



# Applied Java

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# Object Oriented Features

Key features

- Abstraction
- Encapsulation
- Inheritance
- Polymorphism



# Abstraction

Abstraction is the **modelling process**

- hide implementation details
- show only essential information to the user
- abstract class is a restricted class that cannot be used to create objects
- abstract method: can only be used in an abstract class
- interface: only methods prototypes (also default implementations)



# Encapsulation

Technique of hiding data from users

- object data (fields) should not be directly visible
- object data should be protected from direct modification
- object should expose methods allowing modification
- scope modification
  - private - method and field is visible only by an object
  - protected - method and field is visible also by child object
  - public - method and field is visible by all



# Inheritance

In the Java language, classes can be derived from other classes, thereby inheriting fields and methods from those classes

- A class that is derived from another class is called a subclass (also a derived class, extended class, or child class)
- The class from which the subclass is derived is called a superclass (also a base class or a parent class).



# Polymorphism

Biology:

- an organism or species can have many different forms or stages

Java

- subclasses of a class can define their own unique behaviors
- and yet share some of the same functionality of the parent class.

# An exercise

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# SOLID principles

SOLID principles were formulated in a response to arising problems with maintaining and developing complex programs

- Single Responsibility
- Open/Closed
- Liskov Substitution
- Interface Segregation
- Dependency Inversion





# Single Responsibility

- class should have a single responsibility
- class should have only one reason to change.
- natural tendency to mix responsibilities (aka features)
- finding and separating those responsibilities is a challenging



# Open for Extension, Closed for Modification

- class open for extension (i.e. through inheritance)
- closed for modification
- new functionality without changing the existing code



# Liskov Substitution

- substitutability states that if S is a subtype of T, then objects of type T may be replaced with objects of type S
- subclass must not break superclass contract
- *equals* and *hashCode*
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# Interface Segregation

- client should not be forced to depend on methods it does not use
- larger interfaces should be split into smaller ones
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# Dependency Inversion

- decoupling of software modules
- must not depend on implementation
- must be based on abstractions

# An exercise

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# References

- <https://en.wikipedia.org/>
- <https://docs.oracle.com/en/java/>
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