ITMD 411

Abstraction

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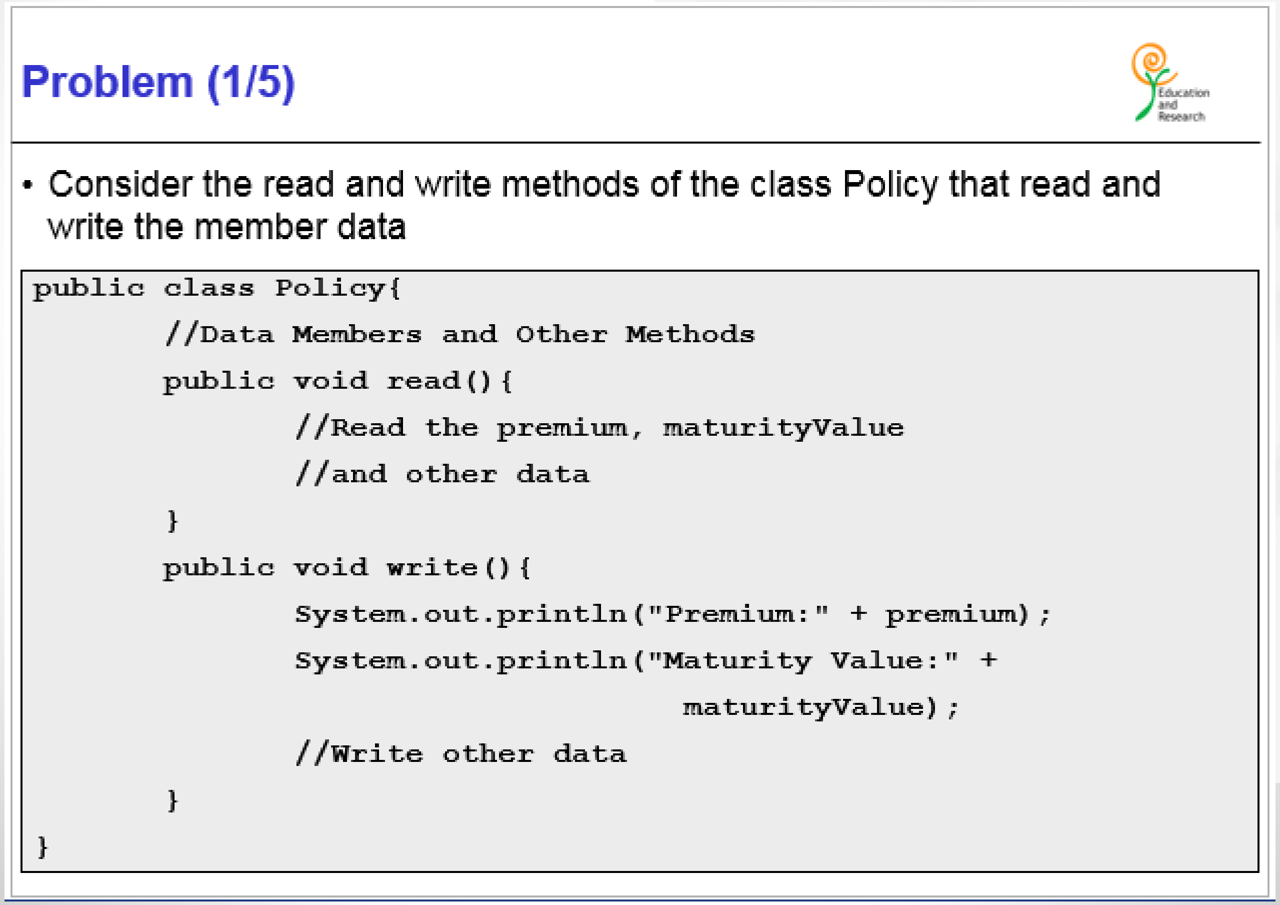
ITMD 411 Key word - extends



Problem (1/5)

Education and Research

- Consider the read and write methods of the class Policy that read and write the member data

```
public class Policy{
        //Data Members and Other Methods
        public void read(){
                //Read the premium, maturityValue
                //and other data
        }
        public void write(){
                System.out.println("Premium:" + premium);
                System.out.println("Maturity Value:" +
                                            maturityValue);
                //Write other data
        }
}
```

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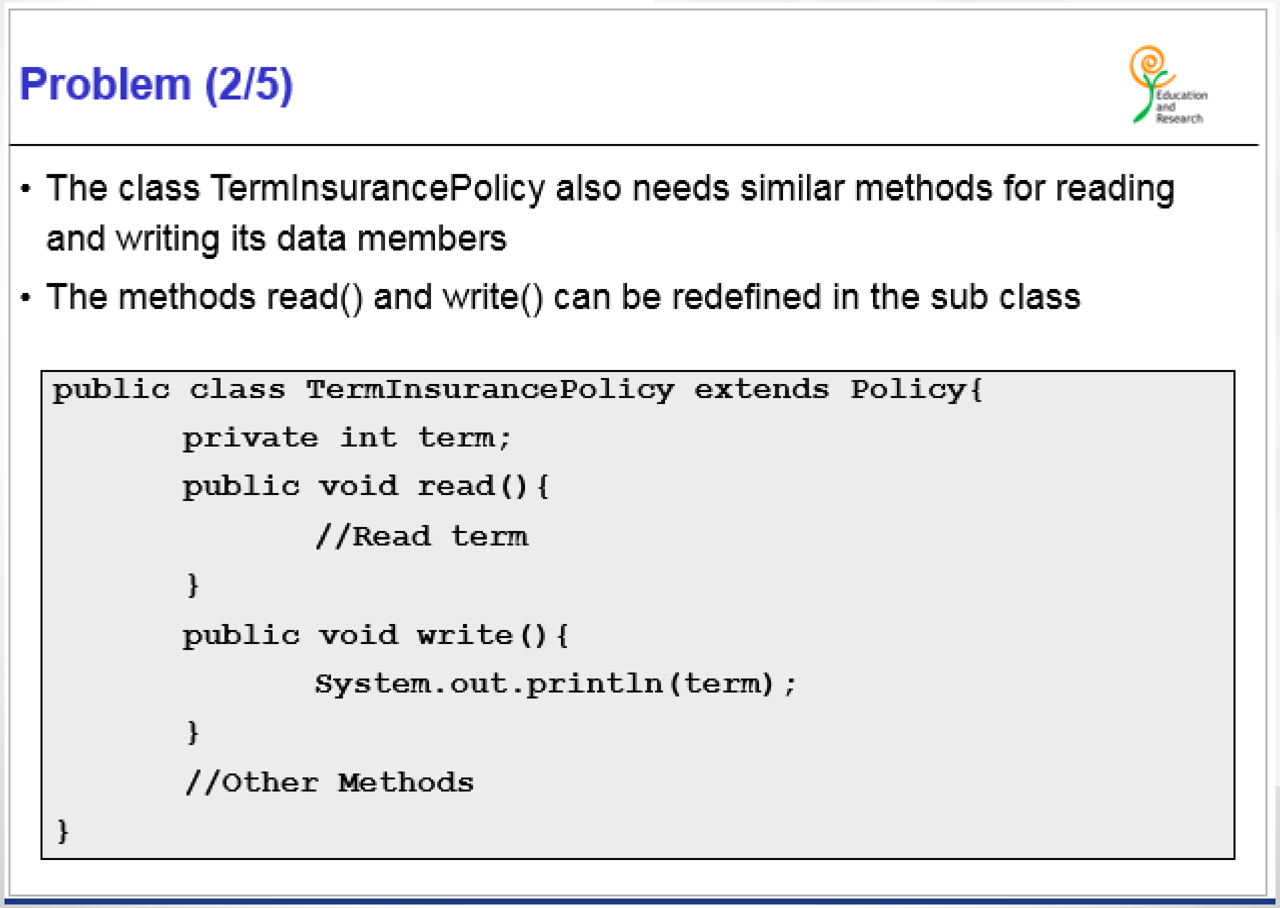

Problem (2/5)

- The class TermInsurancePolicy also needs similar methods for reading and writing its data members
- The methods read() and write() can be redefined in the sub class

```
public class TermInsurancePolicy extends Policy{
        private int term;
        public void read(){
                //Read term
        }
        public void write(){
                System.out.println(term);
        }
        //Other Methods
}
```

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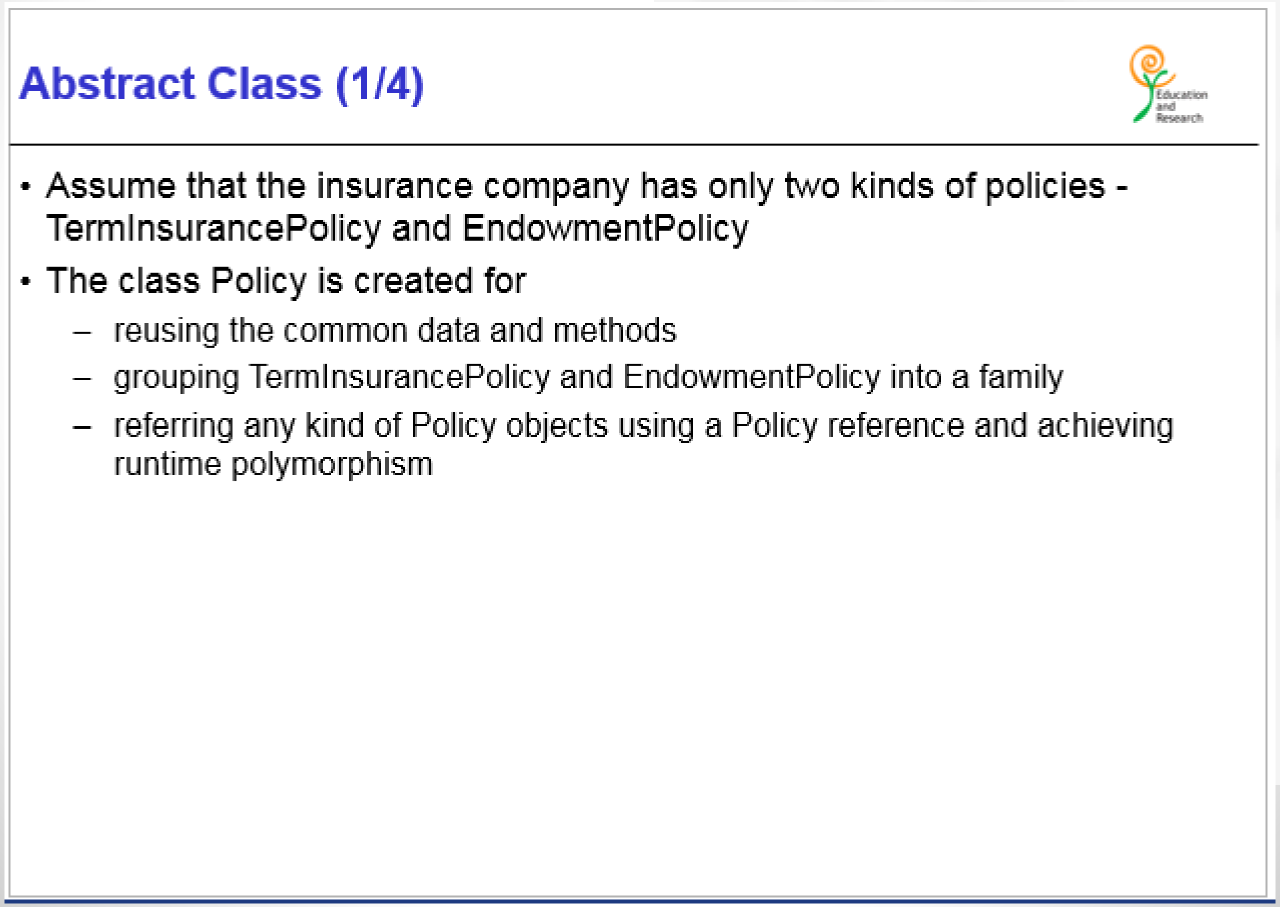

Abstract Class (1/4)

- Assume that the insurance company has only two kinds of policies - TermInsurancePolicy and EndowmentPolicy
- The class Policy is created for
  - reusing the common data and methods
  - grouping TermInsurancePolicy and EndowmentPolicy into a family
  - referring any kind of Policy objects using a Policy reference and achieving runtime polymorphism

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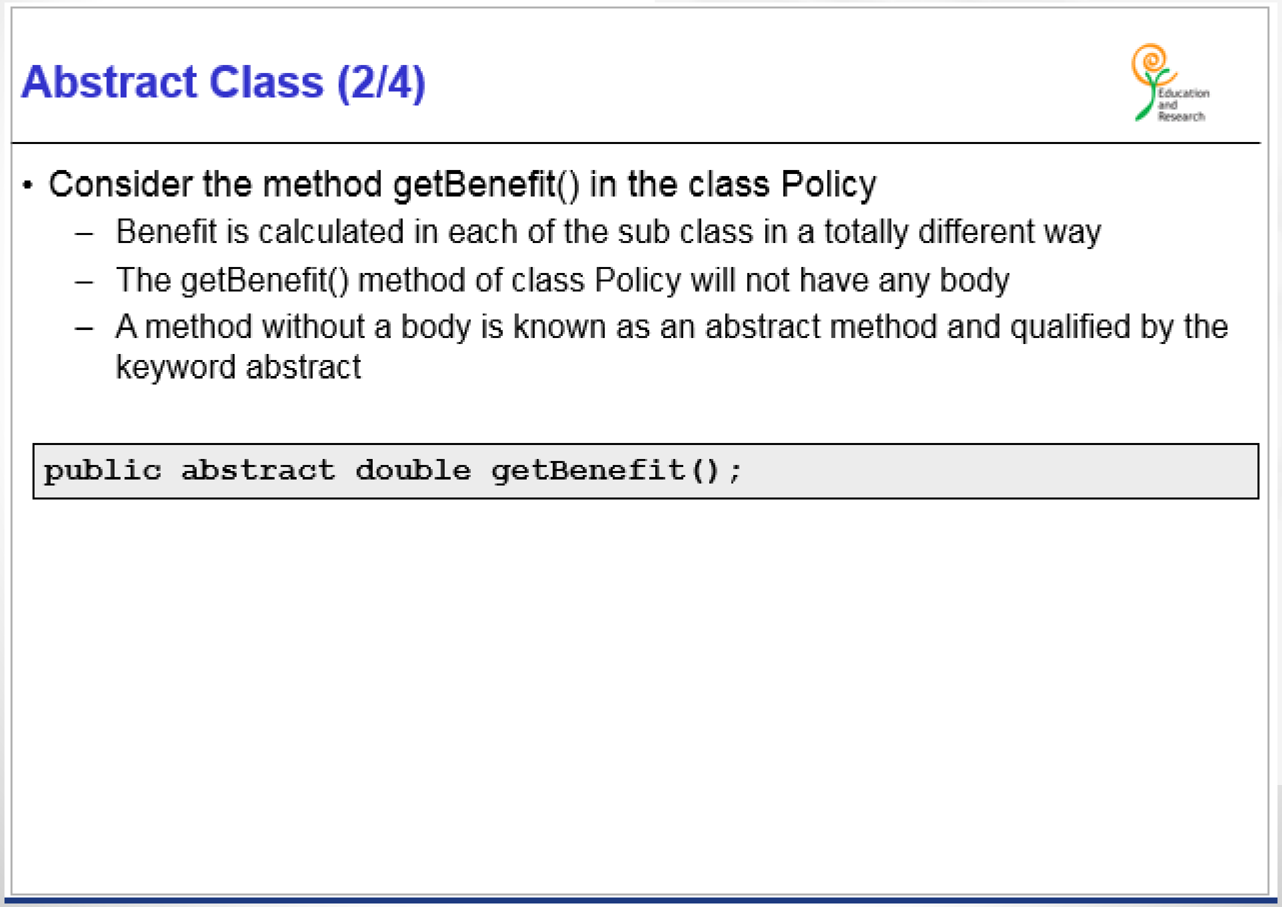

Abstract Class (2/4)

- Consider the method getBenefit() in the class Policy
  - Benefit is calculated in each of the sub class in a totally different way
  - The getBenefit() method of class Policy will not have any body
  - A method without a body is known as an abstract method and qualified by the keyword abstract

```
public abstract double getBenefit();
```

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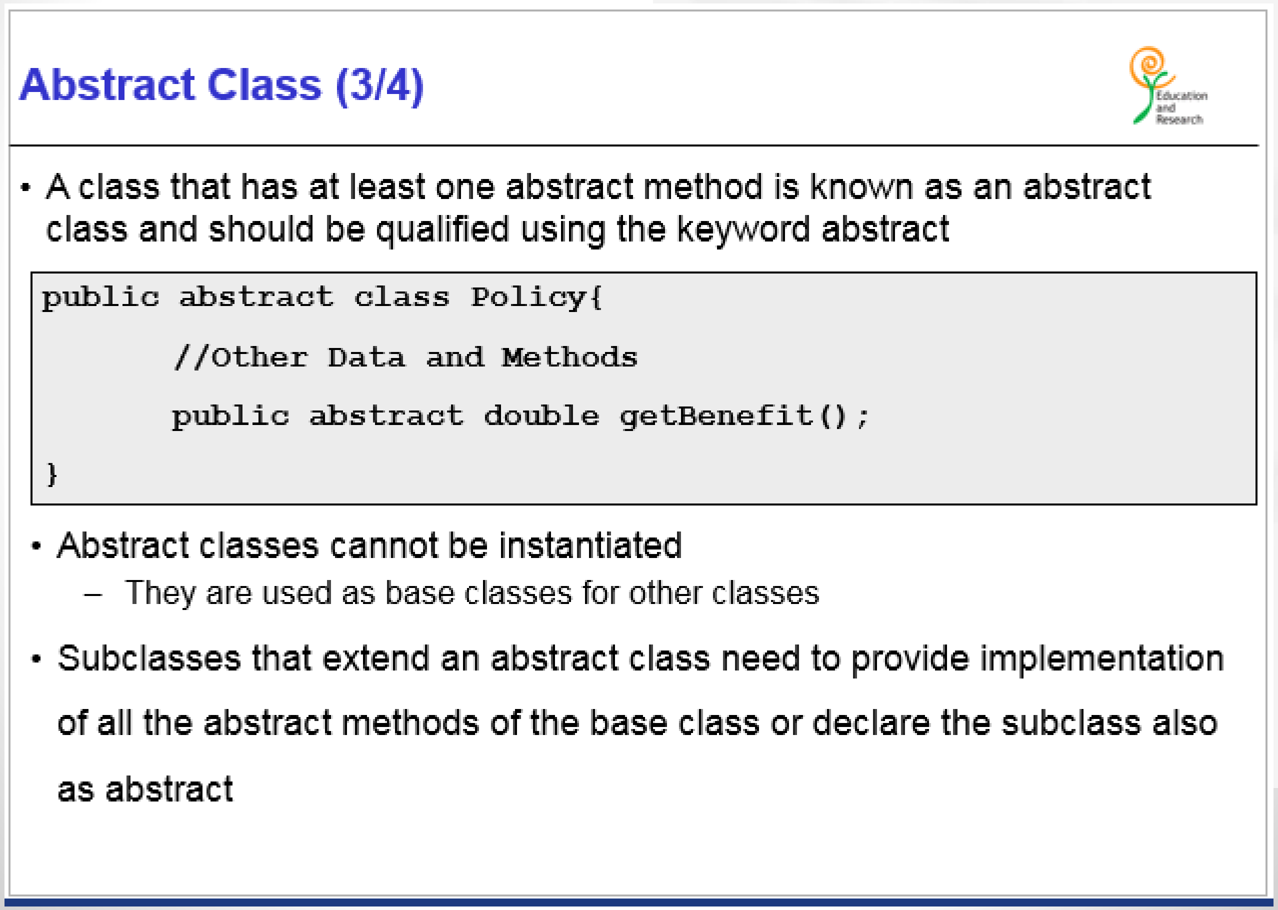

Abstract Class (3/4)

Education and Research

- A class that has at least one abstract method is known as an abstract class and should be qualified using the keyword abstract

```
public abstract class Policy{
       //Other Data and Methods
       public abstract double getBenefit();
}
```

- Abstract classes cannot be instantiated
  - They are used as base classes for other classes
- Subclasses that extend an abstract class need to provide implementation of all the abstract methods of the base class or declare the subclass also as abstract

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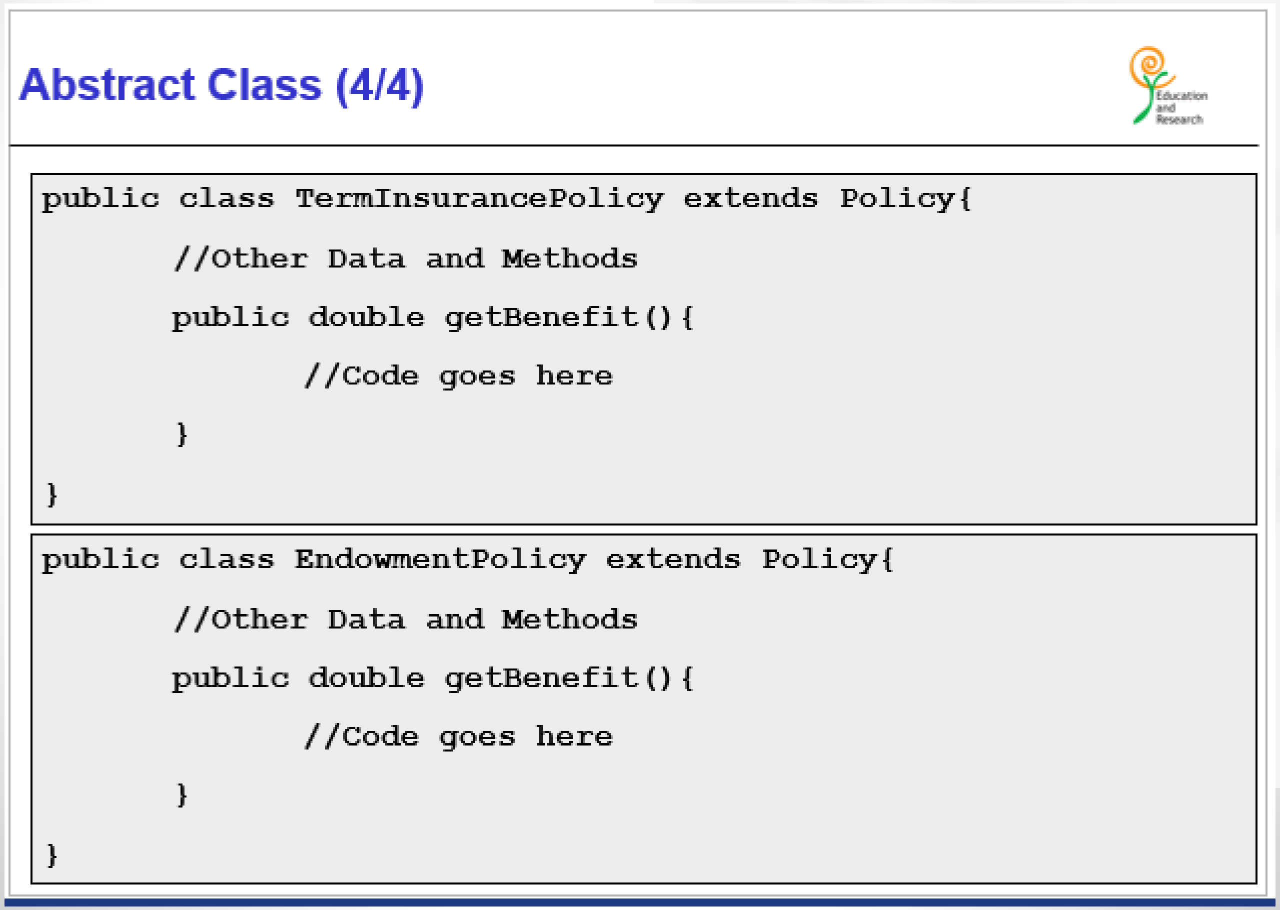

Abstract Class (4/4)

```
public class TermInsurancePolicy extends Policy{
        //Other Data and Methods
        public double getBenefit(){
                //Code goes here
        }
}
```

```
public class EndowmentPolicy extends Policy{
        //Other Data and Methods
        public double getBenefit(){
                //Code goes here
        }
}
```

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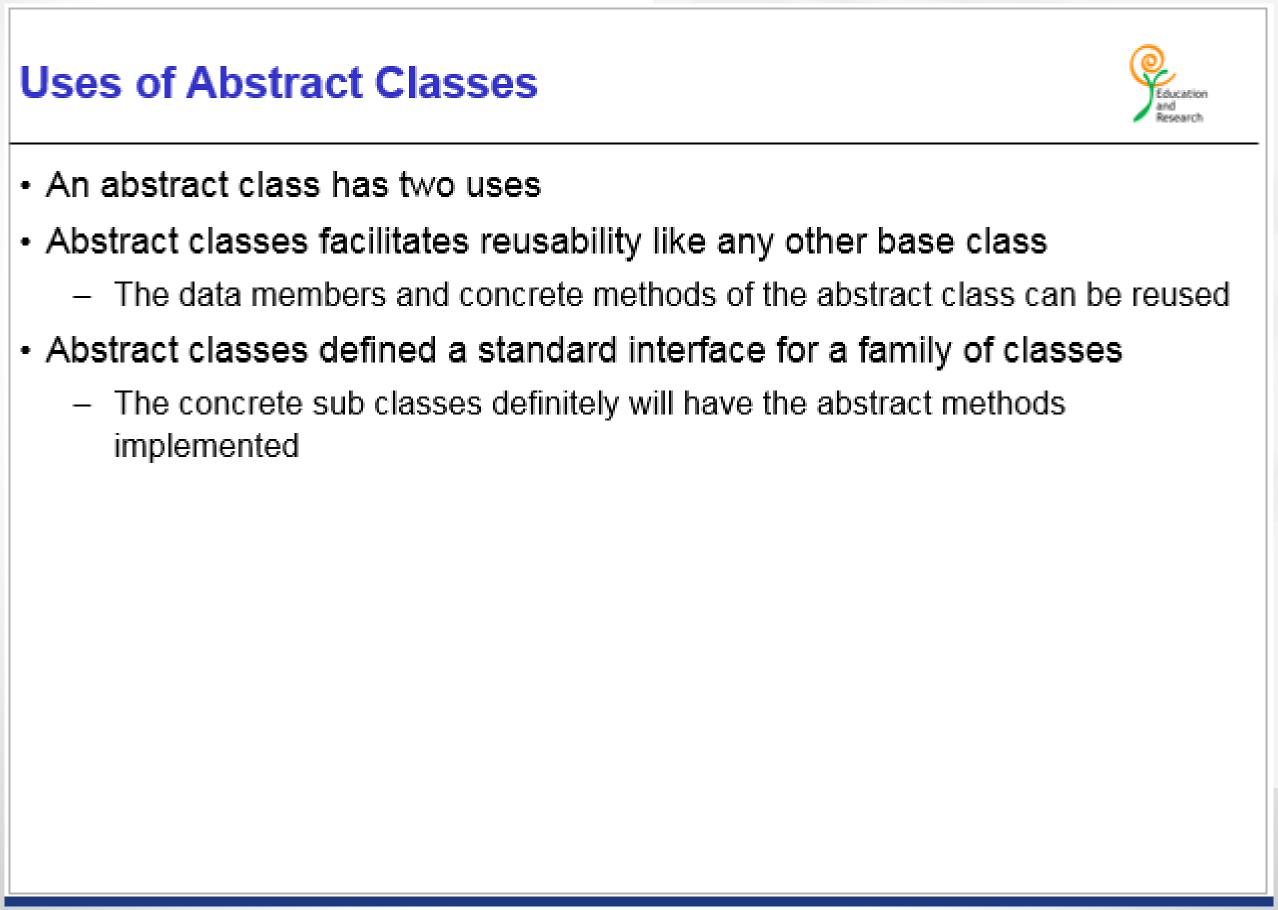

Uses of Abstract Classes

- An abstract class has two uses
- Abstract classes facilitates reusability like any other base class
  - The data members and concrete methods of the abstract class can be reused
- Abstract classes defined a standard interface for a family of classes
  - The concrete sub classes definitely will have the abstract methods implemented

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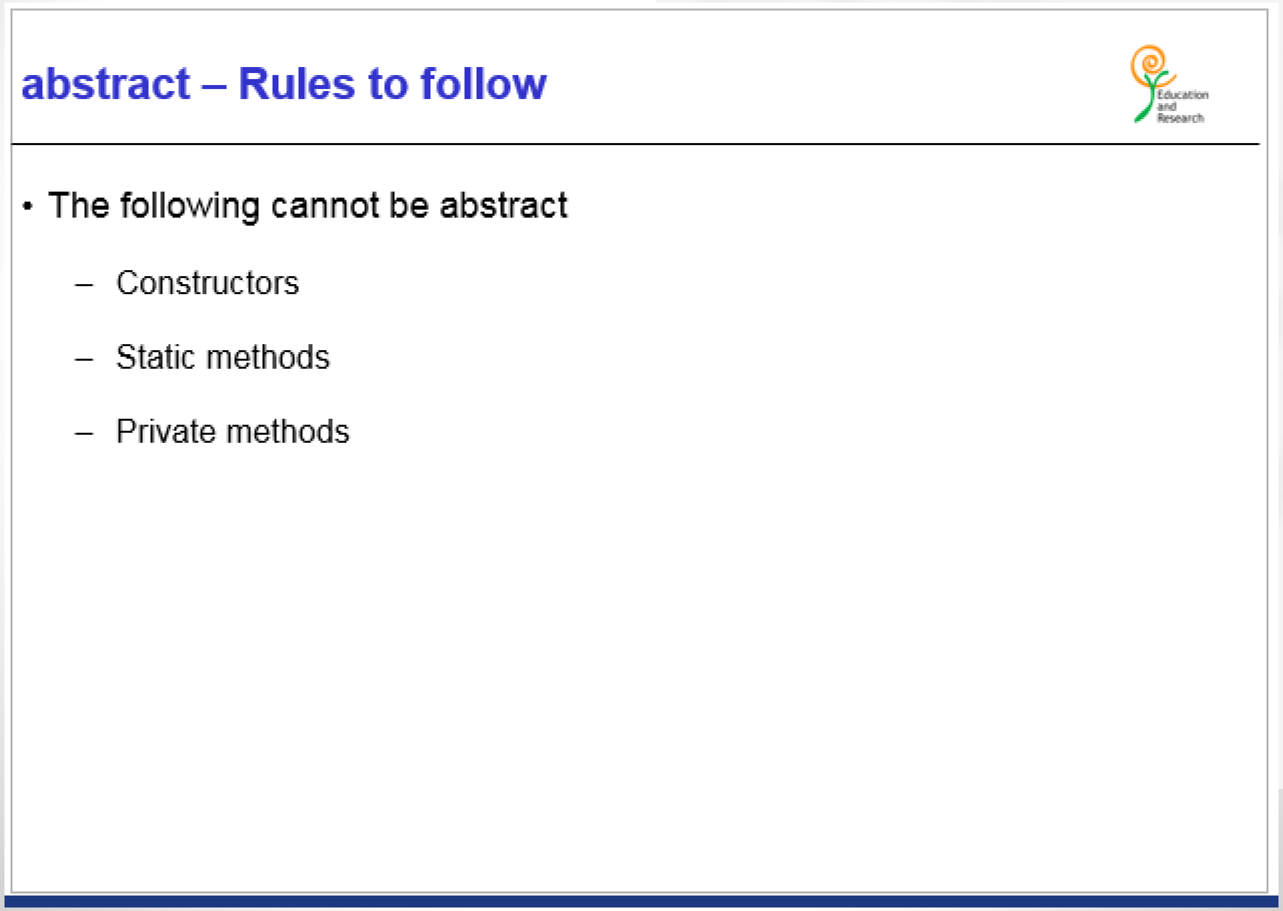

abstract – Rules to follow

Education and Research

- The following cannot be abstract
  - Constructors
  - Static methods
  - Private methods

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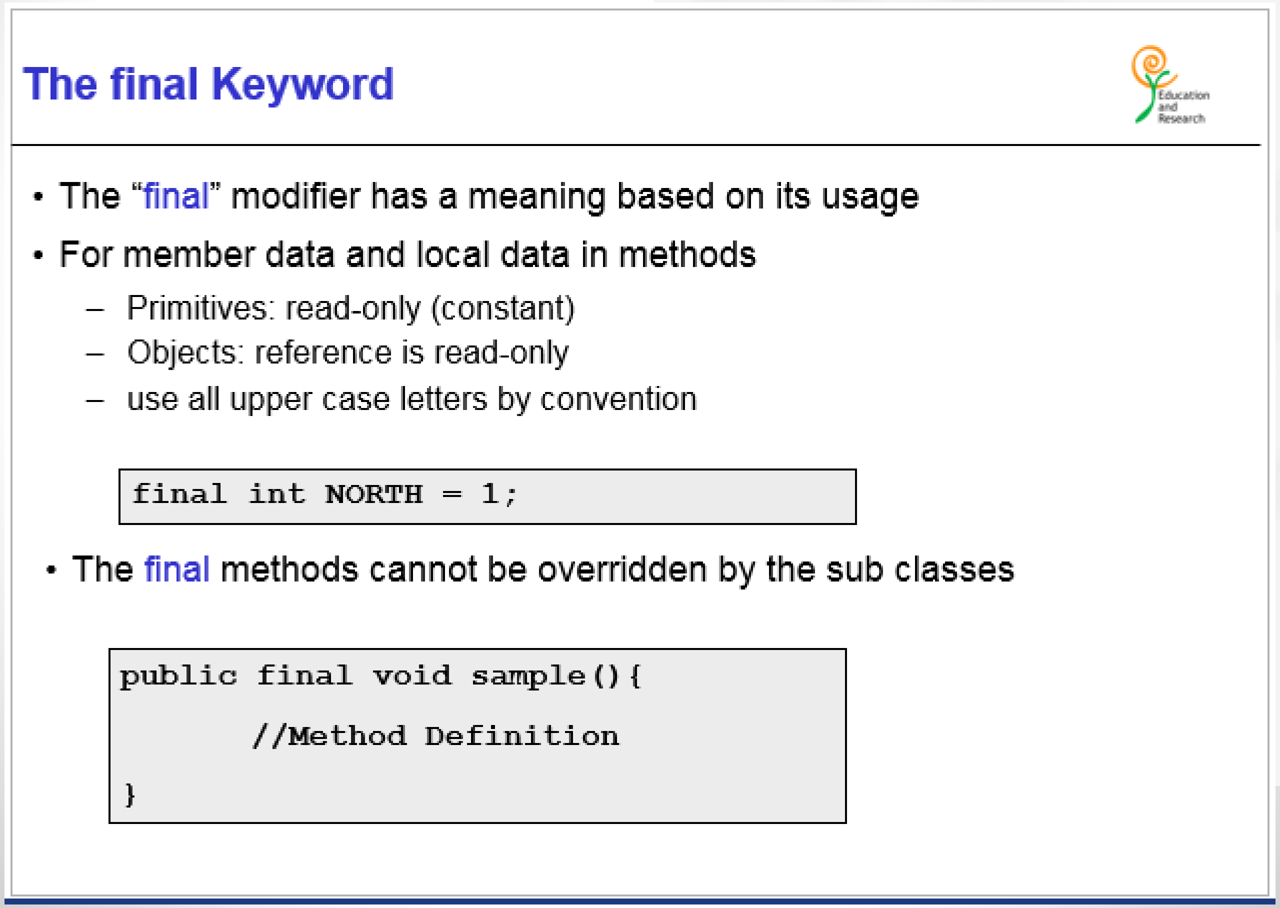

The final Keyword

- The “final” modifier has a meaning based on its usage
- For member data and local data in methods
  - Primitives: read-only (constant)
  - Objects: reference is read-only
  - use all upper case letters by convention

```
final int NORTH = 1;
```

- The final methods cannot be overridden by the sub classes

```
public final void sample(){

       //Method Definition

}
```

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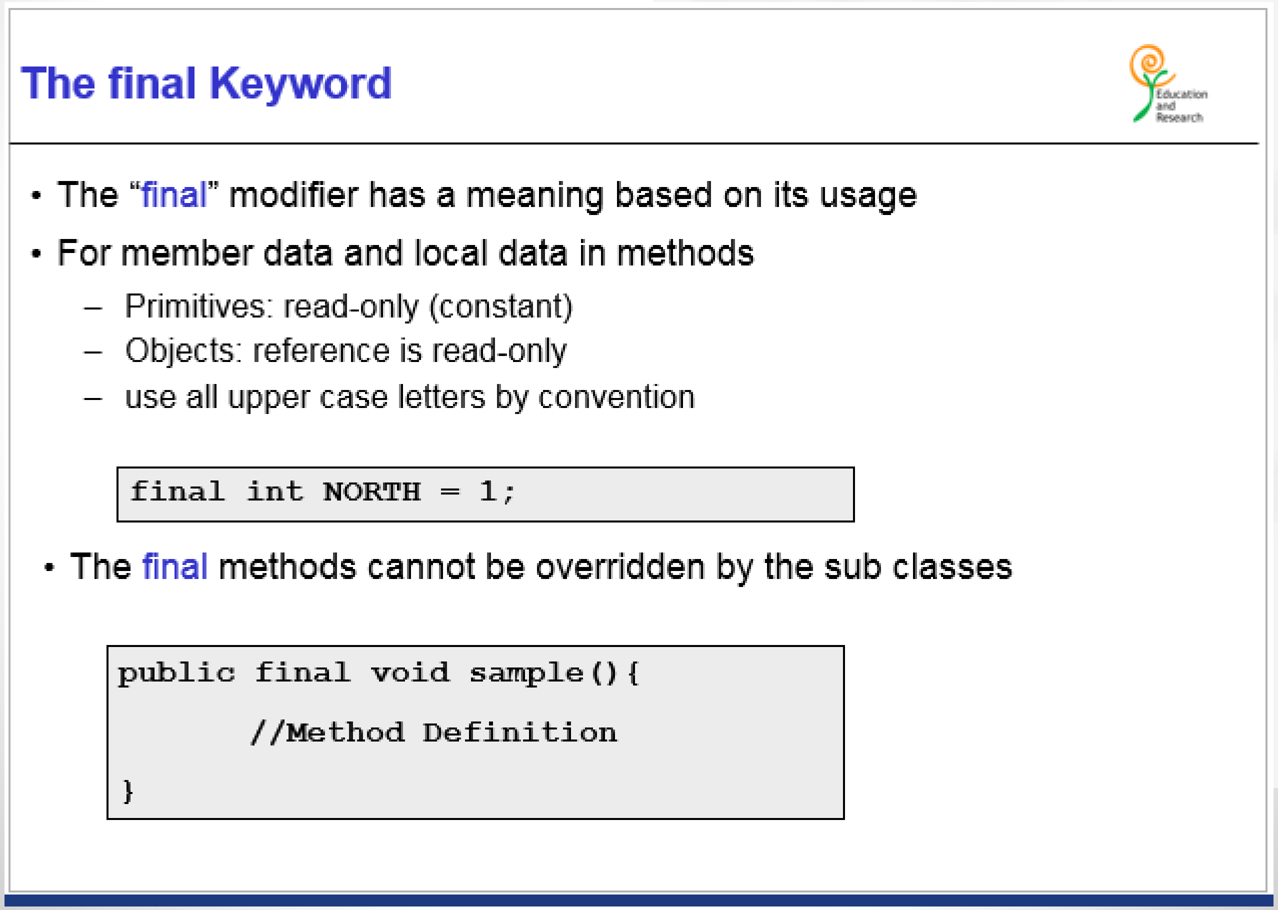

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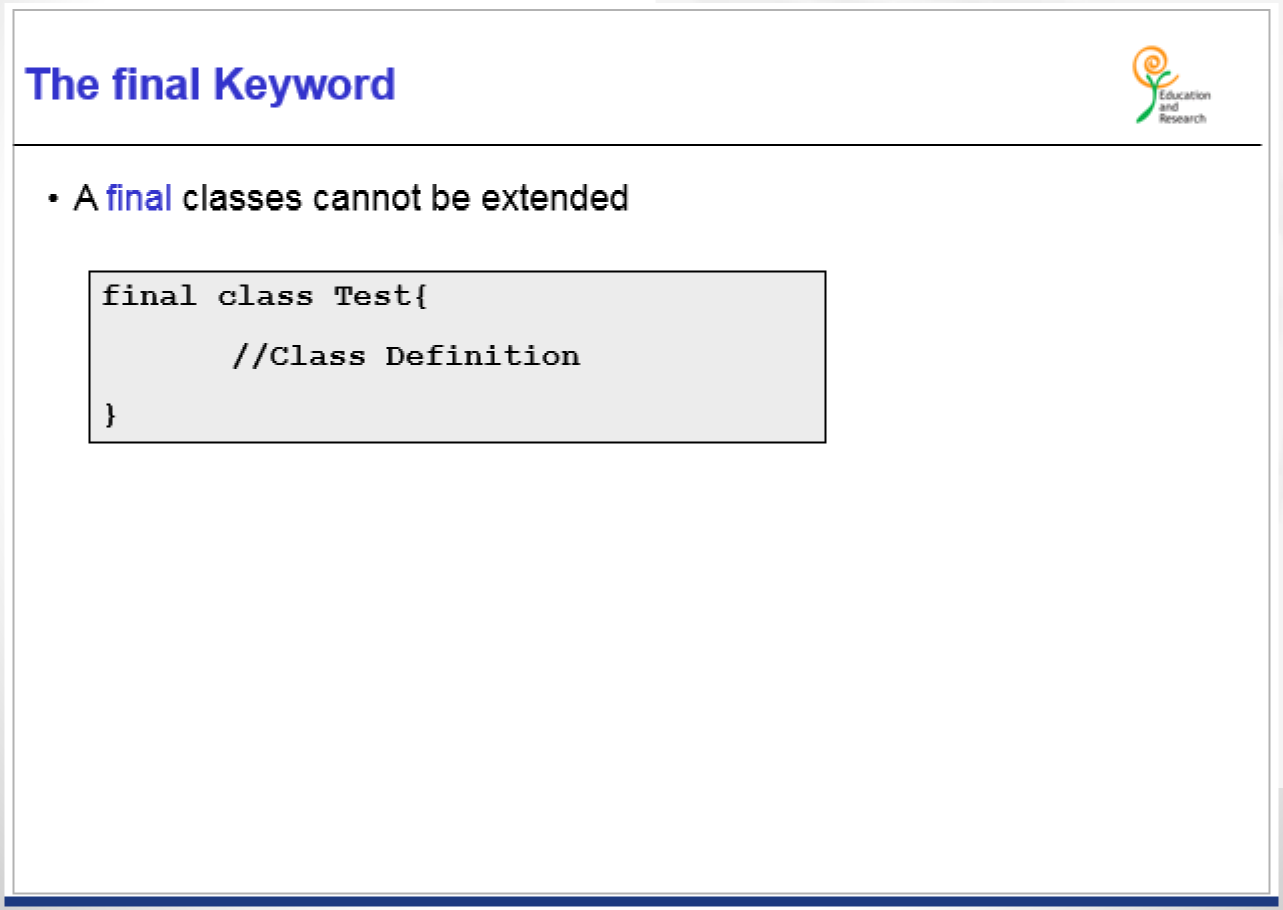

The final Keyword

- A final classes cannot be extended

```
final class Test{
        //Class Definition
}
```

Questions ??????????