## Programming and Data Structures Laboratory | 2021-22 Autumn semester, Section 20

## Assignment 1 | December 14, 2021

**Submission instructions**

* Submit one .c file for each part of the assignment. Each of your .c files should be named as:

**<your roll number>_A<assignment number>_<part number>.c**

For instance, if your roll number is 21CS10023, and if you are presently doing Assignment 1 which has 4 parts, then you should submit 4 separate .c files named as:
21CS10023_A1_1.c    21CS10023_A1_2.c    21CS10023_A1_3.c    21CS10023_A1_4.c

**\*** Submissions must be through the course Moodle, before the end of Lab session (11:55 AM). Late submissions will be penalized / not accepted.
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1. [10 marks] Write a C program to determine the total amount accrued in a cumulative fixed deposit account for 3 years at the rate of 12 percent per annum if the interest is compounded annually on an initial principal amount of Rs. 1,00,000. The program should print out the total amount.

2. [10 marks] Consider a triangle ABC. Input the <u>lengths</u> of the sides AB, BC, and CA from the user, using scanf statements. Compute and print (i) the perimeter of the triangle ABC, (ii) the square of the area of the triangle. Use Heron's formula to compute the square of the area: https://www.mathopenref.com/heronsformula.html

3. [15 marks] In this problem, you need to compute the derivative of a <u>degree-5 polynomial</u> of one variable x:        $a_5x^5 + a_4x^4 + a_3x^3 + a_2x^2 + a_1x + a_0$

Assume that the coefficients ($a_i$) of the polynomial are integers. Input the 6 coefficients from the user. Print the polynomial, and then compute and print the derivative polynomial. A sample input and output are given below; <u>stick to the format shown below</u>.

Enter coefficient of 1: 5

Enter coefficient of x: 2

Enter coefficient of x^2: -2

Enter coefficient of x^3: 7

Enter coefficient of x^4: 0

Enter coefficient of x^5:3

Polynomial: 3*x^5 + 7*x^3 - 2*x^2 + 2*x + 5

Derivative: 15*x^4 + 21*x^2 - 4*x + 2

Note that, the numbers given above are only examples. You should write the program such that the coefficients can be any valid integer (different from what is given in the example) and the program still works.

4. [15 marks] In this problem, you need to evaluate trigonometric functions like sin(x) and cos(x), using their respective series expansion formulas. For the series expansion formulas, refer to http://mathworld.wolfram.com/SeriesExpansion.html. Input an angle x (in radians) from the user.

(a) Compute approximate values of sin(x) and cos(x) using the <u>first four terms</u> of their series expansion formulae

(b) Compute sin(2*x) = 2 * sin(x) * cos(x)

(c) Compute sin(2*x) directly using the <u>first four terms</u> of the series expansion formula for *sin*, and compare the value with that obtained in (b).

Your program should take x (in radians) as input, and then print out the values of sin(x), cos(x), and sin(2*x) computed by the two methods described above.