

A Gentle Introduction to R

Jonathan Whiteley


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Pop Quiz

We will review these *at the end*, so you can see how much you have learned.

- What does 'CRAN' stand for?
- Why is it called 'R'?
- How can you use R *interactively*?
- How do you find out what a function does & how to use it?
- How do you store values to re-use later?
- True or False: Warnings can be ignored, but an Error means I made a mistake.
- True or False: Error messages will tell me how to fix the problem.

Learning Objectives

- Get familiar with the  *interface*
- Enter *commands*
 - ▶ input & output: using R interactively
 - ▶ use some common *functions*
- Understand *Errors & Warnings*
- Use technical *terms* for R concepts
- How to get Help

Why is it named ?

- R started as an *open-source* implementation of the S statistical computing language (S-PLUS)
 - ▶ S was created at Bell Laboratories in 1976
 - ▶ R was based on the S syntax (mostly v3), but works very differently “under the hood”.
- R was created by Ross Ihaka and Robert Gentleman at the University of Auckland in the early 1990s.

The interface

- R has a slightly different interface for each **O**perating **S**ystem (OS)
 - ▶ GUI = **G**raphical **U**ser **I**nterface
- In every case, you interact with R primarily using a *command line*
 - ▶ aka “Question-and-Answer Model”
 - ▶ You ask R to do something (a *command*),
and R tells you the answer (*result*).
 - ▶ Instructions are given to R using the *R language*.

The command-line

- The command *prompt* normally looks like this:

>

(the colour varies, depending on the interface)

- ▶ This is R's way of saying "I am ready to accept new commands".
- ▶ Type a new command on the line after this prompt (i.e., *input*).
- **Press `return`/`enter` to execute the current command**
- If the prompt looks like this:
+
it means the last command was *incomplete* and R is waiting for more input.
R will not do anything until the command is completed or cancelled.
 - ▶ This usually means you forgot a closing
quote `"`, parenthesis `(`, bracket `[`, or brace `{`
- You can *cancel* the current command at any time by pressing escape
(`esc`)

In this presentation,

- *commands* that can be entered in the *command-line* look like this:

```
Input (commands)
```

- Expected output (results) look like this:

```
## Output (results)
```

is a show-off

```
demo(graphics)
```

- some plots and graphs that can be made with R

```
demo(image)
```

- image-like graphics and maps that can be made with R
a line of plain text.

```
demo()  
Text with  
print("inline code").
```

- bullet point

```
demo()
```

← description.

```
demo()
```

a block of monospace text.

is a show-off (2)

```
demo(graphics)  #  
demo(image)     #  
demo(lm.glm)    #  
demo()          #  
  
help.start()    #
```

A great place to start, especially if you are comfortable reading documentation for a programming language.
More on this later.

- some plots and graphs that can be made with R
- image-like graphics and maps that can be made with R
- a demonstration of linear modelling & GLMs
- a list of available demos

Note that R will not only show the output, but also *the code used to produce it.*

```
1 + 1
```

```
## [1] 2
```

```
2 * 2
```

```
## [1] 4
```

```
2^3
```

```
## [1] 8
```

```
10 - 1
```

```
## [1] 9
```

```
8 / 2
```

```
## [1] 4
```

```
sqrt(9)
```

```
## [1] 3
```

- These are *expressions*
- *Expressions* are *evaluated*, and the *value* (result) is *returned* (sometimes *invisibly*)

- With the cursor next to the empty prompt (`>`), use the up & down **arrow keys** (`↑↓`) to re-produce previous commands
- This lets you “scroll through your *command history*”
- Press **up** (`↑`) once, and you get the last command you entered without having to copy & paste

Symbolic *variables*

- You can store values (*objects*) in symbolic variables (*names*) using an *assignment operator*

`<-` assign the *value* on the **right** to the *name* on the **left**

- Names can include:

letters	a-z A-Z
numbers	0-9
periods	.
underscores	_

```
A <- 10
B <- 10 * 10
A_log <- log(A)
B.seq <- 1:B

assign('x', 3)
```

- Names *should begin with a letter*



References & More Information

```
help.start()
```

Available from the above screen:

- An Introduction to R
- The R Language Definition

Online:

- RStudio Education (education.rstudio.com)
 - ▶ tutorials, workshop materials, and other resources.
-  Manuals (<https://cran.r-project.org/manuals.html>)
-  Contributed Documentation
 - ▶ e.g., <http://cran.r-project.org/doc/contrib/usingR.pdf>
- Internet search
 - ▶ Stack Overflow (stackoverflow.com)
 - ▶ Cookbook for R (www.cookbook-r.com)