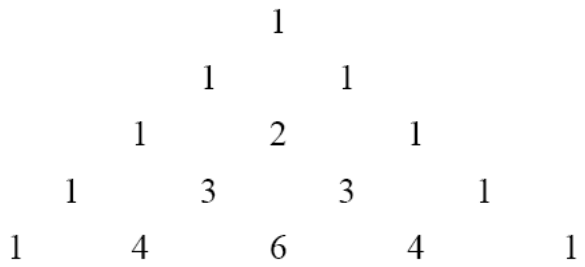
PROGRAMMING FUNDAMENTALS

Assignment # 3 Due On/Before 16 Oct. 2024

Total Marks 100

Q # 1. Write a c code to produce the following output:



Q # 2. Write a program to print all prime numbers from 1 to 300.

A Prime Number can be divided evenly only by 1 or itself. And it must be greater than 1.

Hint: Use nested loops, break and/or continue

Q # 3. Write a program to fill the entire screen with a smiling face. The smiling face has an ASCII value 1. [10]

For this task you should know the height and width of your screen.

Q # 4. Write a program to generate all combinations of 1, 2 and 3 using for **loop. [10]**

Sample Output:

111

112

113

…

Q # 5. The natural logarithm can be approximated by the following series.

$$\frac{x-1}{x}+\frac{1}{2}\left(\frac{x-1}{x}\right)^2+\frac{1}{2}\left(\frac{x-1}{x}\right)^3+\frac{1}{2}\left(\frac{x-1}{x}\right)^4+....$$

If x **is input through the keyboard, write a program to calculate the sum of first seven terms of this series.**

Q # 6. Write a c code to produce the following output: [10]

```
A B C D E F G F E D C B A
A B C D E F   F E D C B A
A B C D E       E D C B A
A B C D           D C B A
A B C               C B A
A B                   B A
A                       A
```

Q # 7 Write a program to add first seven terms of the following series using a for **loop:**

$$\frac{1}{1!} + \frac{2}{2!} + \frac{3}{3!} + \ldots\ldots$$

Q # 8 Write a program to simulate the Collatz sequence for a given number n. The Collatz conjecture is defined as:

If n is even, divide it by 2 n = n/2 (if n is even)

If n is odd, multiply it by 3 and add 1 n = 3n + 1 (if n is odd)

Repeat until n becomes 1.

The length of each chain should be printed at the end of the chain.

Sample Input: 13

Sample Output:

```
13 -> 40 -> 20 -> 10 -> 5 -> 16 -> 8 -> 4 -> 2 -> 1 ; length = 10
```

Q # 9 Write a program to check whether a given number is an Armstrong number using a loop.

(An Armstrong number is a number that is equal to the sum of its digits raised to the power of the number of digits.

For example, 153 is an Armstrong number: 13+53+33=15313+53+33=153

Q # 10 Write a program that calculates the Least Common Multiple (LCM) and Greatest Common Divisor (GCD) of two numbers using loops

Note: It is an independent assignment. Discussion with your class fellows and your teacher is encouraged but plagiarism is strictly prohibited. Anyone involved in plagiarism would get zero marks in this assignment.