COMP 132: Advanced Programming

Homework 9

C++ Enhancements to C, and C++ classes

Question 1:

Write a C++ program with the two alternate functions specified below, each of which simply triples the variable *count* defined in main program. Then, compare and contrast the two approaches. These two functions are:

a) function *tripleByValue* that passes a copy of count by value, triples the copy and returns the new value

b) function *tripleByReference* that passes count by reference via a **reference parameter** and triples the original value of count through its alias (i.e., the reference parameter).

```
Enter a value for count: 8

Value of count before call to tripleByValue() is: 8
Value returned from tripleByValue() is: 24
Value of count (in main) after tripleCallByValue() is: 8

Value of count before call to tripleByReference() is: 8
Value of count (in main) after call to tripleByReference() is: 24
```

Question 2:

Write a C++ program that uses a **function template** named *min* to determine the smallest of its two arguments. Test the program using integer, character, floating-point number and string arguments.

```
Testing function template min.

Input two integer values: 7  54
The smallest integer value is: 7

Input two characters: x  e
The smallest character value is: e

Input two double values: 8.46   4.35
The smallest double value is: 4.35

Input two strings: hello world
The smallest string value is: hello
```

Question 3:

Write a C++ class named *Person* that includes four pieces of information as data members: a first name (type **string**), a last name (type **string**), an age (type **int**), and a salary (type **int**).
Your class should have a constructor that initializes the four data members. Provide a *set* and a *get* function for each data member. If the salary is non positive, set it to 0. If the age is not positive, set it to 21. Write a test program that demonstrates class *Person*'s capabilities. Declare two *Person* objects and display each object's *age* and *salary*. Then calculate each *Person*'s salary for 5 years later with 10 percent increase, and display each *Person*'s ages and salaries for 5 years later.

```
Persons' ages and salaries:
--------- Lisa Roberts ---------
Age: 27, Salary: $54000
--------- Mark Stein ---------
Age: 25, Salary: $48000

Persons' ages and salaries for 5 years later with 10% raise:
--------- Lisa Roberts ---------
Age: 32, Salary: $59400
--------- Mark Stein ---------
Age: 30, Salary: $52800
```

Question 4:

Implement a C++ class TicTacToe that would enable you to write a program to play the game of tictac-toe with the following features:

- The class contains as private data a 3-by-3 two-dimensional array of integers.
- The constructor should initialize the empty board to all zeros.
- Design your program to allow two human players.
- Use a text-based interface for your tic-tac-toe application.
- Wherever the first player moves, place a 1 in the specified square; place a 2 wherever the second player moves.
- Each move must be to an empty square.
- After each move, determine if the game has been won or if the game is a draw.

A sample user interface is given next.

```
   0    1    2

0    |    |
 ____|____|____
     |    |
1    |    |
 ____|____|____
     |    |
2    |    |

Player X enter move: 2 0

   0    1    2

0    |    |
 ____|____|____
     |    |
1    |    |
 ____|____|____
     |    |
2  X |    |

Player O enter move: 2 2

   0    1    2

0    |    |
 ____|____|____
     |    |
1    |    |
 ____|____|____
     |    |
2  X |    |  O

Player X enter move: 1 1
...
Player X enter move: 0 2

   0    1    2

0    |    |  X
 ____|____|____
     |    |
1    |  X |  O
 ____|____|____
     |    |
2  X |    |  O

Player X wins!
```