. Your program must be menu driven, giving the user the choice of converting the time between the two notations. Furthermore, your program must contain at least the following function: a function to convert the time from 24-hour notation to 12-hour notation, a function to convert the time from 12-hour notation to 24-hour notation, a function to display the choices, function to get the input, and function to display the results. (For 12-hour time notation, your program must display AM or PM.). Use function pass by reference where arguments needed.

Best of luck ☺

You are done with your exercise, submit on slate at given time.