CS101 - Data Abstraction

OOPS - Module2

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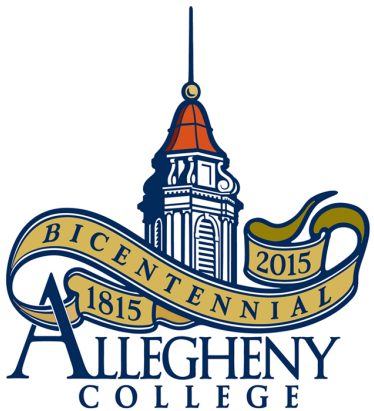


Abstract Class

- **Definition** - An abstract class is a template definition of methods and variables of a class.
- An abstract class cannot be instantiated. That is, an object for an abstract class cannot be created.
- It is not required to create abstract classes. But the code is cleaner and makes programming more efficient.
- Avoid looking at extraneous details frequently.

Abstract Class

- How to declare an Abstract method?

  Which among the following is valid?
- public **abstract** void m(){}
- public void m();
- public **abstract** void m();
- public void m(){}

Interface

- **Definition** - An Interface is a contract, that is used to specify a behavior that classes must implement.
- One or more classes should implement an Interface.
- What is the need for an Interface? Can we replace Interface with an Abstract class?

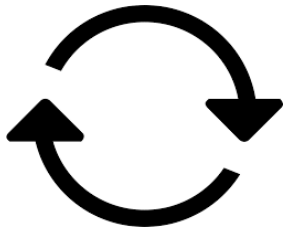
Abstract versus Interface

- Let us suppose a hospital is recruiting a Janitor. Eligibility - candidate should know how to mop the floor, clean the toilets, and should know how to perform a medical surgery.
- The doctors association will not like this advertisement.
- Doctors can mop and clean in their house but they are not janitors.
- Doctors are like abstract class. Janitors are like interfaces.

Interface

- An Interface can extend any number of interfaces simultaneously. Hence Java support for multiple inheritance with respect to Interfaces.
  - Why ambiguity problem is not there in Interfaces?
    Even though multiple method declarations are available, but implementation is unique and hence there is no chance of ambiguity problem in Interfaces. Stricly speaking we don't get any code reusability and inheritance.

Cyclic Inheritance



Does Java supports Cyclic Inheritance?

Recap of OOPS

- Data hiding - Secure data from external world. Data exposed through a protected manner.
- Abstraction - Hiding internal implementation and highlighting the services.
- Abstraction Vs Interface - by using abstract and interface classes we can implement abstraction.

Encapsulation is data hiding.

Encapsulation - Advantages and Disadvantages

Implemented using private variables in a class and by using getters and setters.

Advantages of encapsulation are:

1. Security
2. It becomes easier to Enhancement
3. Improves usability
4. Flexible maintainence

Disadvantages

1. Increases length of the code
2. Slows down execution

Polymorphism

- Definition: Polymorphism is ability of an object to appear and behave differently for the same invocation. ex: each car can give different mileage (when driving it)
- Enables ”programming in the general”
- The same invocation can produce ”many forms” of results

Polymorphism Case1

- Method Overloading: The notion of having two or more methods in the same class with the same name but different arguments.

```
void foo(int a);
void foo(int a, float b);
```

Polymorphism Case2

- Method Overriding: Multiple methods with same arguments, but different implementations.
- Parent and child class implementation.

Polymorphism Case2

```
class Parent {
    void foo(double d) {
        // do something
    }
}
class Child extends Parent {
    @Override
    void foo(double d){
    // this method is overridden.
    }
}
```

Reading Assignment

GT Chapter 2 [2.2, 2.3]

Next

More on Arrays and Linked Lists.

Questions?

Please ask if there are any Questions!