

# NTUST OOP Midterm Problem Design

**Subject: Large Integer Operation**

**Author: 陳昕璇 (HSIN-HSUAN CHEN)**

**Main testing concept: Array**

## Basics

- C++ BASICS
- FLOW OF CONTROL
- FUNCTION BASICS
- PARAMETERS AND OVERLOADING
- ARRAYS
- STRUCTURES AND CLASSES
- CONSTRUCTORS AND OTHER TOOLS
- OPERATOR OVERLOADING, FRIENDS, AND REFERENCES
- STRINGS
- POINTERS AND DYNAMIC ARRAYS

## Functions

- SEPARATE COMPILATION AND NAMESPACES
- STREAMS AND FILE I/O
- RECURSION
- INHERITANCE
- POLYMORPHISM AND VIRTUAL FUNCTIONS
- TEMPLATES
- LINKED DATA STRUCTURES
- EXCEPTION HANDLING
- STANDARD TEMPLATE LIBRARY
- PATTERNS AND UML

## Description:

Large number computation refers to the process of performing calculations on numbers that are beyond the typical range of numerical values. Common examples include high precision calculation, large integer computation, and large floating-point number computation. In computer science and mathematics, integers and floating-point numbers are typically used to represent numbers. However, due to the precision and range limitations in storing and processing numbers in computers, large number computation techniques are required when dealing with very large numbers.

For example, in certain mathematical problems, very large integers may need to be calculated, such as integers with more than 200 digits, while computers can usually only handle integers up to a few thousand digits. Therefore, large number computation techniques are used to perform high-precision calculations. These techniques utilize special data structures and algorithms to process extremely large data, avoiding loss of numerical precision or range limitations.

In C++, we can store big numbers by using data structures such as arrays, vectors, or strings. Then, we can implement operators for addition, subtraction, multiplication, division, modulo, as well as functions for comparison, input, and output.

## Input:

Each test case may contain multiple inputs and outputs. The input consists of two numbers, please perform **addition**, **subtraction**, and **multiplication**. The input of this problem are both integers.

a

b

### Output:

Please output the **sum**, **difference**, and **product**. The output of this problem are both integers.

```
s (sum = a + b)
```

d (difference =  $a - b$ )

p (product = a \* b)

### Sample Input / Output :

[illegible]

- ☐ **Eazy,** Only basic programming syntax and structure are required.
- ☐ **Medium,** Multiple programming grammars and structures are required.
- ☒ **Hard,** Need to use multiple program structures or more complex data types.

**Expected solving time:**

90 minutes

**Other notes:**