**150018 - C++ Workshop**

**Homework Assignment #1**

**Object Oriented Programming**

1. Take care to make the program readable (including proper indentation)
2. Make sure the program does exactly what is required in each question.
3. In each of the questions, helper functions should be defined to improve program readability.
4. The exercise must be submitted according to the general instructions for submitting exercises (which appears on the course website), including:
   * Use meaningful names for the variables.
   * The program must document all functions defined, as well as conditional and loop statements and complex code snippets.
   * Include results of program execution as a comment at the end of the file!
5. Do not submit in teams.

Important Note: You have one week to submit each homework assignment unless you instructed differently by your lecturer. An open submission box does not imply that you can submit after the due date.

**Question 1**

Define a class for rational numbers. The class should contain the following fields:

* + numerator
  + denominator

and the following methods:

* for each field, a getter and setter method (should set the denominator to 1 if the parameter passed was 0)
* print method in the format numerator/denominator (e.g., ½, ¾, 54/56) according to the values that have been set.
* private method **Rational** **reduction()** which returns a Rational in reduced form
* a method **Rational** **add(Rational)** that returns a Rational that is the sum of the two rational numbers.
* a boolean method **equal** that compares 2 rational numbers and checks if their reduced values are equal.

Using the class that you created, write a main program that inputs 2 rational numbers in the format numerator/denominator and prints out:

* the sum of the two numbers
* the message The two numbers are equal if they are equal
* the message The two numbers are different and the original numbers (before reduction)

enter two rational numbers:  
1/2 3/6  
1/2 + 3/6 = 1/1  
The two numbers are equal

enter two rational numbers:  
1/2 2/6  
1/2 + 2/6 = 5/6  
The two numbers are different   
1/2 2/6

You should use the following main program:

#include"Rational.h"

#include <iostream>

using namespace std;

int main()

{

int numerator, denominator;

char tav;

cout << "enter two rational numbers:" << endl;

cin >> numerator >> tav >> denominator;

Rational r1;

r1.setNumerator(numerator);

r1.setDenominator(denominator);

cin >> numerator >> tav >> denominator;

Rational r2;

r2.setNumerator(numerator);

r2.setDenominator(denominator);

Rational ans = r1.add(r2);

r1.print();

cout << "+ ";

r2.print();

cout << "= ";

ans.print();

cout << endl;

if (r1.equal(r2))

cout << "The two numbers are equal" << endl;

else

{

cout << "The two numbers are different" << endl;

r1.print();

r2.print();

cout << endl;

}

return 0;

}

**Question 2**

Define a class that represents employee data in the "Give from the Heart" organization for the purpose of calculating salaries.

The class should include the following fields:

* Social security number (int).
* Name - up to 20 characters (static array) (char name[21 [)
* Hourly wage (float)
* Number of hours worked (int)
* The amount of money collected for the organization (float).

And the following methods

For each field:

* Set method.
* A method that returns its value
* a method to calculate the total salary according to the formula: number of hours worked \* wages per hour + percentage of amount collected

The percentages are calculated according to the following table:

|  |  |
| --- | --- |
| Salary | Percentage |
| up to 1000 nis (inclusive) | 10% |
| from 1000 nis to 2000 nis (inclusive) | 15% |
| from 2000 nis to 4000 nis (inclusive) | 20% |
| from 4000 nis to 5000 nis (inclusive) | 30% |
| above 5000 nis | 40% |

For example, a worker that collected 4500 NIS for the organization, the percentage of their salary would be 1000\*0.1+1000\*0.15+2000\*0.2+500\*0.3=800, that is in addition to the employee’s base salary theemployee receives an additional 800 nis.

Write a main program that will input information of employees (until an SSN of 0 is entered). For each employee, the following data will be received, in order: SSN number, name, hourly wage, number of hours worked, the NIS amount of contributions collected. (It can be assumed that there is at least one employee).

The program should print out:

* the SSN and name of the employee who collected the least amount of money
* the employee who received the highest salary

Note:

* The program should read all the data for an employee before checking if it is legal. On illegal input, the program should print ERROR. Each field should contain legal data relevant for that field.
* The main program should not allocate an array of employees.

enter details, to end enter 0:

123456789 moshe 50 40 2000

135792468 rivka 120 55 3450

97531246 sara 35 100 5632

0

minimum sum: 2000 moshe 123456789

highest salary: 7140 rivka 135792468

enter details, to end enter 0:  
111111111 doron 35 120 6000  
222222222 tal 50 55 1400  
444444444 levi 45 -4 100  
ERROR  
333333333 naomi 30 120 800  
0  
minimum sum: 800 naomi 333333333  
highest salary : 5550 doron 111111111

**Question 3**

Write a class to represent circles (define a class Point to represent a point). The class contains the following fields:

* + center point
  + radius

and the following methods:

* getter/setter methods for all fields
* a method to compute area (define a constant PI=3.14)
* a method to compute circumference
* a method that receives a point as input and return 0 if the point lies on the circle, -1 if it is inside the circle, and 1 if it is outside the circle.

Write a main program the inputs data for 3 circles (A, B, and C) and for each circle, prints its area and circumference. The program then inputs data for points until it receives the point (0,0). The program outputs the number of points (not including the terminating point) that lie on or inside each circle.

enter the center point and radius of 3 circles:

(0,0) 3

(1,1) 2

(5,5) 2

perimeter: A: 18.84 B: 12.56 C: 12.56

area: A: 28.26 B: 12.56 C: 12.56

enter points until (0,0):

(0,1)

(1,0)

(0,4)

(0,0)

num of points in circle: A:2 B:2 C:0