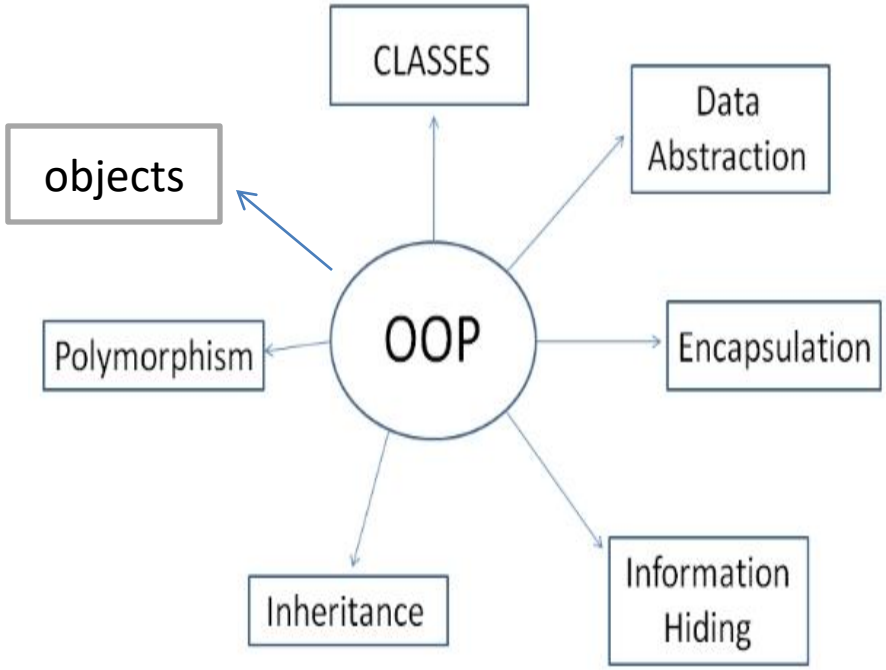
Review of
OBJEC OREINTED PROGRAMMING CONCEPTS

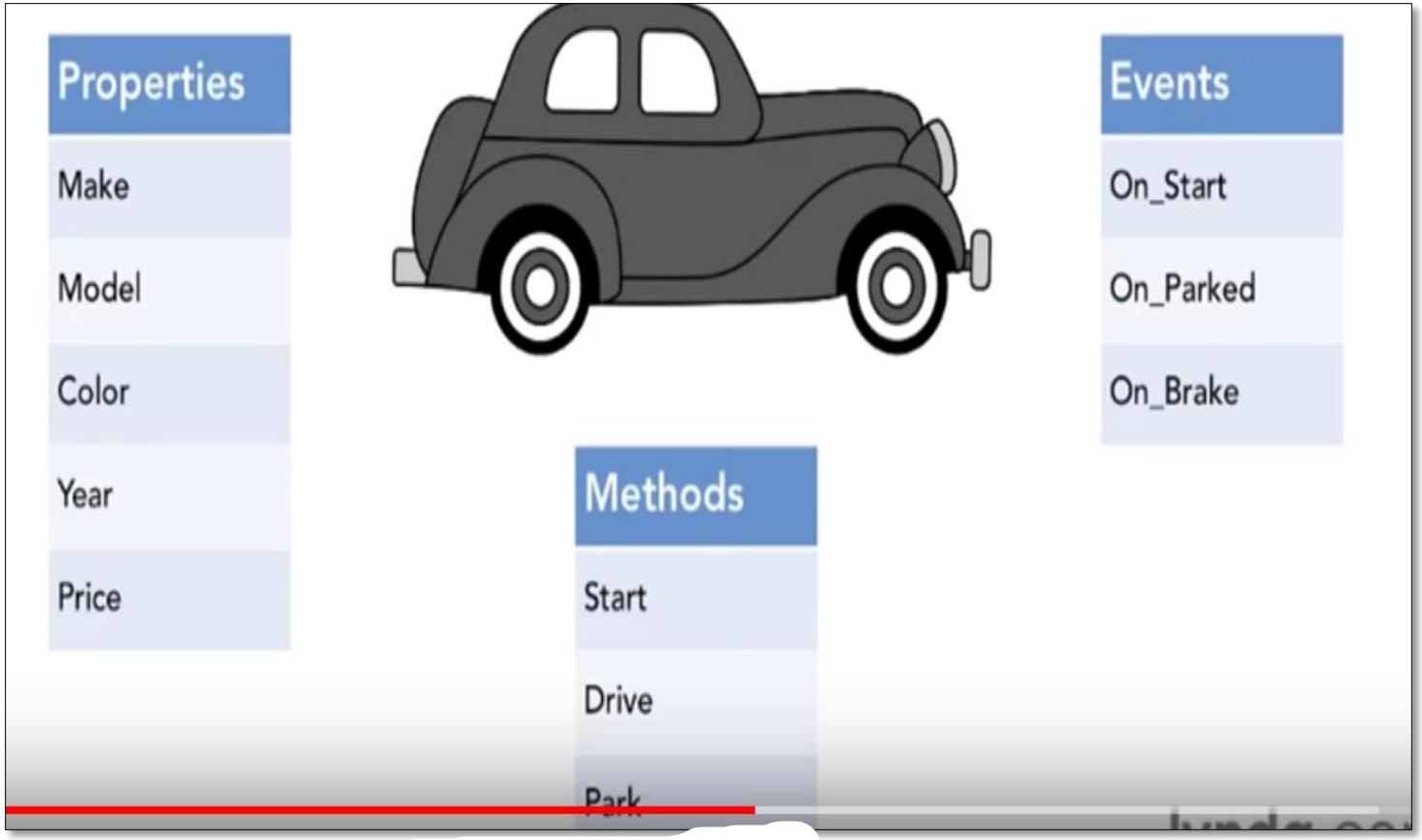
Basic concepts of OOP

- Classes
- Objects
- Data abstraction
- Encapsulation
- Inheritance
- Polymorphism
- Information hiding



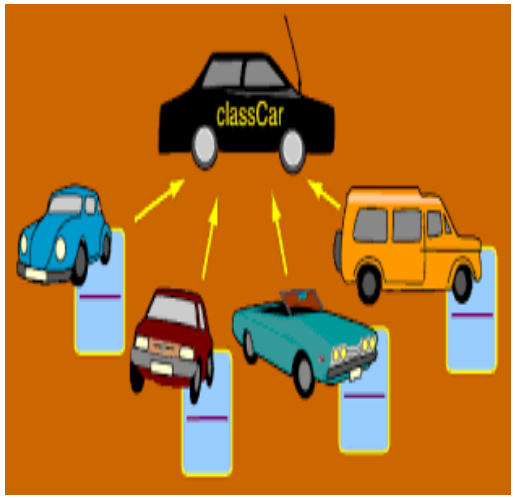
Class

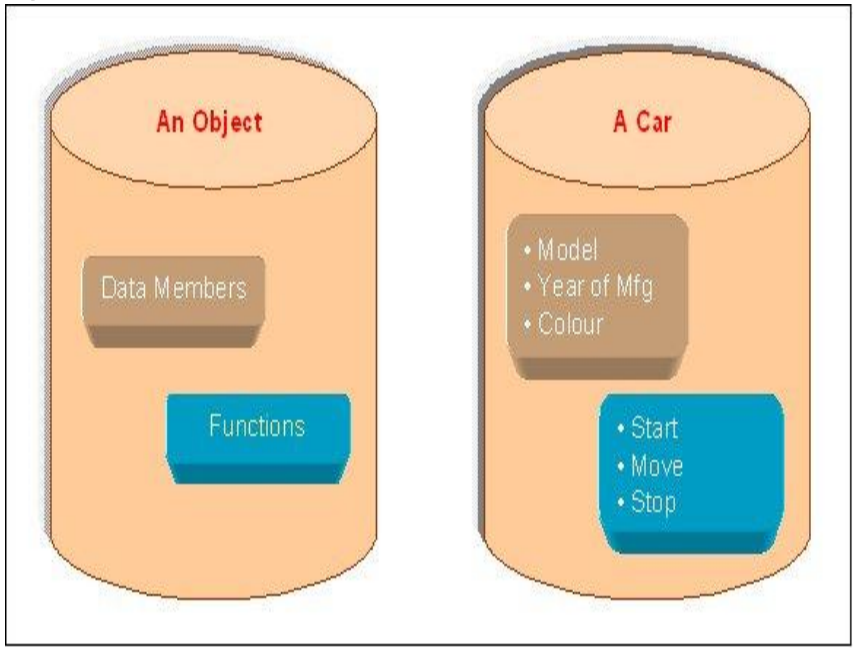
➢**Class:** is a template definition of the method s and variable s in a particular kind of object . Thus, an object is a specific instance of a class



Objects

- This is the basic unit of object oriented programming that is both data and function that operate on data are bundled as a unit called as object



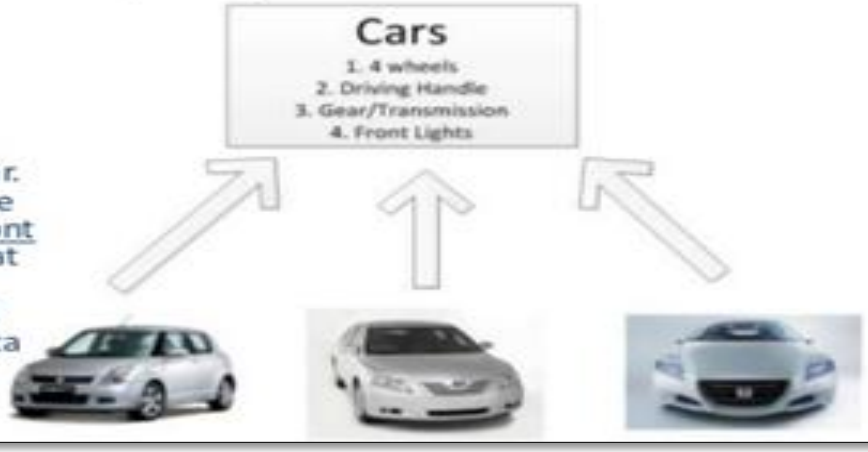


Data Abstraction

- Data abstraction refers to, providing only essential information hiding their background details
- i.e., to represent the needed information in program without presenting the details
- In simple words, abstraction is 'Hiding implementation details behind the interface' When abstraction is created our concern is limited to what it can do rather how it is doing it
- Eg:database system hides certain details how data is stored and created and maintained

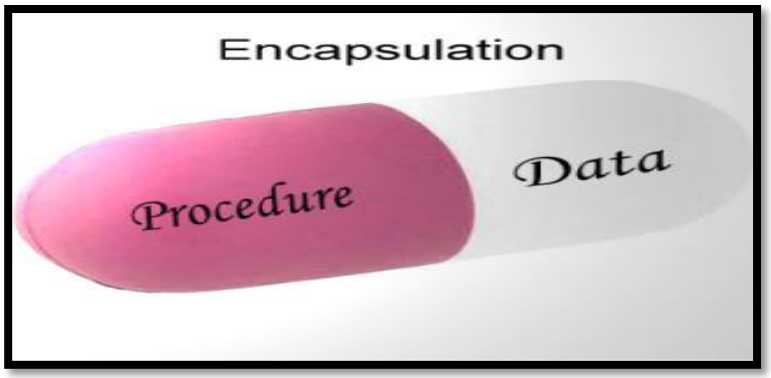
Abstraction

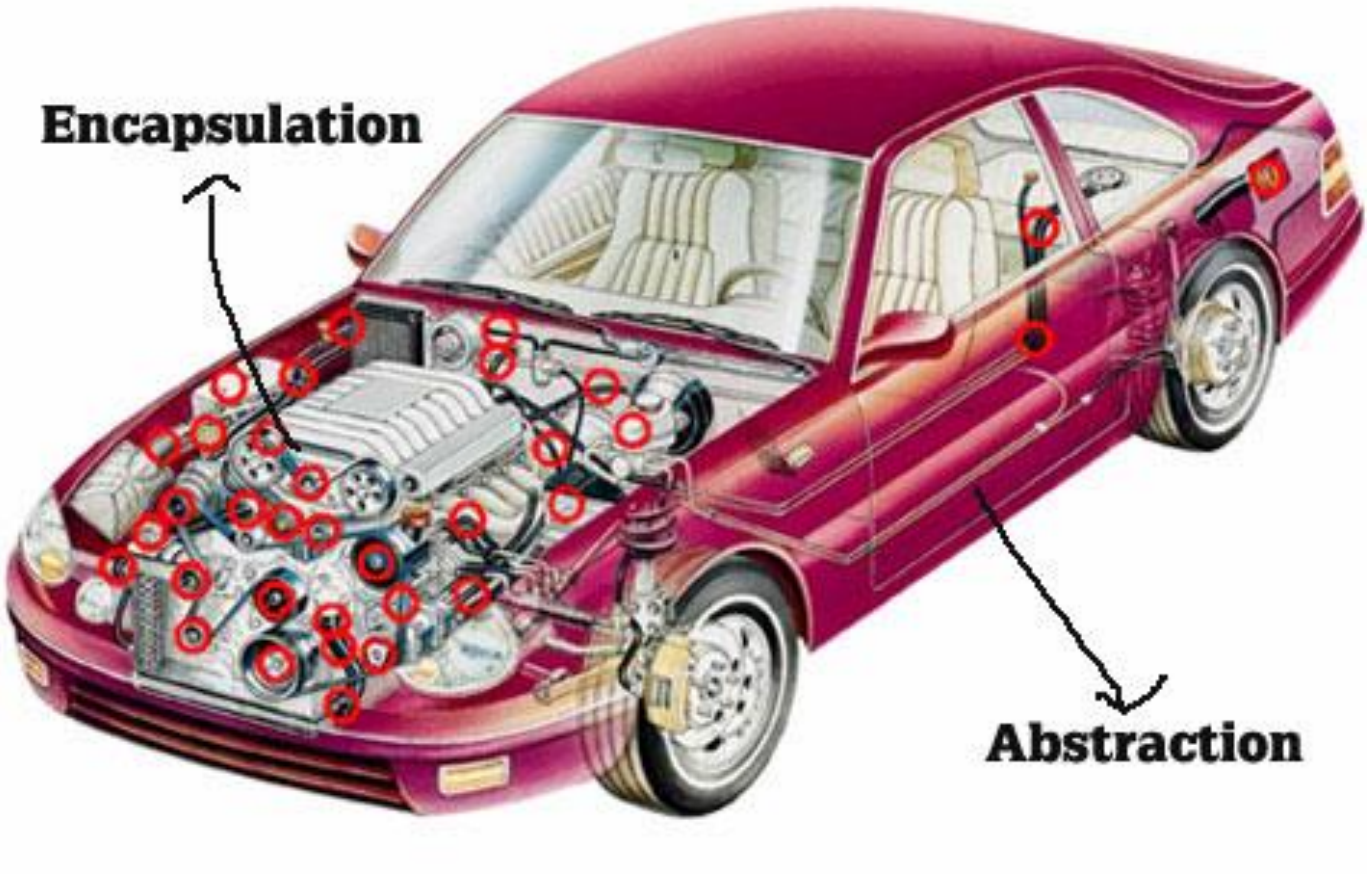
- Abstraction: a process of **Generalizing** things
  - "Suzuki car is a car. Toyota car is a car. Honda car is a car. All 3 of these have front lights. So all cars must have front lights." Here, we are generalizing that all cars have front lights based on **common property** (front lights) of **3** different **instances** (honda car, toyota car and suzuki car).



Data Encapsulation

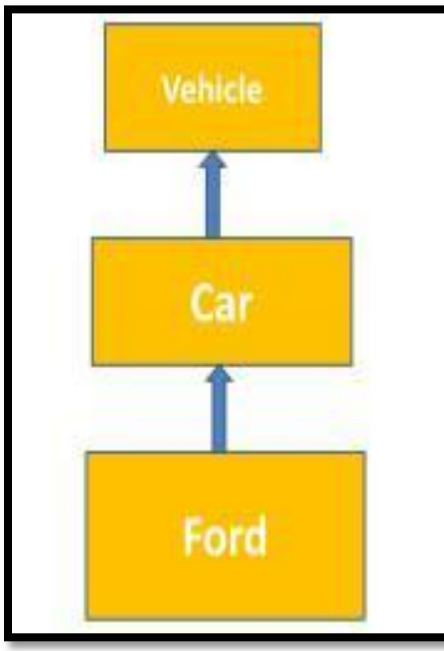
- The packaging of data and functions into single unit called encapsulation
- Data is not accessible to outside world and only functions wrapped in class can access it
- Isolation of data from direct access by the program is called Data Hiding

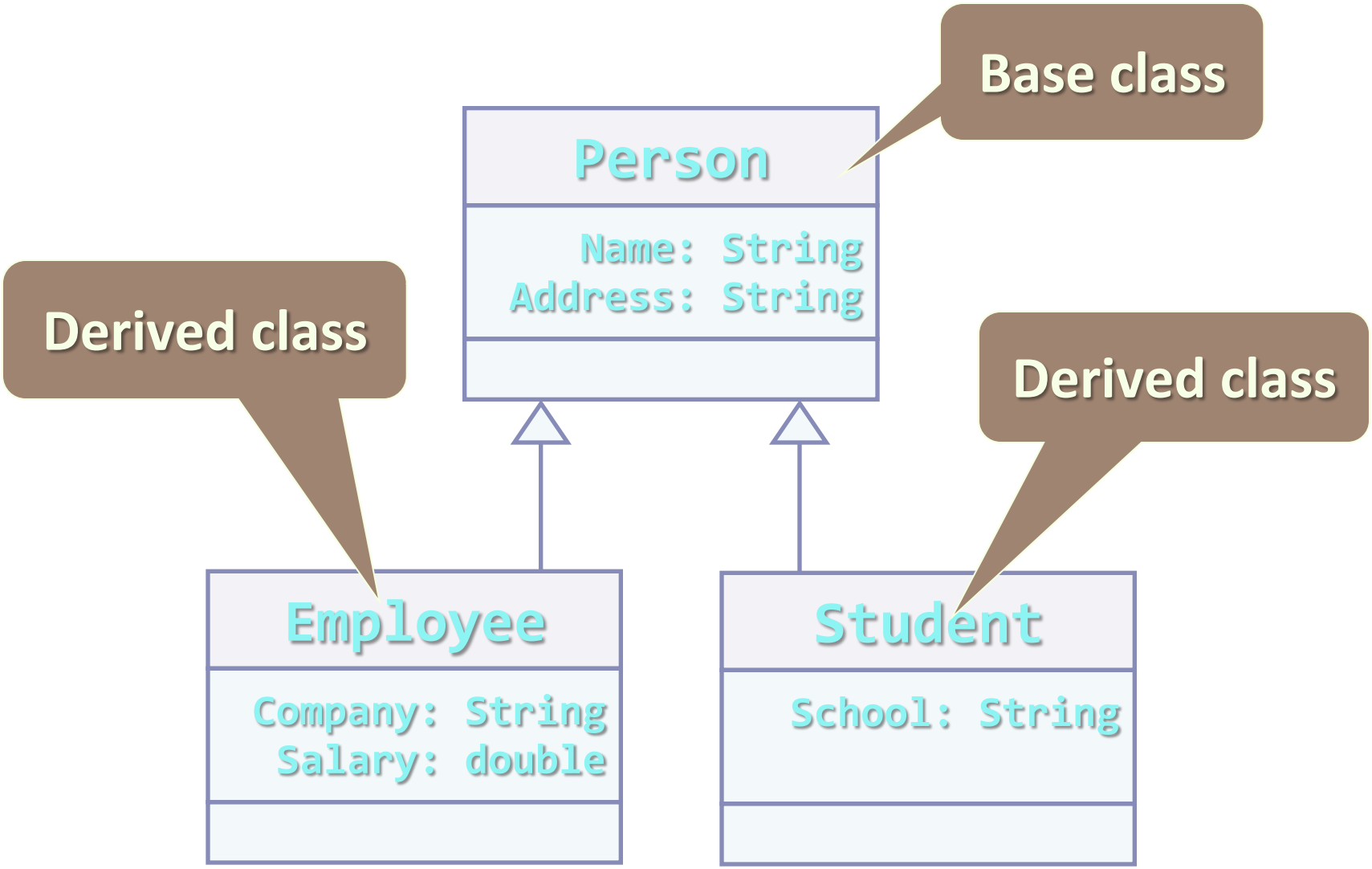



Encapsulation
Abstraction

Inheritance

- Inheritance is the process of forming a new class from an existing class
- The existing class called as base class, new class is formed called as derived class
- In OOP the concept of inheritance provide idea of reusability
- We can add additional feature to an class without modifying it

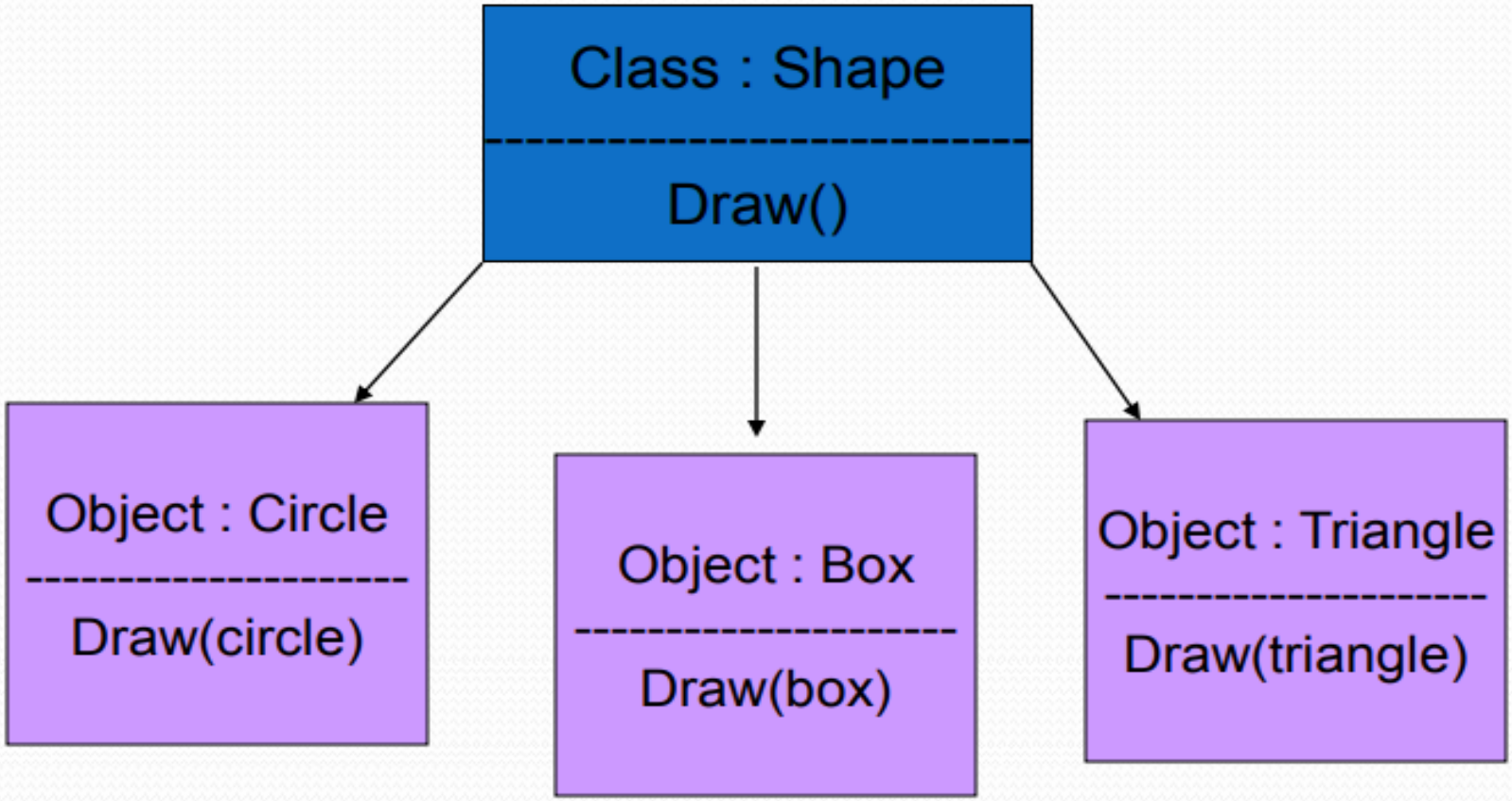



Base class
Person
Name: String
Address: String
Derived class
Derived class
Employee
Company: String
Salary: double
Student
School: String

Polymorphism

- Polymorphism means ability to take more than one form
- Poly refers to many
- This is an operation may exhibit different behavior in different instances

Polymorphism



Car

Ford

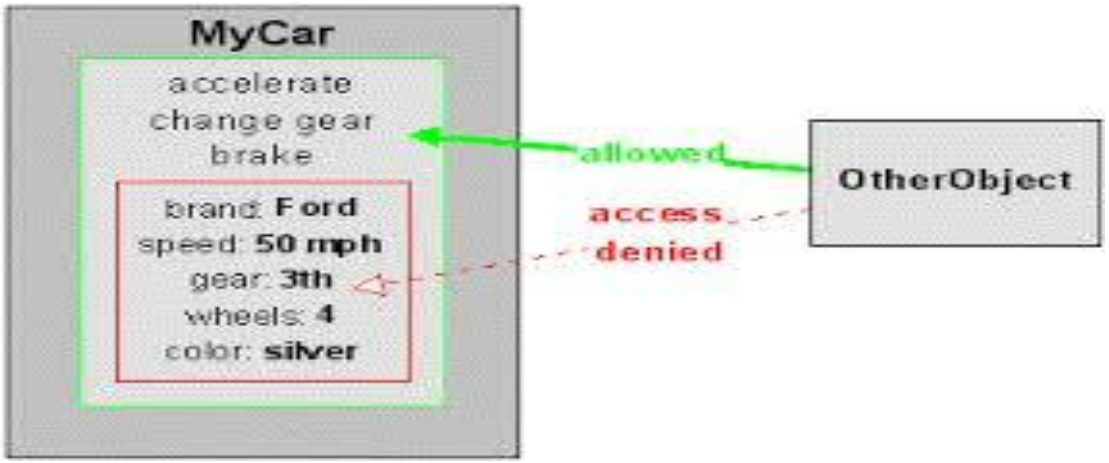
Honda

Move

- Car uses normal engine to move
- Ford uses V engine to move
- Honda uses i-vtec technology to move

Information Hiding

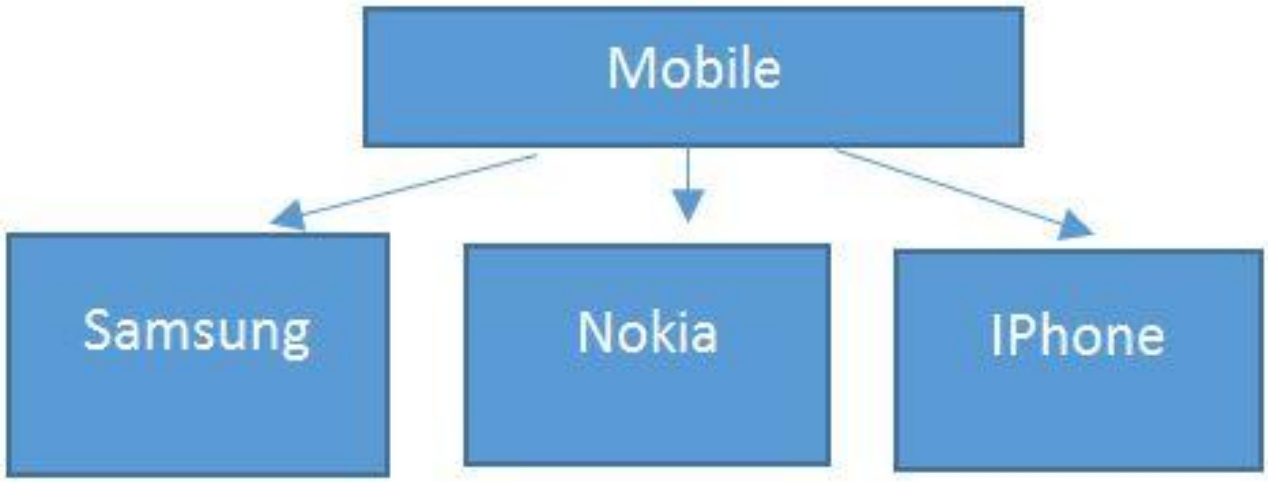
- Information hiding is the primary criteria of system modularization and should be concerned with hiding the critical decisions of OOP designing.
- Information hiding isolates the end users from knowledge the internal design of an object.



Object Oriented Programming With Real-World Scenario

Let’s consider an example for explaining each concepts which at the end will make you understand & follow Object Oriented Programming.

When we take a mobile as an object, its basic functionality for which it was invented were Calling & Receiving a call & Messaging. But now a days thousands of new features & models were added & the count is still increasing.



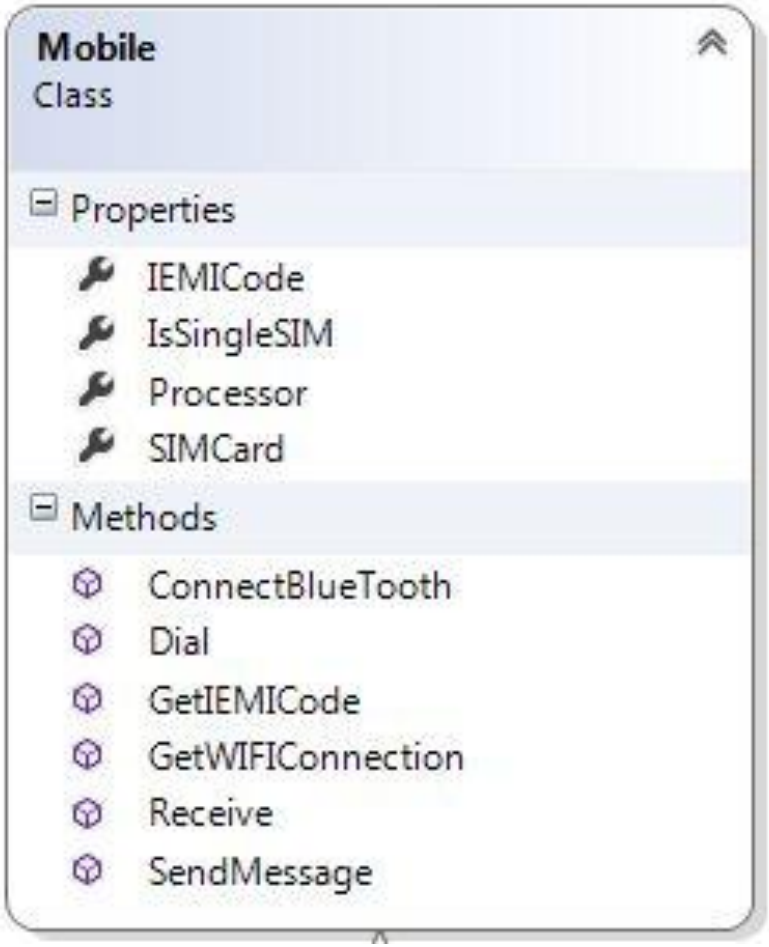
In above diagram, each brand (Samsung, Nokia, IPhone) have their own list of features along with basic functionality of dialing, receiving a call & messaging.

Objects

Any real world entity which can have some characteristics or which can perform some work is called as Object. This object is also called as an instance i.e. - a copy of entity in programming language. If we consider the above example, a mobile manufacturing company, at a time manufactures laces of pieces of each model which are actually an instance. This objects are differentiated from each other via some identity or its characteristics. This characteristics is given some unique name.

Class

A Class is a plan which describes the object. Mainly a class would consist of a name, attributes & operations. Considering the above example, A Mobile can be a class which has some attributes like Profile Type, IMEI Number, Processor, and some more.) & operations like Dial, Receive & SendMessage.


Mobile
Class
Properties
IEMICode
IsSingleSIM
Processor
SIMCard
Methods
ConnectBlueTooth
Dial
GetIEMICode
GetWIFIConnection
Receive
SendMessage

Abstraction

Abstraction says, only show relevant details and rest all hide it. This is most important pillar in OOPS as it is providing us the technique to hide irrelevant details from User. If we consider an example of any mobile like Nokia, Samsung, IPhone.

Some features of mobiles

- Dialing a number call some method internally which concatenate the numbers and displays it on screen but what is it doing we don't know.

- Clicking on green button actual send signals to calling person's mobile but we are unaware of how it is doing.

This is called abstraction where creating method which is taking some parameter & returning some result after some logic execution without understating what is written within the method

Encapsulation :

is defined as the process of enclosing one or more details from outside world through access right. It says how much access should be given to particular details. Both Abstraction & Encapsulation works hand in hand because Abstraction says what details to be made visible & Encapsulation provides the level of access right to that visible details. i.e. – It implements the desired level of abstraction.

Talking about Bluetooth which we usually have it in our mobile. When we switch on the Bluetooth I am able to connect another mobile but not able to access the other mobile features like dialing a number, accessing inbox etc. This is because, Bluetooth feature is given some level of abstraction.

Another point is when mobile A is connected with mobile B via Bluetooth whereas mobile B is already connected to mobile C then A is not allowed to connect C via B. This is because of accessibility restriction.
This is handled by access specified like public, private, protected, and internal

Polymorphism

Polymorphism can be defined as the ability of doing the same operation but with different type of input.

Let’s say Samsung mobile have the 5MP camera available i.e. – it is having a functionality of CameraClick(). Now same mobile is having Panorama mode available in camera, so functionality would be same but with mode. This type is said to be Static polymorphism

Inheritance

Ability to extend the functionality from base entity in new entity belonging to same group.
This will help us to reuse the functionality which is defined before .

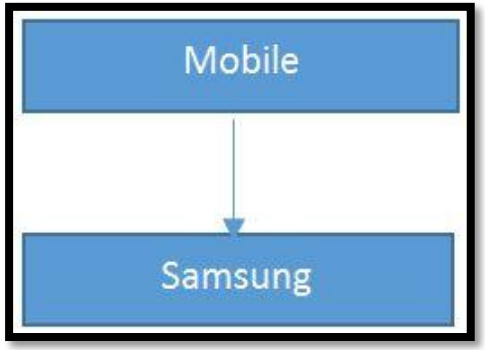
Considering the example, Basic Mobile functionality is to Send Message, dial & receive call. So the brands of mobile is using this basic functionality by extending the mobile class
functionality and adding their own new features to their respective brand.

There are mainly 4 types of inheritance:

- Single level inheritance
- Multi-level inheritance
- Hierarchical inheritance
- Hybrid inheritance

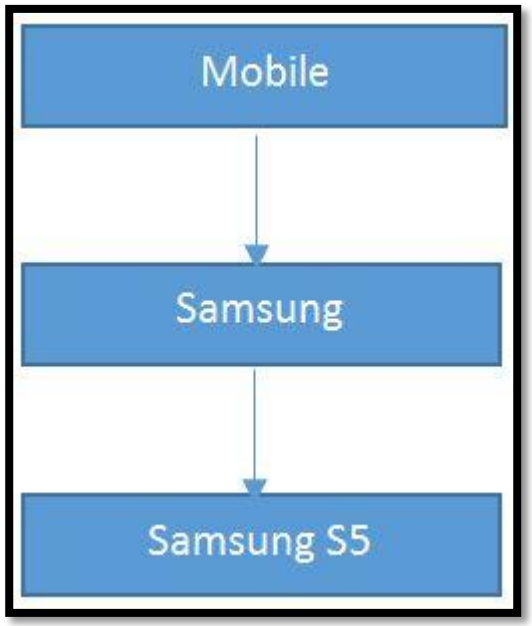
Single level inheritance

In Single level inheritance, there is single base class & a single derived class i.e. - A base mobile features is extended by Samsung brand.



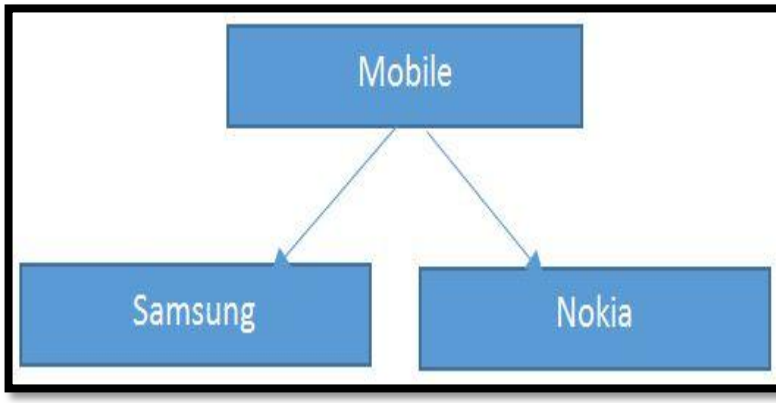
Multilevel inheritance

In Multilevel inheritance, there is more than one single level of derivation. i.e. - After base features are extended by Samsung brand. Now Samsung brand has manufactured its new model with new added features or advanced OS like Android OS, v4.4.2 (kitkat). From generalization, getting into more specification.



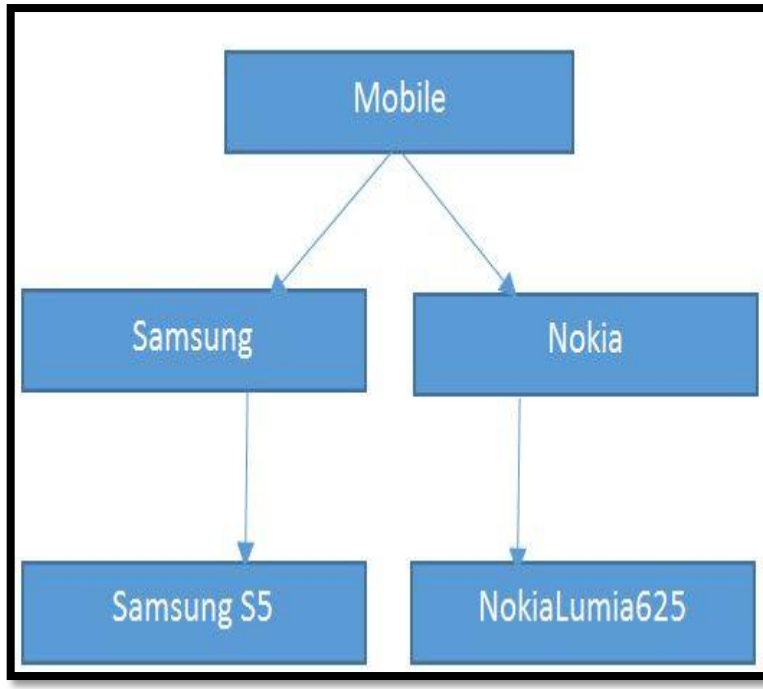
Hierarchal inheritance

In this type of inheritance, multiple derived class would be extended from base class, it's similar to single level inheritance but this time along with Samsung, Nokia is also taking part in inheritance



Hybrid inheritance

Single, Multilevel, & hierarchal inheritance all together construct a hybrid inheritance.



Summary:

Class: A category of objects. The class defines all the common properties of the different objects that belong to it.

Object: a self-contained entity that consists of both data and procedures to manipulate the data.

Abstraction: The process of picking out (abstracting) common features of objects and procedures.

Information hiding: The process of hiding details of an object or function. Information hiding is a powerful programming technique because it reduces complexity.

Encapsulation: The process of combining elements to create a new entity. A procedure is a type of encapsulation because it combines a series of computer instructions.

Inheritance: a feature that represents the "is a" relationship between different classes.

Polymorphism: A programming language's ability to process objects differently depending on their data type or class.

Interface: the languages and codes that the applications use to communicate with each other and with the hardware.

Messaging: Message passing is a form of communication used in parallel programming and object-oriented programming.

Procedure: a section of a program that performs a specific task.