Assignment 2 – Control Statements/User-Defined Functions

Deadline: Friday Oct. 11 at 23:55
Type: Individual Assignment
Weight: 5%

Submission instructions:

- Create a cpp file for each question
- Compress the files using zip or other tools
- Submit the zip file on Moodle

Notes:

- Please do not submit exe files
- All submissions must be done through Moodle

Marking Scheme:

- Program correctness (80%)
- Program clarity (output format, comments, completeness, readability) (20%)

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1. You are asked to write a C++ program which draws a house with a roof based on the following specifications.

Application name: Display a welcome banner

1) *Welcome user*: Ask the user for their name and using their name welcome them to your application.
2) *Request house dimensions and validate input:* Ask the user to enter the width and height of the house to be drawn (Note: Both height and width are integer). The width must be odd and bigger than 1. If the user enters even numbers or a number less than 1 for the width, you are required to prompt the user until they enter an odd number. They have 3 tries for entering width. If after 3 tries they are still entering even numbers terminate your program with an appropriate personalized message otherwise move on to step 3.
3) *Draw the house*
    a. *Draw the roof:*
        i. The roof consists of a set of stars on each row. Number of stars in the last row of the roof is equal to the width of the house. The first row starts with one * and you increase the number of starts in the next row bye 2 and repeat this process until you reach to the width. For example if the width is 5 the roof shape will be a triangle like this (1,3 and 5 stars):

```
  *

 * * *

* * * * *
```

Hint: The number of rows needed to print/draw the roof is half the width of the house+1.

b. *Draw the body of the house:*
   i. The body of the house has *height+1* rows in all.
   ii. Last row are drawn using the dash character (-). There are *width* dashes.
   iii. The walls are represented by *height* rows. Each of the rows are made up of 2 characters of | in the left and right sides and the rest are spaces.

c. *Keep track of the number of houses you have drawn.*

4) *Again?* Ask the user if they wish you to draw another house. If yes repeat steps 3. If no, move on to step 5.
5) *End program:* display this message: "Hope you like your house(s)"

Here are a few sample outputs: user input is highlighted in grey

```
 ---------------------------------------------------------
          House Drawing Program
 ---------------------------------------------------------


What is your name? Anna
Well Anna, welcome to the house drawing program.
Do you want me to draw a simple house for you? (yes/no) yes

 Enter height of the house you want me to draw: 4
 Please enter an odd number for the width of the house (must be odd
 numbers and bigger than 1): 2
 You enter 2 for the width. Not an odd number!

 Please enter an odd number for the width of the house (must be odd
 numbers and bigger than 1): 6
 You enter 6 for the width. Not an odd number!

 Please enter an odd number for the width of the house (must be odd
 numbers and bigger than 1): 10

 You enter 10 for the width. Not an odd number!


 it seems you are having troubles entering odd numbers! Program ends now.
 --------------------------------------------------------
           House Drawing Program
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What is your name? Anna
Well Anna, welcome to my silly house drawing program.
Do you want me to draw a simple house for you? (yes/no) yes

 Enter height of the house you want me to draw: 3
 Please enter an odd number for the width of the house (must be odd numbers and bigger than
 1): 5
  *
 ***
*****
|   |
|   |
|   |
-----



Do you want me to draw a simple house for you? (yes/no) yes


 Enter height of the house you want me to draw: 5
 Please enter an odd number for the width of the house (must be odd numbers and bigger than
 1): 9
    *
   ***
  *****
 *******
*********
|       |
|       |
|       |
|       |
|       |
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Do you want me to draw a simple house for you? (yes/no) no

Hope you like your 2 houses!
```

2. Write a C++ program that asks the user to enter two positive integer numbers as the lower bound and upper bound. Then it asks the user to enter a character:

-If the entered character is ‘a’, ***function1*** is called.

-If the entered character is ‘b’, ***function2*** is called and then the value of ***result*** variable is printed

-If the entered character is ‘c’, ***function 3*** is called and the returned value of the function 3 is printed.

-If the user enters any other character, the program prints “invalid input” and terminates.

Function 1:

This function accepts the upper bound and lower bound numbers as the input arguments and prints out all the numbers in this range (Inclusive) which are multiples of both 3 and 7.

Function 2:

This function has no return value. It accepts 3 input arguments: the **upper bound** and **lower bound** numbers and a variable ***result*** (by reference) and calculates the difference between two entered numbers and save it in the ***result***.

Function 3:

This function returns a variable of type double (***sum***) and accepts the upper bound and lower bound numbers (*lower* and *upper* variables) as input arguments. It calculates the results of following equation and returns the ***sum*** variable. (please note that the number of digits after the decimal point should be set to 3 for the ***sum*** value).

$$\textit{sum} = \frac{1}{lower} + \frac{1}{lower+1} + \frac{1}{lower+2} + \cdots \frac{1}{upper}$$

Here are several sample outputs:

```
Please enter two positive integer numbers: (Lower bound/Upper bound): 11 63

Please enter a character: a

List of numbers in this interval which are multiple of both 3 and 7: 21 42 63
```

```
Please enter two positive integer numbers: (Lower bound/Upper bound): 11 63

Please enter a character: b

The difference between two numbers is 52
```

```
Please enter two positive integer numbers: (Lower bound/Upper bound): 20 25

Please enter a character: c

the value of sum is: 0.268
```

```
Please enter two positive integer numbers: (Lower bound/Upper bound): 20 25

Please enter a character: z

Invalid input
```