CS 150 Lab 07

while Loops

The purpose of today's lab is to for you to get some hands-on experience with the different things you can do with loops.
- Be sure your output looks exactly like the specified output.
- Save each project in a folder called 07LabPUNetID. When you have completed the required projects, drop your folder in CS150-01 Lab.
- Show the instructor to TA your solution to each problem before submitting it.

Lab 7.1

For this lab, you will need to create a new Visual Studio project that will contain your source code. Name this project "07_1LoopsXXXXXXXX", replacing the XXXXXXXX with your PUNetID.

Write a program that will display all of the following. Your program should have one loop only!

Sample Input and Output:

```
**************************************
*               Loopy                *
**************************************

How many iterations would you like to loop? 5

   Iteration     Multiples of 2     Powers of 2
   -------------------------------------------------
          1               2                   2
          2               4                   4
          3               6                   8
          4               8                  16
          5              10                  32
```

1. List each variable declaration necessary to store the data and information in your program. The variable name and type must be enough information to describe the information the variable holds.
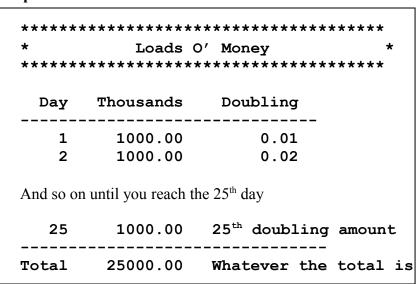
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_____

2. Briefly describe the calculations you will need to perform in your program. Be sure to explain which variables from 1. will be used in each calculation.

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3. For each loop used in your program, discuss what will happen in the loop and what data and conditions will be used by the program to stop the loop.

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Lab 7.2

For this lab, you will need to create a new Visual Studio project that will contain your source code. Name this project "07_2MoneyXXXXXXXX", replacing the XXXXXXXX with your PUNetID.

Determine whether you'd prefer to be paid $1,000.00 a day for 25 days or a penny the first day, two pennies the second, four pennies the third day and so on, doubling the amount you made the previous day.

Sample input and output follow:

```
*************************************
*          Loads O' Money           *
*************************************

  Day    Thousands     Doubling
  ------------------------------
   1      1000.00         0.01
   2      1000.00         0.02
```

And so on until you reach the 25th day

```
   25     1000.00      25ᵗʰ doubling amount
  ------------------------------
 Total    25000.00     Whatever the total is
```

1. List each variable declaration necessary to store the data and information in your program. The variable name and type must be enough information to describe the information the variable holds.

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2. Briefly describe the calculations you will need to perform in your program. Be sure to explain which variables from 1. will be used in each calculation.

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3. For each loop used in your program, discuss what will happen in the loop and what data and conditions will be used by the program to stop the loop.

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Lab 7.3 (Challenge)

In mathematics, it is often useful to approximate the value of a function. The more terms in the approximation the better it is. Hyperbolic sine (*sinh*) can be approximated with the following formula:

$$sinh(x) = \sum_{n=0}^{\infty} \frac{x^{2n+1}}{(2n+1)!}$$

We cannot sum to infinity but we can use a computer to sum a large number of values. Write some code that will approximate *sinh*, given a value for x and a maximum value for n. Both of these values should come from the user. Once you've approximated sinh(x), compare your calculated value to the result produced by the function **double sinh(double)** which is available from the **cmath** library that contains the function **pow()**.

Display to the user the approximated value of sinh(x), the result of the function **sinh**, and the difference between them.