

A minimalistic introduction to R

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This document recycles tutorials written by Koen van Benthem and Tina Cornioley

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There are many ways to achieve the same goal in R, and we do not claim to teach you the most efficient way to use R. If you at some point during the computer practicals encounter a code that you could make more efficient or elegant, please do let us know!

Do try to understand exactly what the code and the functions we use do. The best way to learn how functions work is by either using the R-manual (type `?functionname` or use the RStudio Help tab by clicking on it or pressing F1) or by creating dummy data (just make up a small amount of data yourself, using R if possible!) and analyse what the function does to this data.

How this document works

This is a `knitr` document, which knits R code and output within a \LaTeX document. R code and output is generally contained within boxes with a gray background. Comments within the R code start with a `#` symbol; lines with R-outputs start with `##`.

All the files necessary to go through the workshop are (or should be!) in the folder of a github repository. We recommend you copy these files, or fork the repository if you are a git user.

Now, let's the fun begin.

1 Trash your calculator

1.1 Operators

R can be used as a calculator, and a far more powerful one than any physical calculator. If you use your calculator to enter numbers in R, you are being inefficient.

Below we demonstrate the use of some basic mathematical operators:

```
1+3 #addition

## [1] 4

5-2 #subtraction

## [1] 3

6*4 #multiplication

## [1] 24

14/2 #division

## [1] 7

2^3 #exponent

## [1] 8

2**3 #or equivalently

## [1] 8
```

There are many mathematical functions already present in R:

```

exp(3) #exponential

## [1] 20.08554

log(2.71) #logarithm

## [1] 0.9969486

sqrt(9) #square root, which of course you can also write as:

## [1] 3

9 ^ (1/2)

## [1] 3

sin(pi/2); cos(1); tan(pi/3) #trigonometric functions

## [1] 1
## [1] 0.5403023
## [1] 1.732051

```

Small Use R to compute

$$y = \frac{1}{2\sqrt{2\pi}} e^{\frac{-1}{2}(\frac{3-\pi}{2})^2}$$

Logical operators are very important for programming and scripting. You can test whether two things are equal with double = signs:

```

3 == 6/2 #is 3 equal to 6/2? TRUE!

## [1] TRUE

3 == pi # FALSE!

## [1] FALSE

```

You can also test if they are NOT equal with the operator !=:

```

2 != 3

## [1] TRUE

2 != 2

## [1] FALSE

```

The AND operator is &

```
2 == 2 & 3==3  
## [1] TRUE  
2 ==2 & 3==2  
## [1] FALSE
```

The OR operator is |

```
2 == 2 | 3==2  
## [1] TRUE  
2 == 4 | 3==2  
## [1] FALSE
```

1.2 Assignment

2 loops and if statements

2.1 for loops

2.2 while loops

2.3 if statements