

KIE1008: Programming 2
Week 3: Object-Oriented Programming – Composition

1. Find the syntax errors in the following class definition.

```
1  class discover()
2  {
3  public:
4      set(string, int, double);
5      void print() const;
6      discover() const;
7      discover(string, int, double);
8      set(string, int, double);
9  private:
10     string type;
11     int l;
12     double w;
13 }
```

2. Define a class `pointType` to implement the properties of a point in a two-dimensional plane. Your class must contain functions to individually set and retrieve the `x` and `y` coordinates, find the distance between this point and another point, and constructors to initialize `pointType` objects. If `p1` and `p2` are `pointType` objects, then `p1.distance(p2)` returns the distance between `p1` and `p2`.

If we know two points on a line, we can describe various properties of a line, such as whether the line is vertical, horizontal, or slanted, and if the line is nonvertical, then find its slope. Define the class `lineType` with two private data members of type `pointType` to store the coordinates of two points on a line in the two-dimensional plane. Among others, your class must contain functions to determine if the line is vertical, horizontal, or slanted, find the slope of the line, and output the equation of the line in slope intercept form ($y = mx + c$). If the line is vertical, then output its equation in the form $x = a$, where a is a real number.

3. (Friend and Proxy Classes) Write a program to keep students' information for a university
 - Create a proxy class `student`, which contains the following data members: name, age and gender, and the necessary (get and display) functions.
 - Create a class `undergrad`, which uses proxy class `student`.
 - Create a class `postgrad`, which uses proxy class `student`.
 - Create a friend function to modify the age of the undergrad and postgrad students.
Demonstrate your program.
4. Write a program to record the information about courses offered by a university.
 - Create class `course` that records the course's name and code. Create the appropriate accessor and mutator functions. Also, create a friend function that display the course info.
 - Create class `lecturer` that records a lecturer's position (Professor/Associate Professor/Senior Lecturer/Lecturer) and name. Create the appropriate accessor, mutator and utilization functions.

- c) Create class student that records a student's name, ID, mark and grade. Create the appropriate accessor, mutator and utilization functions. The grade for each student is calculated automatically from the randomly assigned marks (0-100) for each student.
- d) Create a class called core that contains course, lecturer and an array of size 10 student as private data. Create the appropriate accessor, mutator and utilization functions.
- e) Create main() that declares a core course, then prompt the user to key in the students' info (name and ID).

The sample output of the program is as follows:

```
Gradebook for KIE1008: Programming II
Lecturer: XXX (Position: Professor)
1.    John Lee (87654321)    70 (B)
2.    Mohd. Amin (87654322)  80 (A)
3.    Siti Rohani (87654323) 90 (A+)
...
```

where the first line is printed using the friend function, second line is printed by function inside class lecturer, and each student info is printed by function inside class student.