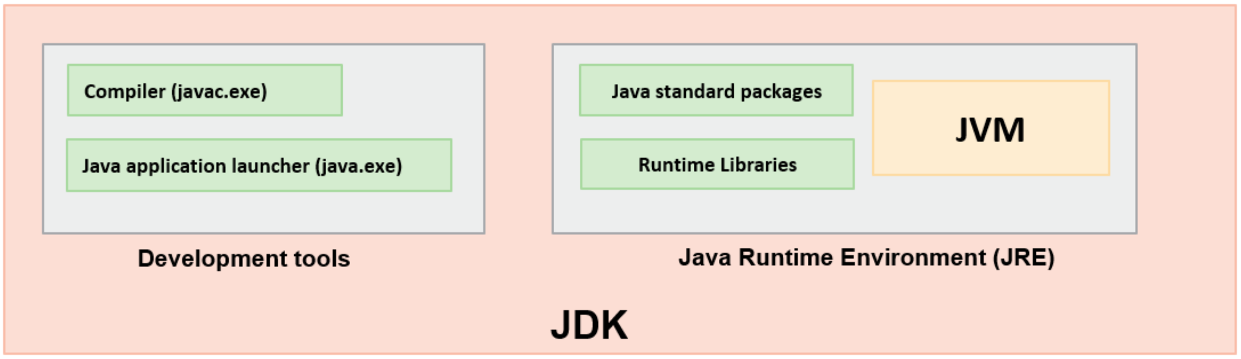
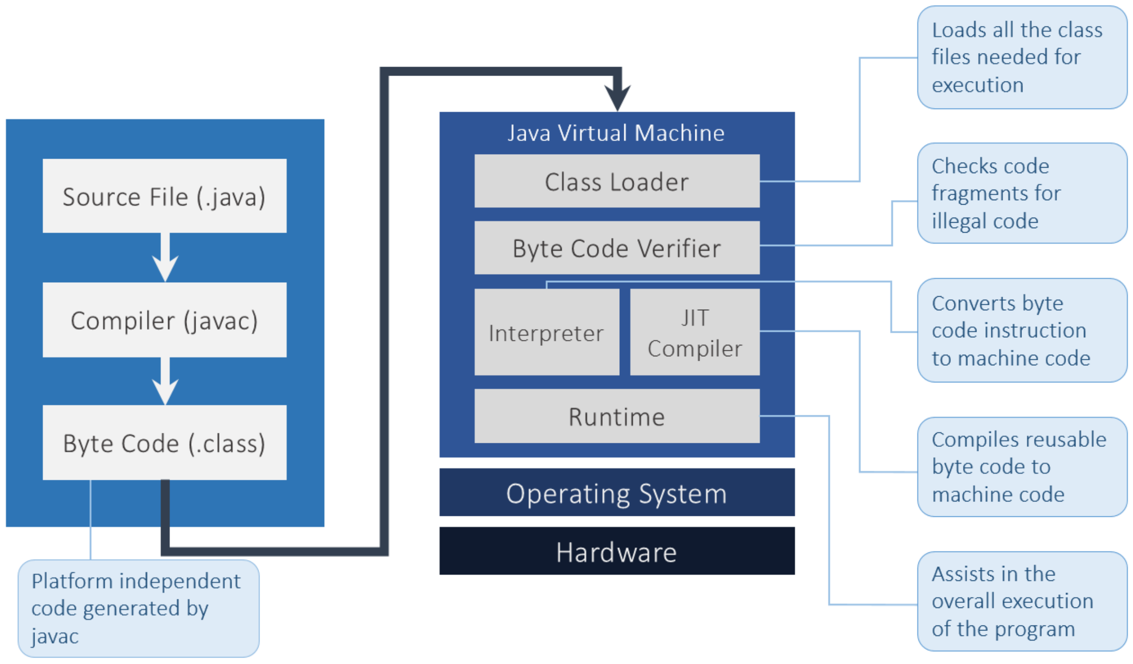
JAVA important notes



This is the basic JAVA development kit scenario and now onwards from java 11 we don't have JRE

Best Practices:

- The name of class should start with an uppercase letter using Camel Case notation, like for example Employee
- The name of methods should start with a lowercase letter using CamelCase notation, like for example getName()


Source File (.java)
Compiler (javac)
Byte Code (.class)
Platform independent code generated by javac
Java Virtual Machine
Class Loader
Byte Code Verifier
Interpreter
JIT Compiler
Runtime
Operating System
Hardware
Loads all the class files needed for execution
Checks code fragments for illegal code
Converts byte code instruction to machine code
Compiles reusable byte code to machine code
Assists in the overall execution of the program

**** **<u>interpreters</u>** are platform dependant

**** **<u>JVM</u> is an Interpreter**

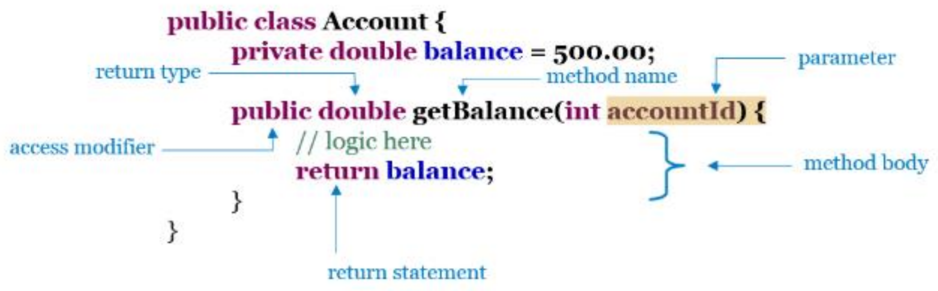
JVM (Java Virtual Machine) is an abstract machine. It is a specification that provides runtime environment in which java bytecode can be executed.

OOPS:

An instance of a class contains its own copy of variables (attributes) and the methods (behavior) with all the other objects of that class.

Objects collaborate by exchanging messages with one another via method invocations (i.e., invoking each other's behaviors).

And here we have the syntax for creating a method:



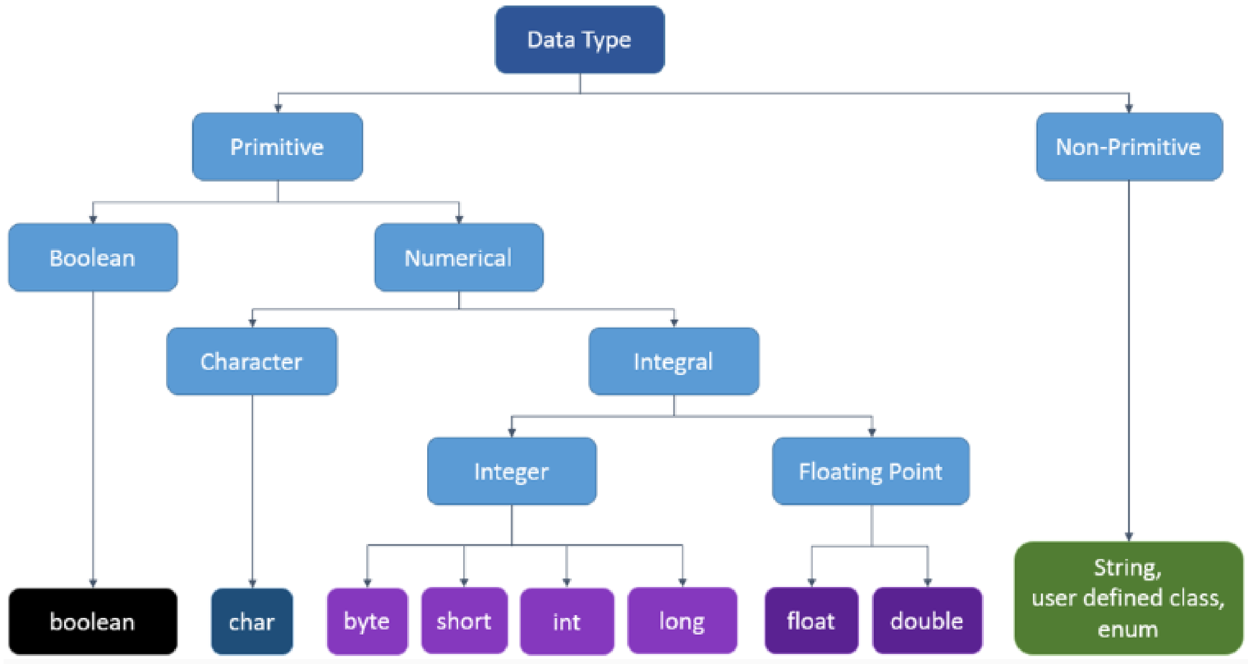
```
public class Account {
    private double balance = 500.00;
    public double getBalance(int accountId) {
        // logic here
        return balance;
    }
}
```

**** main() method cannot be private as it will result in a RUN TIME error

**** even if there is no main class the .class file will be generated if the class has no errors

Rules for naming identifiers

- Case-sensitive
- Should not start with a number
- Can start with a letter, $ or _
- Should not have spaces
- Should not be a Java keyword or literal
- No restriction on the length



These are the basic data types of java which helps in defining the variables

Non Primitive Data types holds the memory address where the data item (object) is stored and also known as reference data types

Datatype	Default Value	Default size
boolean	false****	1 bit (depends on JVM)
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

In Java we can have three different scopes of variables:

Local Variable

Variables are declared and used inside same method only.

Static Variable

Static variables are declared inside class and can be used outside class with class name and class object. But class name is preferred.

Instance Variable Instance variables are declared inside class and can be used outside class with class object only.

Syntax: result = (test_condition) ? (value_1) : (value_2) **{Ternary Operator}**

Now for ++ operator :

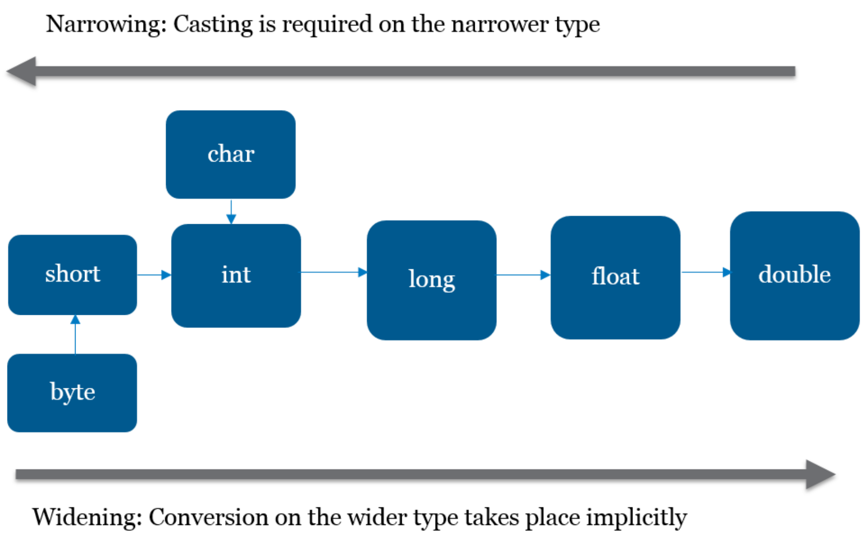
for m++ we first use m then increment its value and for ++m we first increment m then use its value in the expression

Java is a strongly-typed language, where type-checking is strictly enforced at runtime. This makes it impossible to convert incompatible types.

There are 2 types of type conversions:

- Widening conversion / implicit type casting
- Narrowing conversion / explicit type casting

Converting a variable of smaller datatype to the larger datatype, without data loss is known as widening conversion while Converting a variable of larger datatype to the smaller datatype, with some data loss is known as narrowing conversion.


Narrowing: Casting is required on the narrower type
char
short
int
long
float
double
byte
Widening: Conversion on the wider type takes place implicitly

```
double d = 234.04;
long l = (long)d; //explicit type casting
int i = (int)l; // explicit type casting
int i = 300;
long l = i; //no explicit type casting
float f = l; //no explicit type casting
```

The instanceof operator in Java is used to check whether the object is an instance of the specified class or subclass or interface.

A boolean cannot be cast to any other data type and vice versa

Switch statements can only take Int, String, Enum type for case matching while case can hold expressions in the it like “ Case 1+2: -----”

```
for(int i: arr) {       //for-each loop in java
```

You can't use for-each when

- You have to modify or delete the collection or array selectively
- You need to iterate through more than one collection in parallel

Classes----------------------------------→

If the programmer does not provide the default constructor, the compiler will provide one

On finding a parametrized constructor, compiler doesn’t give the default constructor.

It doesn’t have a return type.

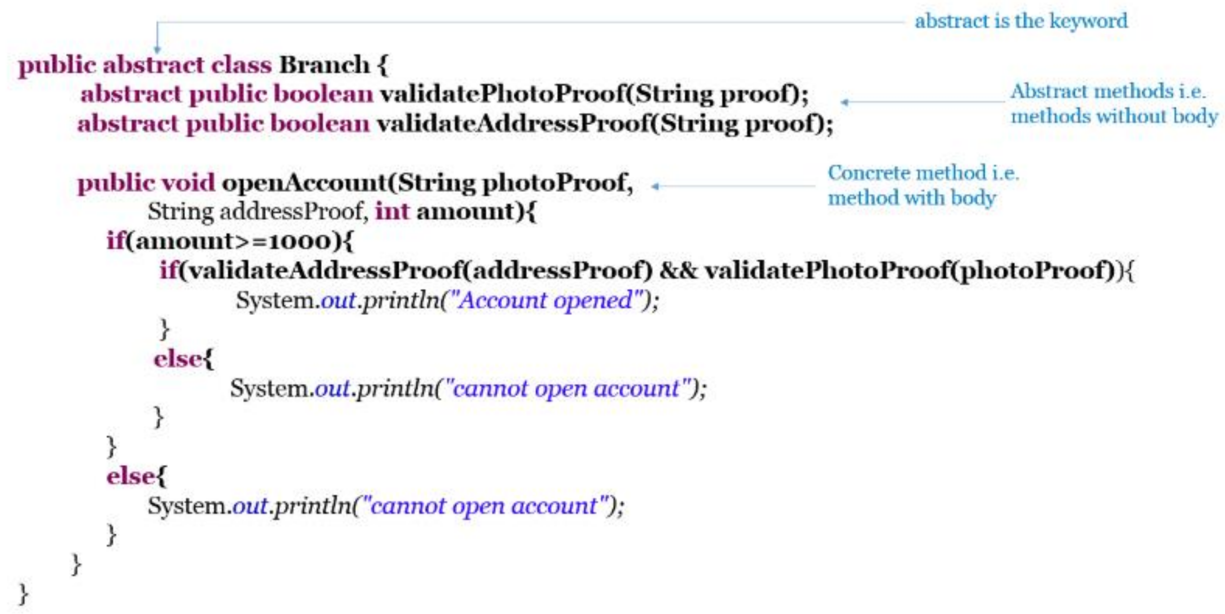
It may or may not have parameters.

We have to always provide a return type in constructor otherwise error will be generated in the code

We also have to see that if suppose void is the return type and something is written in the constructor then also it won’t print in the console as the return type is null

this keyword is used to refer to the current instance of an object.

ABSTRACTION


abstract is the keyword
Abstract methods i.e. methods without body
Concrete method i.e. method with body

```
public abstract class Branch {
      abstract public boolean validatePhotoProof(String proof);
      abstract public boolean validateAddressProof(String proof);

      public void openAccount(String photoProof,
            String addressProof, int amount){
         if(amount>=1000){
            if(validateAddressProof(addressProof) && validatePhotoProof(photoProof)){
                  System.out.println("Account opened");
            }
            else{
                  System.out.println("cannot open account");
            }
         }
         else{
            System.out.println("cannot open account");
         }
      }
}
```

This is an implementation of abstract class which is basically used for hiding details in a program

- An abstract class cannot be instantiated using the new keyword.
- The subclass of an abstract class can be only instantiated if it provides the implementation for all the abstract methods.
- If a class has at least one abstract method, then the class must be declared as abstract.
- If the subclass does not implement all the abstract methods, then the subclass must also be declared as abstract.
- An abstract class can also have concrete methods i.e. methods with implementation.
- An abstract class reference can be assigned an object of its subclass, thereby achieving run-time polymorphism.
- Always use abstract classes when you want to share code among several closely related classes
- Always use abstract classes when you want to declare non-static or non-final fields. This enables you to define methods that can access and modify the state of the object to which they belong
- **An abstract class cannot have private abstract methods and also there is no compulsion that we have to use abstract method in the class , we can also have constructor inside an abstract class**

---INTEFACE---

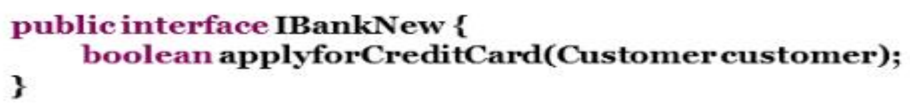
We required interface in java because we do not have multiple inheritance in java so if in case we need to extend new abstract class which is already extending an abstract class we cannot do this here so to ease this possibility we have interfaces it is same but with 100% abstraction

```
public interface IBank {                                //Interfaces are identified by keyword interface

    int CAUTION_MONEY = 2000;                              //variables are by default public fin al and
static

    String createAccount(Customer customer);

    double issueVehicleLoan(String vehicleType, Customer customer);

    double issueHouseLoan(customer customer);

    double issueGoldLoan(Customer customer);                    //Methods are by default public
and abstract

}
```

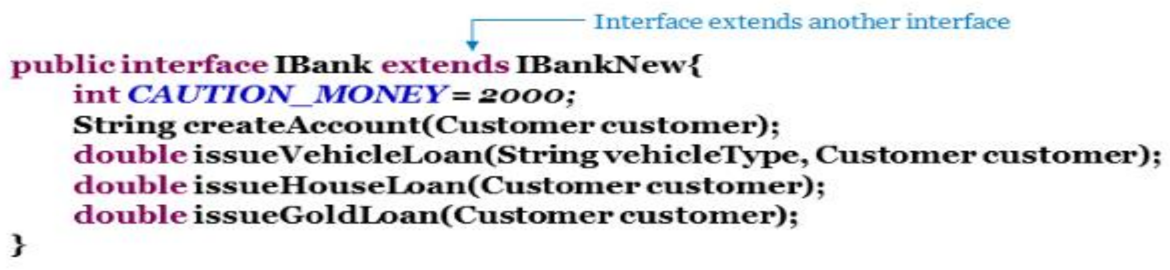
- An interface defines a contract for a class.
- Objects can't be created for interface and an interface cannot h ave private or protected members.
- In an interface, all methods are implicitly public and abstract and variables are implicitly public, static and final
- The class which implements the interface has to provide definitions for all abstract methods.
- If at least one abstract method of the interface has not been overridden by the class that implemented the interface, make it abstract class.
- Inheritance is possible in an interface and it supports multiple inheritance.

```
public class MumbaiOffice implements IBank, IBankNew{ //This is an
example of multiple inheritance using interfaces
```

**** we can also have inheritance in interfaces using this



```
public interface IBankNew {
    boolean applyforCreditCard(Customer customer);
}
```



```
public interface IBank extends IBankNew{
    int CAUTION_MONEY = 2000;
    String createAccount(Customer customer);
    double issueVehicleLoan(String vehicleType, Customer customer);
    double issueHouseLoan(Customer customer);
    double issueGoldLoan(Customer customer);
}
```

Key point here is that when some class implements the interface in java then it is done by **implements** keyword but we can use **extend** keyword in java interfaces to extend each other to have INHERITANCE in INTERFACES

-------------------------ENCAPSULATION--

Encapsulation in Java is a *process of wrapping code and data together into a single unit*

We can create a fully encapsulated class in Java by making all the data members of the class private. Now we can use setter and getter methods to set and get the data in it.

It is a way to achieve **data hiding** in Java because other class will not be able to access the data through the private data members.

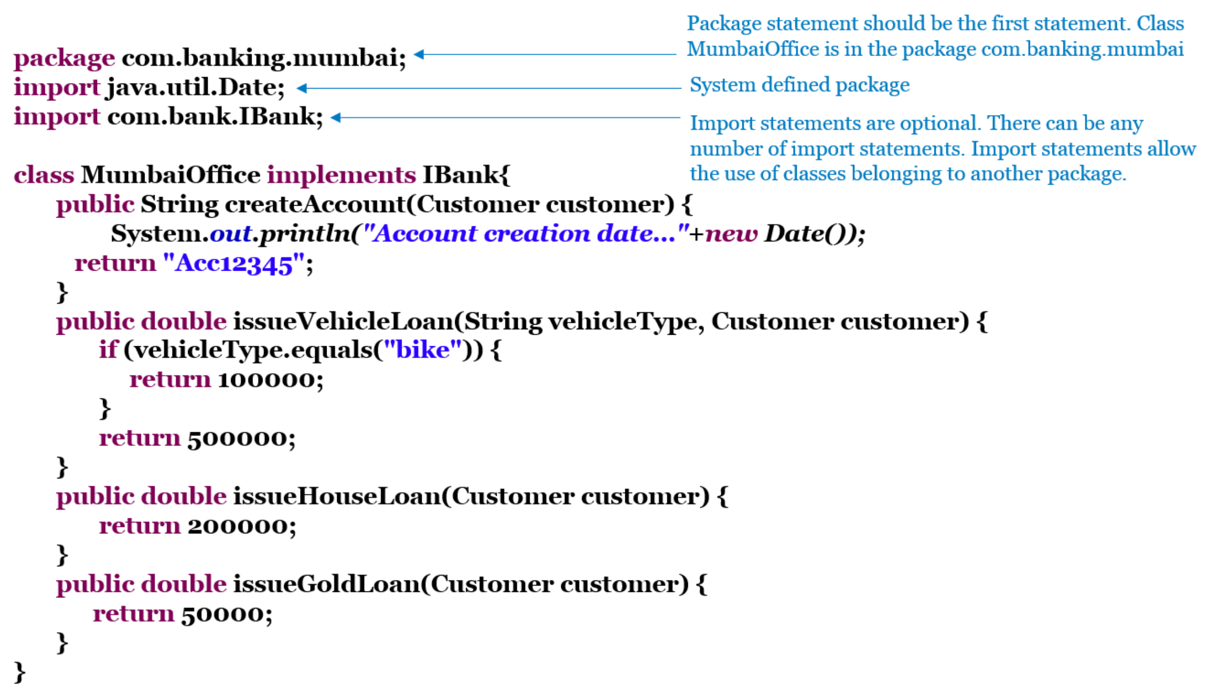
The key point in encapsulation is the use of **SETTERs & Getters and making all the variables private so that data is hidden and cannot be used without the above methods**

----------------------------PACKAGES--

Similarly, a package is a grouping mechanism in Java which contains all related classes and interfaces.
The package is a folder that contains all these related classes and interfaces.
They also restrict access to certain classes and interfaces.
Without packages, we will end up having huge amount of code which is not categorized properly.

Packaging helps in functional grouping of java codes

```
package com.banking; //this is an example of how we import any package
```



```
package com.banking.mumbai;
import java.util.Date;
import com.bank.IBank;

class MumbaiOffice implements IBank{
    public String createAccount(Customer customer) {
        System.out.println("Account creation date..."+new Date());
      return "Acc12345";
    }
    public double issueVehicleLoan(String vehicleType, Customer customer) {
        if (vehicleType.equals("bike")) {
            return 100000;
        }
        return 500000;
    }
    public double issueHouseLoan(Customer customer) {
        return 200000;
    }
    public double issueGoldLoan(Customer customer) {
        return 50000;
    }
}
```

Package statement should be the first statement. Class MumbaiOffice is in the package com.banking.mumbai

System defined package

Import statements are optional. There can be any number of import statements. Import statements allow the use of classes belonging to another package.

package	Description
java.lang	Includes classes like String, StringBuffer, Object, System which are fundamental to the Java Programming Language
java.util	Includes utility classes like Calendar, Collection, Date
java.io	Includes IO classes like FileReader and FileWriter
java.net	Includes networking classes like Inet6Address and Socket
java.awt	Includes classes to create user interface like Button and Checkbox

All packages except java.lang package need to be imported explicitly for developing programs.

****An **import** statement can be used to access the classes and interface of a different package from the current package.

-------------------------------------ACCESS Modifiers--

Java provides access protection at 2 levels:

- Class/Interface level

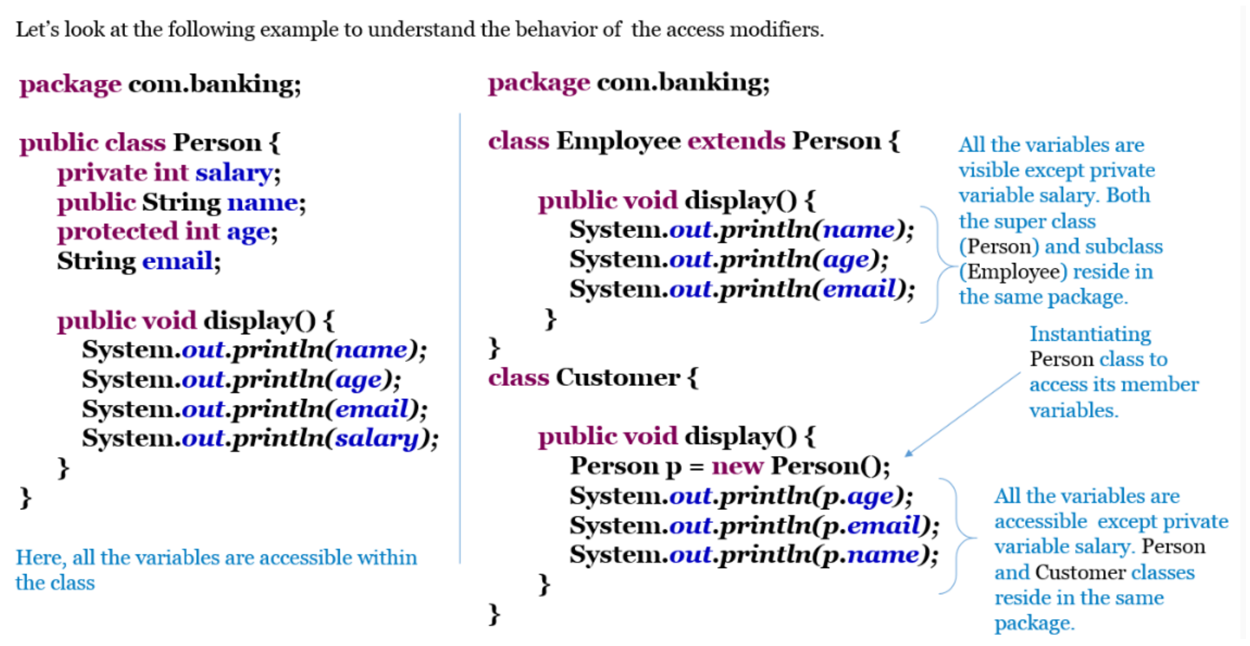
- Member level (variable, method, and constructor)

4 types of access modifiers in java are -→ private, protected, default and public

Keyword	Applicable To	Who can Access
private	Data members, methods, and inner class	All members from the same class only
(No keyword, usually we call it default)	Data members, methods, classes, and interfaces	All classes from within the same package
protected	Data members, methods, and inner class	All classes from within the same package as well as all subclasses i.e. even subclasses residing in a different package
public	Data members, methods, classes, and interfaces	Any class(even other packages)

This is the best table to rectify your query

This is how we access all the queries in java to protect the original data to have restriction as to who can access it (maintains integrity)



Let's look at the following example to understand the behavior of the access modifiers.

```
package com.banking;

public class Person {
    private int salary;
    public String name;
    protected int age;
    String email;

    public void display() {
      System.out.println(name);
      System.out.println(age);
      System.out.println(email);
      System.out.println(salary);
    }
}
```

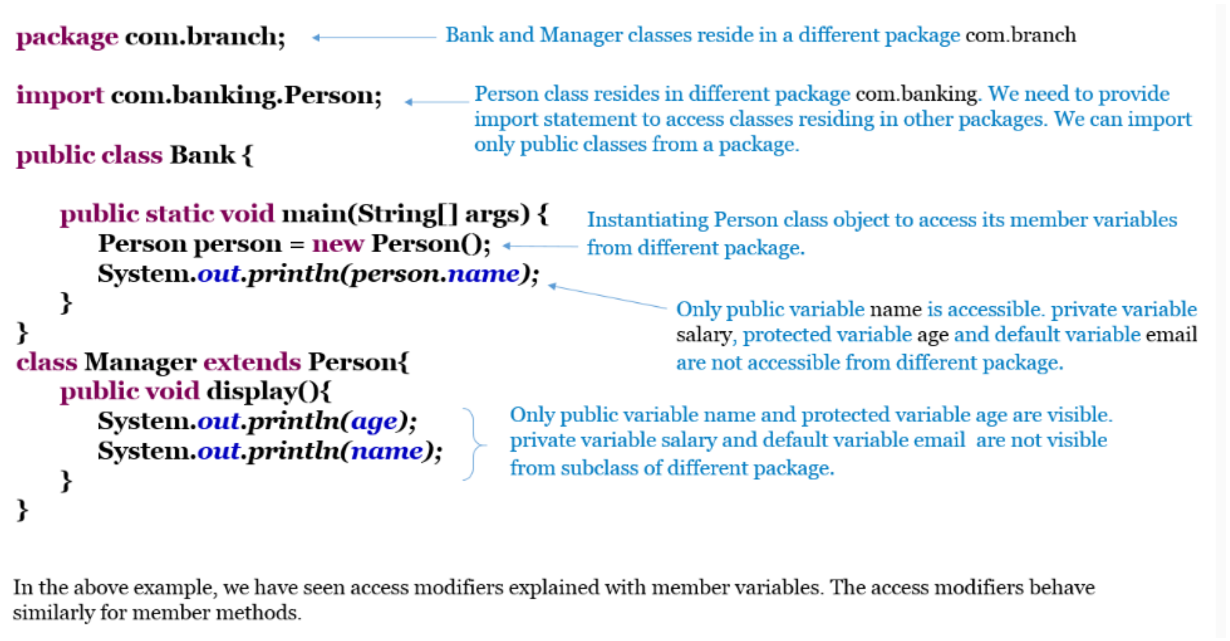
Here, all the variables are accessible within the class

```
package com.banking;

class Employee extends Person {

    public void display() {
       System.out.println(name);
       System.out.println(age);
       System.out.println(email);
    }
}
class Customer {

    public void display() {
       Person p = new Person();
       System.out.println(p.age);
       System.out.println(p.email);
       System.out.println(p.name);
    }
}
```

All the variables are visible except private variable salary. Both the super class (Person) and subclass (Employee) reside in the same package.

Instantiating Person class to access its member variables.

All the variables are accessible except private variable salary. Person and Customer classes reside in the same package.



```
package com.branch;

import com.banking.Person;

public class Bank {

    public static void main(String[] args) {
        Person person = new Person();
        System.out.println(person.name);
    }
}
class Manager extends Person{
    public void display(){
        System.out.println(age);
        System.out.println(name);
    }
}
```

Bank and Manager classes reside in a different package com.branch

Person class resides in different package com.banking. We need to provide import statement to access classes residing in other packages. We can import only public classes from a package.

Instantiating Person class object to access its member variables from different package.

Only public variable name is accessible. private variable salary, protected variable age and default variable email are not accessible from different package.

Only public variable name and protected variable age are visible. private variable salary and default variable email are not visible from subclass of different package.

In the above example, we have seen access modifiers explained with member variables. The access modifiers behave similarly for member methods.

INNER Classes->

- A class can host another class called inner class.
- An inner class can contain member methods and member variables just as any other class.
- Members of an instance of the inner class can access an instance of an outer class, because an inner class is just another member of the outer class. Inner classes can also access the outer class's private members.
- An inner class can be static.
- An inner class can have private, protected, public or package access.

```
class Manager {             // Manager class represents outer class

            class Grade {           // The Grade class represents the inner class

                private char grade;

                public char calculateGrade(String employeeID, int point) {

                        //calculate grade

                        return grade;

                }

            }
```

```
                public char checkEmployeeID(String employeeId, int point) {

                        Grade grade = new Grade();    //Inner class is instantiated and used
in the method of the outer class

                        return grade.calculateGrade(employeeid,point);

                }


}
```

```
Manager.Grade grade = manager.new Grade(); //this is the way we
initialize an inner class like Grade here ouside the outer class
scope
```

ANONYMOUS INNER CLASSES→

```
interface Grade{

     char calculateGrade(String employeeID, int point);

}

class Manager {

     Grade grade = new Grade(){
//Represents anonymous inner class
```

****It is not mandatory that an anonymous inner class should only implement an interface. It can also be a subclass. But an anonymous inner class cannot implement an interface and extend a class at the same time.

Object class →

Implicit super class inherited by all the classes have methods like `.equals(object) .getClass(), hashCode(), .toString()`

These methods can be overridden

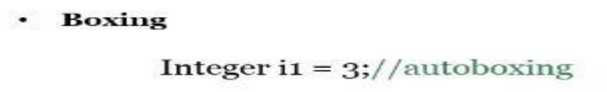
- If object1 and object2 are equal, their hash code values should be same but viceversa is not true

Wrapper Class →

Resides over java.lang.package

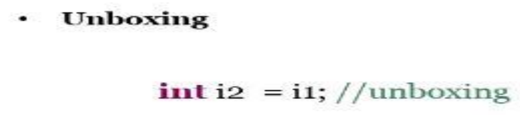
Primitive Data Type	Wrapper Type
boolean	Boolean
char	Character
long	Long
float	Float
int	Integer
short	Short
byte	Byte

- Wrapper class is used to represent primitive data types as Objects.
- Java collections cannot store primitive types. It can store only objects.



- **Boxing**

```
Integer i1 = 3;//autoboxing
```



- **Unboxing**

```
int i2  = i1; //unboxing
```

Wrapper class has methods that help convert one type of data to another data type like for example **Integer.parseInt()**

1. **int i = 45;*//primitive data int***
2. **Integer integer = new Integer(i);*// Integer wrapper class instantiation***
3. **int i2 = integer.intValue();*// unwrapping primitive data int from wrapper object***

== is used to compare the refrence whereas in .equals we compare the actual value stored in the variable

SCANNER CLASS→

we can get it inside the java.util.package

Methods	Description
public String next()	Returns the next token from the scanner.
public String nextLine()	Moves the scanner position to the next line and returns the value as a string.
public byte nextByte()	Scans the next token as a byte.

Methods	Description
public short nextShort()	Scans the next token as a short value.
public int nextInt()	Scans the next token as a int value.
public long nextLong()	Scans the next token as a long value.
public float nextFloat()	Scans the next token as a float value.
public double nextDouble()	Scans the next token as a double value.

The garbage collector will free memory occupied by an object under three conditions:

- **When the reference of the object is set to null.**
- **When the reference of the object is set to some new object such that no reference points to the previous object. In this class, the un-referenced previous object will be garbage collected.**
- **When a reference is local to some method then it will be removed from the Stack as soon as the method is executed. If this reference is pointing to an object, that object will also be garbage collected.**

The finalize method written in a Java class is called garbage collection

- The finalize method is used when certain objects are required to perform some action before they are destroyed.
- By overriding this method, we can define specific actions that will occur when an object is just about to be reclaimed by the garbage collector.