Java Fundamentals and Object Oriented Programming

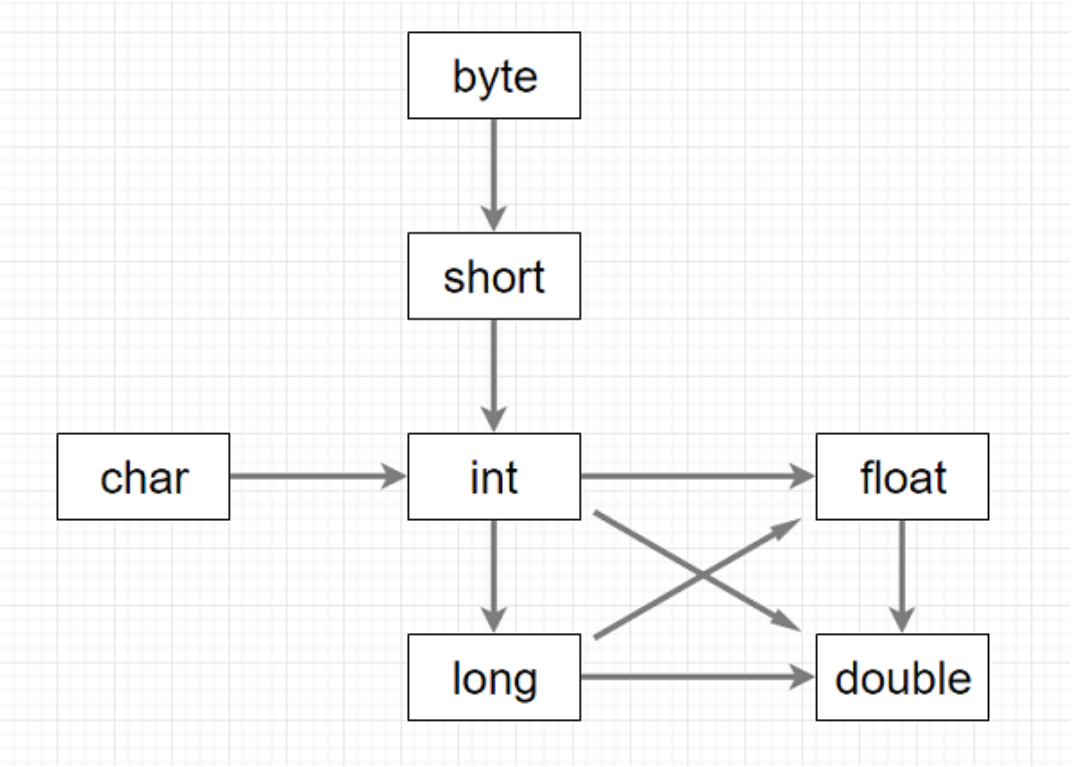
Object-Oriented Programming is a methodology or paradigm to design a program using classes and objects. It simplifies the software development and maintenance. Main Concepts - Inheritance, Polymorphism, Abstraction, Encapsulation.

Data Types in Java

Data Type	Default Value	Default size
boolean	false	1 bit
char	'\u0000'	2 byte
byte	0	1 byte
short	0	2 byte
int	0	4 byte
long	0L	8 byte
float	0.0f	4 byte
double	0.0d	8 byte

NOTE : UTF-8 is the most popular unicode character encoding with 90% websites using it.

Data Type Promotion in Java :



Wrapper Classes in Java

Primitive Type	Wrapper class
boolean	Boolean
char	Character
byte	Byte
short	Short
int	Integer
long	Long
float	Float
double	Double

Operators in Java

Operator Type	Category	Precedence
Unary	postfix	*expr*++ *expr*--
	prefix	++*expr* --*expr* +*expr* -*expr* ~ !

Arithmetic	multiplicative	`* / %`
	additive	`+ -`
Shift	shift	`<< >> >>>`
Relational	comparison	`< > <= >= instanceof`
	equality	`== !=`
Bitwise	bitwise AND	`&`
	bitwise exclusive OR	`^`
	bitwise inclusive OR	`|`
Logical	logical AND	`&&`
	logical OR	`||`
Ternary	ternary	`? :`
Assignment	assignment	`= += -= *= /= %= &= ^= |= <<= >>= >>>=`

Java Naming Conventions :

Name	**Convention**
class name	should start with uppercase letter and be a noun e.g. String, Color, Button, System, Thread etc.
interface name	should start with uppercase letter and be an adjective e.g. Runnable, Remote, ActionListener etc.
method name	should start with lowercase letter and be a verb e.g. actionPerformed(), main(), print(), println() etc.
variable name	should start with lowercase letter e.g. firstName, orderNumber etc.
package name	should be in lowercase letter e.g. java, lang, sql, util etc.
constants name	should be in uppercase letter. e.g. RED, YELLOW, MAX_PRIORITY etc.

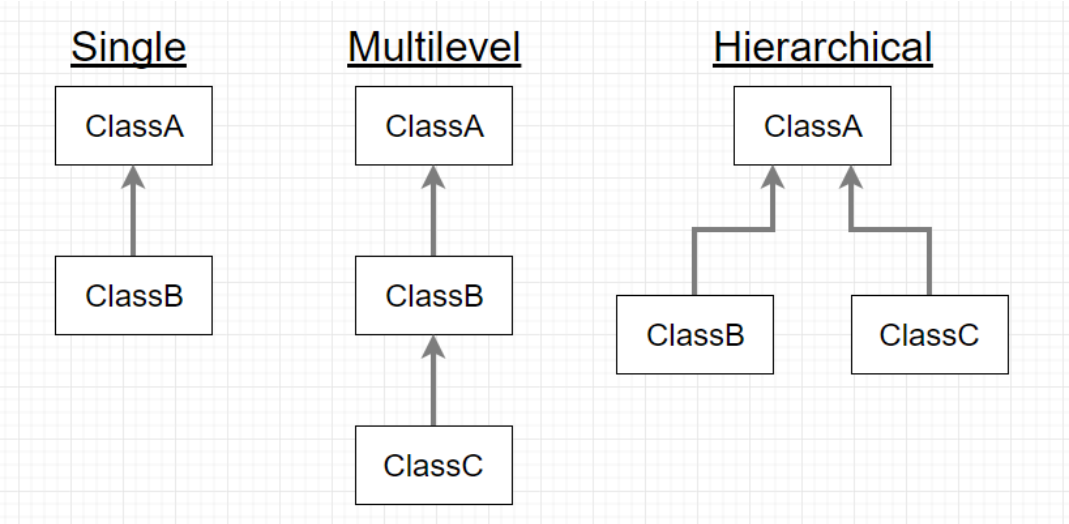
Object vs Class

Object	Class
Object is an **instance** of a class.	Class is a **blueprint or template** from which objects are created.
Object is a **real world entity** such as pen, laptop, mobile, bed, keyboard, mouse, chair etc.	Class is a **group of similar objects**.
Object is a **physical** entity.	Class is a **logical** entity.
Object is created through **new keyword** mainly e.g. Student s1=new Student();	Class is declared using **class keyword** e.g. class Student{}
Object is created **many times** as per requirement.	Class is declared **once**.
Object **allocates memory when it is created**.	Class **doesn't allocated memory when it is created**.
There are **many ways to create object** like new keyword, newInstance() method, clone() method, factory method & deserialization.	There is only **one way to define class** in java using class keyword.

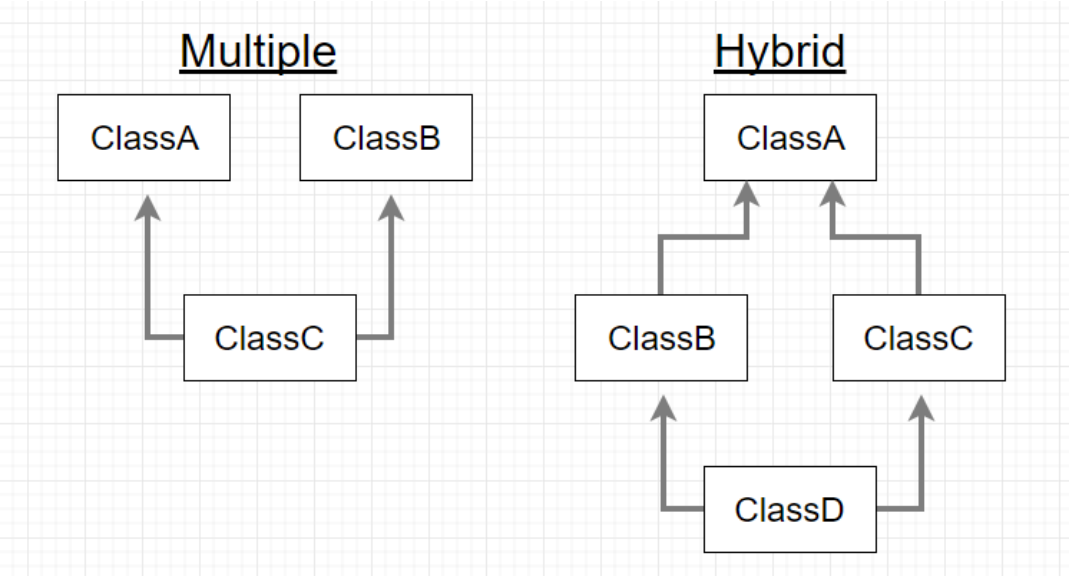
Constructors vs Methods

Java Constructor	Java Method
Constructor is used to initialize the state of an object.	Method is used to expose behaviour of an object.
Constructor must not have return type.	Method must have return type.
Constructor is invoked implicitly.	Method is invoked explicitly.
Compiler provides a default constructor if you don't have any constructor.	Method is not provided by compiler in any case.
Constructor name must be same as the class name.	Method name may or may not be same as class name.

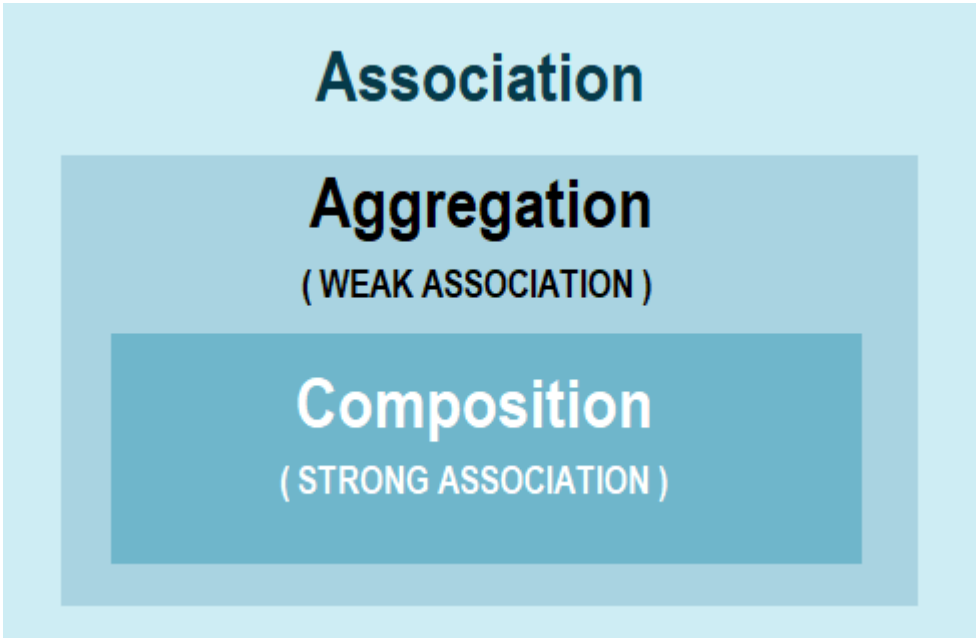
Types of Inheritance (Supported through Class)



Types of Inheritance (Supported through Interface only)



Association vs Aggregation vs Composition



Aggregation vs Composition

Aggregation	**Composition**
Aggregation is a weak Association.	Composition is a strong Association.
Class can exist independently without owner.	Class can not meaningfully exist without owner.
Have their own Life Time.	Life Time depends on the Owner.
A uses B.	A owns B.
Child is not owned by 1 owner.	Child can have only 1 owner.
Has-A relationship. A has B.	Part-Of relationship. B is part of A.
Denoted by a empty diamond in UML.	Denoted by a filled diamond in UML.
We do not use "final" keyword for Aggregation.	"final" keyword is used to represent Composition.
Examples: - Car has a Driver. - A Human uses Clothes. - A Company is an aggregation of People. - A Text Editor uses a File. - Mobile has a SIM Card.	Examples: - Engine is a part of Car. - A Human owns the Heart. - A Company is a composition of Accounts. - A Text Editor owns a Buffer. - IMEI Number is a part of a Mobile.

NOTE : "final" keyword is used in Composition to make sure child variable is initialized.

Polymorphism - Method Overloading vs Method Overriding

Method Overloading	Method Overriding
Method overloading is used *to increase the readability* of the program.	Method overriding is used *to provide the specific implementation* of the method that is already provided by its super class.
Method overloading is performed *within class*.	Method overriding occurs *in two classes* that have IS-A (inheritance) relationship.
In case of method overloading, *parameter must be different*.	In case of method overriding, *parameter must be same*.
Method overloading is the example of *compile time polymorphism*.	Method overriding is the example of *run time polymorphism*.
In java, method overloading can't be done by changing only the return type of method. *Return type can be same/different* in overloading, but you must change the parameter.	*Return type must be same or covariant (changing return type to subclass type)* in method overriding.

Abstract Class vs Interface

Abstract class	Interface
Abstract class can **have abstract and non-abstract** methods.	Interface can have **only abstract** methods. Since Java8, it can have **default & static methods** also.
Abstract class **doesn't support multiple inheritance**.	Interface **supports multiple inheritance**.
Abstract class **can have final, non-final, static and non-static variables**.	Interface has **only static and final variables**.
Abstract class **can provide the implementation of interface**.	Interface **can't provide the implementation of abstract class**.
The **abstract keyword** is used to declare abstract class.	The **interface keyword** is used to declare interface.

Example: public abstract class Shape{ public abstract void draw();}	**Example:** public interface Drawable{ void draw();}

Java Access Modifiers

Access Modifier	within class	within package	outside package by subclass only	outside package
Private	Y	N	N	N
Default	Y	Y	N	N
Protected	Y	Y	Y	N
Public	Y	Y	Y	Y

Abstraction vs Encapsulation

Abstraction	Encapsulation
Abstraction is a process of hiding the implementation details and showing only functionality to the user.	Encapsulation is a process of wrapping code and data together into a single unit
Abstraction lets you focus on what the object does instead of how it does it.	Encapsulation provides you the control over the data and keeping it safe from outside misuse.
Abstraction solves the problem in the Design Level.	Encapsulation solves the problem in the Implementation Level.
Abstraction is implemented by using Interfaces and Abstract Classes.	Encapsulation is implemented by using Access Modifiers (private, default, protected, public)
Abstraction means hiding implementation complexities by using interfaces and abstract class.	Encapsulation means hiding data by using setters and getters.

Methods of Object Class

The Object class is the parent class of all the classes in java by default.

Method	Description

public final Class getClass()	returns the Class class object of this object. The Class class can further be used to get the metadata of this class.
public int hashCode()	returns the hashcode number for this object.
public boolean equals(Object obj)	compares the given object to this object.
protected Object clone() throws CloneNotSupportedException	creates and returns the exact copy (clone) of this object.
public String toString()	returns the string representation of this object.
public final void notify()	wakes up single thread, waiting on this object's monitor.
public final void notifyAll()	wakes up all the threads, waiting on this object's monitor.
public final void wait(long timeout)throws InterruptedException	causes the current thread to wait for the specified milliseconds, until another thread notifies (invokes notify() or notifyAll() method).
public final void wait(long timeout,int nanos)throws InterruptedException	causes the current thread to wait for the specified milliseconds and nanoseconds, until another thread notifies (invokes notify() or notifyAll() method).
public final void wait()throws InterruptedException	causes the current thread to wait, until another thread notifies (invokes notify() or notifyAll() method).
protected void finalize()throws Throwable	is invoked by the garbage collector before object is being garbage collected.