Name: Tai Bui
CSCI 3731 – Hw08

1. What does the friend keyword do?

While methods are allowed to access their class' private data, functions do not have this privilege. Thus, we can use friend keyword to show the function is trusted and allowed to access private data and methods.

2. Why should you never use using namespace std;?

C++ has no convention for keeping the package names of every project on Earth unique. Thus, if two people use the same package name, it will result with naming collisions. If I use namespace std: and put it in a header file, then I will import the namespace in any C++ file that includes that header. As a result, I can't use that namespace to avoid name collisions.

3. Describe fours ways to return an object from a method.

The first option is to return a reference to a class. The downside of this technique is that it returns the same object every time we call the method. Thus, in a multi-threaded application, the method would give incorrect result if it was called by two different threads at the same time.

The second technique is to return a copy of the object. While the advantage of this technique is that we return a new object that is completely separate from the data in the class object, the disadvantage of such technique is that this copies the object, leading to inefficient code.

The third technique is to return an object created on the heap. While this technique ensures that the returned object outlived the method, there are two problems with this pattern. First, callers are forced to deal with heap data and the memory management duties that come with it. Second, the method is allocating fresh memory every it is called.

Finally, the last technique is to use an argument. This is a void method which allows callers to pass in non-const reference to an existing object, which the method modifies. The advantage of this method is that it leaves all memory management decisions up to callers. However, this technique won't work if the object does not have the method to let it set to the desire state.

4. What does the mutable keyword do?

When we want to modify the class's variables, but those variables are incidental to what we think of as the value of the object. We can use mutable to mark variables to be exempted from the rule that one can't modify them inside a const method.

5. What are the three ways a class can contain objects in C++?

The three ways a class can contain objects in C++ are: as an actual object, as a reference and as a pointer. The first case is the simplest memory management. Once the class is destructed, the contained objects are destructed as well. However, the drawback for such method is that two class objects cannot share the same contained object. To bypass such restriction, a class can contain object, which created and stored somewhere outside of the class, as a reference. A drawback of using object reference is that once initialized, we can't change what they refer to. To avoid the reference's restriction, we can also use pointers.

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6. What is a Singleton?

A singleton is a class that allows only a single instance of itself to be initiated. The class contains static variables that can accommodate private instances of itself.