

**R you ready?**

**IntRo to RStudio and R Markdown  
for open data and reproducibility**

Unit 6:

**Code chunks in R Markdown**

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**NOTEBOOKS ARE AWESOME!  
RMARKDOWN IS AWESOME!**



**EVERYTHING IS AWESOME!**

memegenerator.net

# R Markdown: What is it?

**Coding language that allows for text-to-HTML conversion**

**Easy-to-read and easy-to-write plain text format**

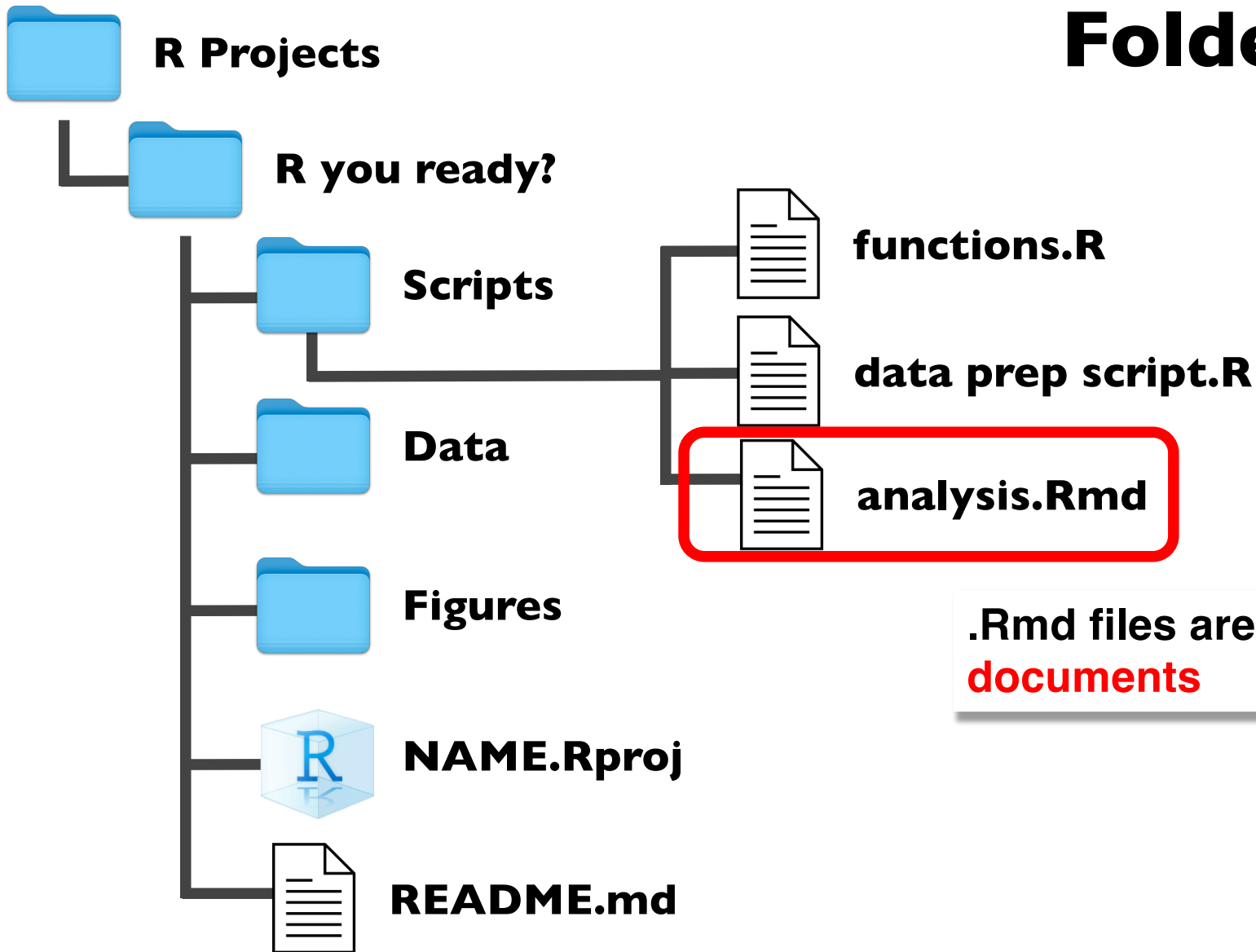
**Can create R Markdown documents (HTML, Word, PDF),  
websites, Markdown books, etc.**

**Websites → <https://rstudio.github.io/distill/website.html>**

**Books → <https://bookdown.org/yihui/bookdown/>**

**Documents → <https://bookdown.org/yihui/rmarkdown/>**

# Folder structure



.Rmd files are **R Markdown documents**

```
1 ---
2 title: "Untitled"
3 author: "Olivier Gimenez"
4 date: "10/24/2020"
5 output: html_document
6 ---
7
8 ```{r setup, include=FALSE}
9 knitr::opts_chunk$set(echo = TRUE)
10 ```
11
12 ## R Markdown
13
14 This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML,
15 PDF, and MS Word documents. For more details on using R Markdown see
16 <http://rmarkdown.rstudio.com>.
17
18 When you click the **Knit** button on the toolbar, you will see the output of this document,
19 as well as the output of each code chunk.
20
21
22 ## Including Plots
23
24 You can also embed plots, for example, using the plot() function.
25
26 ```{r pressure, echo=FALSE}
27 plot(pressure)
28 ```
29
30 Note that the `echo = FALSE` parameter was added to the code chunk to prevent
31 R code from being displayed in the output document.
```

Front matter

keep a **thorough record** of your analysis

**supplementary material** for your publications/theses

**RECORD** what you have **DONE!!!!**

**GROUP** your code into **CHUNKS**

render the R Markdown into **easy-to-read documents**



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8 ```{r setup, include=FALSE}
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15
16 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:
17
18 ```{r cars}
19 summary(cars)
20 ```
21
22 ## Including Plots
23
24 You can also embed plots, for example:
25
26 ```{r pressure, echo=FALSE}
27 plot(pressure)
28 ```
29
30 Note that the `echo = FALSE` parameter was added to the code chunk to prevent printing of the R code that generated the plot.
31
```

Front matter

metadata section that includes **title, author, and date information as well as options for customizing output**

Chunk

Content

Chunk



```
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2 title: "Untitled"
3 author: "Olivier Gimenez"
4 date: "10/24/2020"
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27 plot(pressure)
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31 R code that generated the plot.
```

**global settings to be applied to the R Markdown script**



```
1 ---
2 title: "Untitled"
3 author: "Olivier Gimenez"
4 date: "10/24/2020"
5 output: html_document
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31 plot(pressure)
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34 Note that the `echo = FALSE` parameter was added to the R code that generated the plot.
35
```

Front  
matter

Chunk

Content

Add **content** to your  
markdown document (e.g.  
descriptions, explicit info,  
etc.)





```
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2 title: "Untitled"
3 author: "Olivier Gimenez"
4 date: "10/24/2020"
5 output: html_document
6 ---
7
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31
```

**Add code chunks (= sections of code that are run in the final document) to your markdown document**



```
1 ---
2 title: "Untitled"
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30 Note that the `echo = FALSE` parameter was added to the code chunk to prevent printing of the R code that generated the plot.
31
```

**Add code chunks (= sections of code that are run in the final document) to your markdown document**

**echo = FALSE, only include OUTPUT**



# Install R Markdown

Everyone, go ahead and type in the following code:

```
> install.packages("rmarkdown")
```

**OR**  
open an R Markdown  
document → this should  
automatically install the  
package

A screenshot of the RStudio interface. The top pane shows a file browser with a list of file types: R Script, R Notebook, R Markdown..., Shiny Web App..., Plumber API..., Text File, C++ File, Python Script, SQL Script, Stan File, D3 Script, R Sweave, R HTML, R Presentation, and R Documentation... The middle pane shows a code editor with R code. The code includes a comment in Spanish: "definido la nueva variable, necesitamos definir lo que debe incluirse en la lista. Como queremos categorizar la variable de edad (lo que realmente queremos hacer en la vida real, pero para practicar, es un ejemplo fácil), usamos una declaración 'if' que primero toma un argumento para evaluar. El argumento que necesitamos suministrar es 'si el vampiro es más viejo que el que podemos hacer usando la variable 'ageOfVampire' y el operador '>'. Cuando se aplica el argumento 'if', necesitamos el argumento 'then do', es decir, ¿qué sucede cuando este argumento es verdadero? En este caso, todos los vampiros mayores de 100 años se categorizan como 'old', así que suministramos la función con 'old'. La función final toma la parte 'else', es decir, ¿qué sucede cuando el primer argumento no es verdadero? Como solo queremos categorizar la variable en old and young, si no es old, entonces deben ser jóvenes, así que suministramos el argumento final con el valor 'young'." Below the comment, there is R code: 

```
35 {r}
36
37 Vampires = Vampires %>%
38   mutate(VampOld = ifelse(ageOfVampire > 100, "Old", "Young"))
```

 The bottom status bar shows "48:1 # Exercise 2" and "R Markdown".

```
1 ---
2 |title: "Untitled"
3 |author: "Mason A. Wirtz"
4 |date: "2/22/2022"
5 |output: html_document
6 ---
7
8 ```{r setup, include=FALSE}
9 knitr::opts_chunk$set(echo = TRUE)
10 ```
11
12 ## R Markdown
13
14 This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS
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26 You can also embed plots, for example:
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28 ```{r pressure, echo=FALSE}
29 plot(pressure)
30 ```
31
32 Note that the `echo = FALSE` parameter was added to the code chunk to prevent printing of the R code that
33 generated the plot.
```

**Headings:** Organize your document according to chapters

**Code chunks:** organize your code in chunks (1 topic/analysis → 1 code chunk)

**Code chunks:** only plot the output

```
example.Rmd x
1 # Header 1
2
3 This is an R Markdown document. Markdown is a
4 simple formatting syntax for authoring webpages.
5 Use an asterisk mark to provide emphasis, such
6 as italics or bold.
7 Create lists with a dash:
8
9 - Item 1
10 - Item 2
11 - Item 3
12
13 ```
14 Use back ticks to
15 create a block of code
16 ```
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.
1:1 # Header 1 R Markdown
```

example.html Open in Browser Find

# 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. <sup>1</sup>

---

1. Markdown is great. ↩

The screenshot shows two windows side-by-side. The left window, titled 'example.Rmd', contains the following code:

```
1 # Header 1
2
3 This is an R Markdown document. Markdown is a
4 simple formatting syntax for authoring webpages.
5 Use an asterisk mark to provide emphasis, such
6 as italics or bold.
7 Create lists with a dash:
8
9 - Item 1
10 - Item 2
11 - Item 3
12
13 ```
14 Use back ticks to
15 create a block of code
16 ```
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 bibliography. [^1]
22
23 [^1]: Markdown is great.
```

The right window, titled 'example.html', shows the rendered output:

# 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. <sup>1</sup>

---

1. Markdown is great. ↩

## Block-level elements

# First-level

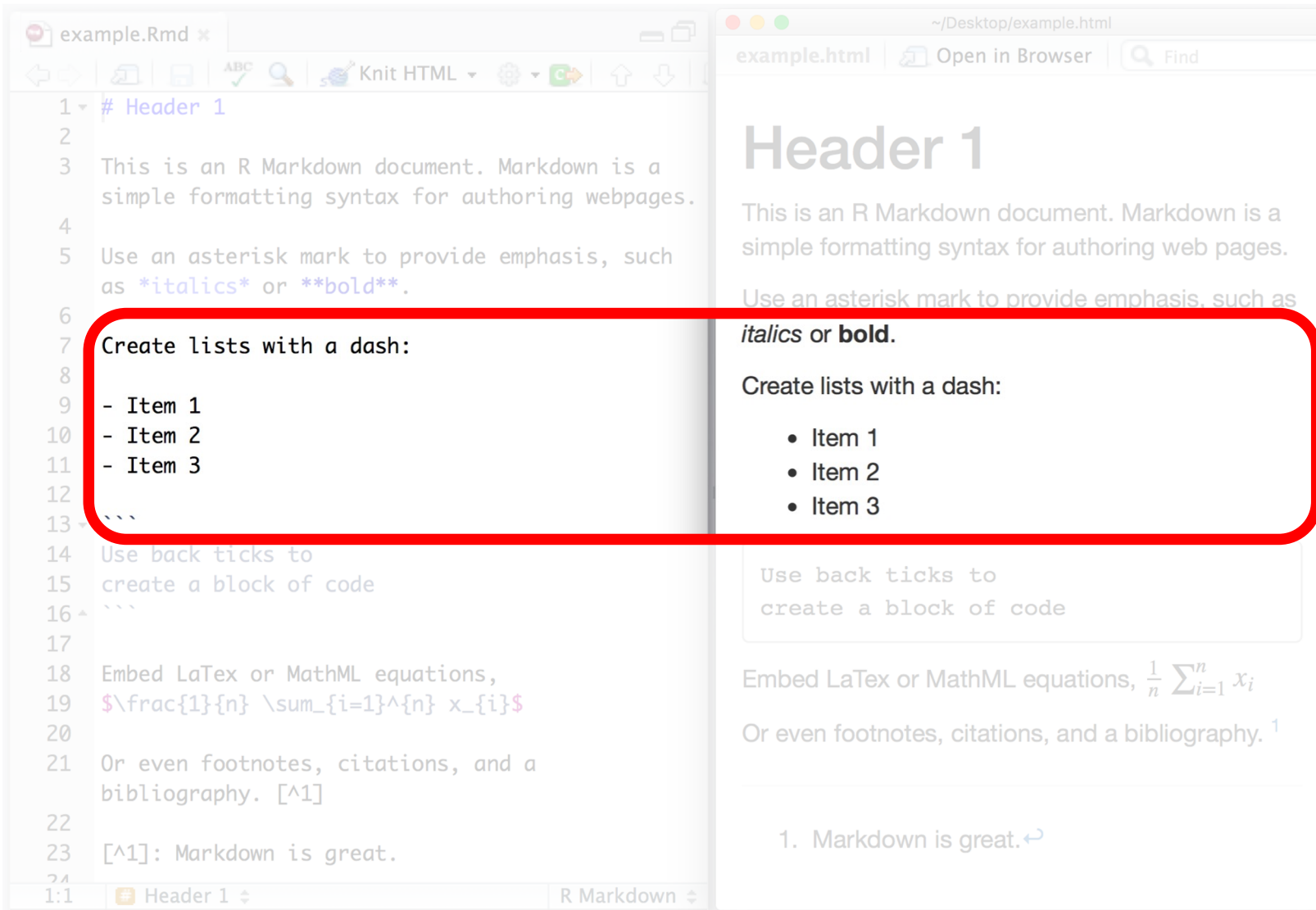
## Second-level

### Third-level

## Inline formatting

*italics*

**bold**



## Unordered lists

- Item 1
- Item 2
- Item 3
  - Item 3.1
  - Item 3.2

## Ordered lists

1. Item 1
2. Item 2
3. Item 3

chunks.Rmd

R Code Chunks

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

RStudio: Preview HTML

Preview: ~/chunks.html Save As Publish

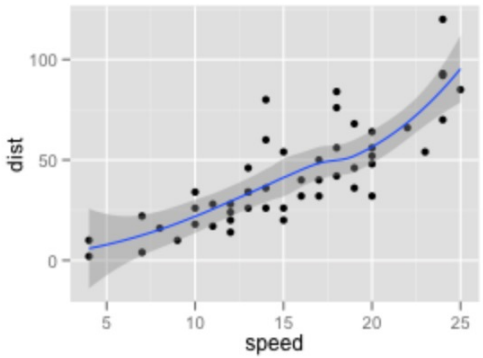
## R Code Chunks

With R Markdown, you can insert R code chunks including plots:

```
# quick summary and plot
library(ggplot2)
summary(cars)
```

##	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

```
qplot(speed, dist, data = cars) + geom_smooth()
```



[https://rmarkdown.rstudio.com/authoring\\_quick\\_tour.html#Markdown\\_Basics](https://rmarkdown.rstudio.com/authoring_quick_tour.html#Markdown_Basics)



The screenshot shows the RStudio interface with two panes. The left pane displays the source R code in a file named 'chunks.Rmd'. The right pane shows the rendered HTML output of the code chunks.

**Source Code (Left Pane):**

```

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

```

**Rendered HTML (Right Pane):**

**R Code Chunks**

With R Markdown, you can insert R code chunks including plots:

```

# quick summary and plot
library(ggplot2)
summary(cars)

```

##	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

```

qplot(speed, dist, data = cars) + geom_smooth()

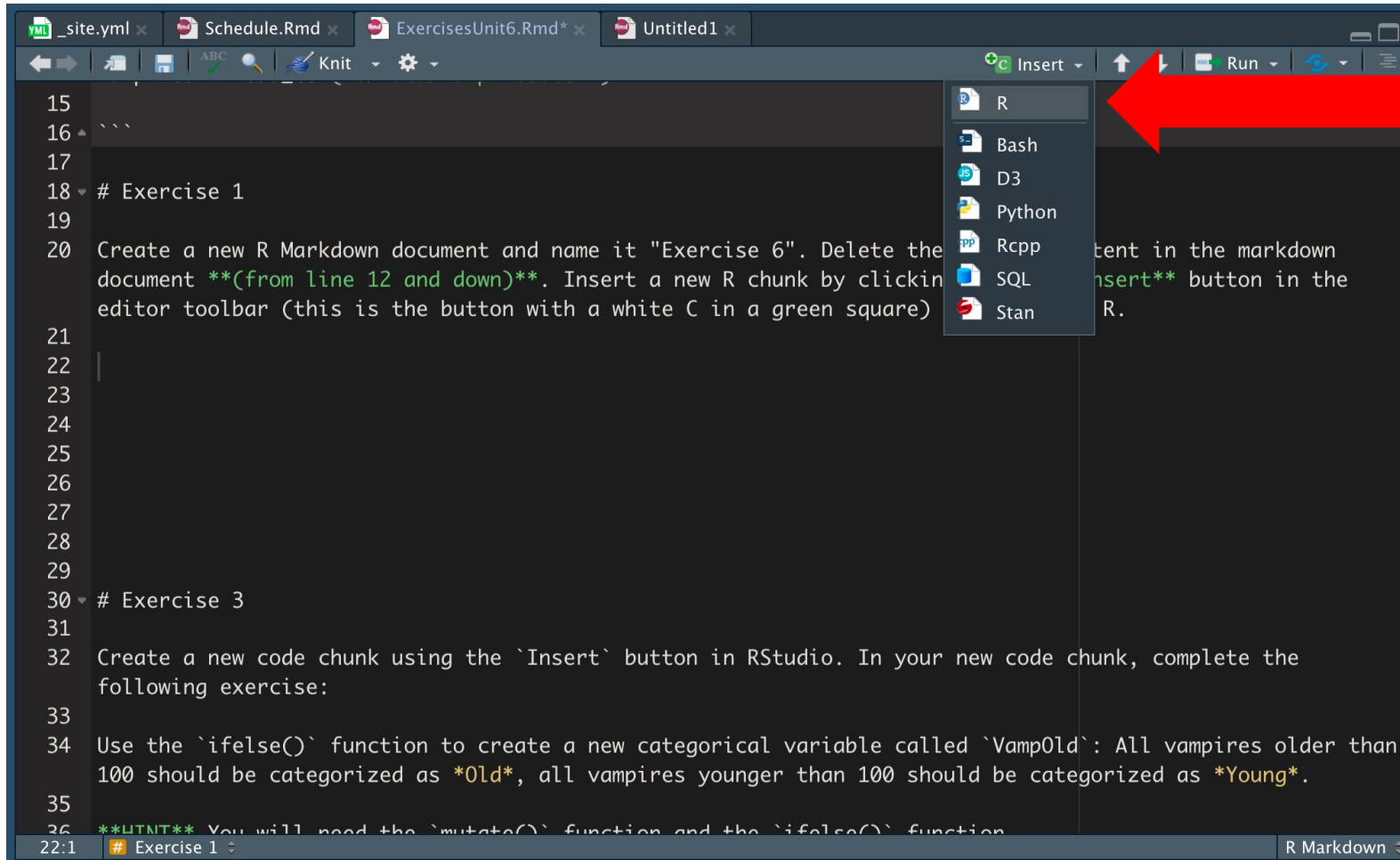
```

## Chunk options

- **eval**: whether to evaluate code chunk
- **echo**: whether to echo source code
- **include**: whether to include a code chunk
- **fig.width / fig.height**: output size of plots in output document
- **out.width / out.height**: output size of plots in output document, using scaling (e.g. `out.width = 80%`)
- See (<https://bookdown.org/yihui/rmarkdown/r-code.html>) for more options

[https://rmarkdown.rstudio.com/authoring\\_quick\\_tour.html#Markdown\\_Basics](https://rmarkdown.rstudio.com/authoring_quick_tour.html#Markdown_Basics)

# Working with chunks



The screenshot shows the RStudio interface with the 'Insert' menu open. The 'R' option is highlighted, and a red arrow points to it. The background text in the editor is as follows:

```
15
16
17
18 # Exercise 1
19
20 Create a new R Markdown document and name it "Exercise 6". Delete the
document **(from line 12 and down)**. Insert a new R chunk by clicking
editor toolbar (this is the button with a white C in a green square)
21
22
23
24
25
26
27
28
29
30 # Exercise 3
31
32 Create a new code chunk using the `Insert` button in RStudio. In your new code chunk, complete the
following exercise:
33
34 Use the `ifelse()` function to create a new categorical variable called `VampOld`: All vampires older than
100 should be categorized as *Old*, all vampires younger than 100 should be categorized as *Young*.
35
36 **[HINT]** You will need the `mutate()` function and the `ifelse()` function
```

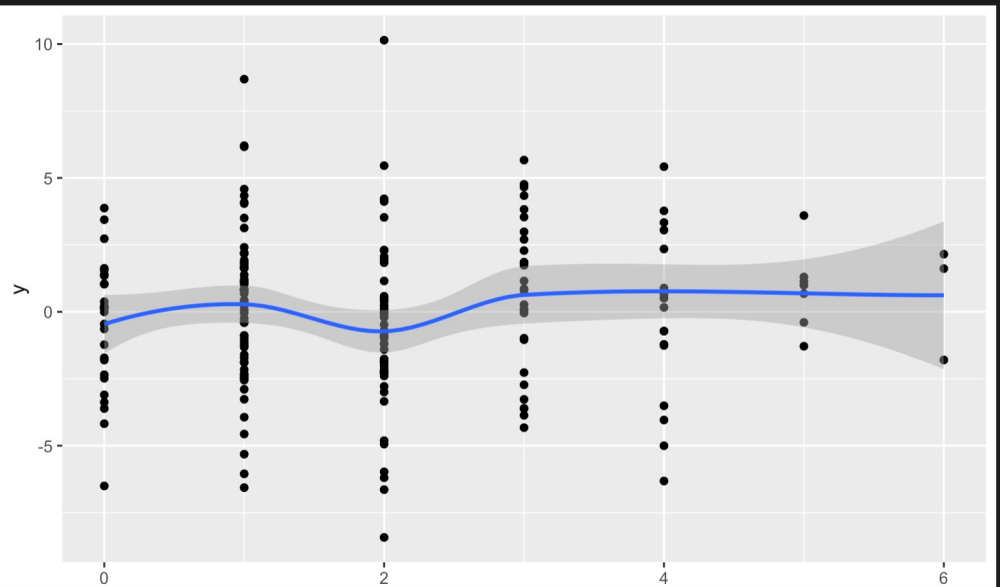
Create a new R code chunk

**We have a code  
now, but how do  
we **run** it?**

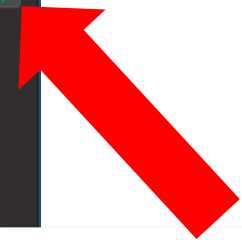
```
_site.yml x Schedule.Rmd x ExercisesUnit6.Rmd x Untitled2* x Untitled1 x
Knit
Insert Run
2 title: "Untitled"
3 author: "Mason A. Wirtz"
4 date: "2/22/2022"
5 output: html_document
6 ---
7
8 ```{r setup, include=FALSE}
9 knitr::opts_chunk$set(echo = TRUE)
10
11 library(tidyverse)
12
13 ```
14
15
16 ```{r}
17
18 tibble(x = rpois(n = 200, lambda = 2),
19        y = rnorm(n = 200, mean = 0, sd = 3)) %>%
20   ggplot(aes(x = x,
21             y = y)) +
22   geom_point() +
23   geom_smooth()
24
25 ```
26
27
28 23:16 Chunk 2 R Markdown
```

```
14
15
16 {r}
17
18 tibble(x = rpois(n = 200, lambda = 2),
19         y = rnorm(n = 200, mean = 0, sd = 3)) %>%
20   ggplot(aes(x = x,
21             y = y)) +
22   geom_point() +
23   geom_smooth()
24
25
```

`geom_smooth()` using method = 'loess' and formula 'y ~ x'



23:17 Chunk 2 R Markdown



**We can run each individual code the same way as in an .R document, OR run the WHOLE code chunk**

# **R Markdown: A few tips**

- ❑ Don't put all your R codes into one big R chunk**
- ❑ Split up your R codes into well-defined small chunks (with names, if possible)**
- ❑ The code in the .Rmd file must be 'self-contained' (i.e. you can't use datasets imported 'outside' the .Rmd file → include all commands for data import in .Rmd file)**
- ❑ Use R Markdown for its strengths: Detail your analyses so that YOU and OTHERS understand your thought/analysis process**

**LET'S GET OUR HANDS DIRTY**



makeameme.org