

Reproducible Research – practical

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30/03/2017

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Markdown is a simple formatting language designed to make authoring content easy for everyone. Rather than write in complex markup code (e.g. HTML or LaTeX), you write in plain text



The image shows two windows side-by-side. The left window, titled 'example.Rmd', displays the source R Markdown code. The right window, titled 'example.html', shows the rendered HTML output of the same document.

Left Window (Source R Markdown):

```

1 # Header 1
2
3 This is an R Markdown document. Markdown is a
4 simple formatting syntax for authoring webpages.
5
6 Use an asterisk mark to provide emphasis, such
7 as *italics* or **bold**.
8
9 Create lists with a dash:
10
11 - Item 1
12 - Item 2
13 - Item 3
14
15 Use back ticks to
16 create a block of code
17
18 Embed LaTeX or MathML equations,
19 
$$\frac{1}{n} \sum_{i=1}^n x_i$$

20
21 Or even footnotes, citations, and a
22 bibliography. [^1]
23
24 [^1]: Markdown is great.
  
```

Right Window (Rendered HTML):

Header 1

This is an R Markdown document. Markdown is a simple formatting syntax for authoring web pages.

Use an asterisk mark to provide emphasis, such as *italics* or **bold**.

Create lists with a dash:

- Item 1
- Item 2
- Item 3

Use back ticks to create a block of code

Embed LaTeX or MathML equations,
$$\frac{1}{n} \sum_{i=1}^n x_i$$

Or even footnotes, citations, and a bibliography. ¹

1. Markdown is great. ↩

- Header
- Text
- Inline R code
- Code chunks

Header

- R Markdown documents can contain a metadata section that includes title, author, and date information
- As well as options for customizing output

```
---  
title: "Wheat infected by Xanthomonas protein analysis"  
author: "University of Insubria - Dept. of Biotechnology and Life Science"  
output:  
  pdf_document:  
    includes:  
      in_header: header.tex  
  number_sections: yes  
  toc: yes  
  toc_depth: 4  
  fig_caption: true  
  fig_width: 10  
  fig_height: 8  
---
```

Text

- Text can be added to comment you code
- Text can be added to comment your outputs

```
## R Markdown
```

```
This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see <http://rmarkdown.rstudio.com>  
List:
```

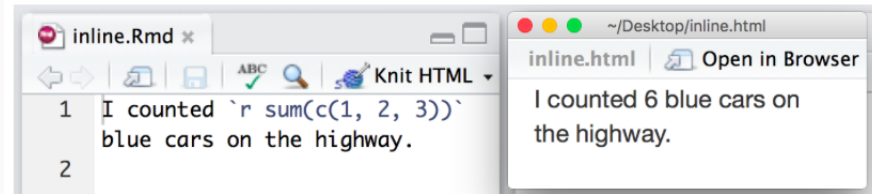
- ```
- Element 1
- **Element 2**
- *Element 3*[^1]
```

```
[^1]: Note
```

[http://rmarkdown.rstudio.com/authoring\\_basics.html](http://rmarkdown.rstudio.com/authoring_basics.html)

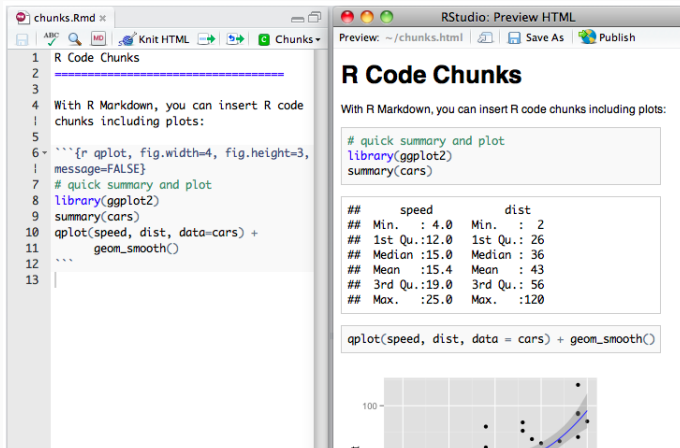
## Inline R code

- R expressions can be evaluated inline
- Enclosing the expression within a single back-tick qualified with r.



## R chunk

- R Code Chunks can be embedded with the native Markdown syntax for fenced code regions



The screenshot displays the RStudio interface with two windows. The left window, titled 'chunks.Rmd', shows an R Markdown document with the following content:

```
1 R Code Chunks
2 =====
3
4 With R Markdown, you can insert R code
5 chunks including plots:
6
7 ```{r qplot, fig.width=4, fig.height=3,
8 message=FALSE}
9 # quick summary and plot
10 library(ggplot2)
11 summary(cars)
12 qplot(speed, dist, data=cars) +
13 geom_smooth()
```

The right window, titled 'RStudio: Preview HTML', shows the rendered HTML output. It includes the title 'R Code Chunks', a paragraph explaining R code chunks, a code block for a quick summary and plot, a table of summary statistics for the 'cars' dataset, and a plot command. The table data is as follows:

|            | speed | dist        |
|------------|-------|-------------|
| ## Min.    | 4.0   | Min. : 2    |
| ## 1st Qu. | 12.0  | 1st Qu.: 26 |
| ## Median  | 15.0  | Median : 36 |
| ## Mean    | 15.4  | Mean : 43   |
| ## 3rd Qu. | 19.0  | 3rd Qu.: 56 |
| ## Max.    | 25.0  | Max. : 120  |

Below the table, the plot command is shown: `qplot(speed, dist, data = cars) + geom_smooth()`. At the bottom, a partial view of the resulting scatter plot with a smoothed regression line is visible.



### R chunk options [few of them]

There are six types of output:

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- **messages**: option message ('FALSE' hides messages in the output)

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- **warnings**: option `warning` ('FALSE' hides warnings in the output)

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- **messages**: option message ('FALSE' hides messages in the output)
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- **errors**: option error ('FALSE' will make R stop if an error occurs; 'TRUE' will show the error messages in the output)

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- **messages**: option message ('FALSE' hides messages in the output)
- **warnings**: option warning ('FALSE' hides warnings in the output)
- **errors**: option error ('FALSE' will make R stop if an error occurs; 'TRUE' will show the error messages in the output)
- **plots**: option 'fig.keep' ('none' discards all plots; 'all' for all plots including low-level plots; 'high' for high-level plots)

# Exercise 1

GOAL: CREATE A DEFAULT MINIMAL DOCUMENT

- Open RStudio

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- Open RStudio
- Select File > New file > R Markdown



# Exercise 1

GOAL: CREATE A DEFAULT MINIMAL DOCUMENT

- Open RStudio
- Select File > New file > R Markdown
- Create an HTML document

# Exercise 1

Untitled1 \*  
Untitled.Rmd

Run Knit HTML Chunks

```
1- ---
2 title: "Untitled"
3 author: "Marco Chiapello"
4 date: "11 June 2016"
5 output: html_document
6- ---
7
8 This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word
9 documents. For more details on using R Markdown see <http://rmarkdown.rstudio.com>.
10
11 When you click the Knit button a document will be generated that includes both content as well as the
12 output of any embedded R code chunks within the document. You can embed an R code chunk like this:
13
14 ```{r}
15 summary(cars)
16 ```
17
18 You can also embed plots, for example:
19
20 ```{r, echo=FALSE}
21 plot(cars)
22 ```
23
24 Note that the 'echo = FALSE' parameter was added to the code chunk to prevent printing of the R code that
25 generated the plot.
```

Viewer

## Untitled

Marco Chiapello

11 June 2016

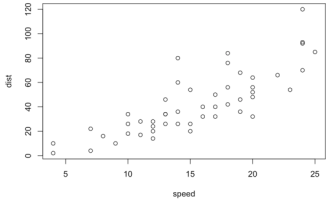
This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see <http://rmarkdown.rstudio.com>.

When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

summary(cars)

|    | speed        | dist           |
|----|--------------|----------------|
| ## | Min. : 4.0   | Min. : 2.00    |
| ## | 1st Qu.:12.0 | 1st Qu.: 26.00 |
| ## | Median :15.0 | Median : 36.00 |
| ## | Mean :15.4   | Mean : 42.98   |
| ## | 3rd Qu.:19.0 | 3rd Qu.: 54.00 |
| ## | Max. :25.0   | Max. :120.00   |

You can also embed plots, for example:



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- Open RStudio
- Select File > New file > R Markdown
- Create an HTML document
- Suppress the printing of the R code

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- Open RStudio
- Select File > New file > R Markdown
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- Suppress the printing of the R code
- Suppress the printing of the R results

# Exercise 1

GOAL: CREATE A DEFAULT MINIMAL DOCUMENT

- Open RStudio
- Select File > New file > R Markdown
- Create an HTML document
- Suppress the printing of the R code
- Suppress the printing of the R results
- Suppress the printing of the plot

## Exercise 2

GOAL: CREATE A DEFAULT MINIMAL DOCUMENT IN OTHER FORMATS

- Create a pdf document
- Create a docx document

## Exercise 3

GOAL: CREATE A RMARKDOWN DOCUMENT

- Using the data from yesterday exercise
- Create a document containing analysis, plots and comments
- Save the document and upload it on course GitHub repository