

# R Markdown :: CHEAT SHEET



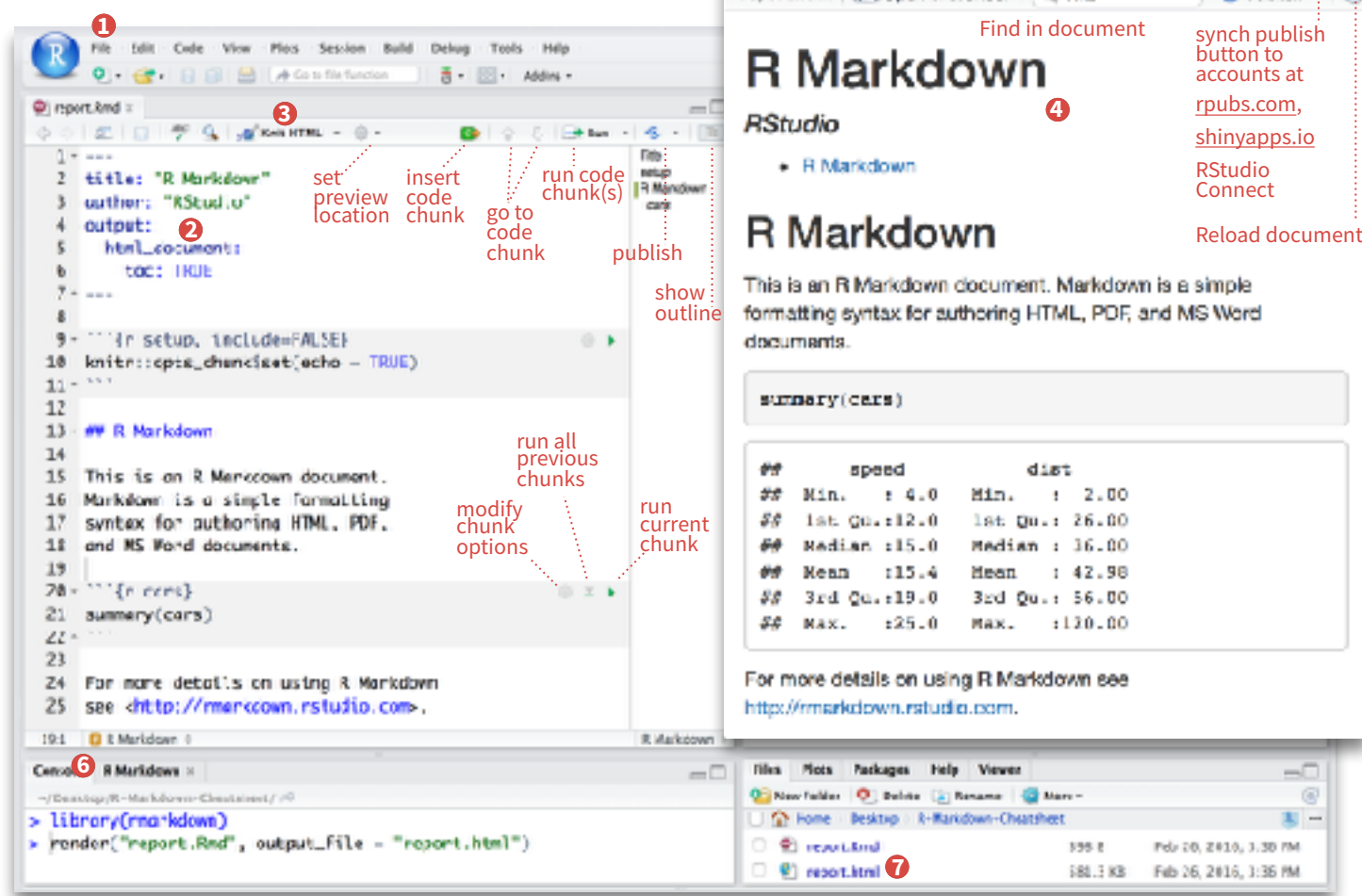
## What is R Markdown?



**.Rmd files** - An R Markdown (.Rmd) file is a record of your research. It contains the code that a scientist needs to reproduce your work along with the narration that a reader needs to understand your work.

**Reproducible Research** - At the click of a button, or the type of a command, you can reproduce the code in an R Markdown file to reproduce your work and export the results as a finished report.

**Dynamic Documents** - You can choose to export the finished report in a variety of formats, including html, pdf, MS Word, or RTF documents; html or pdf based slides, Notebooks, and more.



## Workflow



- 1 **Open a new .Rmd file** at File ► New File ► R Markdown. Use the wizard that opens to pre-populate the file with a template
- 2 **Write document** by editing template
- 3 **Knit document to create report**; use knit button or `render()` to knit
- 4 **Preview Output** in IDE window
- 5 **Publish** (optional) to web server
- 6 **Examine build log** in R Markdown console
- 7 **Use output file** that is saved along side .Rmd

## render

Use `rmarkdown::render()` to render/knit at cmd line. Important args:

|                               |   |                    |                   |                                       |   |                                 |
|-------------------------------|---|--------------------|-------------------|---------------------------------------|---|---------------------------------|
| <b>input</b> - file to render | <b>output_options</b> - List of render options (as in YAML) | <b>output_file</b> | <b>output_dir</b> | <b>params</b> - list of params to use | <b>envir</b> - environment to evaluate code chunks in | <b>encoding</b> - of input file |
|-------------------------------|---|--------------------|-------------------|---------------------------------------|---|---------------------------------|

## Embed code with knitr syntax

**INLINE CODE**  
Insert with ``r <code>``. Results appear as text without code.  
Built with ``r getRversion()`` → Built with 3.2.3

**CODE CHUNKS**  
One or more lines surrounded with ````${r}```` and ````${}````. Place chunk options within curly braces, after `r`. Insert with ````${r, echo=TRUE} getRversion()```${code}````

**GLOBAL OPTIONS**  
Set with `knitr::opts_chunk$set()`, e.g.  
````${r, include=FALSE} knitr::opts_chunk$set(echo = TRUE)```${code}````

## IMPORTANT CHUNK OPTIONS

|                                                                 |                                                                              |                                                                  |                                                                           |                                                                    |                                                                    |                                                                |                                                             |                                                                                                                |                                                  |                                                                       |                                                                      |                                                              |                                                           |                                                                      |                                                                     |                                                                                                                                                                        |                                                       |                                                                     |
|-----------------------------------------------------------------|------------------------------------------------------------------------------|------------------------------------------------------------------|---------------------------------------------------------------------------|--------------------------------------------------------------------|--------------------------------------------------------------------|----------------------------------------------------------------|-------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|--------------------------------------------------|-----------------------------------------------------------------------|----------------------------------------------------------------------|--------------------------------------------------------------|-----------------------------------------------------------|----------------------------------------------------------------------|---------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|---------------------------------------------------------------------|
| <b>cache</b> - cache results for future knits (default = FALSE) | <b>cache.path</b> - directory to save cached results in (default = "cache/") | <b>child</b> - file(s) to knit and then include (default = NULL) | <b>collapse</b> - collapse all output into single block (default = FALSE) | <b>comment</b> - prefix for each line of results (default = '###') | <b>dependson</b> - chunk dependencies for caching (default = NULL) | <b>echo</b> - Display code in output document (default = TRUE) | <b>engine</b> - code language used in chunk (default = 'R') | <b>error</b> - Display error messages in doc (TRUE) or stop render when errors occur (FALSE) (default = FALSE) | <b>eval</b> - Run code in chunk (default = TRUE) | <b>fig.align</b> - 'left', 'right', or 'center' (default = 'default') | <b>fig.cap</b> - figure caption as character string (default = NULL) | <b>fig.height, fig.width</b> - Dimensions of plots in inches | <b>highlight</b> - highlight source code (default = TRUE) | <b>include</b> - Include chunk in doc after running (default = TRUE) | <b>message</b> - display code messages in document (default = TRUE) | <b>results</b> (default = 'markup')<br><b>'asis'</b> - passthrough results<br><b>'hide'</b> - do not display results<br><b>'hold'</b> - put all results below all code | <b>tidy</b> - tidy code for display (default = FALSE) | <b>warning</b> - display code warnings in document (default = TRUE) |
|-----------------------------------------------------------------|------------------------------------------------------------------------------|------------------------------------------------------------------|---------------------------------------------------------------------------|--------------------------------------------------------------------|--------------------------------------------------------------------|----------------------------------------------------------------|-------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|--------------------------------------------------|-----------------------------------------------------------------------|----------------------------------------------------------------------|--------------------------------------------------------------|-----------------------------------------------------------|----------------------------------------------------------------------|---------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|---------------------------------------------------------------------|

Options not listed above: `R.options`, `aniopts`, `autodep`, `background`, `cache.comments`, `cache.lazy`, `cache.rebuild`, `cache.vars`, `dev`, `dev.args`, `dpi`, `engine.opts`, `engine.path`, `fig.asp`, `fig.env`, `fig.ext`, `fig.keep`, `fig.lp`, `fig.path`, `fig.pos`, `fig.process`, `fig.retina`, `fig.scap`, `fig.show`, `fig.showtext`, `fig.subcap`, `interval`, `out.extra`, `out.height`, `out.width`, `prompt`, `pur1`, `ref.label`, `render`, `size`, `split`, `tidy.opts`

## .rmd Structure

**YAML Header**  
Optional section of render (e.g. pandoc) options written as key:value pairs (YAML).  
At start of file  
Between lines of ---  
**Text**  
Narration formatted with markdown, mixed with:  
**Code Chunks**  
Chunks of embedded code. Each chunk:  
Begins with ````${r}````  
ends with ````${}````  
R Markdown will run the code and append the results to the doc.  
It will use the location of the .Rmd file as the **working directory**

## Parameters

Parameterize your documents to reuse with different inputs (e.g., data, values, etc.)

1. **Add parameters** - Create and set parameters in the header as sub-values of `params`

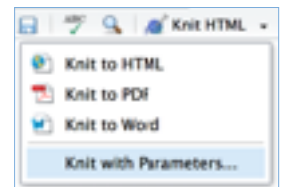
```
---
params:
  n: 100
  d: !r Sys.Date()
---
```

2. **Call parameters** - Call parameter values in code as `params$<name>`

```
Today's date
is `r params$d`
```

3. **Set parameters** - Set values with Knit with parameters or the `params` argument of `render()`:

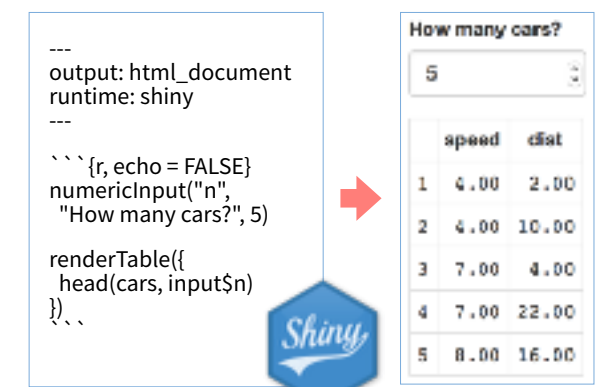
```
render("doc.Rmd", params = list(n = 1,
d = as.Date("2015-01-01")))
```



## Interactive Documents

Turn your report into an interactive Shiny document in 4 steps

1. Add runtime: shiny to the YAML header.
2. Call Shiny input functions to embed input objects.
3. Call Shiny render functions to embed reactive output.
4. Render with `rmarkdown::run` or click Run Document in RStudio IDE



Embed a complete app into your document with `shiny::shinyAppDir()`

NOTE: Your report will be rendered as a Shiny app, which means you must choose an `html` output format, like `html_document`, and serve it with an active R Session.





# Pandoc's Markdown

Write with syntax on the left to create effect on right (after render)

```
Plain text
End a line with two spaces
to start a new paragraph.
*italics* and **bold**
`verbatim code`
sub/superscript^2^~2~
~~strikethrough~~
escaped: \*_ \_ \_
endash: --, emdash: ---
equation: $A = \pi * r^2$
equation block:

$$E = mc^2$$

> block quote
# Header1 {#anchor}
## Header 2 {#css_id}
### Header 3 {#css_class}
#### Header 4
##### Header 5
##### Header 6
<!--Text comment-->
\textbf{Text ignored in HTML}
<em>HTML ignored in pdfs</em>
<http://www.rstudio.com>
[[link](www.rstudio.com)]
Jump to [Header 1](#anchor)
image:
![[Caption](smallorb.png)]
* unordered list
+ sub-item 1
+ sub-item 2
- sub-sub-item 1
* item 2
Continued (indent 4 spaces)
1. ordered list
2. item 2
i) sub-item 1
A. sub-sub-item 1
(@) A list whose numbering
continues after
5. an interruption
(@) an interruption
Term 1
: Definition 1
| Right | Left | Default | Center |
|-----|-----|-----|-----|
| 12 | 12 | 12 | 12 |
| 123 | 123 | 123 | 123 |
| 1 | 1 | 1 | 1 |
- slide bullet 1
- slide bullet 2
(>- to have bullets appear on click)
horizontal rule/slide break:
***
A footnote [^1]
[^1]: Here is the footnote.
```

Plain text  
End a line with two spaces to start a new paragraph.  
*italics* and **bold**  
`verbatim code`  
sub/superscript<sup>2</sup>~~~2~~~  
~~strikethrough~~  
escaped: \\*\_ \\_ \\_  
endash: --, emdash: ---  
equation:  $A = \pi * r^2$   
equation block:  
$$E = mc^2$$

> block quote

# Header1 {#anchor}

## Header 2 {#css\_id}

### Header 3 {#css\_class}

#### Header 4

##### Header 5

##### Header 6

<!--Text comment-->

**Text ignored in HTML**

*HTML ignored in pdfs*

<http://www.rstudio.com>

Jump to [Header 1](#)



Caption

- \* unordered list
  - + sub-item 1
  - + sub-item 2
  - sub-sub-item 1
- \* item 2

Continued (indent 4 spaces)

1. ordered list:
2. item 2
  - i) sub-item 1
  - A. sub-sub-item 1

(@) A list whose numbering continues after 5. an interruption

(@) an interruption

Term 1

: Definition 1

| Right | Left | Default | Center |
|-------|------|---------|--------|
| 12    | 12   | 12      | 12     |
| 123   | 123  | 123     | 123    |
| 1     | 1    | 1       | 1      |

- \* slide bullet 1
- \* slide bullet 2

(>- to have bullets appear on click)

horizontal rule/slide break:

\*\*\*

A footnote [^1]

[^1]: Here is the footnote.

# Set render options with YAML

1. runs the R code, embeds results and text into .md file with knitr
2. then converts the .md file into the finished format with pandoc



Set a document's default output format in the YAML header:

```
---
output: html_document
---
# Body
```

| output value          | creates                          |
|-----------------------|----------------------------------|
| html_document         | html                             |
| pdf_document          | pdf (requires Tex)               |
| word_document         | Microsoft Word (.docx)           |
| odt_document          | OpenDocument Text                |
| rtf_document          | Rich Text Format                 |
| md_document           | Markdown                         |
| github_document       | Github compatible markdown       |
| ioslides_presentation | ioslides HTML slides             |
| slidy_presentation    | slidy HTML slides                |
| beamer_presentation   | Beamer pdf slides (requires Tex) |

Customize output with sub-options (listed to the right):

```
---
output: html_document:
  code_folding: hide
  toc_float: TRUE
---
# Body
```

**html tabsets**  
Use tablet css class to place sub-headers into tabs

```
# Tabset {#tabset .tabset-fade .tabset-pills}
## Tab 1
text 1
## Tab 2
text 2
### End tabset
```

**Tabset**

Tab 1   Tab 2

text 1

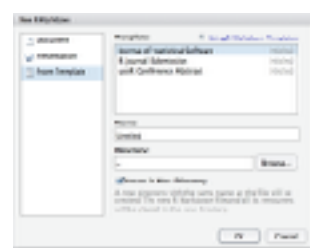
**End tabset**

| sub-option            | description                                                                     | html | pdf | word | odt | rtf | md | github | ioslides | slidy | beamer |
|-----------------------|---------------------------------------------------------------------------------|------|-----|------|-----|-----|----|--------|----------|-------|--------|
| citation_package      | The LaTeX package to process citations, natbib, biblatex or none                |      | X   |      |     |     | X  |        |          |       | X      |
| code_folding          | Let readers to toggle the display of R code, "none", "hide", or "show"          | X    |     |      |     |     |    |        |          |       |        |
| colortheme            | Beamer color theme to use                                                       |      |     |      |     |     |    |        |          |       | X      |
| css                   | CSS file to use to style document                                               | X    |     |      |     |     |    |        |          | X     | X      |
| dev                   | Graphics device to use for figure output (e.g. "png")                           | X    | X   |      |     |     | X  | X      | X        | X     | X      |
| duration              | Add a countdown timer (in minutes) to footer of slides                          |      |     |      |     |     |    |        |          |       | X      |
| fig_caption           | Should figures be rendered with captions?                                       | X    | X   | X    | X   |     |    |        | X        | X     | X      |
| fig_height, fig_width | Default figure height and width (in inches) for document                        | X    | X   | X    | X   | X   | X  | X      | X        | X     | X      |
| highlight             | Syntax highlighting: "tango", "pygments", "kate", "zenburn", "textmate"         | X    | X   | X    |     |     |    |        |          |       | X      |
| includes              | File of content to place in document (in_header, before_body, after_body)       | X    | X   |      | X   |     | X  | X      | X        | X     | X      |
| incremental           | Should bullets appear one at a time (on presenter mouse clicks)?                |      |     |      |     |     |    |        |          | X     | X      |
| keep_md               | Save a copy of .md file that contains knitr output                              | X    |     | X    | X   | X   |    |        |          | X     | X      |
| keep_tex              | Save a copy of .tex file that contains knitr output                             | X    |     |      |     |     |    |        |          |       | X      |
| latex_engine          | Engine to render latex, "pdflatex", "xelatex", or "lualatex"                    |      | X   |      |     |     |    |        |          |       | X      |
| lib_dir               | Directory of dependency files to use (Bootstrap, MathJax, etc.)                 | X    |     |      |     |     |    |        |          | X     | X      |
| mathjax               | Set to local or a URL to use a local/URL version of MathJax to render equations | X    |     |      |     |     |    |        |          | X     | X      |
| md_extensions         | Markdown extensions to add to default definition or R Markdown                  | X    | X   | X    | X   | X   | X  | X      | X        | X     | X      |
| number_sections       | Add section numbering to headers                                                | X    | X   |      |     |     |    |        |          |       |        |
| pandoc_args           | Additional arguments to pass to Pandoc                                          | X    | X   | X    | X   | X   | X  | X      | X        | X     | X      |
| preserve_yaml         | Preserve YAML front matter in final document?                                   |      |     |      |     |     |    |        |          |       | X      |
| reference_docx        | docx file whose styles should be copied when producing docx output              |      |     | X    |     |     |    |        |          |       |        |
| self_contained        | Embed dependencies into the doc                                                 | X    |     |      |     |     |    |        |          | X     | X      |
| slide_level           | The lowest heading level that defines individual slides                         |      |     |      |     |     |    |        |          |       | X      |
| smaller               | Use the smaller font size in the presentation?                                  |      |     |      |     |     |    |        |          |       | X      |
| smart                 | Convert straight quotes to curly, dashes to em-dashes, ... to ellipses, etc.    | X    |     |      |     |     |    |        |          | X     | X      |
| template              | Pandoc template to use when rendering file quarterly_report.html).              | X    | X   |      | X   |     |    |        |          |       | X      |
| theme                 | Bootswatch or Beamer theme to use for page                                      | X    |     |      |     |     |    |        |          |       | X      |
| toc                   | Add a table of contents at start of document                                    | X    | X   | X    |     | X   | X  | X      |          |       | X      |
| toc_depth             | The lowest level of headings to add to table of contents                        | X    | X   | X    |     | X   | X  | X      |          |       |        |
| toc_float             | Float the table of contents to the left of the main content                     | X    |     |      |     |     |    |        |          |       |        |

# Create a Reusable Template

1. Create a new package with an inst/rmarkdown/templates directory
2. In the directory, Place a folder that contains: **template.yaml** (see below) **skeleton.Rmd** (contents of the template) any supporting files
3. Install the package
4. Access **template** in wizard at File ► New File ► R Markdown template.yaml

```
---
name: My Template
---
```



# Table Suggestions

Several functions format R data into tables

Table with kable

|         |         |
|---------|---------|
| express | waiting |
| 3.60    | 76      |
| 1.80    | 54      |
| 3.30    | 74.00   |
| 2.28    | 62      |

express\_waiting

|   |      |       |
|---|------|-------|
| 1 | 3.60 | 79.00 |
| 2 | 1.80 | 54.00 |
| 3 | 3.30 | 74.00 |
| 4 | 2.28 | 62.00 |

Table with stargazer

|   |       |    |
|---|-------|----|
| 1 | 3.600 | 79 |
| 2 | 1.800 | 54 |
| 3 | 3.300 | 74 |
| 4 | 2.280 | 62 |

```
data <- faithful[1:4, ]
knitr::kable(data, caption = "Table with kable")

knitr::xtable(data, caption = "Table with xtable",
  type = "html", html.table.attributes = "border=0")

stargazer::stargazer(data, type = "html", title = "Table with stargazer")
```

Learn more in the **stargazer**, **xtable**, and **knitr** packages.

# Citations and Bibliographies

Create citations with .bib, .bibtex, .copac, .enl, .json, .medline, .mods, .ris, .wos, and .xml files

1. Set **bibliography file** and **CSL 1.0** Style file (optional) in the YAML header
2. Use **citation keys in text**

```
---
bibliography: refs.bib
csel: style.csl
---
```

Smith cited [@smith04].  
Smith cited without author [-@smith04].  
@smith04 cited in line.

3. **Render.** Bibliography will be added to end of document

Smith cited (Joe Smith 2004).  
Smith cited without author (2004).  
Joe Smith (2004) cited in line.

