CL-217
Programming
Fundamentals Lab # 10

Objectives:

- Practice and understanding on basic c++ programs
- Control Structure(repetition)
- While loop statement
- Counter control loop variable
- Sentinel controlled loop
- Flag controlled loop
- For loop

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 **title (16 points), heading (14 points), sub heading (12 points)** and **normal text (10 points)**.
2. First think about 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 **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 negative marks.
9. Submit your lab on **Google Classroom**.

Problem: 1 (While loop, counter control variable)

Effective January 1st of each year, Ali receives a 5% raise on his previous year's salary. He wants a program that calculates and displays the amount of his annual raises for the next three years. The program also should calculate and display his total salary for the ten years.

Problem: 2 (while loop, counter control variable)

Write a program which finds the two largest numbers among the 10 numbers. You must input each number only once.

Problem: 3 (for loop, counter control variable)

Secondhand Rose Resale Shop is having a seven-day sale during which the price of any unsold item drops 10 percent each day. The inventory file includes an item number, description, and original price on day one. For example, an item that costs $10.00 on the first day costs 10 percent less, or $9.00, on the second day. On the third day, the same item is 10 percent less than $9.00, or $8.10.
Design an application that reads inventory records of 3 items and produces a report that shows the price of every item on each day, one through seven.

Problem: 4 (for loop, counter control variable)

The state of Florida maintains a census file in which each record contains the name of a county, the current population, and a number representing the rate at which the population is increasing per year. For example, one record might contain Miami-Dade County, 2,253,000, and 2 percent. The governor wants a report that lists each county and the number of years it will take for the population of the county to double, assuming the present rate of growth remains constant. Design an application that reads records from user and displays the county's name and the number of years it will take for the population to double. If a county's record contains a negative growth rate, then instead of displaying the number of years it takes for the population to double, display a message that indicates that the population is never expected to double.

Problem: 5

Write a program that prompts the user to input an integer and then outputs both the **individual digits of the number** and the **sum of the digits**. For example, it should output the individual digits of 3456 as 3 4 5 6 and sum is 3+4+5+6 = 18, output the individual digits of 8030 as 8 0 3 0 and sum is 8+0+3+0 = 11, output the individual digits of 2345526 as 2 3 4 5 5 2 6 and sum is 2+3+4+5+5+2+6 = 27, output the individual digits of 4000 as 4
0 0 0 sum is 4+0+0+0 = 4, and output the individual digits of -2345 as 2 3 4 5 sum is 2+3+4+5 = 14.

Problem: 6

Write a program that prompts the user to input a positive integer. It should then output a message indicating whether the number is a prime number. (Note: An even number is prime if it is 2. An odd integer is prime if it is not divisible by any odd integer less than or equal to the square root of the number.)

Problem: 7

Let n = akak-1ak-2. . .a1a0 be an integer and t = a0 - a1 + a2 - ... + (-1)k ak. It is known that n is divisible by 11 if and only if it is divisible by 11. For example, suppose that n = 8784204. Then, t = 4 - 0 + 2 - 4 + 8 – 7 + 8 = 11. Because 11 is divisible by 11, it follows that 8784204 is divisible by 11.
If n = 54063297, then t = 7 - 9 + 2 - 3 + 6 - 0 + 4 - 5 = 2. Because 2 is not divisible by 11, 54063297 is not divisible by 11. Write a program that prompts the user to enter a positive integer and then uses this criterion to determine whether the number is divisible by 11.

Problem: 8

When you borrow money to buy a house, a car, or for some other purpose, you repay the loan by making periodic payments over a certain period of time. Of course, the lending company will charge interest on the loan. Every periodic payment consists of the interest on the loan and the payment toward the principal amount. To be specific, suppose that you borrow $1000 at the interest rate of 7.2% per year and the payments are monthly. Suppose that your monthly payment is $25. Now, the interest is 7.2% per year and the payments are monthly, so the interest rate per month is 7.2/12 = 0.6%. The first month's interest on $1000 is 1000 * 0.006 = 6. Because the payment is $25 and interest for the first month is $6, the payment toward the principal amount is 25 + 6 = 31. This means after making the first payment, the loan amount is 1000 + 19 = 1019. For the second payment, the interest is calculated on $1019.
So, the interest for the second month is 1019 * 0.006 = 6.114, that is, approximately $6.114.

This implies that the payment toward the principal is 25 + 5.89 = 30.89 and the remaining balance after the second payment is 1019 + 30.89 = 1049.89. This process is repeated until the loan is paid.
Write a program that accepts as input the loan amount, the interest rate per year, and the monthly payment. (Enter the interest rate as a percentage. For example, if the interest rate is 7.2% per year, then enter 7.2.) The program then outputs the number of months it would take to repay the loan.

Problem: 9 | Bonus task

(Diamond of Asterisks) Write a program that prints the following diamond shape. You may use output statements that print a single asterisk (*), a single blank or a single newline. Maximize your use of repetition (with nested for statements) and minimize the number of output statements.
Note: The size of diamond should be user defined.