R Operators

Arithmetic, Relational, Logical and More

R has several operators to perform tasks including arithmetic, logical and bitwise operations. In this article, you will learn about different R operators with the help of examples.

R has many operators to carry out different mathematical and logical operations.

Operators in R can mainly be classified into the following categories.

Type of operators in R
Arithmetic operators
Relational operators
Logical operators
Assignment operators

R Arithmetic Operators

These operators are used to carry out mathematical operations like addition and multiplication. Here is a list of arithmetic operators available in R.

Arithmetic, Relational, Logical and More

Arithmetic Operators in R

Operator	Description
+	Addition
–	Subtraction
*	Multiplication
/	Division
^	Exponent
%%	Modulus (Remainder from division)
%/%	Integer Division

An example run

```
> x <- 5
> y <- 16
> x+y
[1] 21
> x-y
[1] -11
> x*y
[1] 80
> y/x
[1] 3.2
> y%/%x
[1] 3
> y%%x
[1] 1
> y^x
[1] 1048576
```

R Relational Operators

Relational operators are used to compare between values. Here is a list of relational operators available in R.

Relational Operators in R

Operator	Description
<	Less than
>	Greater than
<=	Less than or equal to
>=	Greater than or equal to
==	Equal to
!=	Not equal to

An example run

```
> x <- 5
> y <- 16
> x<y
[1] TRUE
> x>y
[1] FALSE
> x<=5
[1] TRUE
> y>=20
[1] FALSE
> y == 16
[1] TRUE
> x != 5
[1] FALSE
```

Operation on Vectors

The above mentioned operators work on vectors. The variables used above were in fact single element vectors.

We can use the function `c()` (as in concatenate) to make vectors in R.

All operations are carried out in element-wise fashion. Here is an example.

```
> x <- c(2,8,3)
> y <- c(6,4,1)
> x+y
[1]  8 12  4
> x>y
[1] FALSE  TRUE  TRUE
```

When there is a mismatch in length (number of elements) of operand vectors, the elements in shorter one is recycled in a cyclic manner to match the length of the longer one.

R will issue a warning if the length of the longer vector is not an integral multiple of the shorter vector.

```
> x <- c(2,1,8,3)
> y <- c(9,4)
> x+y # Element of y is recycled to 9,4,9,4
[1] 11  5 17  7
> x-1 # Scalar 1 is recycled to 1,1,1,1
[1] 1 0 7 2
> x+c(1,2,3)
[1]  3  3 11  4
Warning message:
In x + c(1, 2, 3) :
longer object length is not a multiple of shorter object length
```

R Logical Operators

Logical operators are used to carry out Boolean operations like `AND`, `OR` etc.

Logical Operators in R

Operator	Description
!	Logical NOT
&	Element-wise logical AND
&&	Logical AND
|	Element-wise logical OR
||	Logical OR

Operators `&` and `|` perform element-wise operation producing result having length of the longer operand.

But `&&` and `||` examines only the first element of the operands resulting into a single length logical vector.

Zero is considered `FALSE` and non-zero numbers are taken as `TRUE`. An example run.

```
> x <- c(TRUE,FALSE,0,6)
> y <- c(FALSE,TRUE,FALSE,TRUE)
> !x
[1] FALSE  TRUE  TRUE FALSE
> x&y
[1] FALSE FALSE FALSE  TRUE
> x&&y
[1] FALSE
> x|y
[1]  TRUE  TRUE FALSE  TRUE
> x||y
[1] TRUE
```

R Assignment Operators

These operators are used to assign values to variables.

Assignment Operators in R

Operator	Description
<-, <<-, =	Leftwards assignment
->, ->>	Rightwards assignment

The operators `<-` and `=` can be used, almost interchangeably, to assign to variable in the same environment.

The `<<-` operator is used for assigning to variables in the parent environments (more like global assignments). The rightward assignments, although available are rarely used.

```
> x <- 5
> x
[1] 5
> x = 9
> x
[1] 9
> 10 -> x
> x
[1] 10
```