Introduction to R Software

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Lecture 15

Truth Table and Conditional Executions

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Slides can be downloaded from

http://home.iitk.ac.in/~shalab/sp

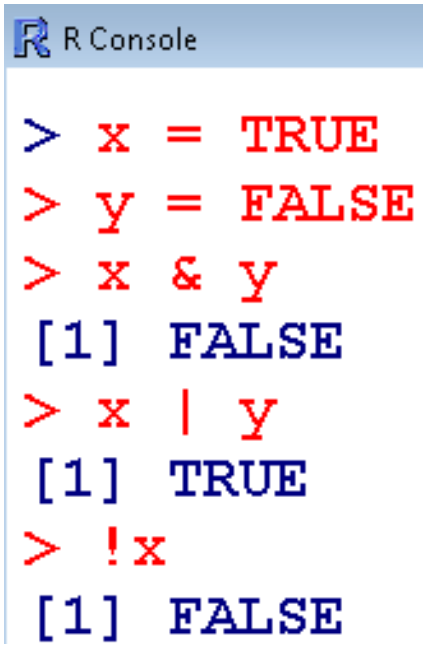
Example of Standard logical operations

Truth table

Statement 1 :: (x)	Statement 2 :: (y)	Outcome :: x and y	Outcome :: x or y
True	True	True	True
True	False	False	True
False	True	False	True
False	False	False	False

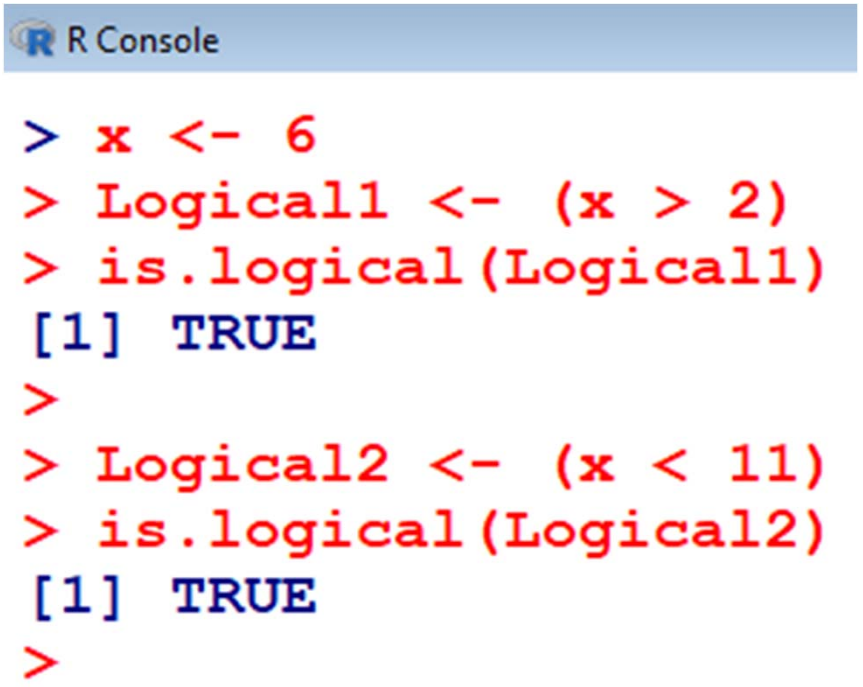
Example of Standard logical operations

```
> x = TRUE
> y = FALSE

> x & y      # x AND y
[1] FALSE

> x | y      # x OR y
[1] TRUE

> !x         # negation of x
[1] FALSE
```



Example

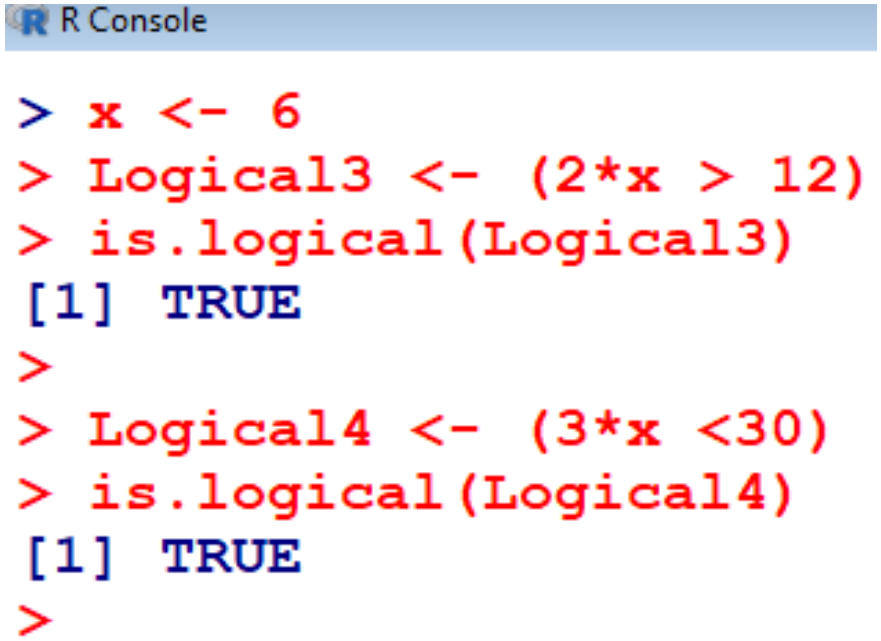
```
> x <- 6
> Logical1 <- (x > 2)
> is.logical(Logical1)
[1] TRUE
```




```
> Logical2 <- (x < 11)
> is.logical(Logical2)
[1] TRUE
```

Examples

```
> x <- 6
> Logical3 <- (2*x > 12)
> is.logical(Logical3)
[1] TRUE
```




```
> Logical4 <- (3*x <30)
> is.logical(Logical4)
[1] TRUE
```

Control structures in R :

Control statements,

loops,

functions

Conditional execution

1. Conditional execution

Syntax

```
if (condition) {executes commands if condition is TRUE}
if (condition) {executes commands if condition is TRUE}
else { executes commands if condition is FALSE }
```

Please note:

- **The condition in this control statement may not be vector valued and if so, only the first element of the vector is used.**

- **The condition may be a complex expression where the logical operators "and" (&&) and "or" (| |) can be used.**

1. Conditional execution

Example

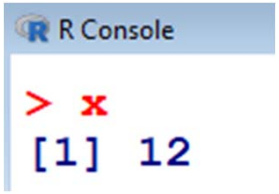
```
> x <- 6
> if ( x==3 ) { x <- x-1 } else { x <- 2*x }
```

Interpretation:

- If x = 3, then execute x = x – 1.
- If x ≠ 3, then execute x = 2*x.

In this case, x = 5, so x ≠ 3. Thus x = 10

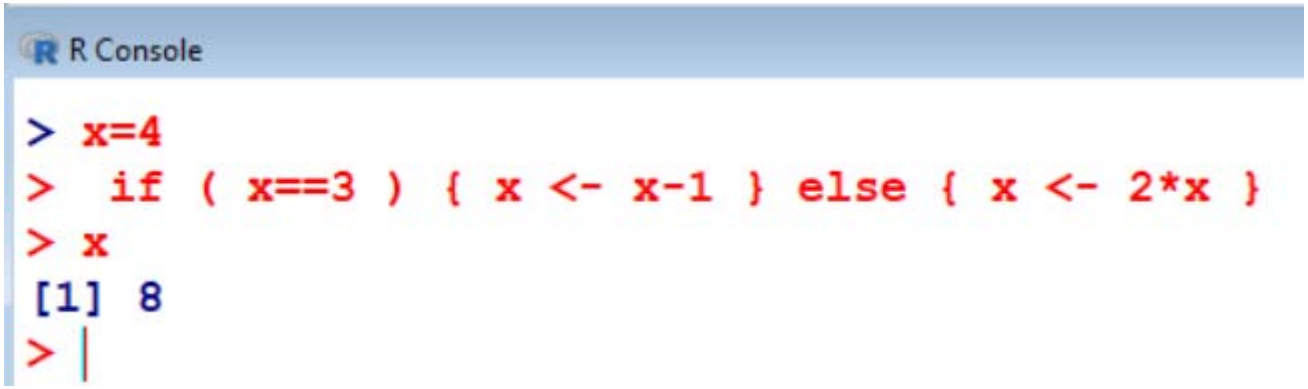
```
> x
 [1] 12
```



1. Conditional execution

Examples

```
> x <- 4
> if ( x==3 ) { x <- x-1 } else { x <- 2*x }
> x
[1] 8
```



Interpretation:

- If x = 3, then execute x = x – 1.
- If x ≠ 3, then execute x = 2*x.

1. Conditional execution

Examples

```
> x <- 8

> if ( x^3+x^2+4 > 30 ) { x <- log(x^2) } else
{ x <- exp(2*x)+log(x) }

> x
[1] 4.158883
```

1. Conditional execution

Examples

```
> x <- 8

> if ( x^3+x^2+4 > 30 ) { x <- log(x^2) } else
{ x <- exp(2*x)+log(x) }

> x
[1] 4.158883
```

2. Conditional execution

Syntax

```
ifelse(test, yes, no)
```

- **Vector-valued evaluation of conditions .**
- **For the components in the vector-valued logical expression `test` which provide the value TRUE, the operations given by `yes` are executed.**
- **For the components in the vector-valued logical expression `test` which provide the value FALSE, the operations given by `no` are executed.**

2. Conditional execution

Examples

```
> x <- 1:10
> x
 [1] 1 2 3 4 5 6 7 8 9 10
> ifelse( x<5, x^2, x+1 )
 [1] 1  4  9 16  6  7  8  9 10 11
```

Interpretation

- If $x < 5$ (TRUE), then $x = x^2$ (YES) .
- If $x \geq 5$ (FALSE), then $x = x + 1$ (NO).

- So for $x = 1, 2, 3, 4, 5$, we get $x = x^2 = 1, 4, 9, 16, 25$
- For $x=6, 7, 8, 9, 10$, we get $x= x+1 = 7, 8, 9, 0, 11$

2. Conditional execution