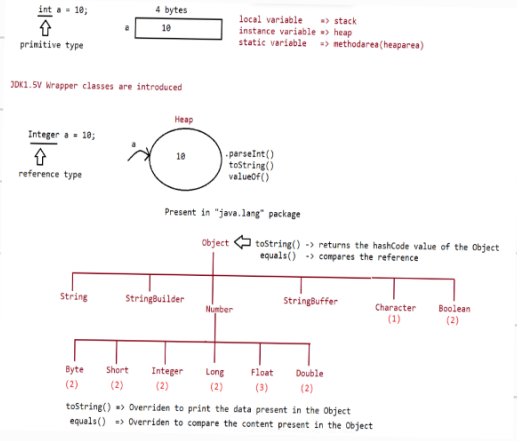
Wrapper Class



Wrapper class

in commandline
(javap java.lang.Integer)

==========

Purpose

1. To wrap primitives into object form so that we can handle primitives also just like objects.
2. To define several utility functions which are required for the primitives.

Constructors

==========

Almost all the Wrapper class have 2 constructors

a. one taking primitive type.
b. one taking String type.

```
eg: Integer i=new Integer(10);   primitive
    Integer i=new Integer("10"); string

    Double d=new Double(10.5);
    Double d=new Double("10.5");
```

Note: If String argument is not properly defined then it would result in RunTimeException called "NumberFormatException".

eg:: Integer i=new Integer("ten");//RE:NumberFormatException

Wrapper class and its associated constructor

- Byte => byte and String (2)
- Short => short and String (2)
- Integer => int and String (2)
- Long => long and String (2)
- **Float => float, String and double (3)
- Double => double and String (2)
- **Character => character (1)
- ***Boolean => boolean and String (2)

java is case sensitive

eg::
```
Boolean b=new Boolean(true);
Boolean b=new Boolean(false);
Boolean b1=new Boolean(True);//C.E
Boolean b=new Boolean(False);//C.E
Boolean b=new Boolean(TRUE);//C.E
```

eg::
```
class Test
{
   public static void main(String[] args)
   {
      Boolean b1 =new Boolean("yes");//false
      Boolean b2 =new Boolean("no");//false
      System.out.println(b1);
      System.out.println(b2);
      System.out.println(b1.equals(b2));//false.equals(false)-> true
      System.out.println(b1 == b2);//false

      Integer i1 = new Integer(10);
      Integer i2 = new Integer(10);
      System.out.println(i1);//10
      System.out.println(i2);//10
      System.out.println(i1.equals(i2));//true
   }
}
```

eg::
```
Boolean b1=new Boolean("true");
Boolean b2=new Boolean("True");
Boolean b3=new Boolean("false");
Boolean b4=new Boolean("False");
Boolean b5=new Boolean("nitin");
Boolean b6=new Boolean("TRUE");
System.out.println(b1);//true
System.out.println(b2);//true
System.out.println(b3);//false
System.out.println(b4);//false
System.out.println(b5);//false
System.out.println(b6);//true
```

eg::
```
1) Float f=new Float (10.5f);
2) Float f=new Float ("10.5f");
3) Float f=new Float(10.5);
4) Float f=new Float ("10.5");
```

eg::
```
1) Charcter c=new Character('a');
2) Character c=new Character("a"); //invalid
```

Note: In case of Boolean constructor, boolean value be treated as true w.r.t to case insensitive part of "true", for all others it would be treated as "false".

Note:

If we are passing String argument then case is not important and content is not important.

If the content is case insensitive String of true then it is treated as true in all other cases it is treated as false.

Note: In case of Wrapper class, toString() is overriden to print the data.

In case of Wrapper class, equals() is overriden to check the content.

Just like String class, Wrapper classes are also treated as "Immutable class".

Immutable class

==========

If we create an Object and if we try to make a change, with that change new object will be created and those changes will not reflected in the old copy.

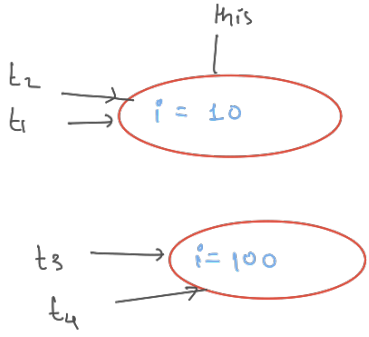
Can we make our userdefined class as Immutable?

ans. yes possible as shown below

```
final class Test
{
   int i;
   Test(int i){
      this.i = i;
   }
   public Test modify(int i){
         if (this.i == i)
            return this;
         else
            return new Test(i);

   }
```

```
public static void main(String[] args)
  {
     Test t1 = new Test(10);
     Test t2 = t1.modify(10);
     Test t3 = t1.modify(100);
     Test t4 = t3.modify(100);
     System.out.println(t1==t2);//true
     System.out.println(t1==t3);//false
     System.out.println(t2==t3);//false
     System.out.println(t3==t4);//true
  }
}
```



→ so that no one can change my immutability, that's why we can't inherit some classes like string(c).

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Wrapper class utiltiy methods

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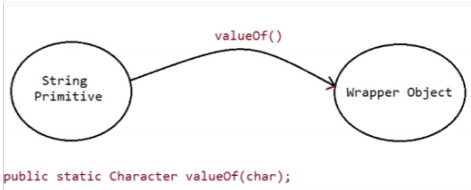
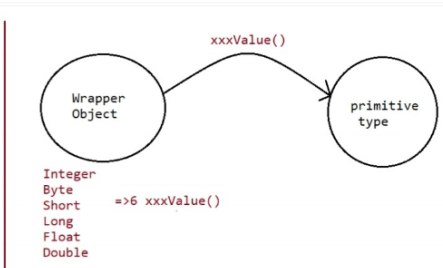
1. valueOf() method.
2. XXXValue() method.
3. parseXxx() method.
4. toString() method.

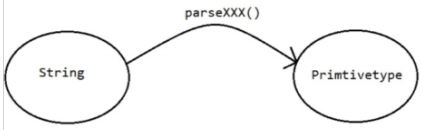


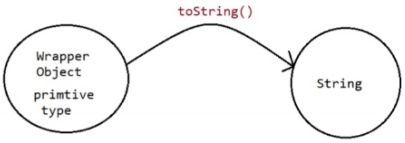
public static Character valueOf(char);



Integer
Byte
Short
Long
Float
Double
=>6 xxxValue()

booleanValue()
charValue()

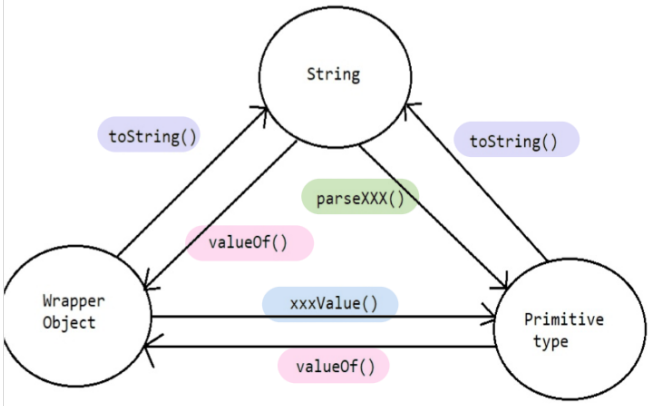




public static wrapper valueOf(String data, int radix) throws java.lang.NumberFormatException;

public static wrapper valueOf(String data) throws java.lang.NumberFormatException;

public static wrapper valueOf(int data);



valueOf() method

==========

To create a wrapper object from primitive type or String we use valueOf().

It is alternative to constructor of Wrapper class, not suggestable to use.

Every Wrapper class,except character class contain static valueOf() to create a Wrapper Object.

eg#1.

```
Integer i=Integer.valueOf("10");
Double d=Double.valueOf("10.5");
Boolean b=Boolean.valueOf("nitin");
 System.out.println(i); 10
 System.out.println(d); 10.5
 System.out.println(b); false
```

```
Integer i1=Integer.valueOf("1111");
 System.out.println(i1);//1111
Integer i2=Integer.valueOf("1111",2);
 System.out.println(i2);//15
Integer i3=Integer.valueOf("ten");
 System.out.println(i3);//RE:NumberFormatException
Integer i4=Integer.valueOf("1111",37);
 System.out.println(i4);//RE:NumberFormatException
```

eg#2.

```
 public static valueOf(String s,int radix)
 |=> binary : 2(0,1)
 |=> octal : 8(0-7)
 |=> decimal : 10(0-9)
 |=> hexadecimal : 16(0-9,a,b,c,d,e,f)
 |=> base : 36(0-9,a-z)
```

eg#3.

```
public static valueOf(primitivetype x)
Integer i1=Integer.valueOf(10);
Double d1=Double.valueOf(10.5);
Character c=Character.valueOf('a');
Boolean b=Boolean.valueOf(true);
 Primtive/String =>valueOf() => WrapperObject
```

2. xxxValue()

We can use xxxValue() to get primitive type for the given Wrapper Object.

These methods are a part of every Number type Object.

(Byte,Short,Integer,Long,Float,Double) all these classes have these 6 methods which is

Written as shown below.

Methods

=======

```
public byte byteValue();
public short shortValue();
public int intValue();
public long longValue();
public float floatValue();
public double doubleValue();
```

eg#1.

```
Integer i=new Integer(130);
// result = minrange +(total -maxrange -1)
 System.out.println(i.byteValue());//-126
 System.out.println(i.shortValue());//130
 System.out.println(i.intValue());//130
 System.out.println(i.longValue());//130
 System.out.println(i.floatValue());//130.0
 System.out.println(i.doubleValue());//130.0
```

3. charValue()

Character class contains charValue() to get Char primitive for the given Character Object.

public char charValue()

eg#1.

```
Character c=new Character('c');
char ch= c.charValue();
System.out.println(ch);
```

4. booleanValue()

Boolean class contains booleanValue() to get boolean primitive for the given boolean Object.

public boolean booleanValue()

eg#1.

```
Boolean b=new Boolean("nitin");
boolean bl=b.booleanValue();
System.out.println(bl);//false
```

In total xxxValue() are 36 in number.

=> xxxValue() => convert the Wrapper Object => primitive.

parseXXXX()

==========

We use parseXXXX() to convert String object into primitive type.

form-1

======

public static primitive parseXXX(String s)

Every wrapper class except Character class has parseXXX() to convert String into primitive type.

```
eg: int i=Integer.parseInt("10");
 double d =Double.parseInt("10.5");
 boolean b=Boolean.parseBoolean("true");
```

usage of Wrapper class in realtime coding

==========

//WAP to take inputs from the command line and perform anthemetic operations

```
class Test
{
public static void main(String[] args)
{
//valueOf() => Converts String/Primitive to Wrapper type
//xxxValue() => Converts Wrapper type to Primitive type
//parseXXX() => converts String to primitive type

//commandline arguments => String inputs = args[0],args[1]

int i1 = Integer.parseInt(args[0]);
int i2 = Integer.parseInt(args[1]);
System.out.println(i1+i2);
System.out.println(i1-i2);
System.out.println(i1*i2);
System.out.println(i1/i2);
```

```
//args -> String, convert into primitive type and process
}
}
```

form-2

======

public static primitive parseXXXX(String s, int radix)

|=> range is from 2 to 36

Every Integral type Wrapper class(Byte,Short,Integer,Long) contains the following parseXXXX() to convert Specified radix String to primitive type.

eg: int i=Integer.parseInt("1111",2);

System.out.println(i);//15

Note: String => parseXXX() => primitive type

toString()

==========

To convert the Wrapper Object or primitive to String.

Every Wrapper class contain toString()

form1

=====

public String toString()

1. Every wrapper class (including Character class) contains the above toString() method to convert wrapper object to String.
2. It is the overriding version of Object class toString() method.
3. Whenever we are trying to print wrapper object reference internally this toString() method only executed

eg: Integer i=Integer.valueOf("10");

System.out.println(i);//internally it calls toString() and prints the Data.

form2

=====

public static String toString(primitivetype)

1. Every wrapper class contains a static toString() method to convert primitive to

String.

String s=Integer.toString(10);

|=> primitive type int.

eg:

String s=Integer.toString(10);

String s=Boolean.toString(true);

String s=Character.toString('a');

form3

=====

Integer and Long classes contains the following static toString() method to convert the

primitive to specified radix String form.

public static String toString(primitive p,int radix)

|=> 2 to 36

eg: String s=Integer.toString(15,2)

System.out.println(s); // 1111

form4

=====

Integer and Long classes contains the following *toXxxString*() methods.

```
public static String toBinaryString(primitive p);
public static String toOctalString(primitive p);
public static String toHexString(primitive p);
```

Example:

```
class WrapperClassDemo {
 public static void main(String[] args) {
String s1=Integer.toBinaryString(7);
String s2=Integer.toOctalString(10);
String s3=Integer.toHexString(20);
String s4=Integer.toHexString(10);
System.out.println(s1);//111
System.out.println(s2);//12
System.out.println(s3);//14
System.out.println(s4);//a
 }
}
```

Note:

```
String class
 public static String valueOf(boolean);
 public static String valueOf(char);
```

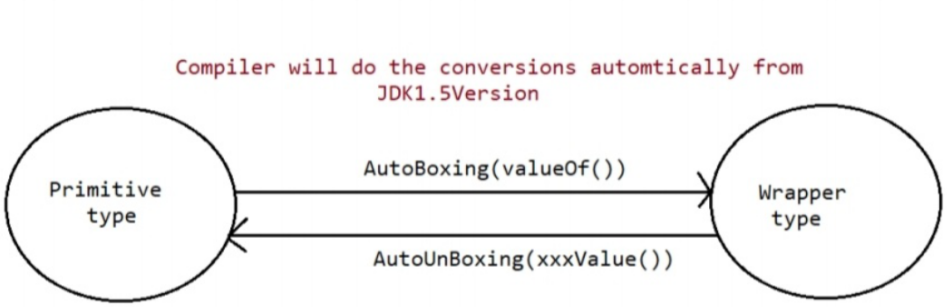
```
 public static String valueOf(int);
 public static String valueOf(long);
 public static String valueOf(float);
 public static String valueOf(double);
String data = String.valueOf('a');//static factory methods
String data = "sachin".toUpperCase();//instance factory methods
```

AutoBoxing and AutoUnBoxing

==========

untill 1.4Version, we can't provide wrapper class objects in place of primitive and primitive in place of wrapper object all the required conversions should be done by the programmer.

But from jdk1.5 Version onwards,we can provide primtive in place of wrapper and in place of wrapper we can keep primitive also.All the requried conversion will be done by the compiler automatically, this mechanism is called as "AutoBoxing" and "AutoUnBoxing".



eg#1.

```
Boolean bl = Boolean.valueOf(true);
if (bl) //auto unboxing to boolean.
 System.out.println("hello");
```

eg#2.

```
ArrayList al = new ArrayList();
 al.add(10); //autoboxing  al.add(new al(10));
```

Autoboxing

==========

Automatic conversion of primtive type to wrapper object by the compiler is called "AutoBoxing".

Integer il = 10;

|

|After compilation the code would be

|

|

Integer il = Integer.valueOf(10);

Note: Autoboxing is done by the compiler using a method called "valueOf()".

Auto-boxing
&
Auto-Unboxing

AutoUnBoxing

==========

Automatic conversion of wrapper object to primtive type by compiler is called "AutoUnBoxing".

```
Integer i1 = new Integer(10);
 int i2 = i1;
```

|

|compiler converts Integer to int type using intValue()

|

```
 int i2 = i1.intValue();
```

Note: AutoUnboxing is done by the compiler using a method called "xxxValue()"

Case1:

=====

```
class Test
{
static Integer i1 = 10;// AutoBoxing
public static void main(String[] args)
{
int i2 = i1;//AutoUnBoxing
m1(i2);
}
public static void m1(Integer i2){//AutoBoxing
int k = i2;//AutoUnBoxing
System.out.println(k);//10
}
}
```

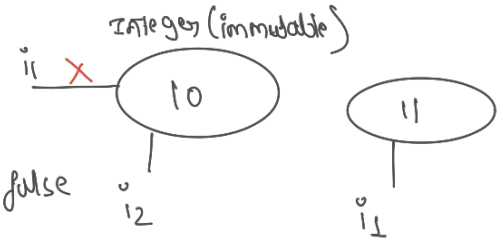
Compiler is responsible for conversion of primitive to wrapper and wrapper to primitive using the concept of "AutoBoxing and AutoUnBoxing".

case2:

```
class Test
{
static Integer i1;//i1 = null
public static void main(String[] args)
{
int i2 = i1;// int i2 = i1.intValue() :: NullPointerException
System.out.println(i2);
}
}
```

Case3 :

```
Integer i1 = 10;//AutoBoxing
Integer i2 = i1;
```



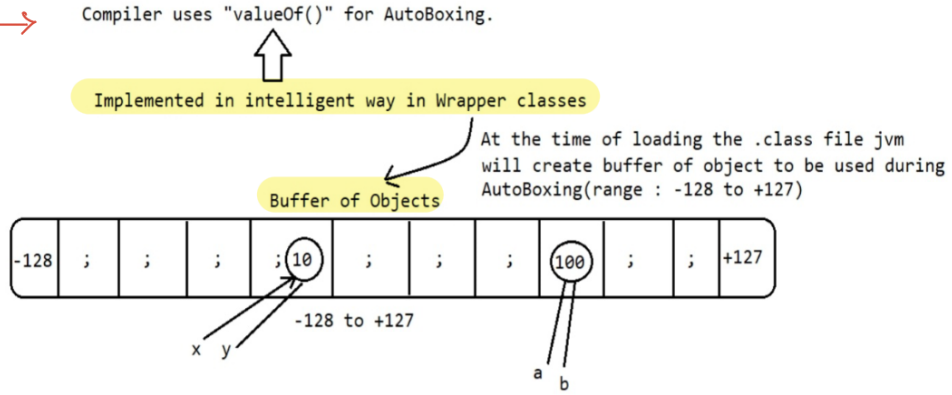

```
i1++; = > i1 = i1+1
System.out.println(i1); 11
System.out.println(i2); 10
System.out.println(i1==i2); false
```

```
Case4:
Integer x = new Integer(10);
Integer y = new Integer(10);
System.out.println(x == y);//false

Case5:
Integer x = new Integer(10);//memory from heap area
Integer y = 10;//AutoBoxing ===> Integer y = Integer.valueOf(10);
System.out.println(x == y);//false

Case6:
Integer x = new Integer(10);
Integer y = x; ===> reference is reused so pointing to same object
System.out.println(x == y);//true

Case7:
Integer x = 10;
Integer y = 10;
System.out.println(x == y); true
Integer a = 100;
Integer b = 100;
System.out.println(a == b); true
Integer i = 1000;
Integer j = 1000;
System.out.println(i == j); false
```



Note:

1. To implement autoboxing concpet in wrapper class a buffer of object will be created at the time of class loading.
2. During AutoBoxing, if an object has to be created first jvm will check whether the object is already available inside buffer or not.
3. If it is available, then JVM will reuse the buffered object instead of creating a new Object.
4. If the Object is not available inside buffer, then jvm will create a new object in the heap area, this approach improves the performance and memory utilization But this buffer concept is applicable only for few cases

1. Byte => -128 to +127
2. Short => -128 to +127
3. Integer => -128 to +127
4. Long => -128 to +127

5. Character => 0 to 127

6. Boolean => true,false

In the remaining cases new object will be created.

// String/primitive to wrapper => valueOf()

// Wrapper type to primitive => xxxValue()

```
class Test
{
public static void main(String[] args)
{
Integer x = 128;
Integer y = 128;
System.out.println(x == y);//false
Integer a = 127;
Integer b = 127;
System.out.println(a == b);//true
Boolean b1 = true;
Boolean b2 = true;
System.out.println(b1==b2);//true
Double d1 = 10.0; //double is not in buffer.
Double d2 = 10.0;
System.out.println(d1==d2);//false
}
}
```