National Yang Ming Chiao Tung University
Department of Electrical Engineering
Data Structures, Fall 2022

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Programming Assignment #1

Arrays

1 Problem Description

Polynomials appear in many fields of mathematics, science, and engineering. For example, they are used in calculus and numerical analysis to approximate other functions. A polynomial is an expression consisting of variables with different exponents and coefficients. The calculation of polynomials involves at least the operations of addition, subtraction, multiplication, and division of variables. In this programming assignment, you are asked to implement the division of polynomials and to show the quotient and remainder.

2 Input Format

The first line of the input file indicates the coefficients of a polynomial dividend, $f(x)$. The second line of the input file indicates the coefficients of a non-zero polynomial divisor, $d(x)$, where the degree of $d(x)$ is less than or equal to the degree of $f(x)$. All coefficients will be integers, while the exponents are non-negative integers. The degree of the polynomial may be as large as the maximum unsigned integer. The example below gives the polynomial, $f(x) = x^4 - 2x^3 + 1$, divided by the polynomial, $d(x) = x^2 - 3x + 2$.

Input format	Sample Input
Coefficients of dividend $f(x)$	1 -2 0 0 1
Coefficients of divisor $d(x)$	1 -3 2

3 Output Format

After performing the division, you will need to generate the output file, which contains a polynomial quotient, $q(x)$, and a polynomial remainder, $r(x)$. The first line of the output file indicates the coefficients of $q(x)$, and the second line of the output file indicates the coefficients of $r(x)$, where $q(x) = x^2 + x + 1$ and $r(x) = x - 1$, resulting from the calculations of the "Sample Input", and the output file must follow the "Sample Output" format below. For simplicity, the coefficients of both $q(x)$ and $r(x)$ in both sample and hidden test cases will be integers.

Output format	Sample Output
Coefficients of quotient $q(x)$	1 1 1
Coefficients of remainder $r(x)$	1 -1

4 Command-line Parameter

In order to test your program, you are asked to add the following command-line parameters to your program:

[executable file name] **[input file name]** **[output file name]**

5 Submission Information

1. Your program must be written in the C/C++ language and can be compiled on the Linux platform.
2. The source files of your program must be named with "[your student ID].h" and "[your student ID].cpp".
3. To submit your program, please archive all source files of your program into a single zip file, named "[your student ID].zip", and upload it to E3.

6 Due Date

Be sure to upload the zip file by "Wednesday, October 12, 2022". There will be a 25% penalty per day for late submissions.

7 Grading Policy

The programming assignment will be graded based on the following rules:

- Pass sample input with compilable source code (50%)
- Pass five hidden test cases (50%)

The submitted source codes, which are either copied from or copied by others, will NOT be graded.