01: Introduction to Object-oriented Programming and Software Development

(Additional Notes to Topic 1)

Programming Technique II (SCSJ1023)

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Adapted from Tony Gaddis and Barret Krupnow (2016), Starting out with C++: From Control Structures through Objects

Object Orientation Principle

- Divide-and-conquer
- Encapsulation and Modularity
- Public Interface
- Information Hiding
- Generality
- Extensibility
- Abstraction

Principles of Object Orientation

✿ Divide-and-Conquer Principle

◆ The first step in designing a program is to divide the overall program into a number of objects that will interact with each other to solve the problem.

◆ Problem solving: Break problems (programs) into small, manageable tasks.

Principles of Object Orientation

✿ Encapsulation Principle

- ◆ The next step in designing a program is to decide for each object, what attribute it has and what actions it will take.
- ◆ The goal is that each object is a self-contained module with a clear responsibility and the attributes and actions necessary to carry out its role
- ◆ Problem solving: Each object knows how to solve its task and has the information it needs.

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- ◆ Problem solving: Each object knows how to solve its task and has the information it needs.

- ◆ For object to work cooperatively and efficiently, we have to clarify exactly how they are to interact, or interface, with one another.

- ◆ Each object should present a clear public interface that determines how other objects will be used.

Principles of Object Orientation

❀ Information Hiding Principle

◆ To enable objects to work together cooperatively, certain details of their individual design and performance should be hidden from other objects.

◆ Each object should shield its users from unnecessary details of how it performs its role.

Principles of Object Orientation

❀ Generality Principle

◆ To make an object as generally useful as possible, we design them not for a particular task but rather for a particular kind of task. This principle underlies the use of software libraries.

◆ Objects should be designed to be as general as possible.

◆ Objects are designed to solve a kind of task rather than a singular task.

Principles of Object Orientation

❀ Extensibility Principle

◆ One of the strength of the object-oriented approach is the ability to extend an object's behavior to handle new tasks.

◆ An object should be designed so that their functionality can be extended to carry out more specialized tasks.

Principles of Object Orientation

✿ Abstraction is the ability to focus on the important features of an object when trying to work with large amounts of information.

✿ The objects we design in Java programs will be abstractions in this sense because they ignore many of the attributes that characterize the real objects and focus only on those attributes that are essential for solving a particular problem.

Benefits of Object-oriented programming

❀ Save development time (and cost) by reusing code
- ◆ once an object class is created it can be used in other applications

❀ Easier debugging
- ◆ classes can be tested independently
- ◆ reused objects have already been tested

Self-test: Introduction to Object Oriented Programming

What are the seven basic principles of object orientation? Provide a brief description of each.

State the benefits of object oriented programming.