Handout 5  
Introduction to Programming in C++

Deadline is November 29

**Exercise 1:** Given the following C++ code:

**class A {**

**public :**

**int x;**

**A \*objARef;**

**private :**

**int y;**

**protected :**

**int z;**

**};**

**class B : public A {**

**public :**

**A objA;**

**};**

**class C {**

**public :**

**A objA;**

**A \*objARef;**

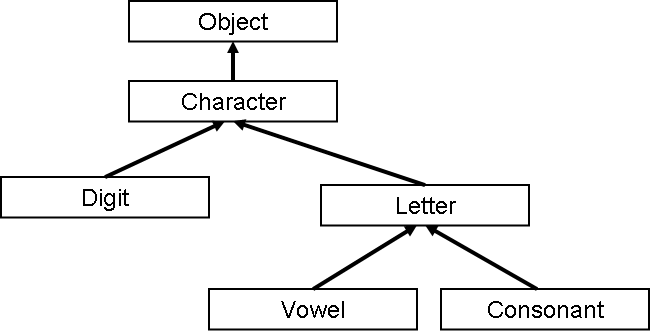
**B objB;**

**};**

Determine for each of the following attribute-access-expressions whether it results in an Error or not.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **in class A** | **in class B** | **in class C** |
| **x** | OK | OK | Wrong |
| **y** | OK | OK | Wrong |
| **z** | OK | OK | Wrong |
| **objA.x** | Wrong | OK | OK |
| **objA.y** | Wrong | OK | Wrong |
| **objA.z** | Wrong | OK | OK |
| **objARef->x** | OK | OK | OK |
| **objARef->y** | OK | OK | Wrong |
| **objARef->z** | OK | OK | OK |
| **objB.x** | Wrong | OK | OK |
| **objB.y** | Wrong | OK | Wrong |
| **objB.z** | Wrong | OK | OK |

**Exercise 2:**

Given the following class hierarchy:

1. Create C++ code without attributes and methods for all for all 6 classes.

2. Extend the class character by a public attribute **ch**, so that it can store a single character.

3. Overload the operator + for the class Character, so that it can add two objects of type Character. Implement the + by summing up the numeric ASCII-codes of two characters followed by the application of a ‘modulo 128’. Similar to:

**char sum(char c1, char c2) { return (char)(((int)c1 + int(c2))%128); }**

4. Override the operator + in the Digit class, so that it adds the numeric value of two digits and delivers the digit that we get if we finally apply “modulo 10”.

(Example ‘5’ + ‘6’ = ‘1’ // 5 + 6 = 11 % 10 = 1)

5. Extend the Object class by an object counter that counts the number of created objects for all objects of the above class hierarchy. (Tip: Lecture 9 slide 5) The counter should be embedded into the Object-class default constructor.

6. Change the visibility of the attribute **ch**, so that it is visible in all subclasses, but inaccessible from outside. Create a get-set method pair for the attribute **ch**.

7. Create a main-method, where you create 2 objects of each class in the above class hierarchy and that prints finally the value of your object counter (**this should be 12**).