

# Boolean

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# Learning Object

- Boolean Data Type
- Comparison Operators and Logical Operators
- Truth Table

# Boolean Data Type

- A Boolean variable can hold only one of two values – **true** or **false**. For Example:

**boolean** isItPayDay = **false**;

- Compare two variables using **Comparison** operators and **logical** operators to get **true** or **false**
  - ❑ In Math:  $a < b$
  - ❑ In real world: front and back of coin for game
- Boolean variable is normally used with **control statement**
  - ❑ Boolean mostly is used to control the program flow

# Comparison Operators

Operator	Meaning
<code>a == b</code>	Is <code>a</code> equal to <code>b</code> ?
<code>a != b</code>	Is <code>a</code> not equal to <code>b</code> ?
<code>a &gt; b</code>	Is <code>a</code> greater than <code>b</code> ?
<code>a &lt; b</code>	Is <code>a</code> less than <code>b</code> ?
<code>a &gt;= b</code>	Is <code>a</code> greater than or equal to <code>b</code> ?
<code>a &lt;= b</code>	Is <code>a</code> less than or equal to <code>b</code> ?

Example:

Let `a = 10`, `b = 10`

`(a == b)` is **true**

`(a != b)` is **false**

```
System.out.println(a > b); //false
System.out.println(a < b) //?
System.out.println(a >= b) //?
System.out.println(a <= b) //?
```

# Logical Operators

Operator	Name	Description
!	not	Negates true to false, and false to true.
&&	and	The result is true if and only if both operands is true.
	or	The result is true if at least one of the operands is true.
^	exclusive or	The result is true if and only if the two operands have different Boolean values.

Let a = 10, b = 10

!(a == b) is false

((a==b) && (a!=b)) is false

((a==b || a!=b)) is ?

((a==b )^ (a!=b)) is ?

# Truth Table

p	q	p && q	p    q	p ^ q	! p
False	False	False	False	False	True
True	False	False	True	True	False
False	True	False	True	True	True
True	True	True	True	False	False

# Practice

1. Make a new project (Reference: Create Project and Class File)

❑ Project name: Boolean\_Type

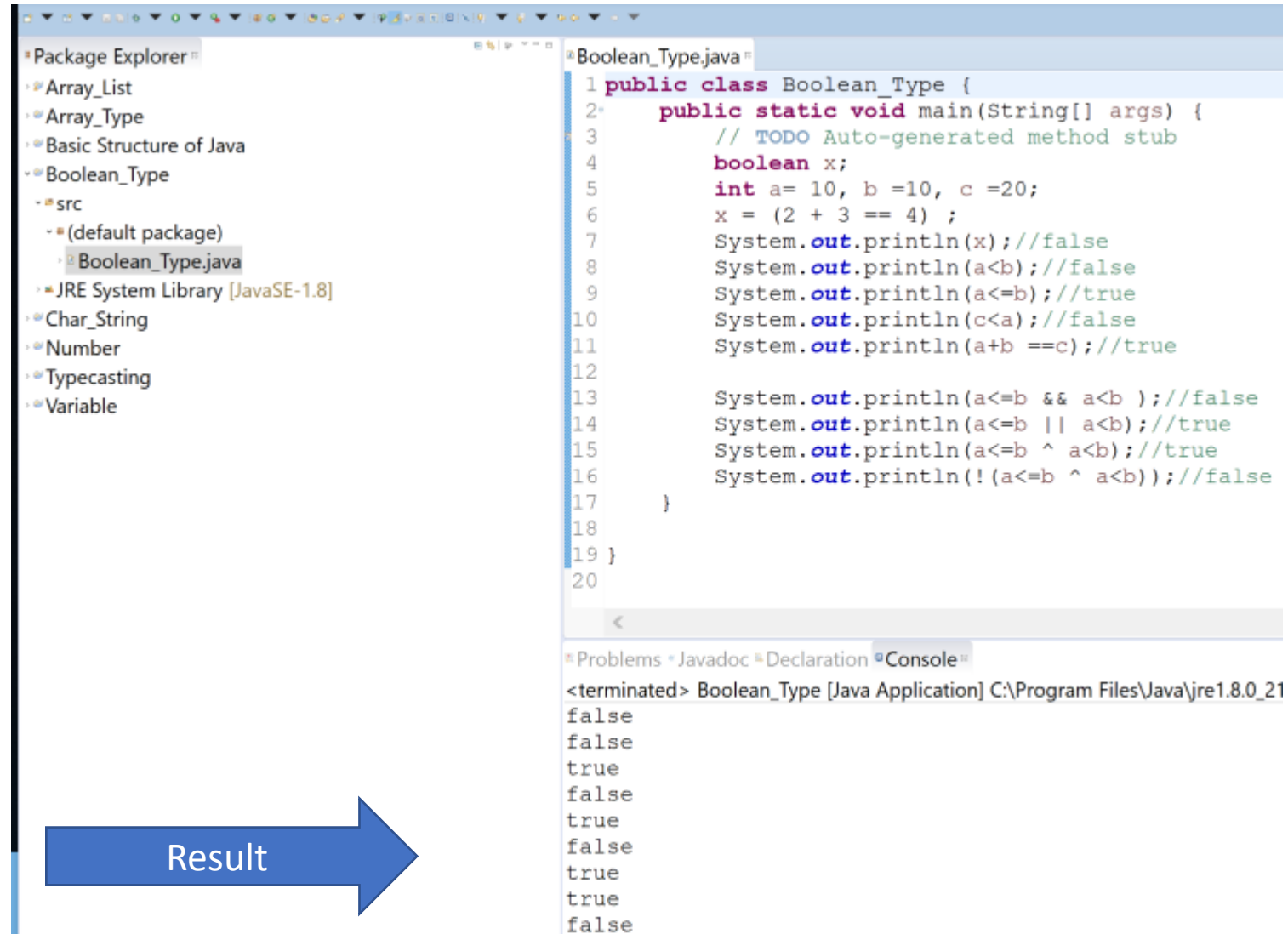
2. Create a new Class File

❑ Class name: Boolean\_Type

3. Coding:

```
public class Boolean_Type {  
    public static void main(String[] args) {  
        boolean x;  
        int a= 10, b =10, c =20;  
        x = (2 + 3 == 4) ;  
        System.out.println(x);//false  
        System.out.println(a<b);//false  
        System.out.println(a<=b);//true  
        System.out.println(c<a);//false  
        System.out.println(a+b ==c);//true  
  
        System.out.println(a<=b && a<b )//false  
        System.out.println(a<=b || a<b);//true  
        System.out.println(a<=b ^ a<b);//true  
        System.out.println(!(a<=b ^ a<b));//false } }
```

# Practice – Code and Result



The screenshot displays an IDE with a Package Explorer on the left and a code editor on the right. The Package Explorer shows a project structure with a package named 'Boolean\_Type' containing a file 'Boolean\_Type.java'. The code editor shows the following Java code:

```
1 public class Boolean_Type {
2     public static void main(String[] args) {
3         // TODO Auto-generated method stub
4         boolean x;
5         int a= 10, b =10, c =20;
6         x = (2 + 3 == 4) ;
7         System.out.println(x); //false
8         System.out.println(a<b); //false
9         System.out.println(a<=b); //true
10        System.out.println(c<a); //false
11        System.out.println(a+b ==c); //true
12
13        System.out.println(a<=b && a<b ); //false
14        System.out.println(a<=b || a<b); //true
15        System.out.println(a<=b ^ a<b); //true
16        System.out.println(!(a<=b ^ a<b)); //false
17    }
18 }
19 }
20
```

Below the code editor, the Console tab is active, showing the output of the program:

```
<terminated> Boolean_Type [Java Application] C:\Program Files\Java\jre1.8.0_21
false
false
true
false
true
false
true
true
false
```

A blue arrow labeled "Result" points from the code editor to the console output.



# Summary

➤ A Boolean variable can hold only one of two values

❑ true or false

➤ **Comparison** operators and **logical** operators to get **true** or **false**

p	q	p && q	p    q	p ^ q	! p
False	False	False	False	False	True
True	False	False	True	True	False
False	True	False	True	True	True
True	True	True	True	False	False

```
Boolean_Type.java
1 public class Boolean_Type {
2     public static void main(String[] args) {
3         // TODO Auto-generated method stub
4         boolean x;
5         int a= 10, b =10, c =20;
6         x = (2 + 3 == 4) ;
7         System.out.println(x); //false
8         System.out.println(a<b); //false
9         System.out.println(a<=b); //true
0         System.out.println(c<a); //false
1         System.out.println(a+b ==c); //true
2
3         System.out.println(a<=b && a<b ); //false
4         System.out.println(a<=b || a<b); //true
5         System.out.println(a<=b ^ a<b); //true
6         System.out.println(!(a<=b ^ a<b)); //false
7     }
8
9 }
```