OOPS CONCEPT

- **Data Hiding**
- **Abstraction**
- **Encapsulation**
- **Tightly Encapsulated Class**
- **IS-A Relationship**
- **HAS-A Relationship**
- **Method Signature**
- **Overloading**
- **Method Hiding**
- **Constructors**
- **Type Casting**
- **Coupling**
- **Cohesion**

DATA HIDING

Hiding of the data, so that outside person can’t access our data directly.

By using private modifier we can implement Data Hiding.

Example 1:

```
            class account
{
 private double balance=1000;
}
```

The main advantage of data Hiding is we can achieve security .

ABSTRACTION

Definition:

Hiding internal implementation details and just highlight the set of services what we are offering, is called “Abstraction”.

Example:

By bank ATM machine,bank people will highlight the set of services what they are offering without highliting internal implementation.This concept is nothing but Abstraction.

By using interfaces and abstract classes we can achive abstraction.

- **Advantages :**

1)We can achieve security as no one can change our internal implementation.

2)Without effecting outside person we can change internal implementation hence enhancement will become very easy.

- **Disadvantages:**

1)It increases length of code and slow down execution.

TIGHTLY ENCAPSULATED CLASS

Definition:

A class is said to be tightly encapsulated iff every data member declared as the private.

Whether the class contain getter and setter methods are not and weather those methods declared as public or not, these are not required to check.

Example:

```
class A
 {
    private int balance;
   public int getbalance()
   {
        Return balance();
   }
 }
```

Qu.Which of the following classes are tightly Encapsulated?

```
1) class a
{
 private int x=10;
}
```

Ans: Tightly Encapsulated class

2) class A extends b

```
  {
   int y=20;
  }
```

Ans:Not Tightly Encapsulated class

3) class C extends a

```
  {
    private int z=20;
  }
```

Ans:Tightly Encapsulated class

ENCAPSULATION

Defination:

Encapsulating data and corresponding methods(behaviour) into a single module is called “Encapsulation”.

If any java class follows data hiding and abstraction such type of class is called encapsulated class.

Encapsulation=Data Hiding+Abstraction

Example 1:

```
    class account
    {
      private double balance;
      public double getbalance()
        {
          return balance;
        }
      public void setbalance(double balance)
        {
          this.balance=balance;
        }
   }
```

Hiding data behind method is the centrol concept of encapsulation.

- **Advantage:**

1)Enhancement will become very easy.

2)Improve modularity to the application

Qu)Which of the following class is encapsulated class.

```
 1) class a
{
    int x=10;
 }
```

Ans:Not Encapsulated

```
2)  class B extends A
     {
       private  int y=20;
    }
```

Ans : Encapsulated class

```
3)  class C extends A
     {
       private  int  z=20;
    }
```

Ans : Encapsulated class

- **Conclusion:**

  1)If parent class is not tightly encapsulated then no child class is tightly encapsulated.

IS-A RELATIONSHIP

1) It also known as “Inheritance”.
2) By using extends keyword we can implement IS-A Realationship.
3) The main advantage if IS-A Realationship is reusability of the code.

Example:

```
class p
{
 public void m1()
{
   ------------
  -------------
}
}
class c extends p
{
 public void m2()
{
    -------------
    -------------
}
}
class test
{
public static void main(String args[])
{
Case1:
        P obj=new p();
            p.m1();                  //Valid
            p.m2();                  //C.E.:Can’t find symbol
                                      symbol:method m2()
                                     location:class p
```

```
case2:
 c obj2=new c();
 obj2.m1();                //Valid
 obj2.m2();                //Valid

case3:
 c ob3=new p();             C.E.   incompitable types
                             required:p
                            found:c
```

- **Conclusion:**

1) Whatever the parent class has by default available to the child class hence child class reference can call both parent class and child class.

2) Whatever the child has by default not available to the parent hence on the parent class reference we can call only parent class methods and we can't all child specific methods.

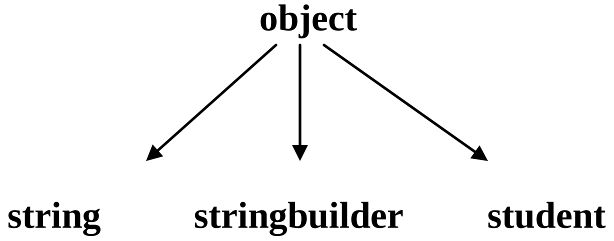
3)Parent class reference can be used to hold child class objects by using they reference we can callonly parent class methods but we can't call child specific methods.

4)We can't use call child specific methods.

5)We can't use child class reference to hold parent class objects.

Example:

1)The common functionality which is required for any java classes is defined in object class and by default that class as super class.Tts functionality by default available to every java classes.



2)The common functionality which is required for all Exceptions and error is defined in Throw able class as Throw able is parent for all Exceptions and Errors. Its functionality will be available automatically to every child not required to rewrite.

Java won’t provide support for multiple inheritance but through interfaces it is possible.

Example:

1)

```
class a extends b,c
{

}
```

But

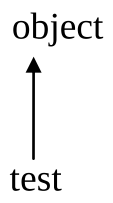
```
Interface a extends b,c
{


}
```

Every class in java is child class of object class.

If our class doesn’t extends any other class then only it is the direct child class of object

Example:

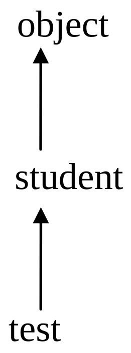
```
class test
{
     -----------

     -----------
}
```



If our class extends any other class then our class is not directly chold class of object.

Example:

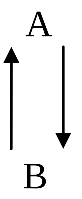
```
class test extends student
{
      -----------
      -----------
}
```



Cyclic inheritance is not allowed in java.

Example:

```
class A extends B
{
      -----------
      -----------
}
 Class B extends A

      -----------

}
```



HAS-A RELATIONSHIP

1) Has-A Relationship is also known as "Composition or aggregation".
2) There is no specific keyword to implement HAS-A Relationship.The mostly we are using "new" keyword.
3) The main advantage of HAS-A Relationship is reusability or code reusability.
4) Example:

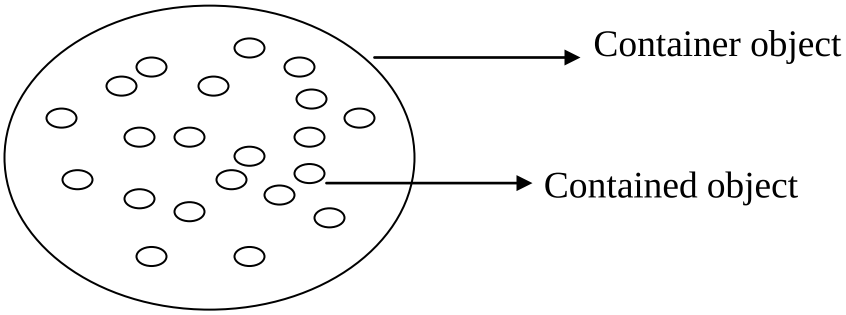
```
 class car                                      class Engine
{                                                        {

   Engine e=new Engine();                           //Engine specific functionality
}                                                        }
```

class car has engine reference.
The main disadvantage of HAS-A Relationship it increases dependency between classes and creates maintainance problem.

Composition vs. Aggregation:

A)Composition:

1)In case of composition whenever container object is destroyed all contained object will be destroyed automatically.i.e. without existing container object there is no chance of existing contained object having 'Strong Association'. This association is called 'Strong Association' which is nothing but "Composition".



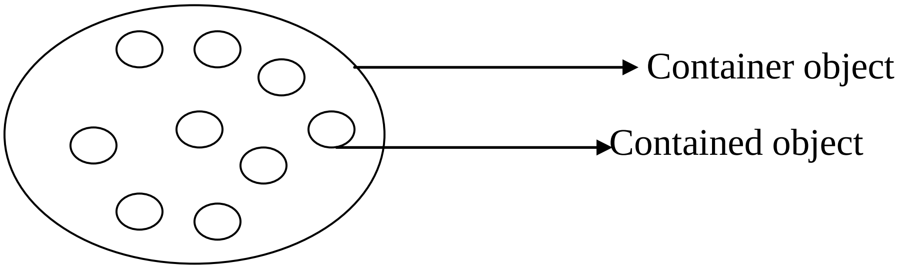
Example:

1)University is composed of several departments.

Whenever you are closing university automatically all departments will be closed.The relationship between university object and department object is strong association which is nothing but composition.

A)Aggregation:

Whenever container object destroyed,there is no guarranty of destruction of contained object i.e. without existing containerobject,there may be chance of contained object.This association is called ‘Weak Association’ which is nothing but “Aggregation”.



Example:

1)Several proffecers will work in the department.

Whenever you are closing department still there may be chance of existing professors.The relationship between department and proffessors is called ‘’Weak Association’ which is nothing but “Aggregation”.

METHOD SIGNATURE

Defination:

Method signature consist of name of method and argument list.

Example: public void m1(int i,float p)

m1(int,float)

1) In java return type is not part of method signature.
2) Compiler will always use method signature while resolving method calls.
3) With in the same class two methods with same signature not allowed otherwise we will get compiletime error.

Example:

```
public class methodsig
{
   public void m1(int i)
{
   System.out.println("I am in m1");
   }
    public void m1(int i)
{
   System.out.println("I am in m1");
 }
public static void main(String ar[])
{
    methodsig obj1=new methodsig();
    obj1.m1();

   }}
```

C.E.m1(int) has already defined in methodsig

OVERLOADING

Defination:

Two methods are said to be overloaded iff method names are same but arguments are different.

- Lack of overloading in'C' increases complexity of programe.
- In C,language if there is a change in method argument we should go for new method.
- Compulsary we should go for new method name.

Example:

1) abs() → int
2) labs() → long
3) fabs() → float

- But in java two methods having same name with different argument is allowed and these methods are considered as overloaded methods.

Example:

1) abs(int)
2) abs(long)
3) abs(float)

- Having overloading concept in java simplifies the programming.

Example:

```
public class methodoverloading {

    public void m1()

    {
```

```
System.out.println("no-arg");
}
 public void m1(int i)
{
System.out.println("int-arg");
}
 public void m1(float f)
{
System.out.println("float-arg");
}
 public static void main(String ar[])
 {
 methodoverloading obj1=new methodoverloading();
 obj1.m1();
 obj1.m1(10);
 obj1.m1(10.5f);
 }
```

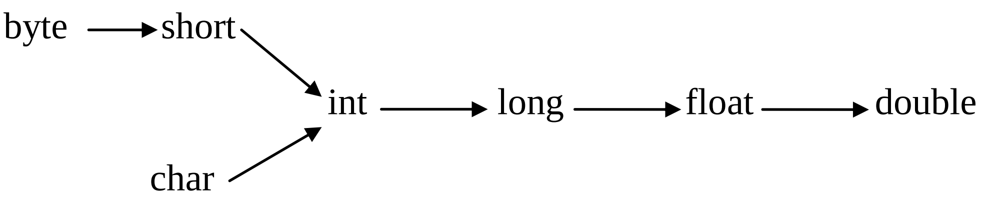
Output:

```
no-arg
int-arg
float-arg
```

- In overloading method resolution always takes care by compiler based on reference type.Hence overloading is also considered as “compiletime polymorphism” or” static polymorphism” or”early binding”.
- In overloading reference type will play important role and runtime object will dummy.

Case1:Automatic promotion in overloading:

- *I*n overloading method resolution,if matched method with specified argument type is not available then compiler won’t raiseany error immediately.First it promotes that argument to the next level and checks match ed method.
- If the matched method is available then it will considered and if not available then compiler once again promotes this argument to next level.
- This process will be continued until all possible promotions.After completing all promotions still if matched method is not available then onlu we will get compiletime error.
- The following various possible promotions in overloading



Example 1:

```
public class autopromotion {
    public void m1()
    {
    System.out.println("int-arg");
    }
      public void m1(float f)
    {
    System.out.println("float-arg");
    }
    public static void main(String ar[])
    {
            autopromotion obj1=new autopromotion();
            obj1.m1();
            obj1.m1(10.5f);
    }
}
Output:
int-arg
float-arg
```

Case2:In overloading more specific version will get highest priority.

Example 2:

```
public class specific {
   public void m1(StringBuffer SB)
    {
    System.out.println("StringBuffer-arg");
    }
      public void m1(String s)
    {
    System.out.println("String version");
    }
    public static void main(String ar[])
    {
            specific obj1=new specific();
            obj1.m1(new StringBuffer("shree"));//StringBuffer-arg
            obj1.m1("jai");                              // String version
             obj1.m1(null);                       // C.E.:reference m1() is ambiguity

    }}
```

Case 3:In overloading method resolution child-argument will get more priority than parent argument.

Example:

```
public class childargumentover {
    public void m1(Object o)
    {
      System.out.println("object version");
    }
     public void m1(String s)
    {
      System.out.println("String-version");
    }
    public static void main(String ar[])
    {
    childargumentover obj=new childargumentover();
    obj.m1(new Object());
    obj.m1("durga");
    obj.m1(null);

    }
}
```

Output:

```
object version
String-version
String-version
```

OVERRIDING

Definition:

Two methods are said to be overriding iff method names are same and arguments are also same.

Hence overriding is also known as “Runtime polymorphism(or) dynamic polymorphism”.

Overriding method resolution is also known as “Dynamic method dispatch” .

- **Rules for Overriding:**

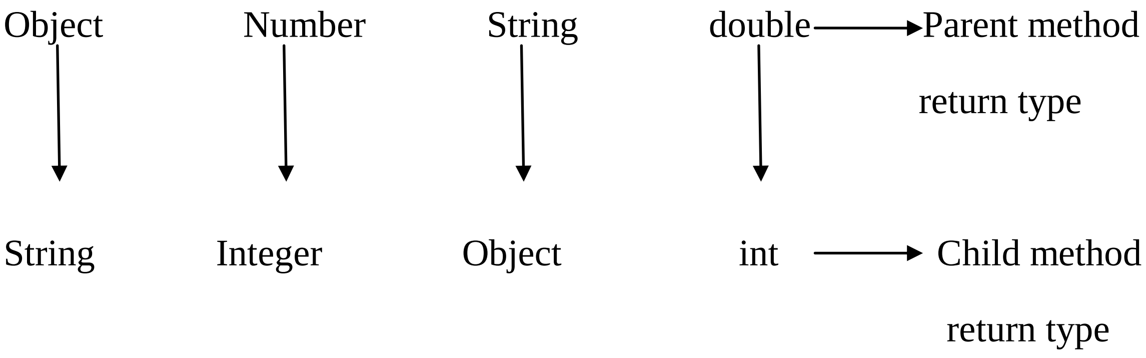
- In overriding method names and arguments must be matched.i.e. method signature must be matched.
- In overriding return type must be matched,but this rule is applicable until 1.4Version,from onward 1.5Version onwards co-variant return types are allowed according to this,child method return type need not be same as parent method return type.Its child classes are allowed.

  Example:

```
public class overriding1 {
    public Object m1()
    {
    return 0;
    }
}
class c extends overriding1
{
    @Override
    public String m1()
    {
      return null;
    }
    public static void main(String ar[])
    {
     c obj=new c();
     obj.m1();
    }

}
```

Note:It is valid in 1.5Version but invalid in 1.4 Version.

Co-variant return type concept is applicable only for object type but not for primitive types.



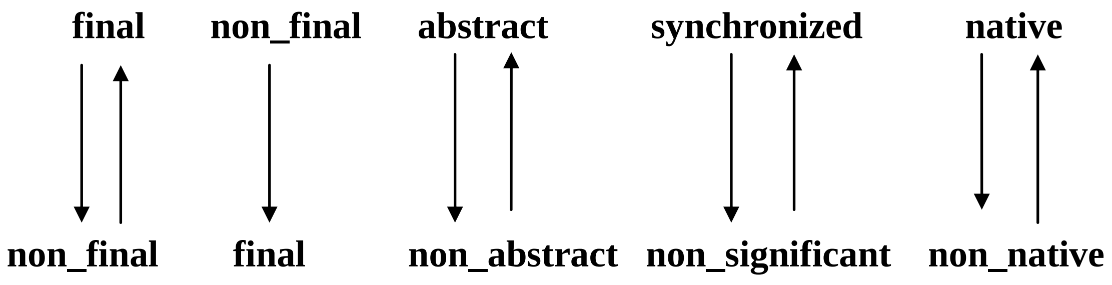
- We can't override parent class final method,but we can use as it is.
- Private methods are not visible in child classes hence overriding concept is not applicable foe private methods.
- Based on our requirement we can declare the same parent class private method in child class also it is valid but it is not overriding.

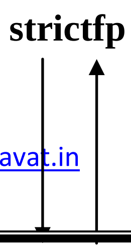
  Example:

  ```
  public class privateEx1 {

   private void m1()
   {
   System.out.println("I am in m1");
   }
  }
  ```

```
 class c extends JavaApplication3
 {
private void m1()
 {
 System.out.println("I am in m2");
 }
  public static void main(String[] args)
    {
        c obj=new c();
        obj.m1();

    }
Output:
I am in m2
```

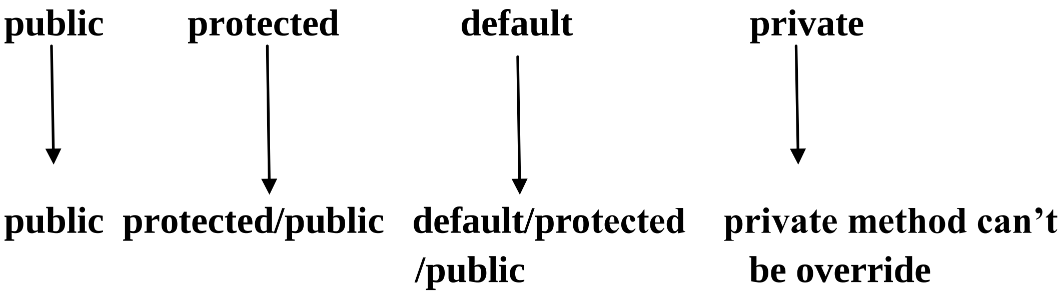
- For parent class Abstract methods we should override in child class to provide implementation.
- We can override parent class non_abstract method as abstract in child class to stop parent class method implementation availability to the child classes.
- The following modifier won’t play any restrictions in overriding
  1)native
  2)synchronized
  3)strictfp





non_strictfp

- While overriding we can’t decrease scope of modifier but we can increase the following are various acceptable overriding.
  Private<default<protected<public



public **protected** **default** **private**

public **protected/public** **default/protected /public** **private method can’t be override**

Example:

```
 public class p
{
public void m1()
{

}
class c extends p
{
protected void m1()        //C.E. m1() in c can’t override in c.
}
}
```

- This rule isapplicable while implementing interface methods also.
- Whenever we are implementing any interface method compulsory it should be declared as public ,because every interface method is public by default.

Example:

```
  interface interf
  {
    void m1();
   }
class test implements interf
  {
void m1();                              //C.E.:weaker access privilages;was  public
  }
```

- If child class method throws some checked exception then compulsory parent class method should throw the some checked exception or its parent class exception,otherwise we will get compiletime error.
- But there is no rule for unchecked exception.

Example:

```
class  first   {
   public  void m1();
  }
   class second extends first
 {
  public void m1()throws exception            //C.E.:m1() in second can't
  {                                               override m1() in first;
```

```
    }

}
```

Qu)Which of the following is valid orInvalid?

1)parent:public void m1()throws IOException

Child:public void m1()

Ans:Valid

2) parent:public void m1()

Child:public void m1()throws IOException

Ans:Invalid

3) parent:public void m1()throws Exception

Child:public void m1()throws IOException

Ans:Valid

4) parent:public void m1()throws IOException

Child:public void m1()throws Exception

Ans:Invalid

5) parent:public void m1()throws IOException

Child:public void m1()throws FileNotFoundException,EOFException

Ans:Valid

6) parent:public void m1()

Child:public void m1()Arithmetic Exception,Null Pointer Exception

Ans:Invalid

➢ Overriding w.r.t static method:

- We can’t override static method as non_static method.

  Example:

```
 public class staticovrriding {
  public static void m1()
  {

  }
}
  class second extends staticovrriding
  {
    public void m1()        //C.E.:m1() is can’t override m1()in p;
    {                            Override method is static.
    }
  }
```

- Similarly we can’t override non-static method as static
- If both parent and child class method are static then we won’t want to get any c.e. it seems to be overriding is happen,but it is not overriding it is “Method Hiding”.

  Example:

```
public class staticovrriding {
  public static void m1()
  {
   System.out.print("Method");
  }
}
  class second extends staticovrriding
  {
    public static void m1()
    {
      System.out.print("Hiding");
    }
    public static void main(String ar[])
    {
    second obj=new second();
```

```
        m1();
        }
      }
```

Output:

```
Hiding
```

Difference between Method Hiding and Overriding:

Method Hiding	**Overriding**
1)Both method should be static.	1)Both method should be non-static.
2)method resolution takes care by compiler based on reference type.	2) method resolution takes care by JVM based on Runtime object.
3)It is considered as compiletime polymorphism or static polymorphism or early binding.	3)It is considered as Runtime polymorphism or dynamic polymorphism or late binding.

➢ Overriding w.r.t Var-arg method:

- We can’t override var-.arg method with general method.If we are trying to override it will become overloading but not overriding .
- A var-arg method should be overridden with var-arg method only.

Example:

```
 public class varargoverriding {
   public void m1(int... i)
   {
   System.out.print("Parent");
   }
}
 class vararg extends varargoverriding
 {
 public void m1(int i)
   {
   System.out.print("child");
   }
 public static void main(String ar[])
 {
 vararg obj=new vararg();                          //child
   obj.m1(10);
 varargoverriding obj2=new varargoverriding();    //parent
   obj2.m1(12);
 varargoverriding obj3=new vararg();              //parent
   obj3.m1(14);
 }
 }
```

Output:

```
childParentParent
```

- If both parent and child methods are var_arg then it will become overriding in thisit will become overriding .

  Example:

```
public class varargoverriding {
    public void m1(int... i)
    {
    System.out.print("Parent");
    }
}
  class vararg extends varargoverriding
  {
      @Override
  public void m1(int... i)
    {
    System.out.print("child");
    }
  public static void main(String ar[])
  {
  vararg obj=new vararg();
    obj.m1(10);

  }
  }
```

Output:
Child

POLYMORPHISM

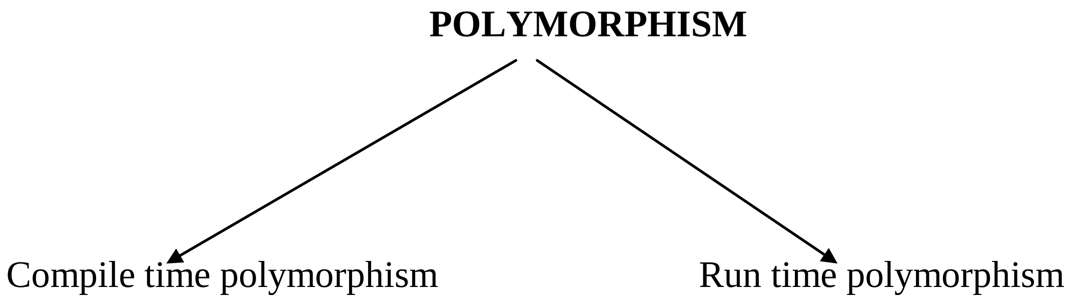
Defination:

poly → many

morphs → forms

polymorphism means many forms.

- WE can use same method name to represent multiple forms in polymorphism.
  Example:
  In overriding we can have mehod with one type of implementation
  In parent,but different type of implementation in child class.
- There are two types of polymorphism.



POLYMORPHISM

Compile time polymorphism

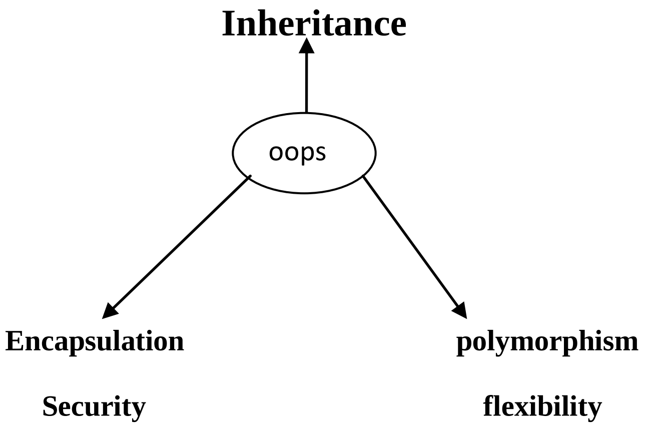
Run time polymorphism

Ex.Method Overloading

Ex.Method overriding

Method Hiding

3 pillars of oops:



Difference between overloading and overriding:

Property	Overloading	Ooverriding
1)method names	Must be same.	Must be same.
2)arguments	must be different.	must be same.
3)method signatures	Must be different.	Must be same.
4)return type	No restriction.	Must be same until 1.4v but from 1.5v onwards co_variant return types are allowed.
5)private,static,final methods	Can be overloaded.	Can't be overloaded.
6)access modifiers	No restriction.	We can't decrease the scope.
7)Throws clause	No restriction	Size and level of checked Exceptions we can't improve but we can decrease,but norestrictionfor unchecked exceptions.
8)method resolution	Always takes care by compiler based on reference type.	Always takes care by JVM based on runtime object.
9)Also known as	Compile time polymorphism or static polymorphism or early	Runtime polymorphism or dynamic polymorphism or late binding.

	binding.	

CONSTRUCTOR

Definition:

Object creation is not enough we should perform initialization. Then only that object is in position to provide response properly.

Whenever we are creating an object some piece of code will executed automatically to perform initialization. This piece of code is nothing but constructor. Hence the main objective of constructor is to perform initialization for the newly created object.

Example:

```
public class constructor {

    int rollno;

    String name;

    public constructor(int rollno1, String name1) {

        this.rollno = rollno1;

        this.name = name1;

    }

    public void disp()

    {

     System.out.print(rollno);

          System.out.print(name);

    }
    public static void main(String args[ ]){


        constructor obj1=new constructor(101,"shree");

        constructor obj2=new constructor(102,"jai");

              obj1.disp();

              obj2.disp();

    }

}
```

Output:

```
101shree102jai
```

Example 2:

```
public class conbuffer {

     int rollno;

    int no1;

    int no2;

    String name;

    public conbuffer(int rollno1, int n1,int n2,String name1) {

        this.rollno = rollno1;

        this.no1 = n1;

        this.no2 = n2;

         this.name = name1;

    }
```

```
   public void disp()
   {
    System.out.println(rollno);
        System.out.println(name);
          int c=no1+no2;
          System.out.println("addition is"+c);
   }
   public static void main(String ar[]) throws IOException{
  BufferedReader br=new BufferedReader(new InputStreamReader(System.in));
  System.out.println("Enter roll no.");
  int rno=Integer.parseInt(br.readLine());
  System.out.println("Enter  name.");
  String na=br.readLine();
  System.out.println("Enter first no.");
  int num1=Integer.parseInt(br.readLine());
   System.out.println("Enter second no.");
   int num2=Integer.parseInt(br.readLine());
    conbuffer obj2=new conbuffer(rno,num1,num2,na);
    obj2.disp();
   }
}
```

Output:

```
Enter roll no.

1

Enter  name.

jai

Enter first no.

33

Enter second no.

34

1

jai

addition is67
```

- **Rules to define constructor:**

  1) The name of the class and name of the constructor must be matched.

  2) Return type of concept is not possible for constructor even void also. By mistake if we declare return type for the constructor we can't get compile time error or runtime error, because compiler treats it as method.

  Example.

```
  class test
{
Void test()              It is normal method but not constructor.
{
}
}
```

3)The only applicable modifiers for constructor are: public, private, protected

<default>,if we are trying to use any other modifier we will get compile_time error saying modifier static/final/strictfp is not allowed here.

Example:

```
class test{
{ final test()                    // C.E.final modifier is not allowed here
}
}
```

- **Defult constructor:**
  1)If we are not writing any constructor then compiler will always generate default constructor.
  2)If we are writing at least one constructor then compiler won’t generate default constructor.
  3)Hence a class can contain either programmer written constructor or compiler generated constructor but not both simultaneously.

- Prototype of default constructor:
  1)It is always no argument constructor.
  2)The access modifier of default constructor is same as class modifier but this rule is applicable public and <default>
  3)It contains only one line,It is a no argument call to super alas constructor.
  Example:

```
Test
{
super()
}
```

Programmers Code

```
1) class Test
   {
   }
```

Compiler Generated Code

```
class Test

   {
      Test()
      {
         super();
      }
   }
```

Programmers Code

```
2) public class Test
   {
   }
```

Compiler Generated Code

```
public class Test

   {
     public Test()
      {
         super();
      }


   }
```

Programmers Code

```
 3)class Test

          {
           void Test()           //It is not a Constructor.It ia an normal
            {                           method
           }
          }
```

Compiler Generated Code

```
     class Test

          {
             Test()
             {
                super();
             }
          void Test()
            {
            }

}
```

Programmers Code

```
     4)class Test

          {
            Test()
             {
            }
          }
```

Compiler Generated Code

```
class Test

    {
       Test()
       {
          super();
       }
    }
```

Programmers Code

```
5) class Test

    {
      Test()
      {
       this(10);
     }
      Test(int i)
       {
      }
    }
```

Compiler Generated Code

```
class Test

    {
      Test()
      {
       this(10);
     }
```

```
       Test(int i)
         {
           super();
       }
     }
```

```
5) class Test

     {
       Test()
       {
        this(10);
      }
       Test(int i)
         {
       }
     }
```

Compiler Generated Code

```
class Test

     {
       Test()
       {
        this(10);
      }
       Test(int i)
         {
           super();
       }
     }
```

```
6) class Test

     {
```

```
Test(int i)
 {
   Super();
 }
}
```

Compiler Generated Code

```
class Test

    {
      Test(int i)
      {
       Super();
     }
    }
```

Super & This

- The first line inside a construction should be either super() or this().
- If we are not writing any thing compiler will always place super().

Case 1:

We have to keep either super() or this() only as.the first line of the constructor.

```
class Test
 {
   Test()
    {
      System.out.println("Hiiiiiiii");
      super();
      }
```

```
        }
```

C.E: call to super must be first statement in constructor.

Case 2:

With in the constructor we can use either super() or this() but not both simultaneously.

```
         class Test
        {
         Test()
          {
            super();
            this();  // call to this must be first statement in the
constructor
            }
        }
```

Case(3):

We can use super & this only insude Constructor if we are using any where else we will get compliler error.

Sol:

```
  class Test
{
       Public void m1()
       {
         super();
  System.out.println(“hiiiiiiiiiiiiii”);
        }
     }
```

super(): Must be used in constructor.

this(): As the first statement only

But not both simultaneously.

this(): To call current class Constructor.

super(): To call parrent class Constructor.

Compiler provides default super() but not this().

Super()
this()
	super
	this

1)These are constructor calls.	1)These are keywords to refer super and current class instance memebers
2)We should use only in constructors	2)we can use anywhere except in static area.

Example:

```
class test

{

Public static void m1()

{

System.out.println(super.hashcode());

}

}
```

➢ Constructor Overloading

- A class can contain more than one constructor with same name but diiferent arguments and this constructors are consider as overloaded constructor.

Example:

```
int id;
```

```
    String name;
    int age;
    ConstructorOverloading(int i,String n){
    id = i;
    name = n;
    }
    ConstructorOverloading(int i,String n,int a){
    id = i;
    name = n;
    age=a;
    }
    void display(){System.out.println(id+" "+name+" "+age);}
    public static void main(String args[]){
    ConstructorOverloading s1 = new ConstructorOverloading(1,"cern");
    ConstructorOverloading s2 = new ConstructorOverloading(2,"system",25);
    s1.display();
    s2.display();
   }
}
```

Output:

```
1 cern 0
   2   system 25
```

Inheritance and overriding concepts are not applicable for constructor.

Every class in java including abstract class also can contain constructor,but interfaces can’t have the constructor.

```
 class test
{
test()
 {
 }
}                                    //Valid
abstract class test
{
test()
{
 }
}                                    //Valid
Interface test
{
test()
}
}
}                                    //Invalid
```

Case 1:

Recursive method call is always runtime exception where as recursive constructor invocation is a compile time.

Example:

```
class Test
 {
     public static void m1()
           {
           m2();
          }
      public static void m2()
           {
           m1();
          }
 public static void main(String args[])
           {
             System.out.println("Hello");
             m1();
          }
        }
```

Runtime:StackOverFlowError.

Example :

```
public class recursiveconstructor{
   recursiveconstructor()

   {

       this(10);

   }

   recursiveconstructor(int i)

   {

      this();

   }

   public static void main(String ar[])


   {

    System.out.println("Hello");

   }

   }

 //C.E. Recursive constructor invocation
```

Case ii)

Example:

1)class p

```
    {
     }
class c extends p
    {
     }
2)class p
  {
P()
         {
          }
   }
class c extends p
 {
 }


3)class p
{
P(int i)
{
}
}
class c extends p
```

```
{
}
```

```
 C.E.:can’t find symbol
        symbol:constructor p()
        location:class p
```

Note:

If the parent class contains some constructors then while writing child class we have to take the special case about constructors.

Whenever we are writing any argument constructor it is highly recommended to write no argument constructor also.

Case(iii):

If parent class constructor throws some checked exception compulsory child class constructor should throw some checked exception or its parent otherwise the code won’t compile.

```
class p
{

P()throws IOException
 {
 }
}
class c extends p
```

```
{
}
```

//C.E. unsupportedException java.io. IOException in default constructor.

Example:

```
class p
{
P()throws IOException
 {
 }
}
class c extends p
{
C()throws IOException/Exception
{
}
}
```

Qu)Which of the following is true?

1)Every class contains constructor. :True

2)Only concrete class contains constructor but not abstract class :False

3)The name of the constructor need not be same as class name:false

4)The only applicable modifier for constructor are public and default.:True

5)returntype is applicable for the constructor:False

6)If we are trying to declare return type for the constructor we will get compiletime error:False

7)compiler will always generate default constructor.:False

8)The acess modifier of the default constructor is always default.:False

9)The First line inside every constructor should be super.:False

10)The First line inside every constructor should be super() or this().:True

11)If we are not writing anything compiler will always place this():False

12)interface can contains constructor.:False

13)Both overloading and overriding concept are apllicable for constructor.:False

14)Inheritance concept is applicable for constructor.:False

Type Casting

- Parent class reference can be used to hold child class object
  Example: parent p=new child();

- Similarly,interface reference can be used to hold implemented class object.
  Example: Runnable r=new Thread();

  Syntax:
  ```
     A b=(c) d;
  A  //class/interface
  b  //Referance Variable
  c    //class/interface
  d     //ObjectReference/Object
  ```

- **Compiler Rule 1:**

c and type of d must have some relationship(either parent to child (or) child Parent as same type)other wise we will get complie time error saying "Inconvertible types found d type but require c type."

Ex.1.

```
          Object o=new String("Priyanka");
           StringBuffer sb=(StringBuffer)o;
```

Ex.2.

```
                    String s=new String("Priyanka");
            SB sb=(SB)s;    //C.E. inconvertible types
                                   Required:java.lang.SB
Found:java.lang.String
```

CompilerChecking rule 2:

C must be either same or derived type of A otherwise we will get compiler time error saying "incompatable types"

found:c

reqired:A

Ex.1.

```
        Object o=new String("Priyanka");
           String s=(String)o;
```

Ex:

```
 Ex:   String s=new String("Priyanka");
        StringBuffer sb=(Object)s;  //C.E. incompatable types
                                       Required:SB
                                      Found:object3:
```

RuntimeChecking Rule 3:

The underling object type of ‘d’ must be either same or derived type of c. otherwise we will get runtime exception saying “ClassCastException”

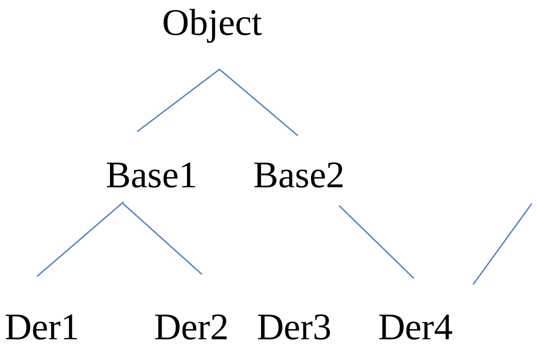
Ex.1.

```
Object o=new String(“Priyanka”);
 SB sb=(SB)o; //ClassCastException
```

Ex.2.

```
Object o=new String(“Priyanka”);
 String s=(String)o;
```

Ex.3.



Explanation:

```
1)  Base2 b=new Der4();  //valid
2)  Object o= (Base2)b;    //valid
3)  Object o= (Base1)b;    //C.E. inconvertable types
                                        reqired: Base1
                                         found:Base2
4)  Base2 b1=(Base2)o; //valid
5)  Base1 b3=(Der1)(new Der2());//C.E. inconvertable
    types
                                        reqired: Der1
                                         found:Der2
```

Strictly speaking in typecasting just we are converting only type of object but not underling object itself.

Ex.1.

```
String s1=new String(“Priyanka”);

Object o=(Object)s1;

System.out.println(s1==o); //true
```

Ex.2.

```
A  →  public void m1()
↑
|        {
|
|          System.out.println(“A”);
|
|        }
|
B  →  public void m1()
↑
|        {
|
|          System.out.println(“B”);
|
|        }
|
C  →  public void m1()

         {

           System.out.println(“c”);

         }

C c=new C();

  c.m1();

((B)c).m1(); → c   // B b=new c();
```

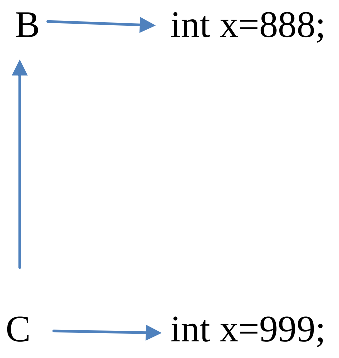
```
                              b.m1();
    ((A)c).m1(); → c    // A a=new c();
                              a.m1();
```

Ex.2.

```
    A → public void m1()
          {
            System.out.println("A");
          }
    B → public static void m1()
          {
            System.out.println("B");
          }
    C → public static void m1()
          {
            System.out.println("c");
          }
   C c=new C();
     c.m1();        //C
    ((B)c).m1();  //B
    ((A)c).m1();    //A
```

Ex.3.

```
  A → int x=777;
```



```
C c=new C();
 System.out.println(c.x); //999
 System.out.println(((B)c)); //888
System.out.println((A((B)c)).x); //777
```

(because the overriding concept is not applicable for variables)

If we declare all variables as static then there is no change of the output.

Note:

Wheather the variables is static or instance variable resolution should be done based on reference type but not based on runtime object.

Coupling

- The degree of dependency between the components is called coupling.
  Ex.
  1) class A
     {

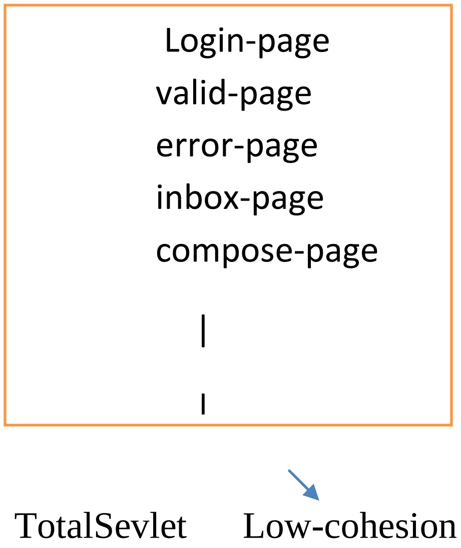
```
          Static int i=B;
        }

    2)    Class B
        {
          Static int j=c.m1();
        }

     3)class  C
          {
            Public static void main(m1())
             {
                 Return D.k;
              }
          }

      4) class D
        {
          Static int k=10;
        }
```

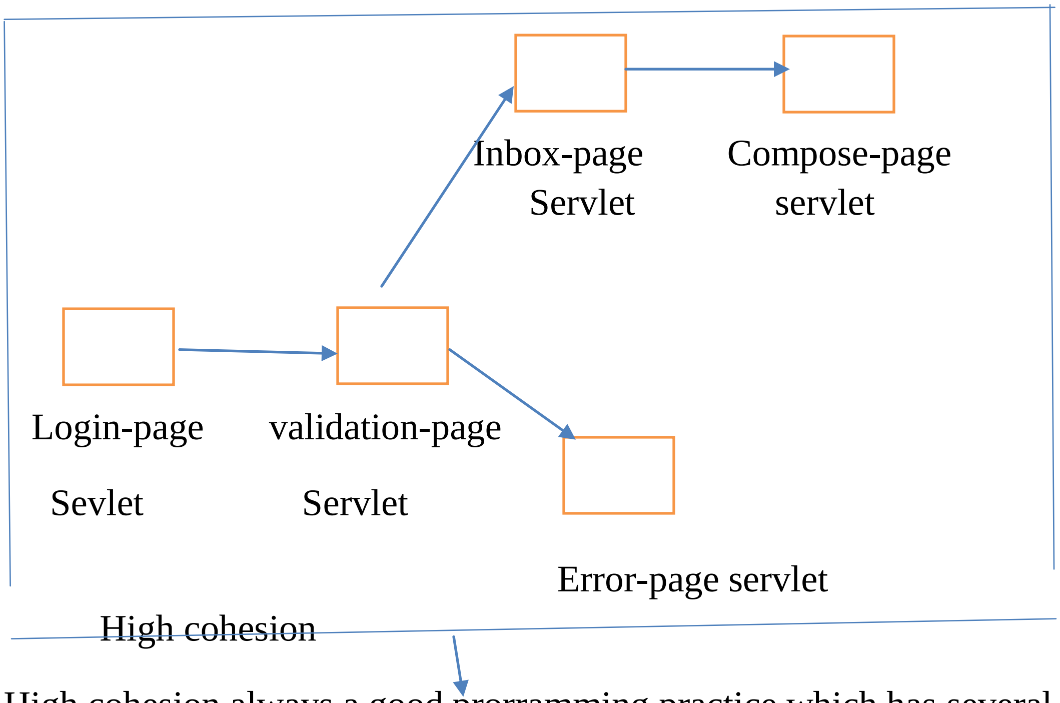
- The above components are said to be tightly coupled with each other.Tightly coupling is not recommended because it has several serious disadvantages,
  1) Without effecting remaining component we can't modify any component. Hence enhancement will beCome difficult.
  2) It reduces maintainability.
  3) It does not prompt reusability
- Hence it is highly recommended to maintain loosely coupling and dependence between the compoents should be as less as possible.

Cohesion

- For every component a clear well define functionality we have to define, such type of component is said to be follow high cohesion.

Ex.





High cohesion always a good prorramming practice which has several advantages,

1) Without effecting remaining components we can modify any component hence enhancement will be come very easy.
2) It improves maintainability of the application
3) It promotes reusability of the code

   Ex.

Wherever validation is require we can reuse the same validate servlet without rewrite.

Note:

Loosely coupling and high cohesion are good pragramming practice.