**Introduction To Computer Science – 150005**

**Homework Assignment #4**

**Loops**

**Comments:**

1. Use meaningful variable names
2. Comment each program (including a comment before the main program explaining its purpose and how it works). Also, at the end of each program add a comment with a sample run with its output.
3. Be careful on code readability and appearance (indentation)
4. Make sure to compute exactly what is requested in each question.
5. Whenever an input is illegalor there is an error give a message ERROR.
6. Submit the solution according to the directions in moodle.
7. This question will be graded manually. There is a submission entry as usual.  
   Write a program that random chooses 10 integers between 1 and 1000 (included), and prints out these numbers on the screen. The program will also print out sorted list if the numbers in the list are in non-descending order or not sorted list otherwise. Remember, non-descending order means that the second number is not smaller than the first, the third is not smaller than the second, etc.  
     
   sample program run:

|  |  |
| --- | --- |
| 33 99 135 7 987 51 8 67 31 400  not sorted list | 3 3 58 431 431 666 738 890 950 990  sorted list |

1. Write a program that asks the user to enter 2 positive numbers: and reads in the 2 numbers. If the input wasn’t legal then the program outputs the message ERROR until it receives legal input. The program reads each number separately so that if the first number is not legal it reads a number until a legal number is received. Similarly for the second number, it reads the input until a second legal number is received.  
   After it receives the numbers, the program outputs enter a list of numbers: and reads in a list of integers until their sum is greater than the first number or the number of numbers read is equal to the second number. The program outputs the sum of the numbers.  
   For example, if the 2 numbers were 5 and 8, then it stops reading in numbers once the sum is greater than 5 or the number of numbers read is 8.  
     
   Sample program run:

|  |  |  |
| --- | --- | --- |
| enter 2 positive numbers:  -25  ERROR  -10  ERROR  25  -2  ERROR  2  enter a list of numbers:  9 8  17 | enter 2 positive numbers:  25  2  enter a list of numbers:  9 8  17 | enter 2 positive numbers:  25  12  enter a list of numbers:  9 8 7 6  30 |

1. The Fibonacci series is defined as follows:  
   f0 = **0**f1 = **1**fn = fn-1 + fn-2 for n ≥ 2 (that is, the sum of the previous 2 numbers)  
   The first 10 entries in the series is 0 1 1 2 3 5 8 13 21 34  
     
   Write a program that asks the user to enter a number: and reads in a non-negative whole number n. If it receives an illegal number, it prints ERROR until it receives a legal input. The output of the program is the first n+1 numbers in the Fibonacci series. For example, for n=9, the program prints the series above.  
     
   Sample program run:

|  |
| --- |
| enter a number:  9  0 1 1 2 3 5 8 13 21 34  enter a number:  -10  ERROR  1  0 1 |

1. Write a program that computes the sum of the first n elements of the series  
   X + (-1/3)X3 + (1/5)X5 + (-1/7)X7 + …. +((-1) n-1/2n-1)X2n-1  
   The program asks the user to enter 2 numbers: and reads in 2 integers corresponding to X (base of exponential term) and n (number of elements) respectively. Note, n must be positive (X can be any integer including 0 or negative). The program prints ERROR until it receives legal inputs. The output is the exact sum computed.  
   Do not use any math function that computes the power function.  
     
   Sample program run:

|  |  |
| --- | --- |
| enter 2 numbers:  3  -2  ERROR  -42  ERROR  2  -6 | enter 2 numbers:  3  2  -6 |

1. Write a program that asks enter a one digit number: and read in a positive single digit n. The output is a pyramid such that the first line contains the numbers n to 1 in descending order, the second line n-1 to 1 and so on until it prints a line containing only the number 1. For example, for n=4, it will print

4, 3, 2, 1  
 3, 2, 1  
 2, 1  
 1  
Hint: Look at question 5 in the lab assignment.  
Note:

* + The numbers should line up as in the example above.
  + In each line comes the first number, a comma, a space, and then the next number until the last number is printed (with no following comma).
  + The program should print the pyramid when n is a single digit. (You can try to extend the program to handle 2 digit numbers.)

Sample program run:

|  |
| --- |
| enter a one digit number:  4 4, 3, 2, 1  3, 2, 1  2,1  1 |

1. Write a program that asks enter a number: and reads in a single positive integer. If it receives an illegal number, it prints ERROR until it receives a legal input. The program then checks if each digit is one smaller than the previous digit on its left, and prints YES or NO accordingly.  
     
   Sample program run:  
     
   