**Homework : Class problem**

**Problem 1:**

Create a “Fraction” class that will allow you to add, multiply ( or subtract, or divide) and display the fraction numbers. Please define the following constructors and function members. You may define more function members by yourself. The more functions in this class, the higher scores you will get.

You may need to display the results in reduced form.

Note1: Please use operator overloading to redefine the operator + for this fraction class.

Note2: Put the result fraction in reduced form(最簡分數表示結果).

a. Find the greatest common divisor (gcd) of the numerator and denominator.

b. Divide the numerator and denominator by the gcd.

Note3: Please declare objects in the main program and call the function members to test the class.

The specification of class Fraction is the following:

class Fraction

{ int numer;

int denom;

int find\_gcd(int, int);

public:

Fraction();

Fraction(int);

Fraction(int, int);

void setNum( int);

void setDEN( int);

int getNum();

int getDen();

void increment();

Fraction operator + (const Fraction &fr);

Fraction operator \* (const Fraction &fr);

void reduce\_fraction(int, int );

void print\_fraction( );

};

Note: You can add more function members into the class Fraction.

The more function members you add, the higher score you get.

Problem 2:

Define a “Rectangle” class with the following members:

Data member:

The constructor(s) or the set function(s) that accept four parameters:

x - the *x* coordinate of the rectangle to be drawn.

y - the *y* coordinate of the rectangle to be drawn.

where (x, y) is Cartesian coordinate of the left, top corner of the rectangle.

width - the width of the rectangle to be drawn.

height - the height of the rectangle to be drawn

Function members:

calPerimeter : calculate the perimeter of the rectangle

calArea: calculate the area of the rectangle

draw: draw the rectangle on graphics mode.

…

(a). Write a testing program to test the usage of class Rectangle.

(b). You may define “line”, “circle”, …, “polygon” in class forms as you need, combine these figures to form pictures and draw the pictures out on the screen.

Problem 3:

Design a class named Quadratic for quadratic equation *a*+ *bx +c =* 0. The class contains:

* Private data members a, b, c that represent three coefficients.
* A constructor for the arguments for a, b, c
* A function member getDis( ) that returns the discriminant, which is － *4ac.*
* The method named findRoot for displaying two roots of the equation:

 =   = 

If the discriminant is positive, display the two roots.

If the discriminant is 0, display the one root.

If the discriminant is negative, display “The equation has no real roots”

I. Write a test program that declares one object “**q1**” of the class Quadratic with

parameters *a, b, c* read from the keyboard.

II. Use **q1**to call **getDis()** and display the result in the screen.

III. Use **q1** to call **findRoot()** to display the roots.

加分題 (請儘量做)

請設計一個LargeInt “大數運算” 及 “大數運算式計值” 系統

Step I: 大數運算: 運算結果總長度不超過50位數

\* 請至少提供下列的基本運算:

Ex: LargeInt x, y, z;

|  |  |  |
| --- | --- | --- |
| Operator | Function | Example |
| + | Addition | x+y |
| += | Compound assignment | x+=y |
| － | Subtraction | x-y |
| \* | Multiplication | x\*y |
| / | Division | x/y |

\* 請設計可以直接由cout or System.out.println(“ ”)輸出variables(or objects) of LargeInt的值. 輸出格式由右到左每四位一個逗點

請直接在testing程式中宣告x, y, z, w四個variables(or objects) of LargeInt.

這四個 variables的初值由輸入檔file1.txt 依序輸入.

輸入資料：輸入包含四個資料. 第一列是x變數的初值. 第二列是y變

數的初值. 第三列是y變數的初值. 第四列是w變數的初值.

輸出資料： 請設計可以直接由cout or System.out.println(“ ”)輸出結果或者輸

出variables(or objects)of LargeInt的值.

輸出格式由右到左每四位一個逗點

輸出的the first line為x - y的結果

輸出的the second line 為y += x的結果

輸出的the third line為x \* z的結果

輸出的the fourth line為x / w的結果

Sample Input:

66666666666666666666

88888888888888888888

123456789123456

333333333333333

Sample Output:

-2222,2222,2222,2222,2222

1,5555,5555,5555,5555,5554

82,3045,2608,2303,9999,9917,6954,7391,7696

540000

Step II: 大數運算式計值規則:

\* 運算式計值結果總長度不超過50位數

\* 先乘除後加減；

\* 括弧內優先處理；

\* 輸入之運算式由檔案file2.txt讀入；

\* 讀取之運算式文法假設無誤；

\* 不可間斷式輸入，需一次輸入完整運算式；

\* 將運算結果顯示於畫面上。

輸入資料： 請由keyboard讀入大數運算式.

運算式的長度是可變的, 但不會超過100個symbols.

Symbol和symbol之間可以有任何數量的空格或者沒有空格分隔著.

因此運算式總長是未知的.

在input中, 每一條運算式放在one line上.

會有未知個數的運算式. 但是最多不會超過10條運算式.

輸出資料： 請從標準輸出裝置(Standard Output;螢幕)輸出大數運算式結果.

針對輸入檔每一條運算式, 依序在螢幕印出每一條運算式計值的結果.

輸出螢幕中, Each line就是相對應輸入檔每一條運算式計值的結果.

輸出格式由右到左每四位一個逗點.

Sample Input:

x\*w-z

(x+w)\*z

Sample Output:

222,2222,2222,2221,9999,9654,3209,8865,4322

82,3049,3760,4934,4115,1876,5432,1087,6544