

Introduction to R Software

Swayam Prabha

Lecture 13

Missing Data and Logical Operators

Shalabh

Department of Mathematics and Statistics

Indian Institute of Technology Kanpur

Slides can be downloaded from
<http://home.iitk.ac.in/~shalab/sp>



Missing data

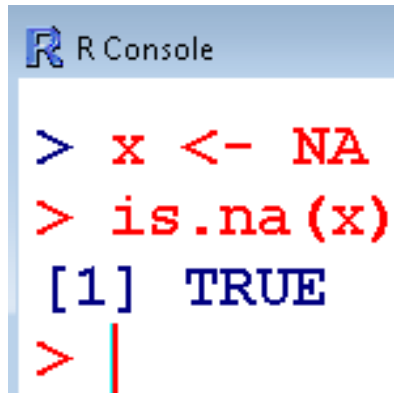
R represents missing observations through the data value `NA`

We can detect missing values using `is.na`

```
> x <- NA # assign NA to variable x
```

```
> is.na(x) # is it missing?
```

```
[1] TRUE
```



```
R Console  
> x <- NA  
> is.na(x)  
[1] TRUE  
> |
```

Missing data

Now try a vector to know if any value is missing?

```
> x <- c(12, NA, 14)
```

```
> is.na(x)
```

```
[1] FALSE TRUE FALSE
```

```
R Console  
  
> x <- c(12, NA, 14)  
>  
> is.na(x)  
[1] FALSE TRUE FALSE  
>
```

Example : How to work with missing data

```
> x <- c(12,NA,14) # vector
```

```
> mean(x)  $\frac{12+NA+14}{2}$   
[1] NA
```

```
> mean(x, na.rm = TRUE) # NAs can be removed  
[1] 12  $\frac{12+14}{2} = 13$ 
```

Example : How to work with missing data

The null object, called **NULL**, is returned by some functions and expressions.

Note that **NA** and **NULL** are not the same.

NA is a placeholder for something that exists but is missing.

NULL stands for something that never existed at all.

Logical Operators and Comparisons

The following table shows the operations and functions for logical comparisons (True or False).

TRUE and **FALSE** are reserved words denoting logical constants.

Operator	Executions
>	Greater than
>=	Greater than or equal
<	Less than
<=	Less than or equal
==	Exactly equal to
!=	Not equal to
!	Negation (not)

Logical Operators and Comparisons

Operator	Executions
<code>&</code> , <code>&&</code>	and
<code> </code> , <code> </code>	or

- The shorter form performs element-wise comparisons in almost the same way as arithmetic operators.
- The longer form evaluates left to right examining only the first element of each vector. Evaluation proceeds only until the result is determined.

Logical Operators and Comparisons

TRUE and FALSE are reserved words denoting logical constants

Operator	Executions
<code>xor ()</code>	either... or (exclusive)
<code>isTRUE(x)</code>	test if <code>x</code> is TRUE
<code>TRUE</code>	true
<code>FALSE</code>	false

Examples:

```
> 8 > 6
```

```
[1] TRUE
```

```
> 9 < 4
```

```
[1] FALSE
```

Is 7 less than 5?

```
> isTRUE(7<5)
```

```
[1] FALSE
```

Is 4 greater than 3?

```
> isTRUE(4>3)
```

```
[1] TRUE
```

```
R Console
> 8 > 6
[1] TRUE
>
> 9 < 4
[1] FALSE
>
> isTRUE(7<5)
[1] FALSE
>
> isTRUE(4>3)
[1] TRUE
>
.
```