INDEPENDENT UNIVERSITY, BANGLADESH
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SPRING 2018-19
CSC 101
Midterm exam

Marks: 100   Time: 120 minutes

1. Write a program in C++ that will calculate accuracy (ACC) and F1 score True Positive
    Rate (TPR) and False Positive Rate (FPR) of machine learning system using following
    formulas. Here, True Positives (TP), True Negatives (TN), False Positive (FP), False
    Negative (FN) values are integer numbers given as input by the user. (25)

$$ACC = \frac{TP + TN}{TP + TN + FP + FN}$$

$$F1 = \frac{2TP}{2TP + FP + FN}$$

$$TPR = \frac{TP}{TP + FN}$$

$$TNR = \frac{TN}{TN + FP}$$

Following is the sample Input and Output of the written program. You can just consider it
as an example.

Sample Input	Sample Output
Please Enter True Positives (TP) = 0.63	For (TP=63, TN=72, FP=28, FN=37)
Please Enter True Negatives (TN) = 72	ACC = 63.36
Please Enter False Positive (FP) = 28	F1 = 0.6596
Please Enter False Negative (FN) = 37	TPR = 0.63
	TNR =0.72.

2. Write a program in C++ that will display a right-angled triangle with a combination of "*"
    and "#" sign. User will be asked to provide an input, which will be taken as the number of
    rows of your triangle. (25)

    Following is the sample Input and Output of the written program. You can just consider it
    as an example.

Sample Input	Sample Output
Please Enter the number of rows of your triangle: 4	* ## *** ####

3. In bioinformatics there are four types of nucleotides (symbols/characters) in a Nucleic acid sequence (string) commonly knowns as 'A', 'C', 'G', 'T'. All the strings are different combination of these four nucleotides. Your friend from microbiology requests you to write a program in C++ that will help them analyzing such strings. They will enter a string and your program will print the percentage of 'A', 'C', 'G', 'T' in that string. Hint: Use a character array to take input. (25)

Following is the sample Input and Output of the written program. You can just consider it as an example.

Sample Input	Sample Output
Enter the Nucleic acid sequence: GAAATTCGGGCTGCCCTTTC	A: 15% C: 30% G: 25% T: 30%

4. Write a function chkPrime(int number) apart from your main function. Note that, the logic of searching a prime number should be inside your defined function. So, take an integer input from user in main, pass it to the chkPrime(…) function as argument. If the value is a prime number, the function will return -1. If the number is not prime, the function will return the first (other than 1) divisor of the given input. Then, based on the return value in main, print outputs as following:
   • If the number is prime, print "the number is prime". If the number is not prime, print: "The number is not prime, the first divisor of the given input is:….". (25)

A sample program input and output for 3 different values are given as follows:

case	Sample Input	Sample Output
1	Enter a positive integer: 3	3 is a prime number
2	Enter a positive integer: 9	9 is not a prime number. The first divisor of the given input is: 3
3	Enter a positive integer: 6	6 is not a prime number. The first divisible number of the given input is: 2