CORE JAVA With SCJP / OCJP Study Material

Chapter 2 : OPERATORS & ASSIGNMENTS

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OPERATORS &0 ASSIGNMENTS

Agenda:

1. increment & decrement operators
2. arithmetic operators
3. string concatenation operators
4. Relational operators
5. Equality operators
6. instanceof operators
7. Bitwise operators
8. Short circuit operators
9. type cast operators
10. assignment operator
11. conditional operator
12. new operator
13. [ ] operator
14. Precedence of java operators
15. Evaluation order of java operands
16. new Vs newInstance( )
17. instanceof Vs isInstance( )
18. ClassNotFoundException Vs NoClassDefFoundError

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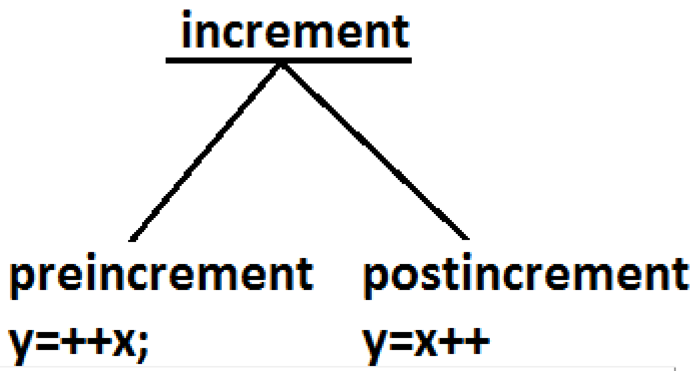
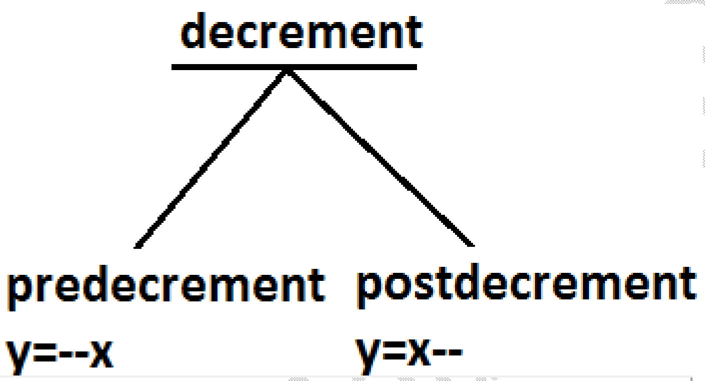
Increment & Decrement operators :



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;
```

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

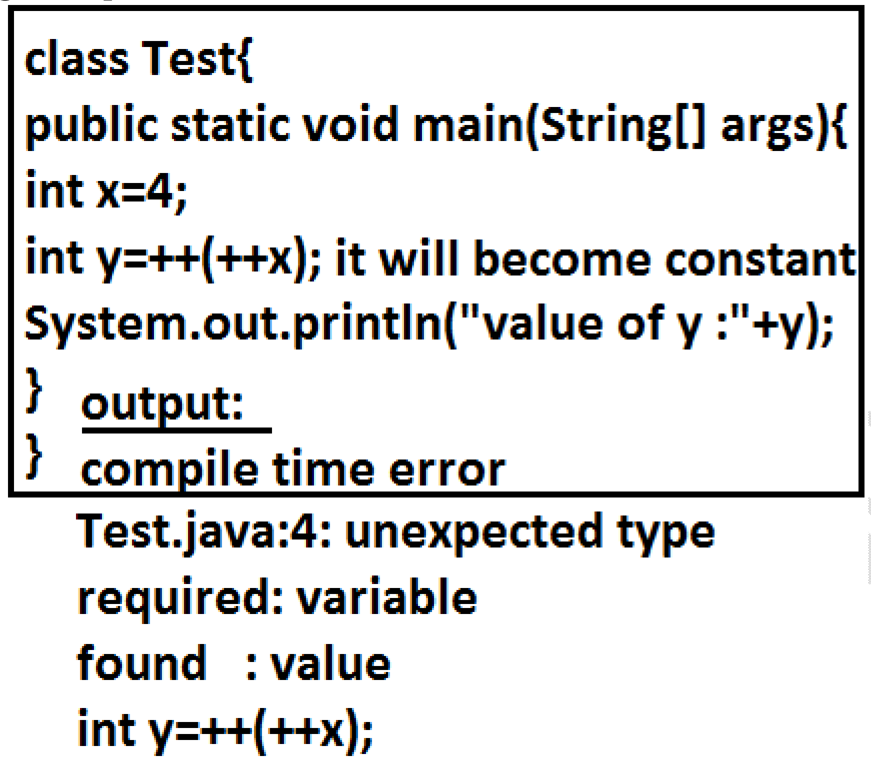
Ex :

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

Ex 2 :

```
int x = 4;
int y = ++4;
System.out.pritnln(y);

C.E: unexpected type
required: varialbe
found : value
```

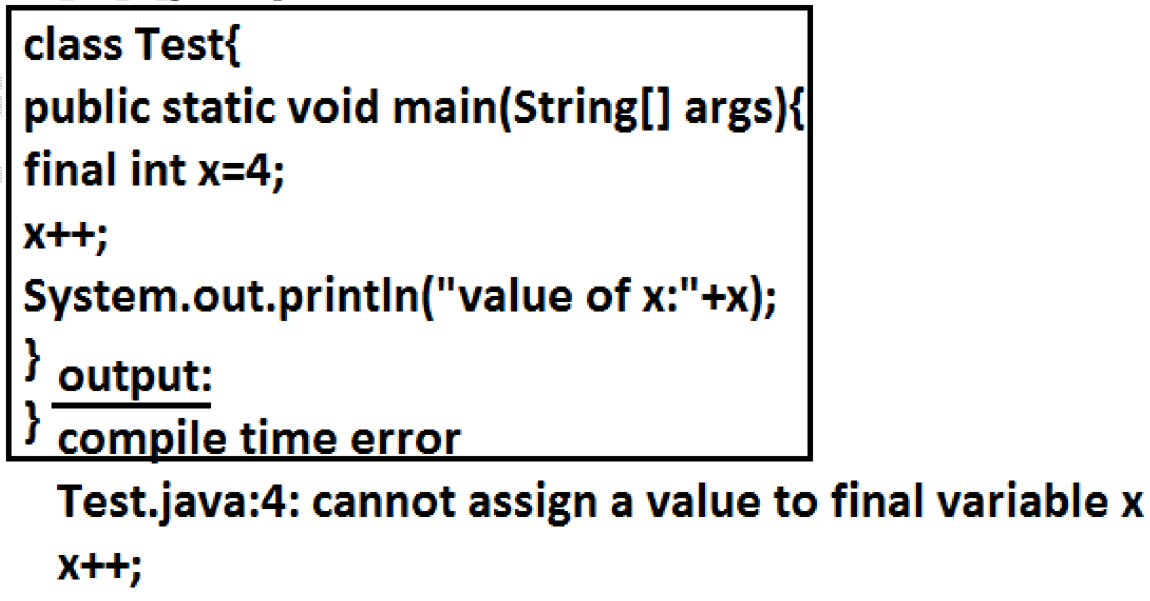
2. **We can't perform nesting of increment or decrement operator, other wise we will get compile time error**



```
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
```

3. **For the final variables we can't apply increment or decrement operators ,other wise 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++;
```

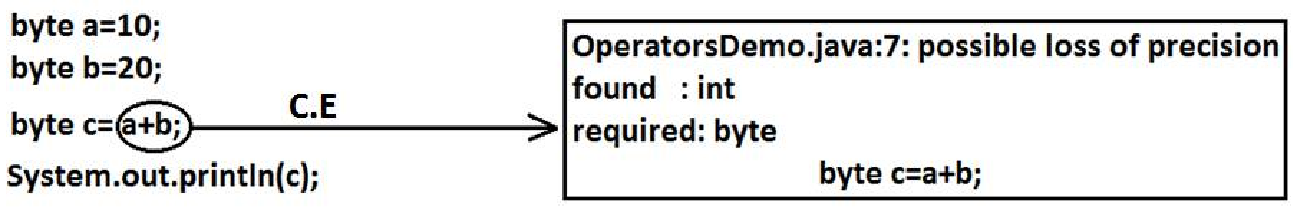
```
Ex:
final int x = 4;
x++;                          //  x = x + 1
System.out.println(x);

C.E :  can't assign a value to final variable 'x' .
```

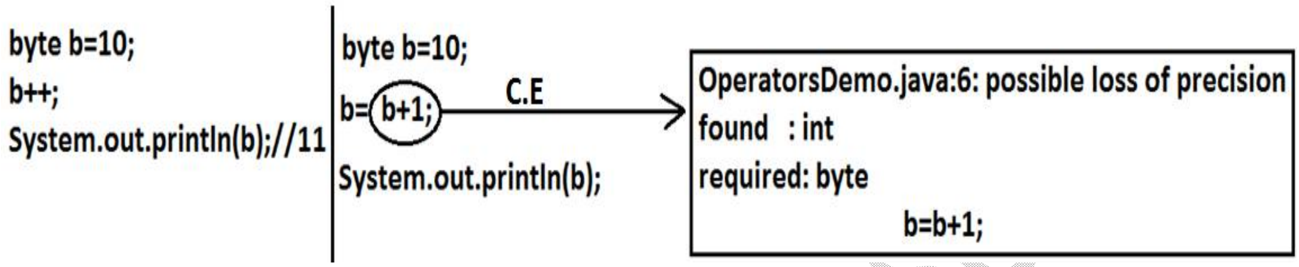
4. **We can apply increment or decrement operators even for primitive data types except boolean .**

```
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
```

<u>Difference between b++ and b = b+1?</u>

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)





```
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);

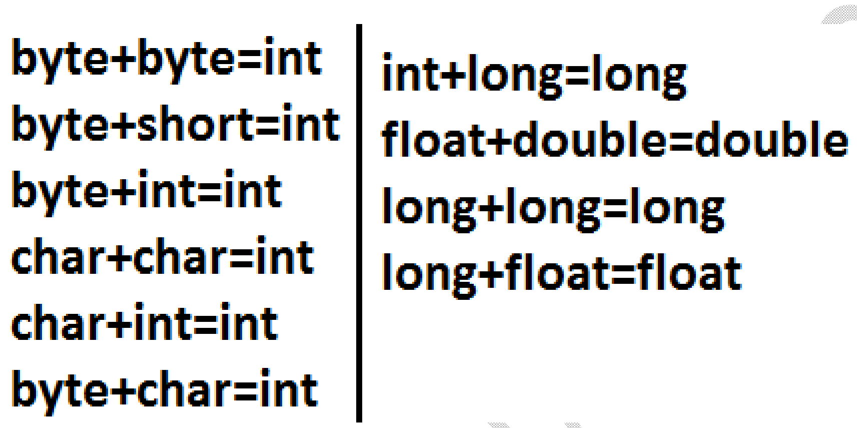
b=(byte)(b+1);

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

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

Arithmetic Operator :

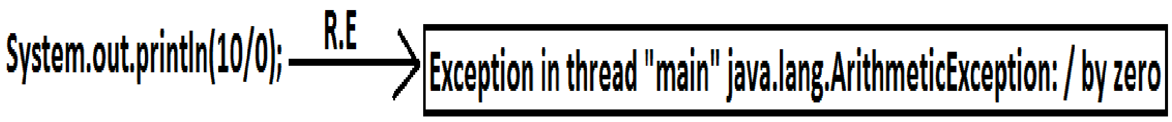
1. **If we apply any Arithmetic operation b/w 2 variables a & b , the result type is always max(int , type of a , type of b)**
2. Example :

```
3.
4. byte + byte=int
5. byte+short=int
6. short+short=int
7. short+long=long
8. double+float=double
9. int+double=double
10.  char+char=int
11.  char+int=int
12.  char+double=double
13.
14.  System.out.println('a' + 'b');  // output : 195
15.  System.out.println('a' + 1);  // output : 98
16.  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	

17. 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



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

For the Float & Double classes contains the following constants :

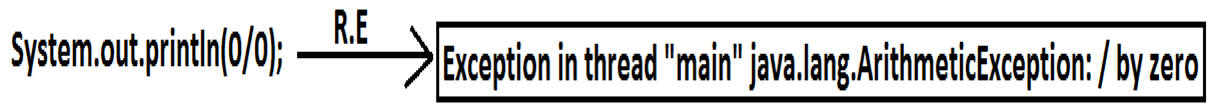
1. **POSITIVE_INFINITY**
2. **NEGATIVE_INFINITY**

Hence , if infinity is the result we won't get any ArithmeticException in floating point arithmetics
<u>Ex :</u>
System.out.println(10/0.0); // output : infinity
System.out.println(-10/0.0); // output : - infinity

18. NaN(Not a Number) in <u>integral arithmetic</u> (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

19. For any 'x' value including NaN , the following expressions returns false



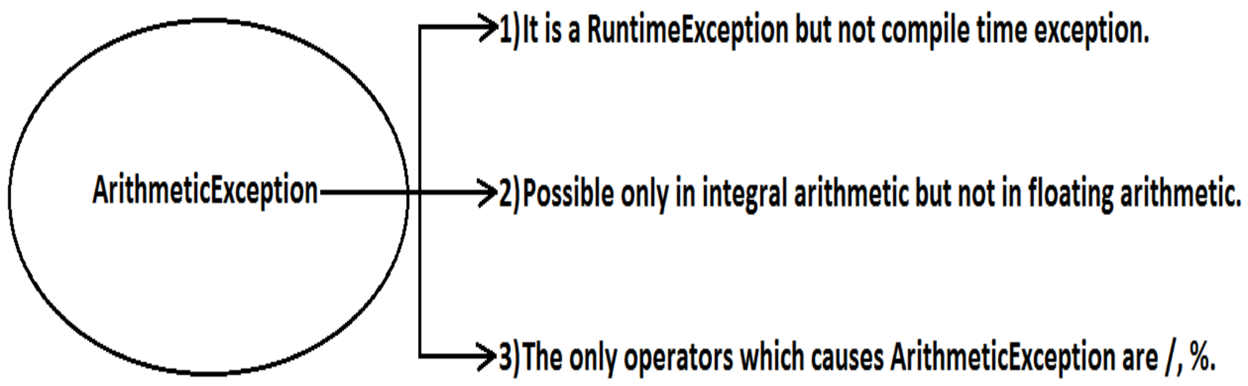
```
System.out.println(0/0);
```

```
Exception in thread "main" java.lang.ArithmeticException: / by zero
```

```
20.    // Ex :       x=10;
21.  System.out.println(10 < Float.NaN );                  // false
22.  System.out.println(10 <= Float.NaN );         // false
23.  System.out.println(10 > Float.NaN );                  // false
24.  System.out.println(10 >= Float.NaN );         // false
25.  System.out.println(10 == Float.NaN );                 // false
26.  System.out.println(Float.NaN == Float.NaN );          // false
27.
28.  System.out.println(10 != Float.NaN );                         //true
29.  System.out.println(Float.NaN != Float.NaN );          //true
```

30. ArithmeticException :

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



1)It is a RuntimeException but not compile time exception.

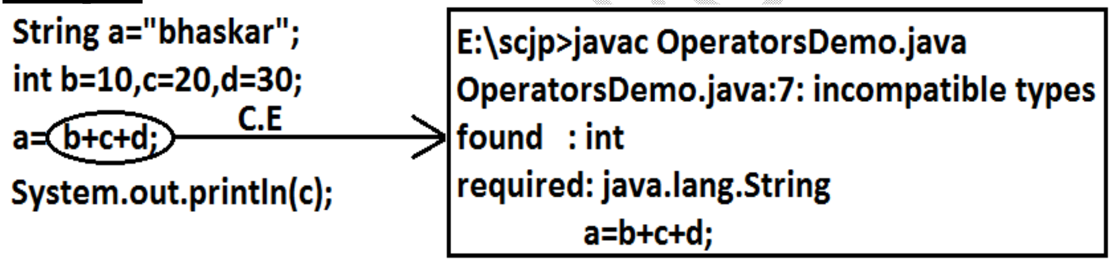
2)Possible only in integral arithmetic but not in floating arithmetic.

3)The only operators which causes ArithmeticException are /, %.

String Concatenation operator :

1. **The only overloaded operator in java is ' + ' operator some times it access arithmetic addition operator & some times it access String concatenation operator.**
2. **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**
3. Ex :
4.
```
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
```

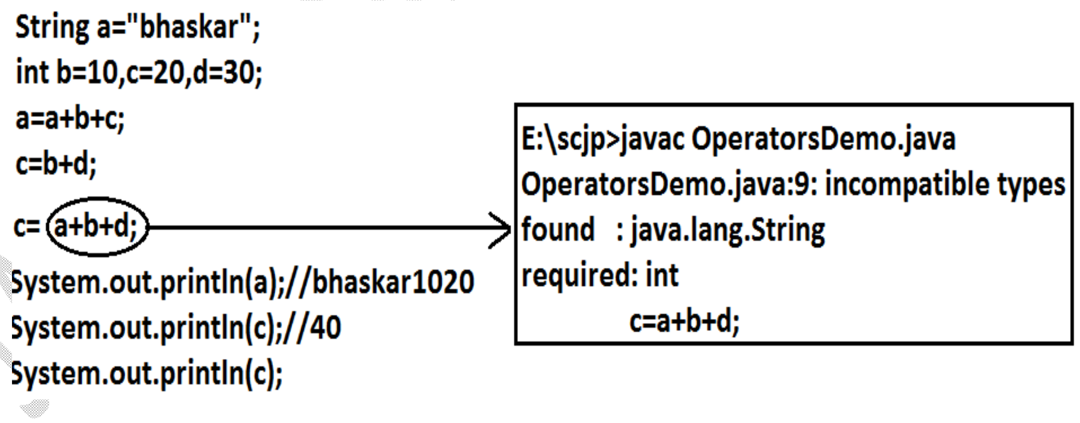
Example :



```
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;
```

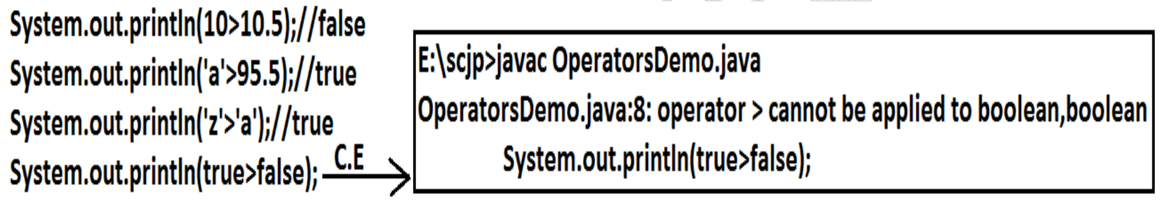
5. **consider the following declaration**
   String a="ashok";
   int b=10 , c=20 , d=30 ;

6.
```
 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* .

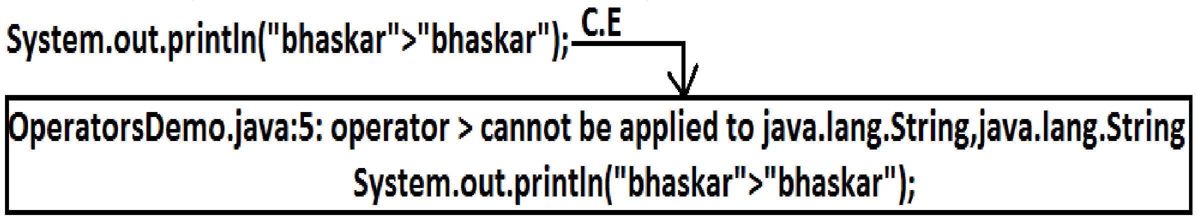


```
System.out.println(10>10.5);//false
System.out.println('a'>95.5);//true
System.out.println('z'>'a');//true
System.out.println(true>false); C.E
```

```
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
```

6. **We can't apply relational operators for object types**

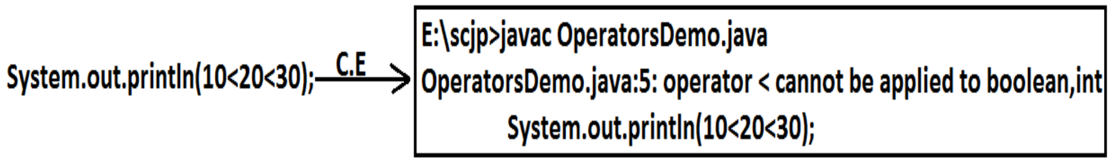


```
System.out.println("bhaskar">"bhaskar");
```

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

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

9. **Nesting of relational operator is not allowed**



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

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

```
10.  System.out.println(10 >  20 > 30); //  System.out.println(true  >
   30);
11.    //CE : operator  > can't  be  applied  to  boolean , int
```

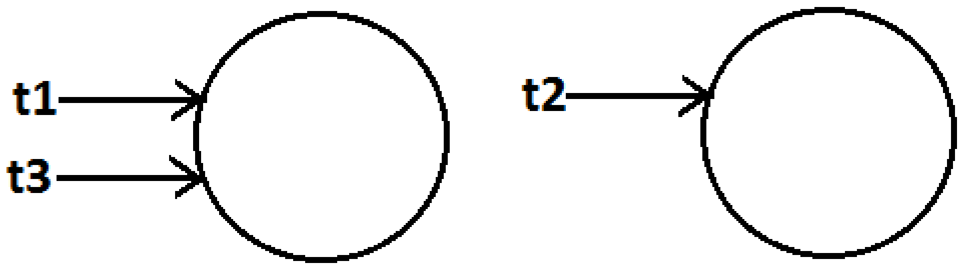
Equality Operators : (== , !=)

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

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

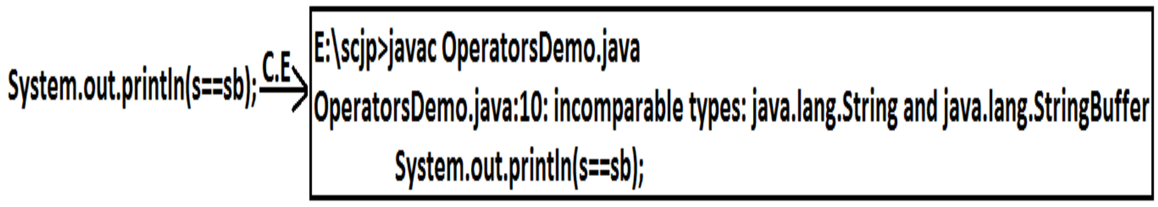
6. **We can apply equality operators for object types also .**
   For object references r1 and r2 , r1 == r2 returns true if and only if both r1 and r2 pointing to the same object. i.e., == operator meant for reference-comparision Or address-comparision.

```
7.          Thread t1=new Thread( ) ;
8.          Thread t2=new Thread( );
9.          Thread t3=t1 ;
10.                 System.out.println(t1==t2);  //false
11.                 System.out.println(t1==t3);  //true
```

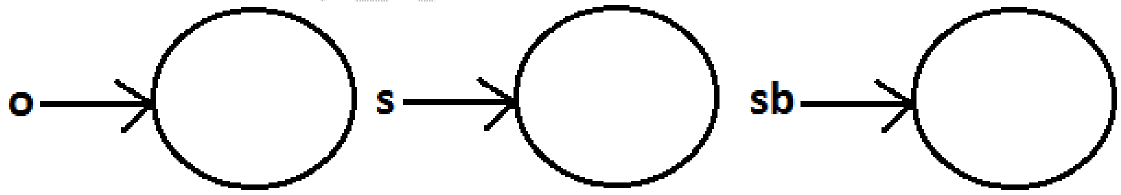


12. **To use the equality operators between object type compulsory these should be some relation between argument types(child to parent , parent to child) , Otherwise we will get Compiletime error incompatible types**

```
13.  Thread t=new Thread( ) ;
14.  Object o=new Object( );
15.  String s=new String("durga");
16.  System.out.println(t ==o);    //false
17.  System.out.println(o==s);     //false
18.  System.out.println(s==t);
19.  CE : incompatible types :  java.lang.String and java.lang.Thread
```



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

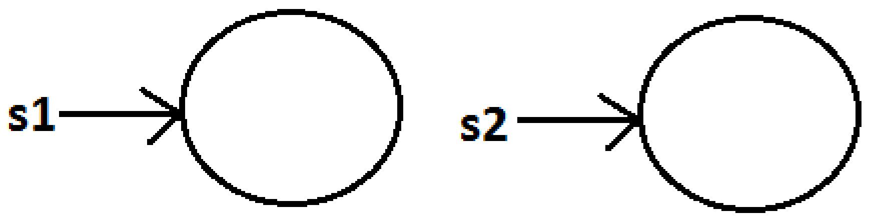


20. **For any object reference of on r==null is always false , but null==null is always true .**

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

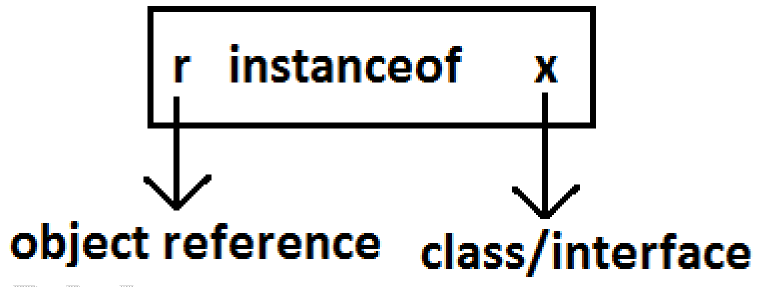
26. **<u>What is the difference between == operator and .equals( ) method ?</u>**
    In general we can use .equals( ) for content comparision where as == operator for reference comparision

```
27.
28.                         String  s1=new String("ashok");
29.                         String  s2=new  String("ashok");
30.                         System.out.println(s1==s2);  //false
31.                         System.out.println(s1.equals(s2));  //true
```



instanceof operator :

1. **We can use the instanceof operator to check whether the given an object is perticular type or not**



```
2.           Object o=l.get(0);          // l is an array name
3.           if(o  instanceof Student) {
4.             Student s=(Student)o ;
5.                   //perform  student  specific  operation
6.             }
7.             elseif(o instanceof Customer) {
8.               Customer c=(Customer)o;
9.                 //perform  Customer specific  operations
10.                    }
```

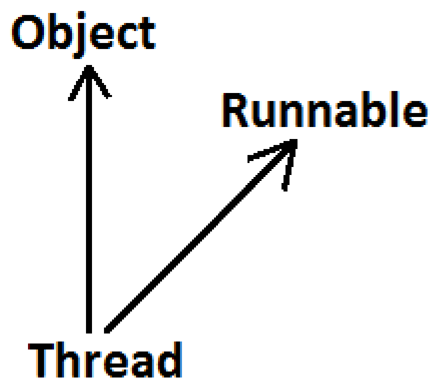
11. O instanceof X here O is object reference , X is ClassName/Interface name

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

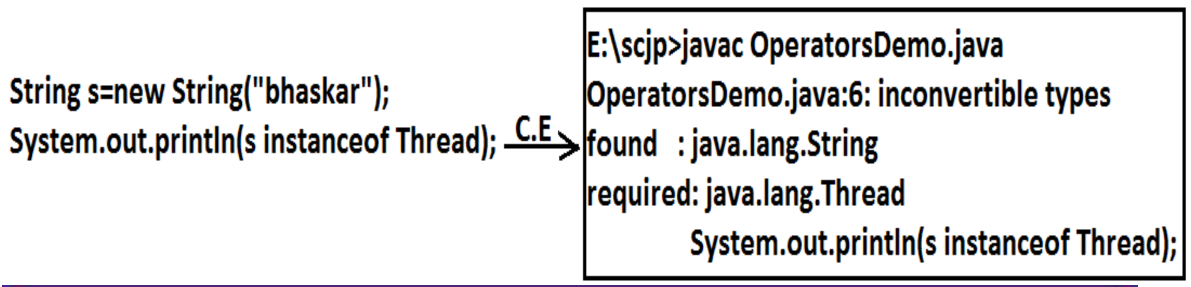
```
                    System.out.println(t instanceof Runnable);  //true
```

Ex :

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



16. **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);
```

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 : inconvertible  errors
                                          found : java.lang.Thread
                                          required : java.lang.String
```

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

```
24.                 Object o=new Object( );
25.                 System.out.println(o  instanceof  String );
   //false
26.
27.                 Object o=new String("ashok");
28.                 System.out.println(o  instanceof String);   //true
```

29. **For any class or interface X null instanceof X is always returns false**

```
30.                 System.out.println(null  instanceof  X);  //false
```

Bitwise Operators : (& , | , ^)

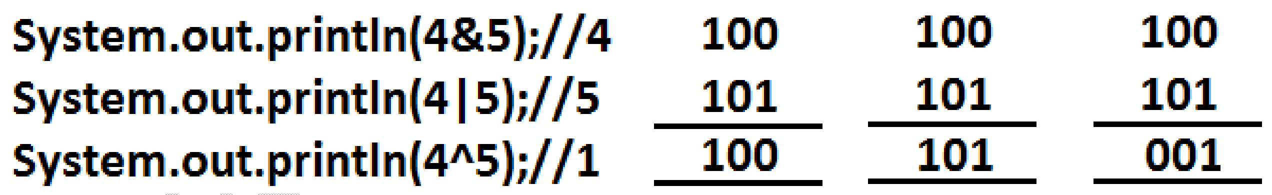
1. **& (AND) : If both arguments are true then only result is true.**
2. **| (OR) : if at least one argument is true. Then the result is true.**
3. **^ (X-OR) : if both are different arguments. Then the result is true.**

```
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
```

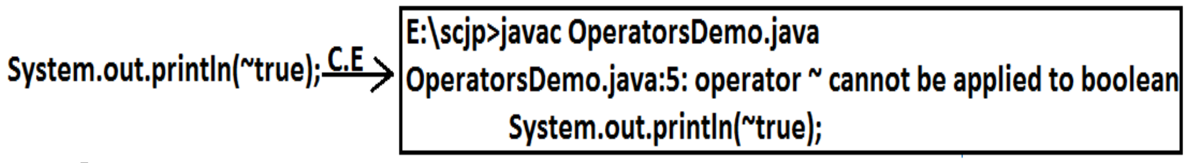
Example :



```
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:

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

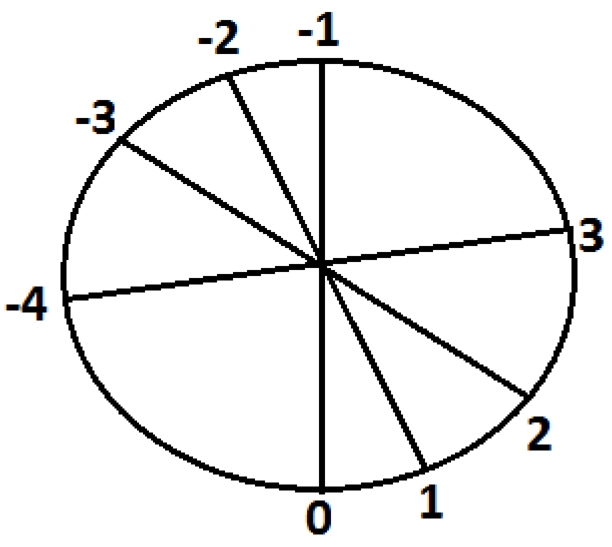


```
System.out.println(~true); C.E →
E:\scjp>javac OperatorsDemo.java
OperatorsDemo.java:5: operator ~ cannot be applied to boolean
        System.out.println(~true);
```

```
2. Example :
3. System.out.println(~true); // CE :opetator ~ can not be applied to
   boolean
4. System.out.println(~4);  //-5
5.
6. description about above program :
7. 4-->  0 000.......0100                0-----+ve
8. ~4--> 1 111.......1011                 1--- -ve
```

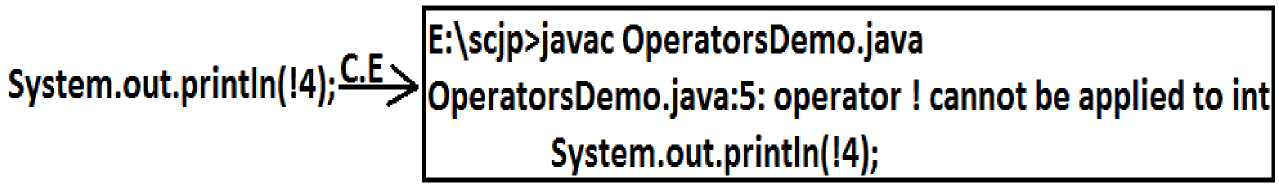
```
9.
10.  2's compliment  of ~4 -->  000....0100 add  1
11.   result is : 000...0101 =5
```

12. **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 where as -ve number will be represented in 2's comlement form.



Boolean complement (!) operator:

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



System.out.println(!4); $\xrightarrow{C.E}$

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

Example :

```
Example:
System.out.println(!true);//false
System.out.println(!false);//true
System.out.println(!4);//CE : operator ! can not 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 ture 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

1. implicit
2. explicit

implicit type casting :

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

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

$$\begin{tikzcd}
\text{byte} \arrow[r] & \text{short} \arrow[dr] & & & & \\
& & \text{int} \arrow[r] & \text{long} \arrow[r] & \text{float} \arrow[r] & \text{double} \\
& \text{char} \arrow[ur] & & & &
\end{tikzcd}$$

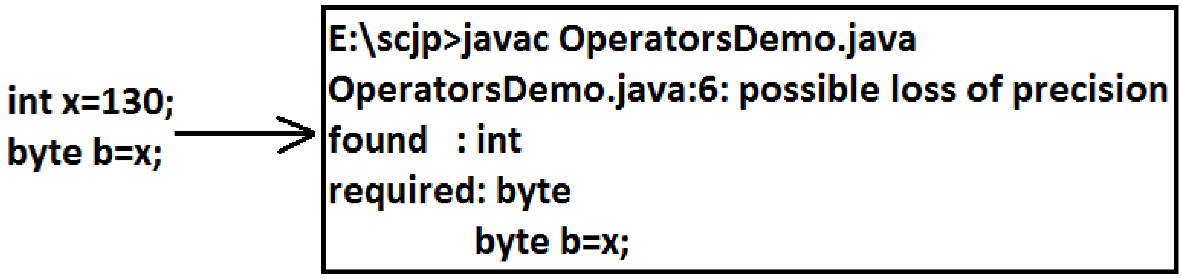
```
6.
7. Example 1:
8. int x='a';
9. System.out.println(x);//97
```
10. Note: Compiler converts char to int type automatically by implicit type casting.
```
11.  Example 2:
12.  double d=10;
13.  System.out.println(d);//10.0
```

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

Explicit type casting:

1. **Programmer is responsible for this type casting.**
2. **Whenever we are assigning bigger data type value to the smaller data type variable then explicit type casting is required.**
3. **Also known as Narrowing or down casting.**
4. **There may be a chance of lose of information in this type casting.**
5. **The following are various possible conversions where explicit type casting is required.**
   Diagram:

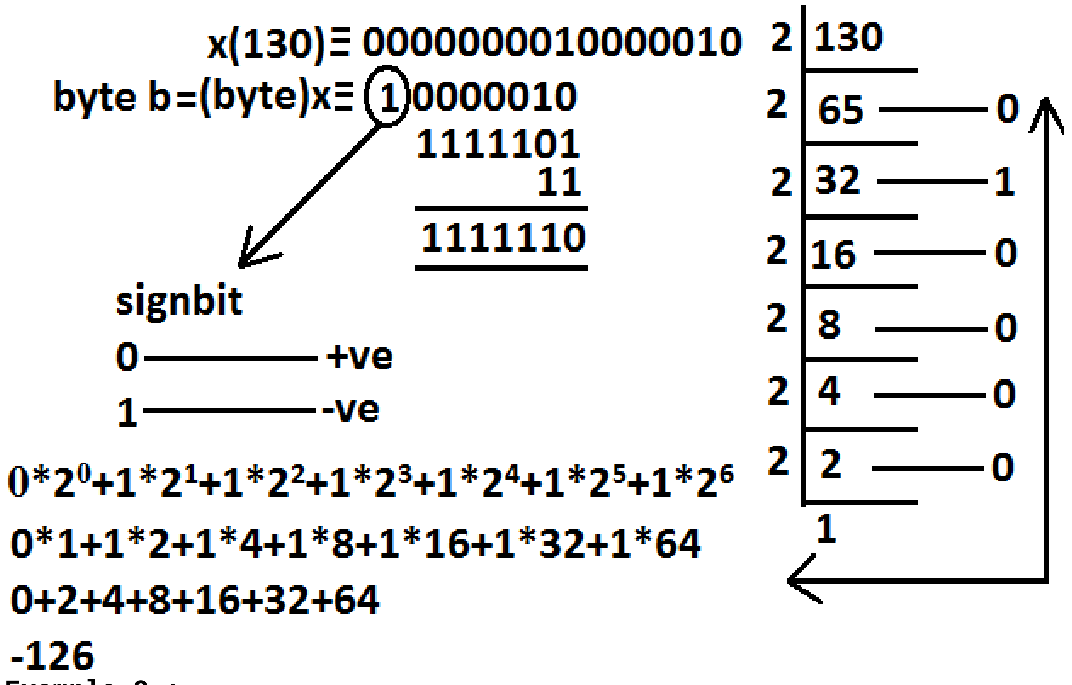
$$\begin{tikzcd}
\text{byte } 8 \arrow[r] & \text{short } 16 \arrow[dr] & & & & \\
& & \text{int } 32 \arrow[r] & \text{long } 64 \arrow[r] & \text{float } 32 \arrow[r] & \text{double} \\
& \text{char } 16 \arrow[ur] & & & &
\end{tikzcd}$$



```
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;
```

```
6.
7. Example :
8.
9. int x=130;
10.  byte b=(byte)x;
11.  System.out.println(b);   //-126
```
12.



```
13.  Example 2 :
14.
15.  int x=130;
```

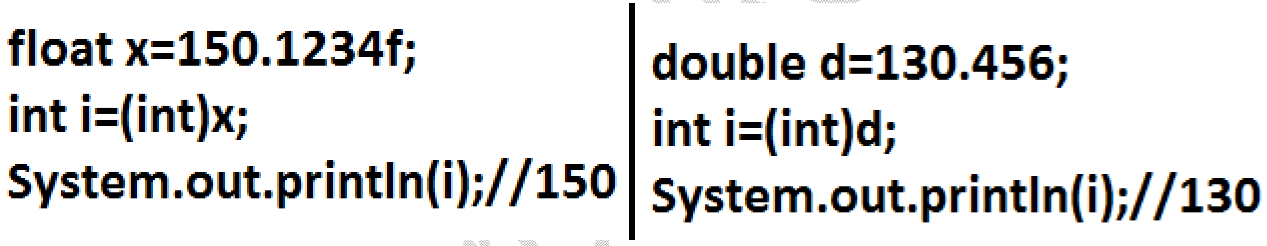
```
16.  byte b=x;
17.  System.out.println(b);  //CE : possible loss of precision
```

18. **When ever we are assigning higher datatype value to lower datatype value variable by explicit type-casting ,the most significant bits will be lost i.e., we have considered least significant bits.**

```
19.  Example 3 :
20.
21.  int x=150;
22.  short s=(short)x;
23.  byte b=(byte)x;
24.  System.out.println(s); //150
25.  System.out.println(b);  //-106
```

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

```
27.  Example 4:
28.
29.  double d=130.456 ;
30.
31.  int x=(int)d ;
32.  System.out.println(x);  //130
33.
34.  byte b=(byte)d ;
35.  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
```

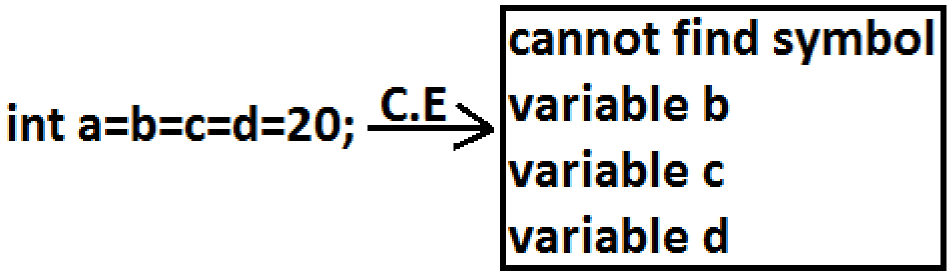
Assignment Operator :

There are 3 types of assignment operators

1. **Simple assignment:**
   Example: int x=10;
2. **Chained assignment:**

```
3. Example:
4. int a,b,c,d;
5. a=b=c=d=20;
6. System.out.println(a+"---"+b+"---"+c+"---"+d);//20---20---20---20
7. int b , c , d ;
8. int a=b=c=d=20 ;  //valid
```

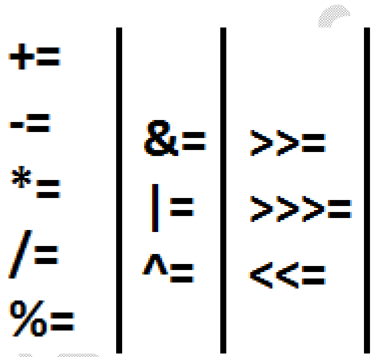
We can't perform chained assignment directly at the time of declaration.



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

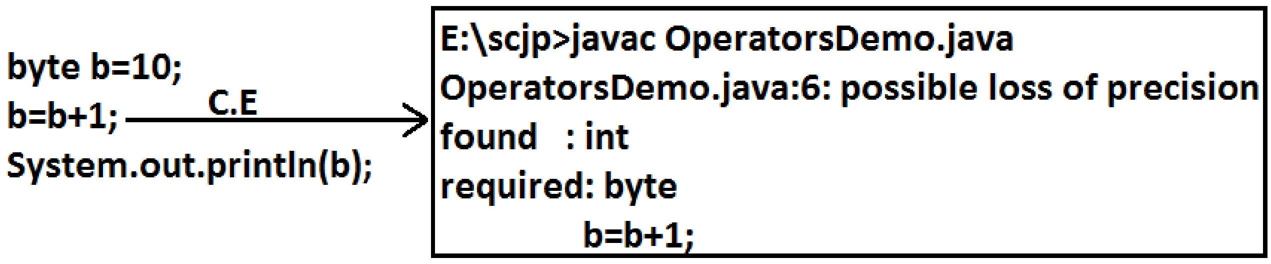
```
Example 2:

int a=b=c=d=30;
  CE : can not find symbol
                     symbol : variable b
                     location : class Test
```

9. <u>**Compound assignment:**</u>
    1. **Sometimes we can mixed assignment operator with some other operator to form compound assignment operator.**
    2. `Ex:`
    3. `int a=10 ;`
    4. `a +=20 ;`
    5. `System.out.println(a);  //30`
    6. **The following is the list of all possible compound assignment operators in java.**



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

7. **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;
System.out.println(b);
```

$\xrightarrow{\text{C.E}}$

```
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

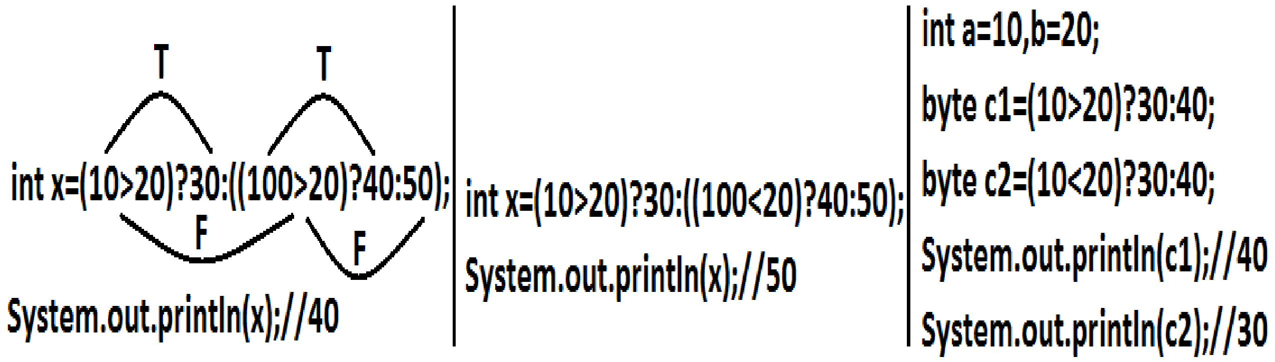
```
Ex :
int a , b , c , d ;
a=b=c=d=20 ;
a += b-= c *= d /= 2 ;
System.out.println(a+"---"+b+"---"+c+"---"+d);// -160...-180---200---10
```

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
```

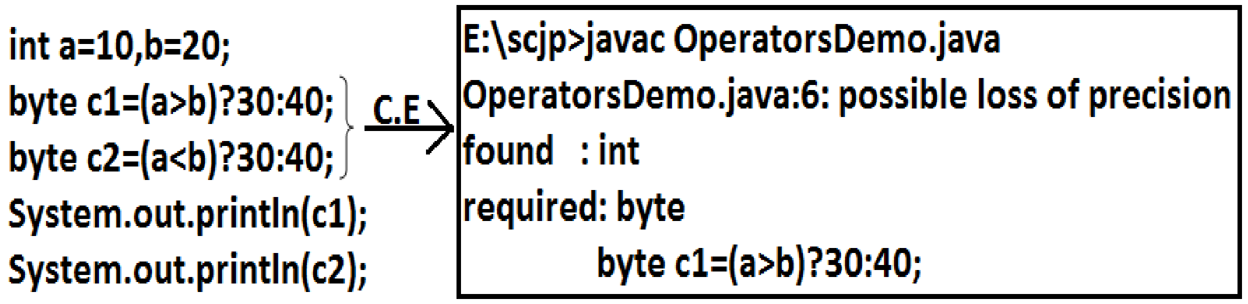
Nesting of conditional operator is possible



```
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);
```

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

new operator :

1. We can use "new" operator to create an object.
2. 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:

1. Unary operators: [] , x++ , x-- , ++x , --x , ~ , ! , new , <type>
2. Arithmetic operators : * , / , % , + , - .
3. Shift operators : >> , >>> , << .
4. Comparision operators : <, <=,>,>=, instanceof.
5. Equality operators: == , !=
6. Bitwise operators: & , ^ , | .
7. Short circuit operators: && , || .
8. Conditional operator: (?:)
9. 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( ) :

1. 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 .
2. newInstance( ) is a method presenting class " Class " , which can be used to create object.
3. If we don't know the class name at the beginning and its available dynamically Runtime then we should go for newInstance() method

```
4.   public  class Test {
5.     public static void main(String[] args) Throws Exception {
6.           Object o=Class.forName(arg[0]).newInstance( ) ;
7.           System.out.println(o.getClass().getName( ) );
8.     }
9.   }
```

10. If dynamically provide class name is not available then we will get the RuntimeException saying ClassNotFoundException
11. 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 , Other wise we will get RuntimeException saying InstantiationException.

Difference between ClassNotFoundException & NoClassDefFoundError :

1. For hard coded class names at Runtime in the corresponding .class files not available we will get NoClassDefFoundError , which is unchecked
   Test t = new Test( );
   In Runtime Test.class file is not available then we will get NoClassDefFoundError
2. 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 perticular 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 perticular 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`