|  |
| --- |
| Computer Programming Language |

【Fall, 2015】

Homework 4

**Program A: Perfect number (25%)**

A positive integer is a perfect number if it is equal to the sum of all of its factors, including one but excluding itself. For example, 6 is a perfect number, since 6 = 1 + 2 + 3, and 1, 2, and 3 are factors of 6. Design a PerfectNumber(long int Num) function that determines whether the supplied number Num is a perfect number. Write a program to find all perfect numbers between 1 and 10000 by calling the function PerfectNumber(long int Num). What is the greatest perfect number you can find?

**Program B: Statistical calculation using array (25%)**

In many statistical analysis programs, data values considerably outside the range of the majority of values are simply dropped from consideration. Using this information, write a C++ program that accepts up to 10 floating-point values from a user and determines and displays the average and standard deviation of the input values. All values more than two standard deviations away from the computed average are to be displayed and dropped from any further calculation, and a new average and standard deviation should be computed and displayed.

**Program C: Data processing and sorting (25%)**

**(a**). Create a two-dimensional list of integer part numbers and quantities of each part in stock, and write a function that displays data in the array in decreasing quantity order. No more than 100 different parts are being kept track of. Test your program with the following data:

**(b)**. Modify the function written in part (**a)** to display the data in part number order.

|  |  |
| --- | --- |
| Part No. | Quantity |
| 1001 | 62 |
| 949 | 85 |
| 1050 | 33 |
| 867 | 125 |
| 346 | 59 |
| 1025 | 105 |

**Program D: Dice rolling simulation (25%)**

Write a program that simulates the rolling of two dice. The program should use random number generator (C++ rand() function) to roll the first die and should use rand() function again to roll the second die. The sum of two values should then be calculated. Each die can show an integer value from 1 to 6, so the sum of the two values will vary from 2 to 12, with 7 being the most frequent sum and 2 and 12 being the least frequent sums. Your program should roll the two dice 1000, 10000, and 100000 times separately. Use a one-dimensional array to tally the numbers of times each possible sum appears. Display the results in a tabular format. Also, determine if the totals are reasonable by comparing the theoretical probability.

**Notes:**

1. Please submit your programs (source codes and execution files) to the CEIBA course website before **Nov. 12**. Hand in the hardcopies of your program codes in the class of **Nov. 12 (3:30PM)**.
2. Late submission will have a penalty of 10% discount per day of your grade toward a minimum score of 60. No late submission over a week will be accepted.
3. Criteria of grading include: (1) Program functionality; (2). User interface; (3). Structure of the program; (4). Suitable comments; (5). Programming style; (6). Creativity.