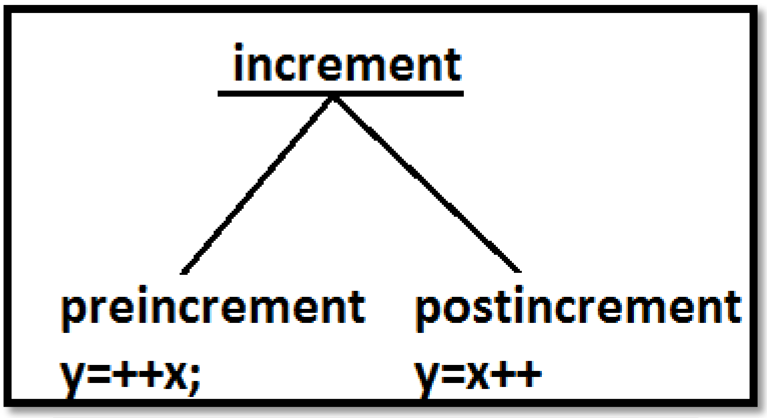
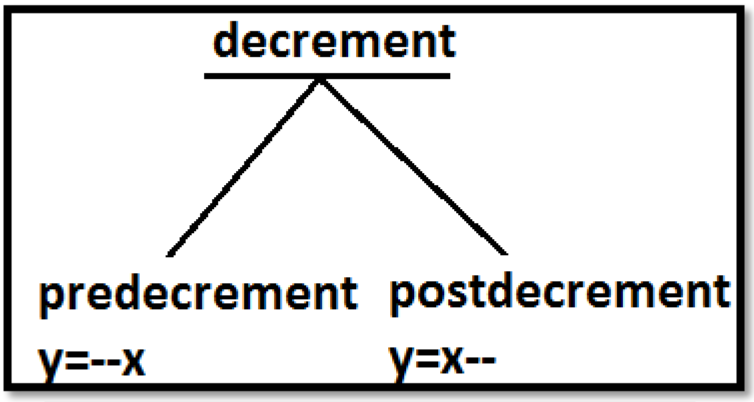
OPERATORS & ASSIGNMENTS

Agenda

Increment & Decrement operators



Increment Operator	pre-increment	ex : y=++x ;
	post-increment	ex: y=x++;



Decrement Operator	pre-decrement	ex : y=--x ;
	post-decrement	ex : y=x-- ;

The following table will demonstrate the use of increment and decrement operators.

Expression	initial value of x	value of y	final value of x
y=++x	10	11	11
y=x++	10	10	11
y=--x	10	9	9
y=x--	10	10	9

Ex:

```
class Test{
public static void main(String[] args){
int x=4;
int y=++x;
System.out.println("value of y :"+y);
} output:
} 5
```

```
class Test{
public static void main(String[] args){
int x=4;
int y=++4;
System.out.println("value of y :"+y);
} output:
} compile time error
  Test.java:4: unexpected type
  required: variable
  found   : value
  int y=++4;
```

Increment & decrement operators we can apply only for variables but not for constant values. Otherwise we will get compile time error.

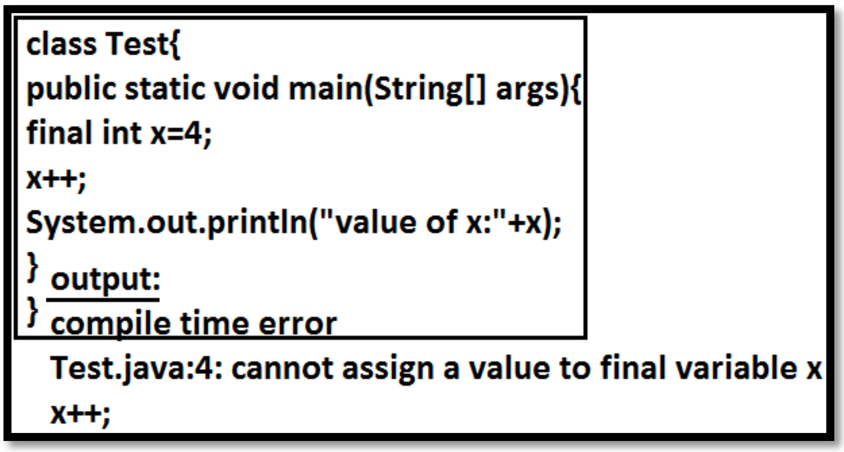
Ex:
```
int x = 4;
int y = ++x;
System.out.pritnln(y);  //output : 5
```

Ex:
```
int x = 4;
int y = ++4;
System.out.pritnln(y);   C.E: unexpected type
                              required: variable
                              found : value
```

We can't perform nesting of increment or decrement operator, otherwise we will get compile time error

```
class Test{
public static void main(String[] args){
int x=4;
int y=++(++x); it will become constant
System.out.println("value of y :"+y);
} output:
} compile time error
  Test.java:4: unexpected type
  required: variable
  found   : value
  int y=++(++x);
int x= 4;
int y = ++(++x);
System.out.println(y);  C.E: unexpected type
                              required: varialbe
                              found : value
```

For the final variables we can't apply increment or decrement operators, otherwise we will get compile time error



```
class Test{
public static void main(String[] args){
final int x=4;
x++;
System.out.println("value of x:"+x);
}  output:
}  compile time error
   Test.java:4: cannot assign a value to final variable x
   x++;
```

```
Ex: final int x = 4;
     x++; //  x = x + 1
     System.out.println(x); C.E :  can't assign a value to final variable 'x' .
```

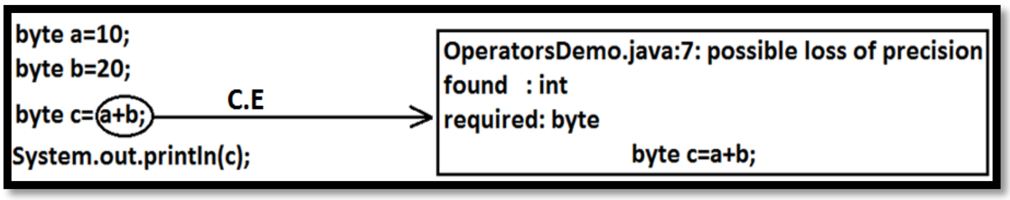
We can apply increment or decrement operators even for primitive data types except boolean .

```
Ex:  int x=10;
     x++;
     System.out.println(x);    //output :11

     char ch='a';
     ch++;
     System.out.println(ch); //b

     double d=10.5;
     d++;
     System.out.println(d); //11.5

     boolean  b=true;
     b++;
     System.out.println(b);  CE : operator ++ can't be applied to boolean
```

Difference between b++ and b = b+1?

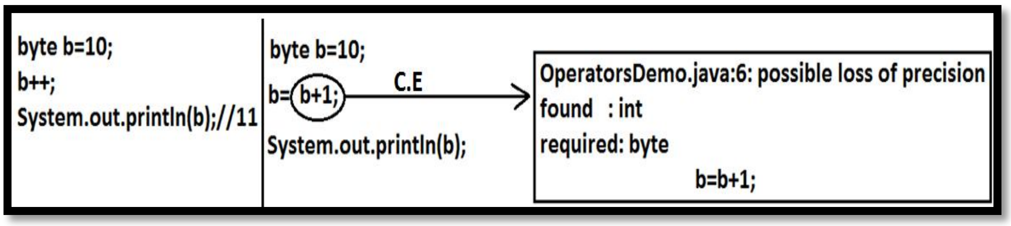
If we are applying any arithmetic operators b/w 2 operands 'a' & 'b' the result type is

max(int , type of a , type of b)



```
byte a=10;
byte b=20;
byte c=a+b;
System.out.println(c);
```

```
OperatorsDemo.java:7: possible loss of precision
found   : int
required: byte
                    byte c=a+b;
```



```
byte b=10;
b++;
System.out.println(b);//11
```

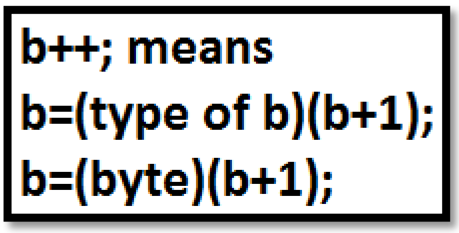
```
byte b=10;
b=b+1;
System.out.println(b);
```

```
OperatorsDemo.java:6: possible loss of precision
found   : int
required: byte
                    b=b+1;
```

```
Ex 1:   byte a = 10;
        byte b = 20;
        byte c = a+b; //byte c = byte(a+b);  valid
        System.out.println(c);  CE : possible loss of precession
                                     found : int
                                     required : byte
```

```
Ex 2:  byte b = 20;
       byte  b = b+1; //byte b=(byte)b+1 ; valid
       System.out.println(c); CE : possible loss of precession
                                   found : int
                                   required : byte
```

In the case of Increment & Decrement operators internal type casting will be performed automatically by the compiler



b++; means
b=(type of b)(b+1);
b=(byte)(b+1);

b++; => b=(type of b)b+1;

```
Ex: byte b = 10;
    b++;
    System.out.println(b);  //output : 11
```

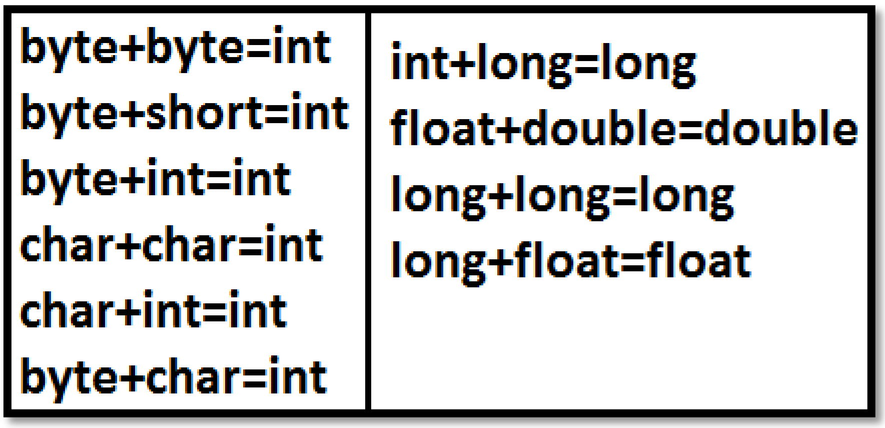
Arithmetic Operator

If we apply any Arithmetic operation b/w 2 variables a & b, the result type is always
max(int, type of a, type of b)

Example:

byte + byte=int
byte+short=int
short+short=int
short+long=long
double+float=double
int+double=double
char+char=int
char+int=int
char+double=double

System.out.println('a' + 'b'); // output : 195
System.out.println('a' + 1); // output : 98
System.out.println('a' + 1.2); // output : 98.2

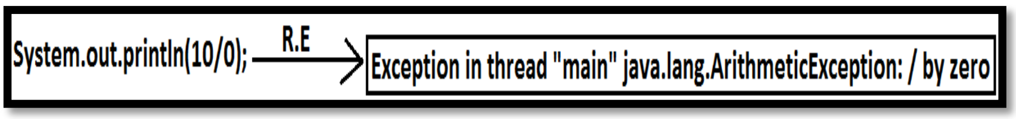


byte+byte=int	int+long=long
byte+short=int	float+double=double
byte+int=int	long+long=long
char+char=int	long+float=float
char+int=int	
byte+char=int	

In integral arithmetic (byte , int , short , long) there is no way to represents infinity , if infinity is the result we will get the ArithmeticException / by zero

System.out.println(10/0); // output RE : ArithmeticException / by zero

But in floating point arithmetic(float , double) there is a way represents infinity.
System.out.println(10/0.0); // output : infinity



System.out.println(10/0); $\xrightarrow{R.E}$ Exception in thread "main" java.lang.ArithmeticException: / by zero

For the Float & Double classes contains the following constants:

POSITIVE_INFINITY
NEGATIVE_INFINITY
Hence, if infinity is the result we won't get any ArithmeticException in floating point arithmetics

Ex:
System.out.println(10/0.0); // output : infinity
System.out.println(-10/0.0); // output : - infinity

NaN(Not a Number) in integral arithmetic (byte , short , int , long) there is no way to represent undefine the results. Hence the result is undefined we will get ArithmericException in integral arithmetic

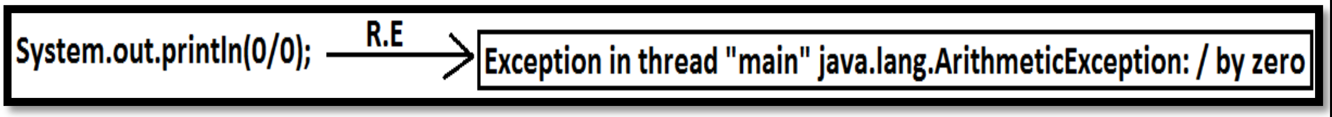
System.out.println(0/0); // output RE : ArithmeticException / by zero

But floating point arithmetic (float , double) there is a way to represents undefined the results .

For the Float , Double classes contains a constant NaN , Hence the result is undefined we won't get ArithmeticException in floating point arithmetics .

System.out.println(0.0/0.0); // output : NaN

System.out.println(-0.0/0.0); // output : NaN
For any 'x' value including NaN , the following expressions returns false



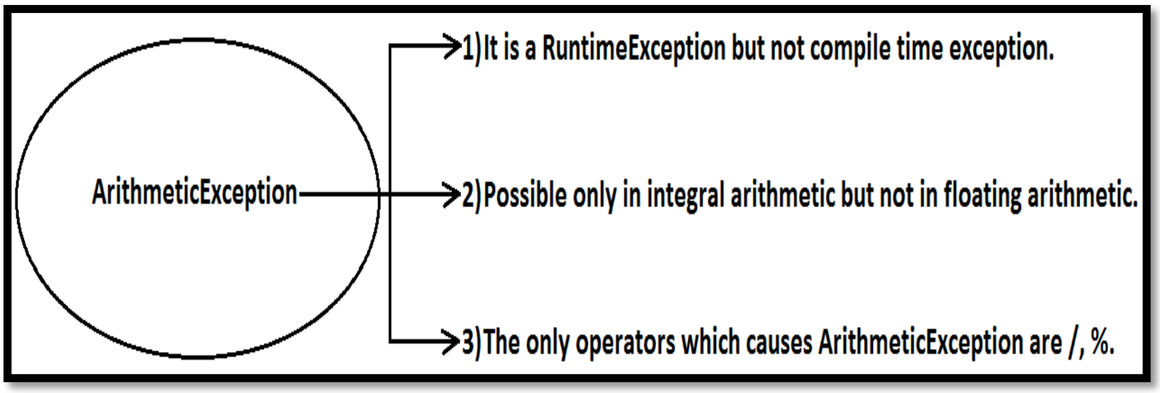
```
System.out.println(0/0);  --R.E-->  Exception in thread "main" java.lang.ArithmeticException: / by zero
```

// Ex : x=10;

```
System.out.println(10 < Float.NaN ); // false
System.out.println(10 <= Float.NaN ); // false
System.out.println(10 > Float.NaN ); // false
System.out.println(10 >= Float.NaN ); // false
System.out.println(10 == Float.NaN ); // false
System.out.println(Float.NaN == Float.NaN ); // false

System.out.println(10 != Float.NaN ); //true
System.out.println(Float.NaN != Float.NaN ); //true
```

ArithmeticException:

- It is a RuntimeException but not compile time error
- It occurs only in integral arithmetic but not in floating point arithmetic.
- The only operations which cause ArithmeticException are : ' / ' and ' % '


ArithmeticException
1)It is a RuntimeException but not compile time exception.
2)Possible only in integral arithmetic but not in floating arithmetic.
3)The only operators which causes ArithmeticException are /, %.

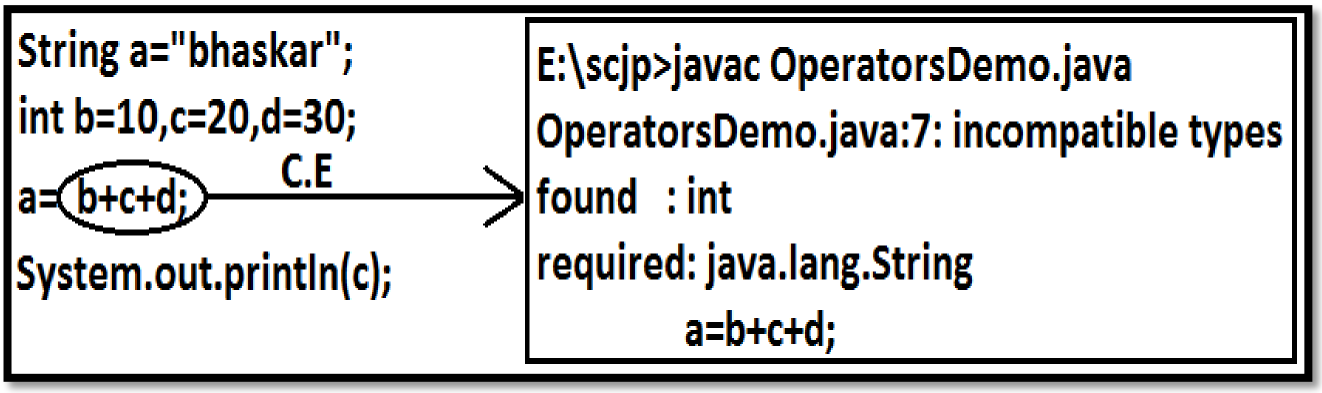
String Concatenation operator

The only overloaded operator in java is ' + ' operator sometimes it access arithmetic addition operator & sometimes it access String concatenation operator.
If acts as one argument is String type , then '+' operator acts as concatenation and If both arguments are number type , then operator acts as arithmetic operator

Ex :

```
String a="ashok";
int  b=10 , c=20 , d=30 ;
System.out.println(a+b+c+d);  //output : ashok102030
System.out.println(b+c+d+a);    //output : 60ashok
System.out.println(b+c+a+d);    //output : 30ashok30
System.out.println(b+a+c+d);    //output : 10ashok 2030
```

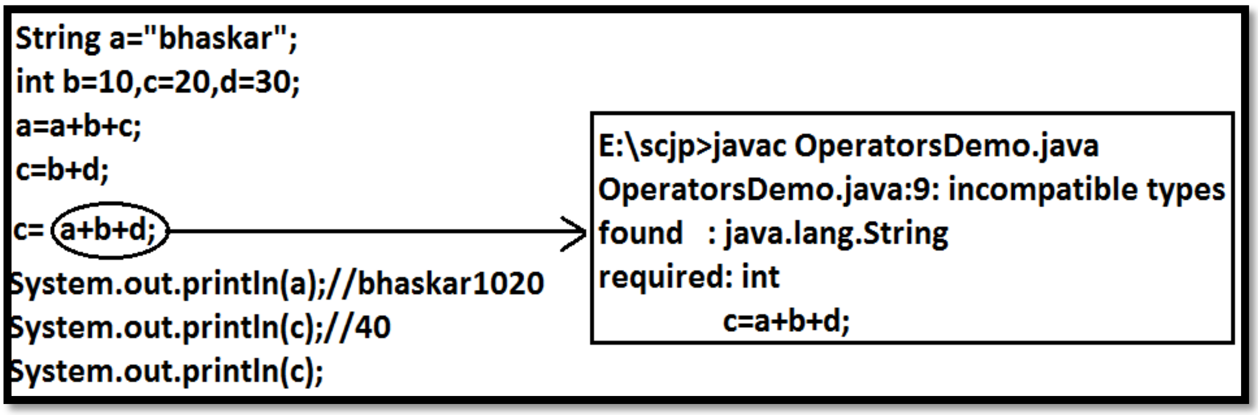
Example :



```
String a="bhaskar";
int b=10,c=20,d=30;
a=(b+c+d;) ──C.E──>
System.out.println(c);
```

```
E:\scjp>javac OperatorsDemo.java
OperatorsDemo.java:7: incompatible types
found   : int
required: java.lang.String
          a=b+c+d;
```

Example:



```
String a="bhaskar";
int b=10,c=20,d=30;
a=a+b+c;
c=b+d;
c=(a+b+d;) ──────>
System.out.println(a);//bhaskar1020
System.out.println(c);//40
System.out.println(c);
```

```
E:\scjp>javac OperatorsDemo.java
OperatorsDemo.java:9: incompatible types
found   : java.lang.String
required: int
          c=a+b+d;
```

Consider the following declaration

String a = "ashok";
int b = 10, c = 20, d = 30;

Example: a = b+c+d;
CE : incompatible type
found: int
required: java.lang.String

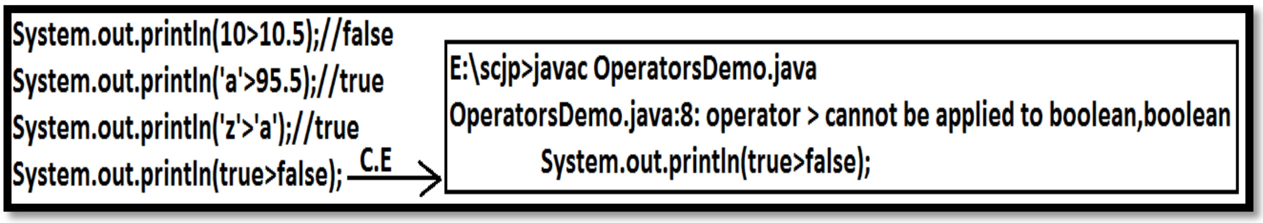
Example: a = a+b+c; // valid

Example: b = a+c+d;
CE: incompatible type
found: java.lang.String
required: int

Example: b = b+c+d; // valid

Relational Operators (< , <= , > , >=)

We can apply relational operators for every *primitive type* except *boolean*.

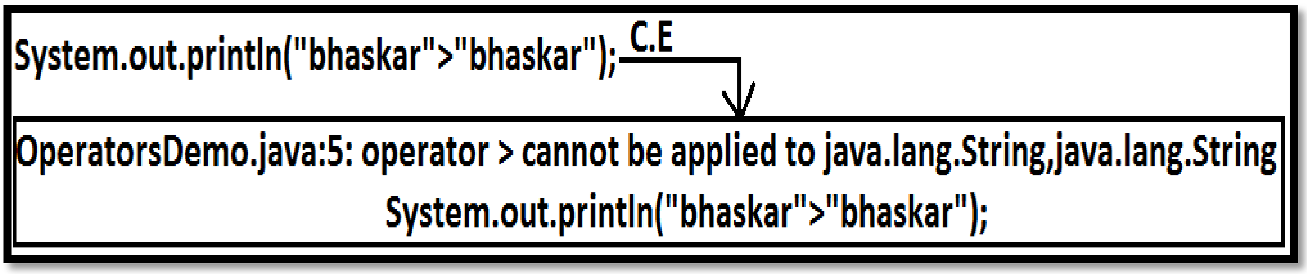


```
System.out.println(10>10.5);//false
System.out.println('a'>95.5);//true
System.out.println('z'>'a');//true
System.out.println(true>false); C.E
```

```
E:\scjp>javac OperatorsDemo.java
OperatorsDemo.java:8: operator > cannot be applied to boolean,boolean
        System.out.println(true>false);
```

System.out.println(10 < 10.5); //true
System.out.println('a' > 100.5); //false
System.out.println('b' > 'a'); //true
System.out.println(true > false); //CE : operator > can't be applied to boolean, boolean

We can't apply relational operators for object types

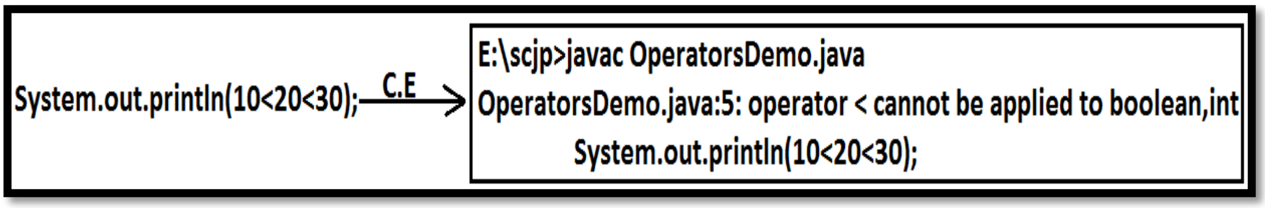


```
System.out.println("bhaskar">"bhaskar"); C.E
```

```
OperatorsDemo.java:5: operator > cannot be applied to java.lang.String,java.lang.String
                    System.out.println("bhaskar">"bhaskar");
```

System.out.println("ashok123" > "ashok");
//CE: operator > can't be applied to java.lang.String , java.lang.String

Nesting of relational operator is not allowed



```
System.out.println(10<20<30); C.E
```

```
E:\scjp>javac OperatorsDemo.java
OperatorsDemo.java:5: operator < cannot be applied to boolean,int
        System.out.println(10<20<30);
```

System.out.println(10 > 20 > 30); // System.out.println(true > 30);

//CE : operator > can't be applied to boolean , int

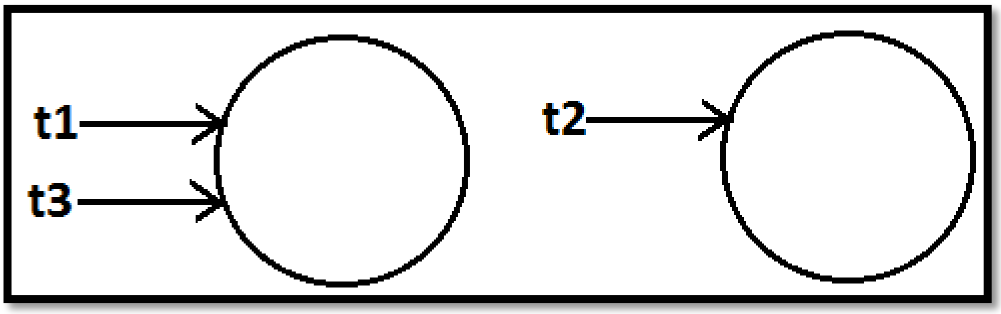
Equality Operators: (== , !=)

We can apply equality operators for every primitive type including boolean type also

```
System.out.println(10 == 20) ;  //false
System.out.println('a' == 'b' );   //false
System.out.println('a' == 97.0 )  //true
System.out.println(false == false)   //true
```

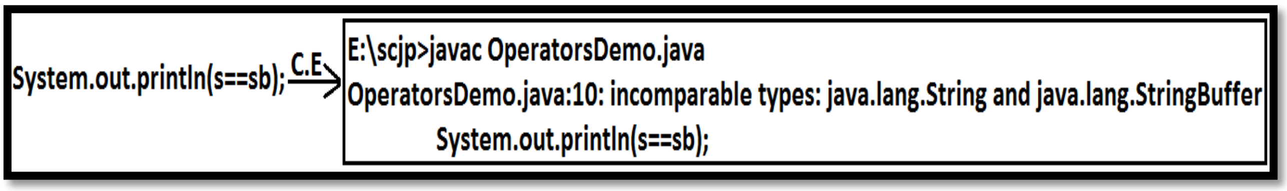
We can apply equality operators for object types also.
For object references r1 and r2 , r1 == r2 returns true if and only if both r1 and r2 pointing to the same object. i.e., == operator meant for reference-comparision Or address-comparision.

```
Thread t1=new Thread( ) ;
Thread t2=new Thread( );
Thread t3=t1 ;
System.out.println(t1==t2);  //false
System.out.println(t1==t3);  //true
```

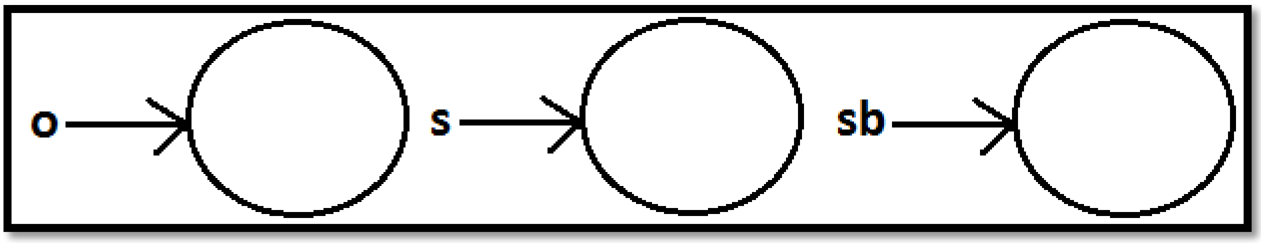


To use the equality operators between object type compulsory these should be some relation between argument types(child to parent , parent to child) , Otherwise we will get Compile time error incompatible types

```
Thread t=new Thread( ) ;
Object o=new Object( );
String s=new String("durga");
System.out.println(t ==o);    //false
System.out.println(o==s);     //false
System.out.println(s==t);
CE : incompatible types :  java.lang.String and java.lang.Thread
```



```
System.out.println(s==sb); C.E.→
E:\scjp>javac OperatorsDemo.java
OperatorsDemo.java:10: incomparable types: java.lang.String and java.lang.StringBuffer
            System.out.println(s==sb);
```



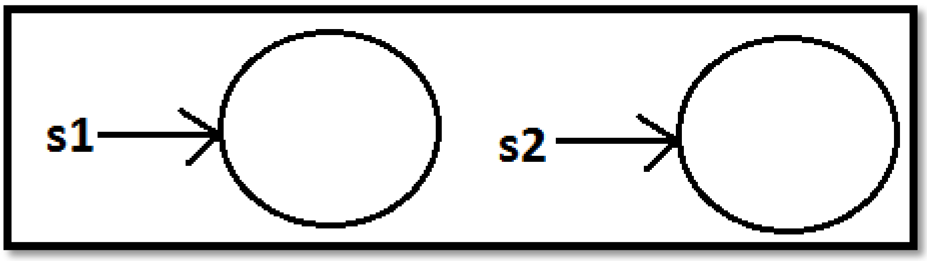
For any object reference of on r==null is always false , but null==null is always true .

```
String s= new String("ashok");
System.out.println(s==null);  //output : false
String   s=null ;
System.out.println(r==null);  //true
System.out.println(null==null); //true
```

What is the difference between == operator and .equals( ) method?

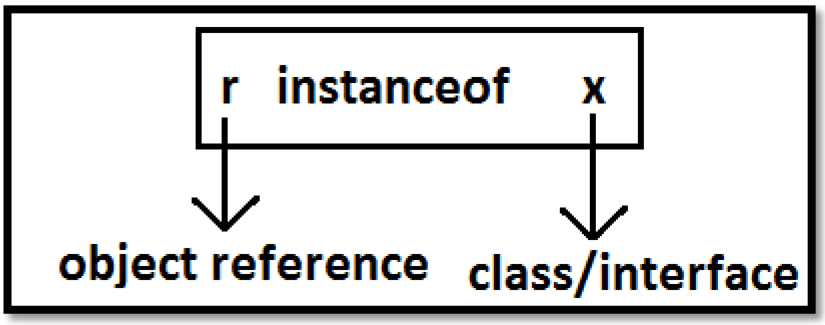
In general we can use .equals( ) for content comparision where as == operator for reference comparision

```
String  s1=new String("ashok");
String  s2=new  String("ashok");
System.out.println(s1==s2);  //false
System.out.println(s1.equals(s2));  //true
```



instanceof operator

We can use the instanceof operator to check whether the given an object is particular type or not

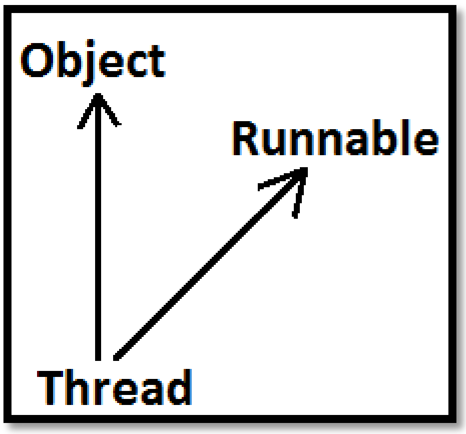


```
Object o = l.get(0); // l is an array name
if(o  instanceof Student) {
        Student s = (Student)o;
        //perform  student  specific  operation
}
elseif(o instanceof Customer) {
         Customer c = (Customer)o;
         //perform  Customer specific  operations
}
```

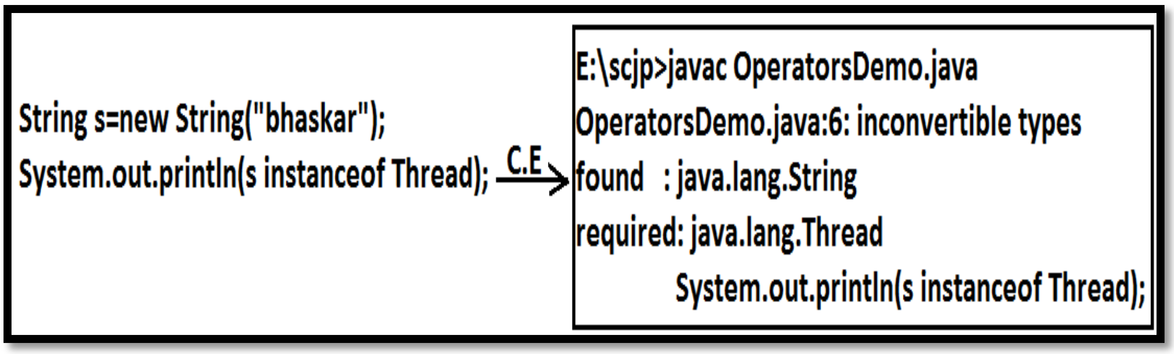
O instanceof X here O is object reference, X is ClassName/Interface name

```
Thread  t = new  Thread( );
System.out.println(t  instanceof Thread);   //true
System.out.println(t instanceof Object);     //true
System.out.println(t instanceof Runnable);  //true
```

Ex: `public class Thread extends Object  implements Runnable {}`



To use instance of operator compulsory there should be some relation between argument types (either child to parent Or parent to child Or same type) Otherwise we will get compile time error saying inconvertible types



```
String s=new String("bhaskar");
System.out.println(s instanceof Thread);
```

$\xrightarrow{C.E}$

```
E:\scjp>javac OperatorsDemo.java
OperatorsDemo.java:6: inconvertible types
found   : java.lang.String
required: java.lang.Thread
          System.out.println(s instanceof Thread);
```

Thread t = new Thread();
System.out.println(t instanceof String);
CE: inconvertable errors
found: java.lang.Thread
required: java.lang.String

Whenever we are checking the parent object is child type or not by using instanceof operator that we get false.

Object o = new Object();
System.out.println(o instanceof String); //false

Object o = new String("ashok");
System.out.println(o instanceof String); //true

For any class or interface X null instanceof X is always returns false
System.out.println(null instanceof X); //false

Bitwise operators

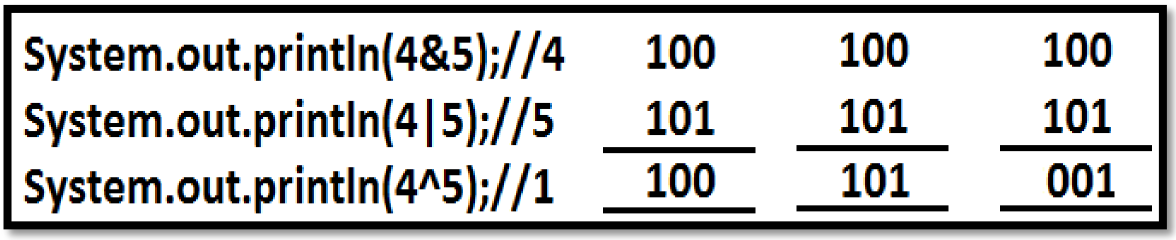
& (AND): If both arguments are true then only result is true.
| (OR): If at least one argument is true. Then the result is true.
^ (X-OR): If both are different arguments. Then the result is true.

Example:
```
System.out.println(true&false);//false
System.out.println(true|false);//true
System.out.println(true^false);//true
```

We can apply bitwise operators even for integral types also.

Example:
```
System.out.println(4&5);//4                    using binary digits
System.out.println(4|5);//5                                4-->100
System.out.println(4^5);//1                                5-->101
```

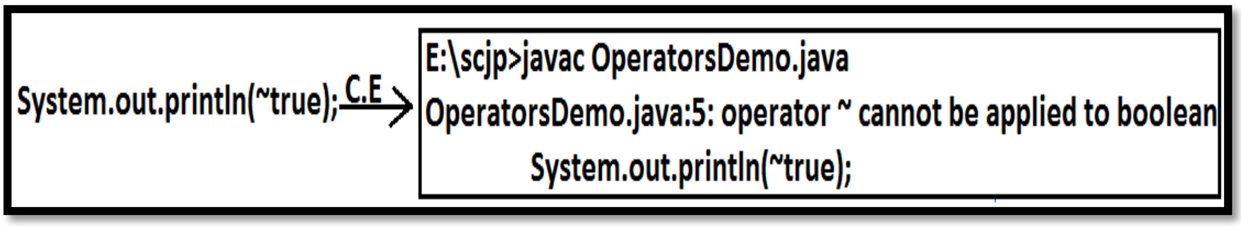
Example:



```
System.out.println(4&5);//4     100      100      100
System.out.println(4|5);//5     101      101      101
                                ---      ---      ---
System.out.println(4^5);//1     100      101      001
                                ---      ---      ---
```

Bitwise complement (~) (tilde symbol) operator:

We can apply this operator only for *integral types* but not for boolean types.



```
System.out.println(~true);──C.E──>
E:\scjp>javac OperatorsDemo.java
OperatorsDemo.java:5: operator ~ cannot be applied to boolean
        System.out.println(~true);
```

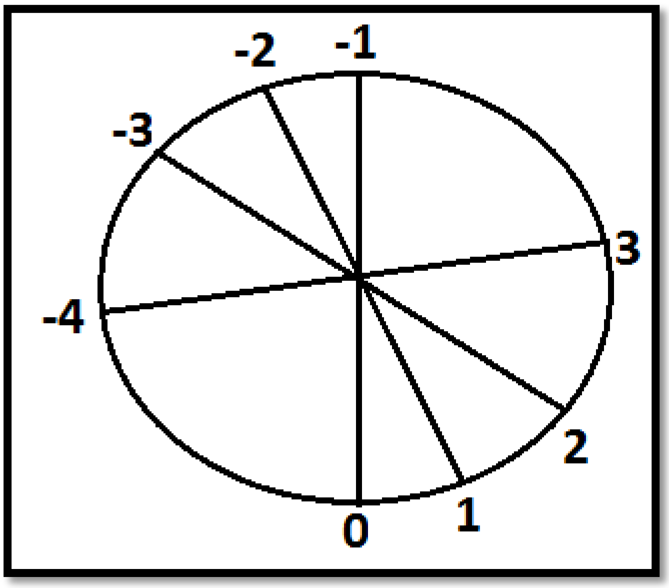
Example:
```
System.out.println(~true); // CE :opetator ~ can not be applied to  boolean
System.out.println(~4);  //-5
```

Description about above program:

```
4-->  0 000.......0100             0-----+ve
~4--> 1 111.......1011              1--- -ve
```

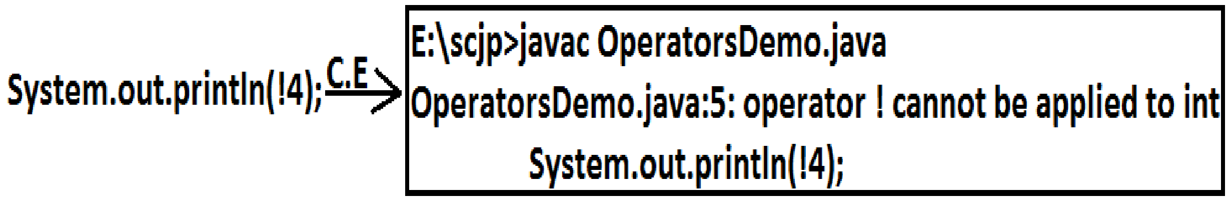
2's compliment of ~4 --> 000....0100 add 1
result is : 000...0101 =5

Note: The most significant bit access as sign bit 0 means +ve number, 1 means -ve number.
+ve number will be represented directly in memory whereas -ve number will be represented in 2's complement form.



Boolean complement (!) operator:

This operator is applicable only for *boolean types* but not for integral types.



```
System.out.println(!4); --C.E-->
E:\scjp>javac OperatorsDemo.java
OperatorsDemo.java:5: operator ! cannot be applied to int
        System.out.println(!4);
```

Example:

```
System.out.println(!true);//false
System.out.println(!false);//true
System.out.println(!4);//CE : operator ! cannot be applied to int
```

Summary:

&
| Applicable for both boolean and integral types.
^
~ --------Applicable for integral types only but not for boolean types.
! --------Applicable for boolean types only but not for integral types.

Short circuit operators

These operators are exactly same as normal bitwise operators &(AND), |(OR) except the following differences.

& , |	&& , ||
Both arguments should be evaluated always.	Second argument evaluation is optional.
Relatively performance is low.	Relatively performance is high.
Applicable for both integral and boolean types.	Applicable only for boolean types but not for integral types.

x&&y: y will be evaluated if and only if x is true.(If x is false then y won't be evaluated i.e., If x is true then only y will be evaluated)

x||y : y will be evaluated if and only if x is false.(If x is true then y won't be evaluated i.e., If x is false then only y will be evaluated)

Example:

```
int x=10 , y=15 ;
if(++x < 10  ||  ++y > 15) {    //instead of || using  &,&&, |
operators
 x++;
}
else {
        y++;
}

System.out.println(x+"----"+y);
```

Output:

operator	x	y
&	11	17
|	12	16
&&	11	16
||	12	16

Example :

```
int x=10  ;
if(++x < 10  && ((x/0)>10) ) {
 System.out.println("Hello");
}
else {
        System.out.println("Hi");
}

output : Hi
```

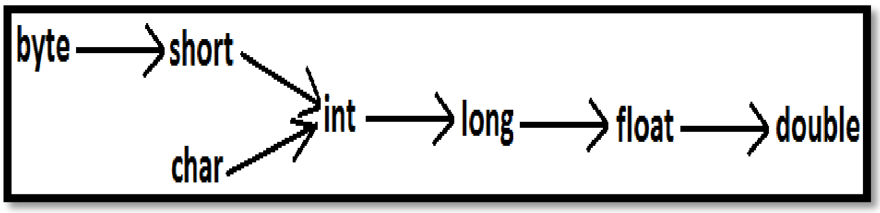
Type Cast Operator

There are 2 types of type-casting
implicit
explicit

implicit type casting:

int x='a';
System.out.println(x); //97

The compiler is responsible to perform this type casting.
Whenever we are assigning lower datatype value to higher datatype variable then implicit type cast will be performed .
It is also known as Widening or Upcasting.
There is no lose of information in this type casting.
The following are various possible implicit type casting.



Example 1:
int x='a';
System.out.println(x);//97

Note: Compiler converts char to int type automatically by implicit type casting.

Example 2:
double d=10;
System.out.println(d);//10.0

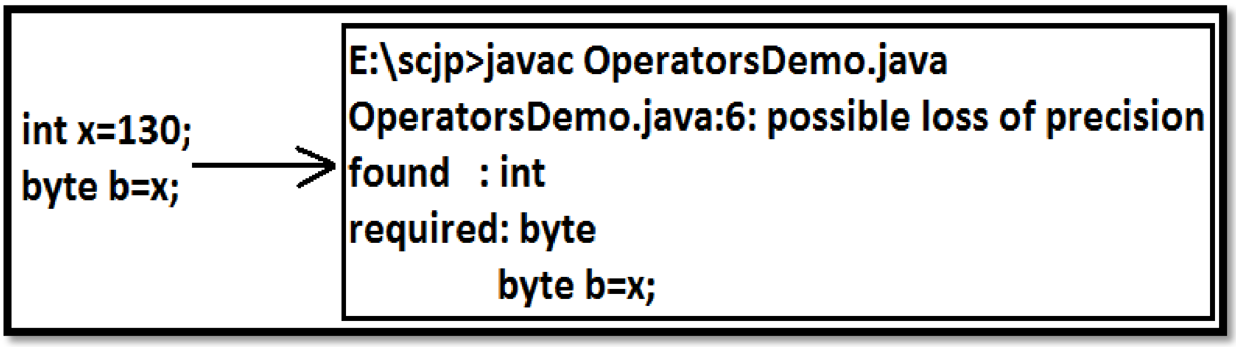
Note: Compiler converts int to double type automatically by implicit type casting.

Explicit type casting:

Programmer is responsible for this type casting.
Whenever we are assigning bigger data type value to the smaller data type variable then explicit type casting is required.
Also known as Narrowing or down casting.
There may be a chance of lose of information in this type casting.

The following are various possible conversions where explicit type casting is required.

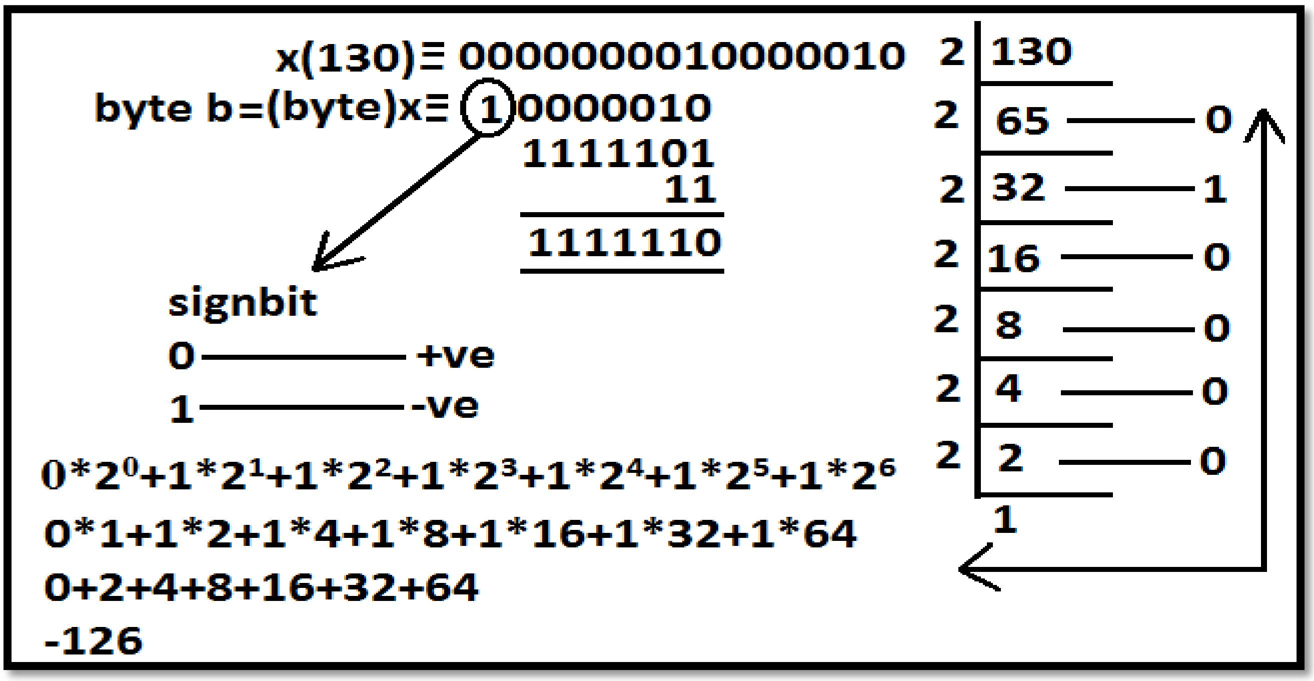
$$\begin{tikzcd}
\underset{8}{\text{byte}} \arrow[r] & \underset{16}{\text{short}} \arrow[dr] & & & & \\
& \underset{16}{\text{char}} \arrow[r] & \underset{32}{\text{int}} \arrow[r] & \underset{64}{\text{long}} \arrow[r] & \underset{32}{\text{float}} \arrow[r] & \text{double}
\end{tikzcd}$$



```
int x=130;
byte b=x;
```

```
E:\scjp>javac OperatorsDemo.java
OperatorsDemo.java:6: possible loss of precision
found   : int
required: byte
          byte b=x;
```

```
Example: int x = 130;
         byte b = (byte)x;
         System.out.println(b);  //-126
```



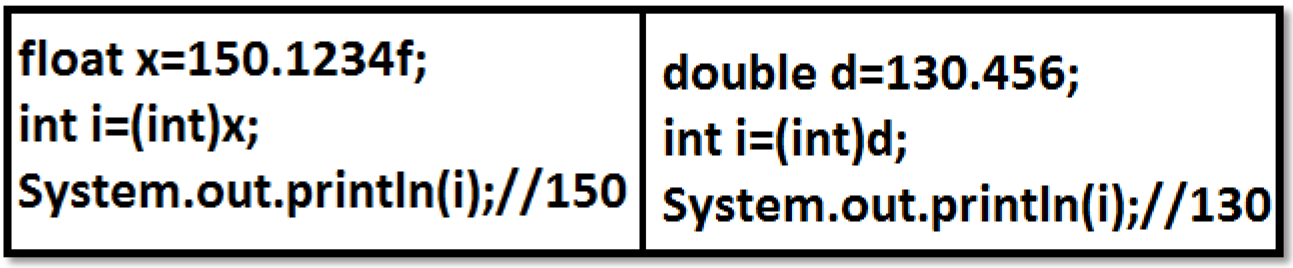
```
Example 2:
int x=130;
byte b=x;
System.out.println(b);  //CE : possible loss of precision
```

Whenever we are assigning higher data type value to lower data type value variable by explicit type-casting ,the most significant bits will be lost i.e., we have considered least significant bits.

```
Example 3:
int x=150;
short s=(short)x;
byte b=(byte)x;
System.out.println(s); //150
System.out.println(b);  //-106
```

Whenever we are assigning floating point value to the integral types by explicit type casting, the digits of after decimal point will be lost .

```
Example 4:
double d=130.456;

int x=(int)d;
System.out.println(x);  //130

byte b=(byte)d ;
System.out.println(b);  //-206
```



```
float x=150.1234f;
int i=(int)x;
System.out.println(i);//150
```

```
double d=130.456;
int i=(int)d;
System.out.println(i);//130
```

Assignment Operator

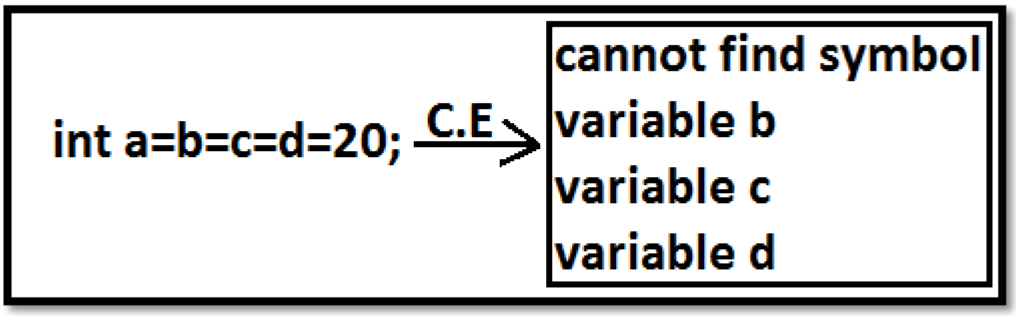
There are 3 types of assignment operators

Simple assignment:

Example: int x=10;

Chained assignment:

Example:
```
int a,b,c,d;
a=b=c=d=20;
System.out.println(a+"---"+b+"---"+c+"---"+d);//20---20---20---20
int b , c , d ;
int a=b=c=d=20 ;  //valid
```
We can't perform chained assignment directly at the time of declaration.



int a=b=c=d=20; $\xrightarrow{\text{C.E}}$
cannot find symbol
variable b
variable c
variable d

Example 2:

```
int a=b=c=d=30;
```

```
CE : cannot find symbol
symbol : variable b
location : class Test
```

Compound assignment:

Sometimes we can mixed assignment operator with some other operator to form compound assignment operator.

Ex:
```
int a=10 ;
a +=20 ;
System.out.println(a);  //30
```

The following is the list of all possible compound assignment operators in java.

+=			
-=	&=	>>=	
*=	|=	>>>=	
/=	^=	<<=	
%=			

In the case of compound assignment operator internal type casting will be performed automatically by the compiler (similar to increment and decrement operators.)

```
byte b=10;
b=b+1;      C.E
System.out.println(b);
```

```
E:\scjp>javac OperatorsDemo.java
OperatorsDemo.java:6: possible loss of precision
found   : int
required: byte
          b=b+1;
```

```
byte b=10;
b++;
System.out.println(b);//11
```

```
byte b=10;
//b+=1;
b=(byte)(b+1);
System.out.println(b);//11
```

```
int a,b,c,d;
a=b=c=d=20;
a+=b-=c*=d/=2;
System.out.println(a+"--"+b+"---"+c+"---"+d);
                 //-160---180---200---10
```

byte b=10;
b=b+1;
System.out.println(b);
 	
CE :
possible loss of precission
found : int
required : byte
	byte b=10;
	b++;
	System.out.println(b); //11

byte b=10;
b+=1;
System.out.println(b); //11
	byte b=127;
	b+=3;
	System.out.println(b);
	//-126

Ex:

```
int a , b , c , d ;
a=b=c=d=20 ;
a += b-= c *= d /= 2 ;
System.out.println(a+"---"+b+"---"+c+"---"+d);// -160...-180---200---10
```

Conditional Operator (? :)

The only possible ternary operator in java is conditional operator

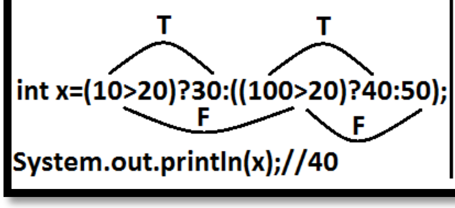
Ex 1:

```
int x=(10>20)?30:40;
System.out.println(x); //40
```

Ex 2:

```
int x=(10>20)?30:((40>50)?60:70);
System.out.println(x); //70
```

Nesting of conditional operator is possible



```
int x=(10>20)?30:((100>20)?40:50);
System.out.println(x);//40
```

```
int x=(10>20)?30:((100<20)?40:50);
System.out.println(x);//50
```

```
int a=10,b=20;
byte c1=(10>20)?30:40;
byte c2=(10<20)?30:40;
System.out.println(c1);//40
System.out.println(c2);//30
```

```
int a=10,b=20;
byte c1=(a>b)?30:40;
byte c2=(a<b)?30:40;
System.out.println(c1);
System.out.println(c2);
```

C.E $\rightarrow$

```
E:\scjp>javac OperatorsDemo.java
OperatorsDemo.java:6: possible loss of precision
found   : int
required: byte
          byte c1=(a>b)?30:40;
```

new operator

We can use "new" operator to create an object.
There is no "delete" operator in java because destruction of useless objects is the responsibility of garbage collector.

[ ] operator

We can use this operator to declare under construct/create arrays.

Java operator precedence:

Unary operators: [] , x++ , x-- , ++x , --x , ~ , ! , new , <type>
Arithmetic operators : * , / , % , + , - .
Shift operators : >> , >>> , << .
Comparision operators : <, <=,>,>=, instanceof.
Equality operators: == , !=
Bitwise operators: & , ^ , | .
Short circuit operators: && , || .
Conditional operator: (?:)
Assignment operators: += , -= , *= , /= , %= . . .

Evaluation order of Java operands:

There is no precedence for operands before applying any operator all operands will be evaluated from left to right.

Example:
```
class OperatorsDemo {
			public static void main(String[] args)	{

				System.out.println(m1(1)+m1(2)*m1(3)/m1(4)*m1(5)+m1(
			6));
			}
			public static int m1(int i)		{
				System.out.println(i);
				return i;
			}
}
```

output:	Analysis:
1	1+2*3/4*5+6
2	1+6/4*5+6
3	1+1*5+6
4	1+5+6
5	12
6	
12	

int x=10;
x=++x;
System.out.println(x);//11
	int x=10;
	x=x+1;
	System.out.println(x);//11
		int x=10;
		int y=x++;
		System.out.println(y);//10
		System.out.println(x);//11

Ex 2:

```
int i=1;
i+=++i + i++ + ++i + i++;
System.out.println(i); //13
```

Description:

```
i=i + ++i  + i++   + ++i  +  i++ ;
i=1+2+2+4+4;
i=13;
```

new Vs newInstance()

new is an operator to create an objects , if we know class name at the beginning then we can create an object by using new operator .
newInstance( ) is a method presenting class " Class " , which can be used to create object.
If we don't know the class name at the beginning and its available dynamically Runtime then we should go for newInstance() method

```
public  class Test {
     public static void main(String[] args) Throws Exception {
          Object o = Class.forName(arg[0]).newInstance( ) ;
          System.out.println(o.getClass().getName( ) );
     }
}
```

If dynamically provide class name is not available then we will get the RuntimeException saying ClassNotFoundException
To use newInstance( ) method compulsory corresponding class should contains no argument constructor, otherwise we will get the RuntimeException saying InstantiationException.

Difference between new and newInstance()

new	newInstance( )
new is an operator , which can be used to create an object	newInstance( ) is a method , present in class Class , which can be used to create an object .
We can use new operator if we know the class name at the beginning. Test t= new Test( );	We can use the newInstance( ) method , If we don't class name at the beginning and available dynamically Runtime. Object o=Class.forName(arg[0]).newInstance( );
If the corresponding .class file not available at Runtime then we will get RuntimeException saying NoClassDefFoundError, It is unchecked	If the corresponding .class file not available at Runtime then we will get RuntimeException saying ClassNotFoundException, It is checked
To used new operator the corresponding class not required to contain no argument constructor	To used newInstance( ) method the corresponding class should compulsory contain no argument constructor , Otherwise we will get RuntimeException saying InstantiationException.

Difference between ClassNotFoundException & NoClassDefFoundError:

For hard coded class names at Runtime in the corresponding .class files not available we will getNoClassDefFoundError , which is unchecked

```
Test t = new Test();
```

In Runtime Test.class file is not available then we will get NoClassDefFoundError

For Dynamically provided class names at Runtime , If the corresponding .class files is not available then we will get the RuntimeException saying ClassNotFoundException

```
Ex: Object o=Class.forname("Test").newInstance();
```

At Runtime if Test.class file not available then we will get the ClassNotFoundException, which is checked exception

Difference between instanceof and isInstance()

instanceof	isInstance( )
instanceof an operator which can be used to check whether the given object is particular type or not We know at the type at beginning it is available.	isInstance() is a method , present in class Class, we can use isInstance( ) method to checked whether the given object is particular type or not We don't know at the type at beginning it is available Dynamically at Runtime.

String s = new String("ashok");
System.out.println(s instanceof Object); //true
If we know the type at the beginning only.
	class Test {
	    public static void main(String[] args) {
	        Test t = new Test( ) ;
	        System.out.println(
	        Class.forName(args[0]).isInstance());
	
	//arg[0] --- We don't know the type at beginning
	 }
	}
	
	java Test Test //true
	java Test String //false
	java Test Object //true

int x= 10 ;
x=x++;
System.out.println(x);//10
	1. consider old value of x for assignment x=10
	2. Increment x value x=11
	3. Perform assignment with old considered x value x=10

Q1. Consider the following code

```
System.out.println("5 + 2 = "+4+3);
System.out.println("5 + 2 = "+(4+3));
```

What is the result?

A) 5 + 2 = 43
   5 + 2 = 43

B) 5 + 2 = 7
   5 + 2 = 7

C) 5 + 2 = 7
   5 + 2 = 43

D) 5 + 2 = 43
   5 + 2 = 7

Answer: D

Q2. Consider the code

```
public class Test
{
  public static void main(String[] args)
  {
    System.out.println("Result A:"+ 4+5);
    System.out.println("Result B:"+ (4)+(5));
  }
}
```

What is the output?

A) Result A:45
   Result B:45

B) Result A:45
   Result B:9

C) Result A:9
   Result B:45

D) Result A:9
   Result B:9

Answer: A

Q3. Consider the following code

```java
class Test
{
   public static void main(String[] args)
   {
      int x =100;
      int a = x++;
      int b = ++x;
      int c =x++;
      int d=(a<b)?(a<c)?a:(b<c)?b:c;
      System.out.println(d);
   }
}
```

What is the result?

A) 100
B) 101
C) 102
D) 103
E) Compilation fails

Answer : E

Q4. Consider the code

```java
public class Test
{
   public static void main(String[] args)
   {
      int x =1;
      int y=0;
      if(++x >++y)
      {
         System.out.print("Hello ");
      }
      else
      {
         System.out.print("Hi ");
      }
      System.out.println("Durga "+x+":"+y);
   }
}
```

What is the output?
A) Hello Durga 1:0
B) Hello Durga 2:1
C) Hi Durga 1:0
D) Hi Durga 2:1

Answer: B

Q5. Consider the code

```java
class Test
{
   public static void main(String[] args)
   {
      if(x++<10)
      {
         System.out.println(x+" Hello India");
      }
      else
      {
         System.out.println(x+" Hello DURGASOFT");
      }
   }
}
```

If x value is 9 then what is the output?

A) 10 Hello India
B) 10 Hello DURGASOFT
C) 9 Hello India
D) Compilation fails

Answer: 10 Hello India

Q6.Consider the code

```java
public class Test
{
   public static void main(String[] args)
   {
      int i =20;
      int j =30;
      int k = j += i/5;
      System.out.println(i+":"+j+":"+k);
   }
}
```

What is the output?
A) 20:34:34
B) 4:34:34
C) 20:34:20
D) 34:34:34

Answer: A

Q7. Consider the code

```java
public class Test
{
   public static final int MIN=1;
   public static void main(String[] args)
   {
      int x = args.length;
      if(checkLimit(x))
      {
         System.out.println("OCJA");
      }
      else
      {
         System.out.println("OCJP");
      }
   }
   public static boolean checkLimit(int x)
   {
      return (x>=MIN) ? true : false;
   }
}
```

And given the commands as :
javac Test.java
java Test

What is the result ?

A) OCJA
B) OCJP
C) Compilation Fails
D) NullPointerException is thrown at runtime

Answer : B

Q8. Given Student class as

```java
public class Student
{
   int rollno;
   String name;
   public Student(int rollno,String name)
   {
      this.rollno=rollno;
      this.name=name;
   }
}
```

Consider the code

```
Student s1= new Student(101,"Durga");
Student s2= new Student(101,"Durga");
Student s3= s1;
boolean b1= s1==s2;
boolean b2= s1.name.equals(s2.name);
System.out.println(b1+":"+b2);
```

What is the result?
A) true:true
B) true:false
C) false:true
D) false:false

Answer: C

Q9. Given the code

```
public class Test
{
   public static void main(String[] args)
   {
      String s1= "durga";
      String s2= new String("Durga");
      //line-1
      {
         System.out.println("Equal");
      }
      else
      {
         System.out.println("Not Equal");
      }
   }
}
```

Which code to be inserted at line-1 to print Equal

A) String s3=s2;
    if(s1==s3)

B) if(s1.equalsIgnoreCase(s2))

C) String s3=s2;
    if(s1.equals(s3))

D) if(s1.toLowerCase() == s2.toLowerCase())

Answer: B

Q10. Consider the code

```
public class Test
{
   public static void main(String[] args)
   {
      String s1="Durga";
      String[] s2={"D","u","r","g","a"};
      String s3="";
      for(String s :s2)
      {
         s3=s3+s;
      }
      boolean b1= (s1==s3);
      boolean b2= (s1.equals(s3));
      System.out.println(b1+":"+b2);
   }
}
```

What is the output?
A)true:true
B)true:false
C)false:true
D)false:false

Answer: C

Q11. Consider the Test class

```
public class Test
{
   public static void main(String[] args)
   {
      if(args[0].equals("Durga")?false:true)
      {
         System.out.println("Success");
      }
      else
      {
         System.out.println("Failure");
      }
   }
}
```

javac Test.java
java Test Durga

What is the output?

A) Success

B) Failure
C) Compilation fails
D) Runtime Exception

Answer: B

Q12. Consider the code

```
public class Test
{
  public static void main(String[] args)
  {
    String s="OCJA";
    String result=null;
    if(s.equals("JAVA"))
    {
      result="First Level";
    }
    else
    {
      result="Second Level";
    }
    System.out.println(result);
    result=s.equals("OCJA") ? "First Level" : "Second Level";
    System.out.println(result);
  }
}
```

What is the result?

A) First Level
Second Level

B) Second Level
First Level

C) First Level
First Level

D) Second Level
Second Level

Answer : B

Q13. Consider the code

```
String s="Color";
String result=null;
if(s.equals("Color"))
{
   result="Blue";
}
else if(s.equals("Wall"))
{
   result="Regular";
}
else
{
   result="No Result";
}
```

Which code fragment can replace the if block?

A) s.equals("Color")?result="Blue":s.equals("Wall")?result="Regular" : result="No Result";
B) result = s.equals("Color")?"Blue" else s.equals("Wall")? "Regular" : "No Result";
C) result = s.equals("Color")? s.equals("Wall")? "Blue" : "Regular" : "No Result";
D) result = s.equals("Color")? "Blue" : s.equals("Wall")? "Regular" : "No Result";

Answer: D

Q14. Consider the code

```
public class Test
{
   public static void main(String[] args)
   {
      double discount=0.0;
      int quantity=Integer.parseInt(args[0]);
      // Line-1
   }
}
```

And the given requirements:

If the value of the quantity variable is greater than or equal to 90, discount=20
If the value of the quantity variable is between 80 and 90 , discount=10

Which two code fragments can be independently placed at Line-1 to meet the requirements ?

A) if (quantity >= 90) { discount=20;}
if (quantity > 80 && quantity < 90) { discount=10;}

B) discount=(quantity >= 90) ? 20 : 0;
discount=(quantity > 80) ? 10 : 0;

C) discount = (quantity >= 90) ? 20 : (quantity > 80) ? 10 : 0;

D)

```
if(quantity >= 80 && quantity <90)
{
 discount=10;
}
else
{
 discount=0;
}
if (quantity >= 90)
{
 discount=20;
}
else
{
 discount=0;
}
```

E) discount= (quantity>80) ? 10 :(quantity >=90)?20:0;

Answer : A and C