Data Structures (CS201)

Lab Assignment 1 (Ungraded)

August 14, 2021

Instructor: Anil Shukla
Due: August 15, 8 am (Morning)

Note: Ungraded means the marks will not be counted for the final grading.
Note: Place proper comments in your source code.
Note: Write in C only. C++ is not allowed for this particular lab.
Note: The instructions for submiting the assignment is mentioned in the google classroom. Carefully read the same and follow the instructions.
Note: At the end, find some test cases for each problem.

Warmup question (1) Write a C program to find the average and standard deviation of given any n numbers. The program first ask the user the number n, and then takes n numbers. The program then computes and prints the average and standard deviation of the n numbers.

Warmup question (2) Write a C function to count and print the number of 1-bits in its integer argument. Again your program should ask the user to enter an integer number. Your program should run correctly regardless of the machine. Hint: The given integer can be a negative number as well. The C programming language uses 2's complement to represent an integer.

(3) Write a C program to **add** two polynomials. Do not destroy the input. Use a linked list implementation. Your program should first ask the user to input the polynomials. Your program then display the two input polynomials. Then compute and display the output polynomial. See the test cases.

(4) Write a C program to **multiply** two polynomials, using a linked list implementation. Your program should first ask the user to input the polynomials. Your program then display the two input polynomials. Then compute and display the output polynomial. You must make sure that the output polynomial is sorted by exponent and has at most one term of any power.

Test Cases:

Test Cases for warmup question (1):
How many numbers? 5
Enter 5 numbers:
1, 2, 3, 4, 5
Output : average = 3, and standard deviation = 1.5811
How many numbers? 5

Enter 5 numbers:
1.5, 3.25, 4.5, 6.4, 7.92
Output: average = 4.714, and standard deviation = 2.5317
Test Cases for warmup question (2): (Assuming 32 bits machine)
Input: -8
Output: 29
Input: 8
Output: 1
Input: -1024
Output: 22
Test cases for problem (3):
Input coefficients and exponents in decreasing order by exponent. Do not input the terms with zero coefficients:
Input polynomial 1:
coefficient = 1, exponent = 1
coefficient = 1, exponent = 0
Input polynomial 2:
coefficient = 1, exponent = 1
coefficient = 1, exponent = 0
Input polynomial 1 = 1x^ 1+1
Input polynomial 2 = 1x^ 1+1
Output polynomial = 2x^1+2
Test cases for problem (4):
Input coefficients and exponents in decreasing order by exponent. Do not input the terms with zero coefficients:
Input polynomial 1:
coefficient = 1, exponent = 2
coefficient = 2, exponent = 1
coefficient = 1, exponent = 0
Input polynomial 2:
coefficient = 1, exponent = 2
coefficient = 2, exponent = 1
coefficient = 1, exponent = 0
Input polynomial 1 = 1x^2+ 2x^1 + 1
Input polynomial 2 = 1x^2+ 2x^1 + 1
Output polynomial: 1x^4 + 4x^3 + 6x^2 + 4x^1 + 1