

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 CS150-02 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 XXXXXXXXX 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.

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.

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.

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
```

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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.

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.

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.