Lecture 4.1

Classes and Objects

Object-oriented design

- The system is divided into objects which interact with each other by sending messages.
- Object-oriented programming (OOP) *encapsulates* data (attribute) and functions (behavior) into packages called *classes*.
- Each object has a set of properties/ attributes and behavior/methods.
- In C++ these properties are like variables and behaviors are like functions.

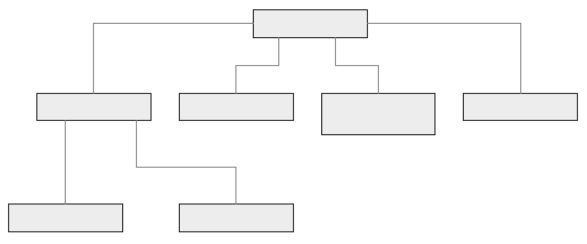
Top-Down Design Approach

- In this approach the problem is successively broken down into smaller tasks or functions.
- The result is a tree structure where the top is main task and the nodes further down the tree are the sub-tasks and functions.

Top-Down Design Approach

Example:

- A program to calculate the final grade can be broken down in the following sub-tasks (functions)



Advantages

- Programs are modular
- Easy to keep track of tasks and easy to maintain programs
- Objects can be **reused** in other projects

Classes and object

- Classes are like blueprints of which objects are created. In other words the class specifies the attributes and methods which every object of that particular class will contain.
- In simple terms classes are user defined data types and objects are just variables (I will say complex variables).
- Just as an instance of a built-in type such as int is called a variable, and instance of a user-defined data type is called an object.

Classes and object (cont)

- Each class contains data as well as the set of functions that manipulate the data.
- The data components of a class are called data members or *properties*.
- The function components of a class are called member functions or *methods or behaviors.*

Example

- What are some attributes/properties of a car?
  - A car has color, model, registration number, engine capacity
- What are some actions you can perform on a car?
  - You can start it, drive it, stop it.

Example

- The car class describes just about any car in the world. Now consider a specific car, say James Bond’s car.
  - It is grey BMW with 3L V8 engine and of course the registration number is 007.
  - You can start, drive and stop his car.

- In programming terms Mr. bond’s car is an object or an instance of the car class.

What are classes?

- Classes are a software construct that can be used to emulate a real world object.
- Classes encapsulate data (attributes) and abilities (functions/methods).

```
int x; //Declares x to be a variable of type int.
Car pajero; //Declares pajero to be an object of class
            //Car.
```

Structs and Classes

- So what is the difference between classes and structs?
- Both are user defined types
- Both are used for data encapsulation
- Both creates objects (variables)
- Structs are used to store data only but classes are used to store data as well as functions (methods).
- Classes are just enhanced structs.