

اور نماز ادا کرتے رہو اور زکوٰۃ دیتے رہو۔ اور جو بھلائی اپنے لیے آگے بھیج رکھو گے، اس کو خدا کے ہاں پالو گے۔ کچھ شک نہیں کہ خدا تمہارے سب کاموں کو دیکھ رہا ہے۔ البقرة آیت ۱۱۰

Lecture 03

More Operators [Relational, Logical] – Programming Practice

In this lesson we will do some programming practice and learn about relational and logical operators. First we will discuss some necessary things about each program than we will have a discussion on relational and logical operators required in relational and logical expressions. At the end again we will discuss some programs using relation and logical operators.

Let's start with programs. Two things are necessary to remember about java programs:

1. Each program has a class name:
 - a. Class name should start from Capital letter
 - b. Class name should be related to program. For example a program to print table should have name "Table" and program to calculate quadratic roots should have name "QuadraticRoots"
 - c. Program should be saved with same name as class name is
 - d. Each program should be saved with different name to save them separately
2. Each program should have main method with fixed signature i.e.

public static void main(String []args)

Therefore to write each new program open an existing program, change class name, save as program with name name and modify/ add statement(s) in main. Finally compile and execute new program.

Lets consider some simple programs:

- a. Program to print following paragraph (from book Islam for Beginners by Sheikh Yawar Baig) using print statements:

It is my purpose to give you accurate information about Islam to the best of my ability without trying to color your judgment or to convince you one way or the other. What conclusions you come to and what decisions you take after reading this, is entirely up to you. I only hope that whatever you decide will be based on good information and not on propaganda.

```
class PrintParagraph{
    public static void main(String []args){
        System.out.print ("It is my purpose to give you accurate information about Islam to the best ");
        System.out.print ("of my ability without trying to color your judgment or to convince you one ");
        System.out.print ("way or the other. What conclusions you come to and what decisions you ");
        System.out.print ("take after reading this, is entirely up to you. I only hope that whatever you ");
        System.out.println ("decide will be based on good information and not on propaganda.");
    }
}
```

Above program has **print** functions which will print in same line after the previous statement ends, only it will move to next line when text will reach to the end of window on right hand side. In last line **println** function is used so that any message like "Press any key to continue" will print on separate line.

b. Program to print capital A with # sign:

```
class PrintA{
    public static void main(String []args){
        System.out.println("#####");
        System.out.println("#      #");
        System.out.println("#      #");
        System.out.println("#      #");
        System.out.println("#####");
        System.out.println("#      #");
        System.out.println("#      #");
        System.out.println("#      #");
        System.out.println("#      #");
        System.out.println("#      #");
        System.out.println("#      #");
    }
}
```

c. Similarly student should write a program to print house like this:

```
#####
# #          #
# #          #
# #          #
# #          #
#####
# #          #
# #          #
# #          #
# #          #
# #          #
#####
```

Relational Operators

Java has six relational operators given in the table:

Operator	Use
==	equal to
!=	not equal to
>	greater than
>=	greater than or equal to
<	less than
<=	less than or equal to

Each of these are binary operators require two operands, one of left side and other on the right side of operator. Each of these operators gives only true or false as a result. Like 3==4 give false; whereas; 4<=5 give **true** result. Remember = is used for assignment like x=3 means assign value 3 to x; where == "double equal without space" is used for comparison. Let us write some examples of relational expression with their results. Similarly there are no spaces between != symbols.

2==3 false 3>1 true 4==4 true 4<=10 true 4!=5 true 4!=4 false

If you write relational expression inside print statement it will print true or false, for example consider following program and its output:

<pre> class RelationOperators{ public static void main(String []args){ System.out.println(3==3); System.out.println(3>1); System.out.println(3<=1); System.out.println(3<=7); System.out.println(3!=3); System.out.println(4==5); System.out.println(5<=10); System.out.println(6<9); } } </pre>	Output: true true false true false false true true
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Logical Operators

Java has three logical operators given in the table:

Operator	Use
&&	logical and
	logical or
!	not equal

Each of these are binary operators require two operands, one of left side and other on the right side of operator but in this case operands will be relation expressions not numbers or variables like "4>3 && 5<1" is a logical expression. Once again a logical expression has result true or false. Lets us discuss logical operator one by one.

Logical And:

&& sign is used for logical anding. The two relational expressions on left and right of logical operator may be true or false, hence final result of logical expression depends. To understand see following table:

Expression 1	Operator	Expressions 2	Result
true	&&	true	true
false	&&	true	false
true	&&	false	false
false	&&	false	false

So according to table in a logical expression first and second expressions can be true or false but result will be true only if both expressions are true and otherwise false. Therefore, logical and is a strict condition and used where we have to fulfill both requirements or we may extend expression by writing more operators and operands.

Logical Or:

|| sign is used for logical oring. The two relational expressions on left and right of logical operator may be true or false, hence final result of logical expression depends. To understand see following table:

Expression 1	Operator	Expressions 2	Result
true		true	true
false		true	true
true		false	true
false		false	false

So according to table in a logical expression first and second expression can be true or false but result will be false only if both expressions are false and otherwise true. Therefore, logical or is a

relax condition and used where we it is sufficient to fulfill one requirement or we may extend expression by writing more operators and operands like "a>b || b>c || s==t".

Logical Not:

! sign is used for logical not. Logical not is unary operator, requires only one operand. Logical not also require relational expression as operand on right hand side like"! (a>b)". Logical and reverse the result of expression for example if expression a>b is true and we have ! operator it will give result false and vice versa. Let us consider some examples with results:

!(2==2)	false	!(2==3)	true
!(2>3 && 3==4)	true	!(2>3 3==4)	false

Again we can write logical expressions inside print statement it will print true or false, for example consider following program and its output:

<pre>class LogicalOperators{ public static void main(String []args){ System.out.println(!(4>3)); System.out.println(!(3>1) && 4!=3); System.out.println(!(3>1 && 4!=3)); System.out.println(!(3>1 4!=3)); System.out.println(!(3>1) 4!=3); System.out.println(4!=5 && 5!=6); } }</pre>	Output: false false false false true true
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