Department of Information Systems and Technologies

**CTIS151 – Introduction to Programming**

SPRING 2023- 2024

## Lab Guide 10 – Week 9-1

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| **OBJECTIVES :** Nested Loops |
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**Q1.** Write a C program that generates and displays a number between 5 and 15, and draws a left triangle as in example run.

**Project Name:** LG10_Q1
**File Name:** Q1.cpp

**Example Run#1:**

```
Randomly generated number is: 8
*
**
***
****
*****
******
*******
********
```

**Example Run#2:**

```
Randomly generated number is: 11
*
**
***
****
*****
******
*******
********
*********
**********
***********
```

**Q2.** Write a C program that takes positive integer numbers until a non-positive integer is given, finds and displays the product of the digits of each number.

**Project Name:** LG10_Q2
**File Name:** Q2.cpp

**Example Run:**

```
Enter a positive integer (negative number to stop): 6587
Product of digits = 1680

Enter a positive integer (negative number to stop): 158
Product of digits = 40

Enter a positive integer (negative number to stop): 96
Product of digits = 54

Enter a positive integer (negative number to stop): 3658
Product of digits = 720

Enter a positive integer (negative number to stop): -1
```

**Q3.**

**a)** Write a function named **`dispLine()`** that displays a line containing 10 '#' on the screen. Write C program that displays a single line on the screen by using the function.

**Project Name:** LG10_Q3a
**File Name:** Q3a.cpp

**Example Run**:

```
##########
```

**b)** Modify the **Q3a.cpp** as follows:
Write the following functions;

- **menu()** that displays a menu on the screen (see in the example run).
- **dispRectangle()** that displays a 4x10 rectangle with the (#) using the function dispLine.
- **dispParallelogram()** that displays a 4x10 parallelogram with the (#) using the function dispLine.

Write a C program that displays a menu, reads and validates the choice, and displays a single line, a rectangle or a parallelogram according to the user's choice.

**Project Name:** LG10_ Q3b
**File Name:** Q3b.cpp

**Example Run**:

```
MENU
1. Draw a single line
2. Draw a rectangle
3. Draw a parallelogram
4. EXIT
Enter your choice: 1

##########

MENU
1. Draw a single line
2. Draw a rectangle
3. Draw a parallelogram
4. EXIT
Enter your choice: 2

##########
##########
##########
##########
```

```
MENU
1. Draw a single line
2. Draw a rectangle
3. Draw a parallelogram
4. EXIT
Enter your choice: 3

##########
 ##########
  ##########
   ##########

MENU
1. Draw a single line
2. Draw a rectangle
3. Draw a parallelogram
4. EXIT
Enter your choice: 4
```

**c)** Modify the **Q1b.cpp** as follows:

- **dispLine()** takes the symbol and the n-number of symbols to be displayed as parameters and displays the given symbol n times on a line.
- **dispRectangle()** takes the symbol and side lengths of the rectangle and displays the rectangle with the given symbols.
- **dispParallelogram()** takes the symbol and side lengths of the parallelogram and displays the parallelogram with the given symbols.

**Project Name:** LG10_ Q3c
**File Name:** Q3c.cpp

**Example Run**:

```
MENU
1. Draw a single line
2. Draw a rectangle
3. Draw a parallelogram
4. EXIT
Enter your choice: 1

Enter a symbol: #
Enter the number of symbols to be
displayed: 5
#####

MENU
1. Draw a single line
2. Draw a rectangle
3. Draw a parallelogram
4. EXIT
Enter your choice: 2

Enter a symbol: #
Enter the side1: 4
Enter the side2: 8
########
########
########
########
```

```
MENU
1. Draw a single line
2. Draw a rectangle
3. Draw a parallelogram
4. EXIT
Enter your choice: 3

Enter a symbol: #
Enter the side1: 6
Enter the side2: 10
##########
 ##########
  ##########
   ##########
    ##########
     ##########

MENU
1. Draw a single line
2. Draw a rectangle
3. Draw a parallelogram
4. EXIT
Enter your choice: 4
```

**ADDITIONAL QUESTIONS**

**AQ1.** Write a C program that gets the side length of a rhombus in the range of 4 and 10 and gets a character until the character is '**!**', and draws that rhombus using the given character and displays it on the screen.

**Project Name:** LG10_AQ1
**File Name:** AQ1.cpp

**Example Run:**

```
Enter a character (! to stop): X
Enter the side length (4 - 10): 3
Enter the side length (4 - 10): 11
Enter the side length (4 - 10): 4
    X
   XXX
  XXXXX
 XXXXXXX
  XXXXX
   XXX
    X

Enter a character (! to stop): %
Enter the side length (4 - 10): 7
       %
      %%%
     %%%%%
    %%%%%%%
   %%%%%%%%%
  %%%%%%%%%%%
 %%%%%%%%%%%%%
  %%%%%%%%%%%
   %%%%%%%%%
    %%%%%%%
     %%%%%
      %%%
       %

Enter a character (! to stop): @
Enter the side length (4 - 10): 100
Enter the side length (4 - 10): 10
          @
         @@@
        @@@@@
       @@@@@@@
      @@@@@@@@@
     @@@@@@@@@@@
    @@@@@@@@@@@@@
   @@@@@@@@@@@@@@@
  @@@@@@@@@@@@@@@@@
 @@@@@@@@@@@@@@@@@@@
  @@@@@@@@@@@@@@@@@
   @@@@@@@@@@@@@@@
    @@@@@@@@@@@@@
     @@@@@@@@@@@
      @@@@@@@@@
       @@@@@@@
        @@@@@
         @@@
          @

Enter a character (! to stop): !
```

**AQ2**. In the kids' game "Paper, Rock, Scissors" each player chooses one of the three and the winner is determined by the relationship between the two choices. "Paper covers rock" so paper wins; "rock breaks scissors" so rock wins; and "scissors cuts paper" so scissors wins. If the both choose the same, it is a tie and no one wins.

Write the function **`machineChoice`**() that randomly generates a number (0, 1, 2) and returns a character (p, r, s) according to the number. Examine the following table:

| Random Number | Character to be returned |
|---|---|
| 0 | p |
| 1 | r |
| 2 | s |

Write a C program to play the game against the computer until the player enters **q** instead of a choice.

**Project Name:** LG10_AQ2
**File Name:** AQ2.cpp

**Example Run**:

```
Choose (p)aper, (r)ock, (s)cissors or (q)uit: p
it's a tie! Your score: 0

Choose (p)aper, (r)ock, (s)cissors or (q)uit: s
The machine chooses paper. Scissors cuts Paper. You Win! Your score: 1

Choose (p)aper, (r)ock, (s)cissors or (q)uit: r
The machine chooses scissors. Rock breaks Scissors. You Win! Your score: 2

Choose (p)aper, (r)ock, (s)cissors or (q)uit: r
The machine chooses paper. Paper covers Rock. You Lose! Your score: 1

Choose (p)aper, (r)ock, (s)cissors or (q)uit: s
The machine chooses rock. Rock breaks Scissors. You Lose! Your score: 0

Choose (p)aper, (r)ock, (s)cissors or (q)uit: p
it's a tie! Your score: 0

Choose (p)aper, (r)ock, (s)cissors or (q)uit: r
The machine chooses scissors. Rock breaks Scissors. You Win! Your score: 1

Choose (p)aper, (r)ock, (s)cissors or (q)uit: q
```

**AQ3.** Write a C program to display the **hour glass** shape on the screen using the function named **dispChar**( ). Number of line(3-20) will be read from the user. **Make data validation for the number of lines**.

Write a function named **dispChar**( ) that takes an integer number ***n*** and a character **ch** as input parameters, and displays the specified character (**ch**) n times on the screen.

**Project Name:** LG10_AQ3
**File Name:** AQ3.cpp

**Example Run#1:**

```
Enter the side length (3-20): 5
*********
 ********
  ******
   ****
    **
    **
   ****
  ******
 ********
*********
```

**Example Run#2:**

```
Enter the side length (3-20): 2
Enter the side length (3-20): 25
Enter the side length (3-20): 3

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