

Introduction to RMarkdown

Andrew Zieffler



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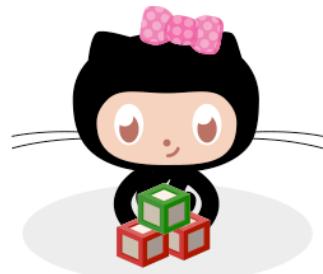
Markup

A markup language is a system for including both text and software instructions for interpreting / displaying that text in the same document. The markup instructs the software to carry out appropriate actions, but is omitted from the version of the text that users see.

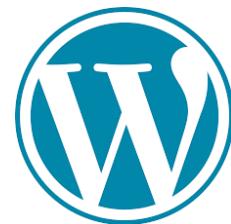
One of the most common markup languages is **Hypertext Markup Language** (HTML)—the language that powers the web. In HTML, the markup describes the formatting of the text displayed on a webpage.

Markdown

Markdown is a more human-readable system for using markup language. It is designed so that it can be converted to HTML and many other formats



WIKIPEDIA
The Free Encyclopedia



Markup

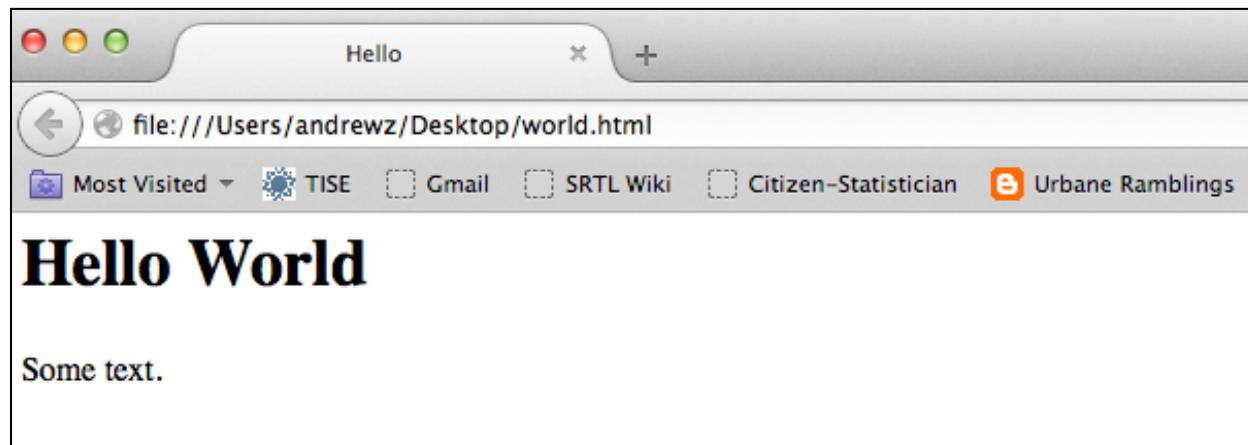
```
<html>
  <head>
    <title>Hello</title>
  </head>
  <body>
    <h1>Hello World</h1>
    <p>Some text.</p>
  </body>
</html>
```

Markdown

```
---
title: Hello
---

# Hello World

Some text.
```

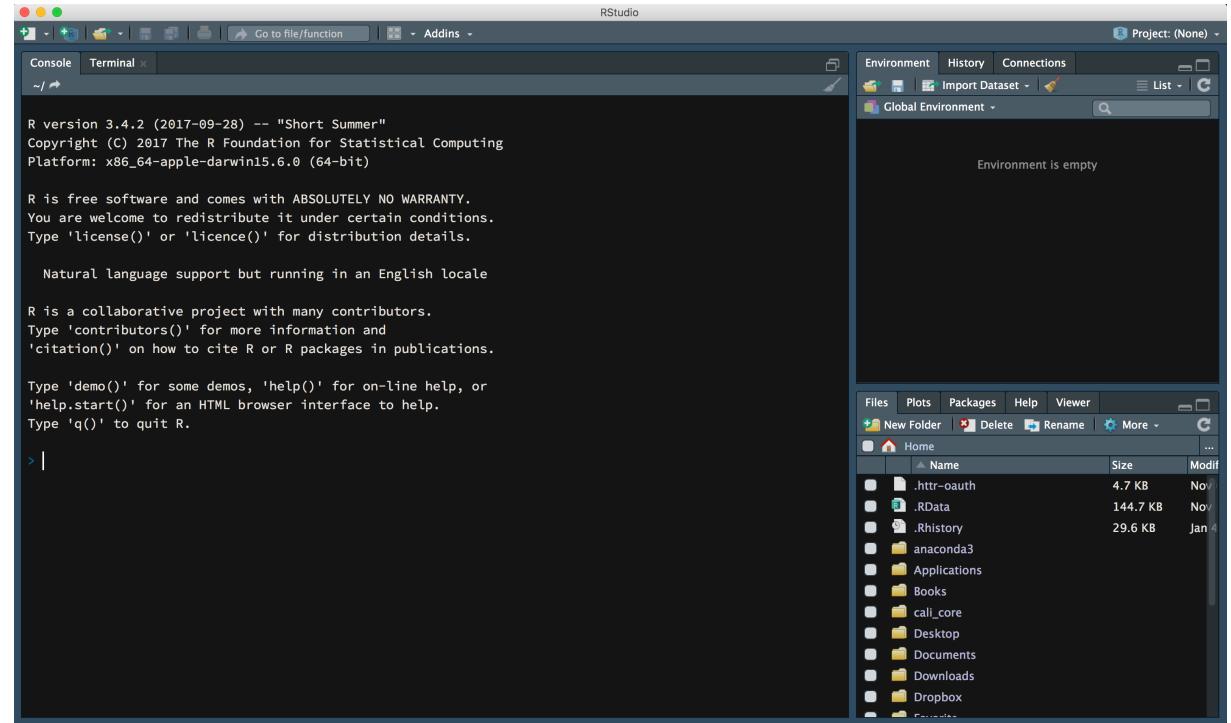


Hello World: Creating a Markdown Document

Markdown Editor: RStudio



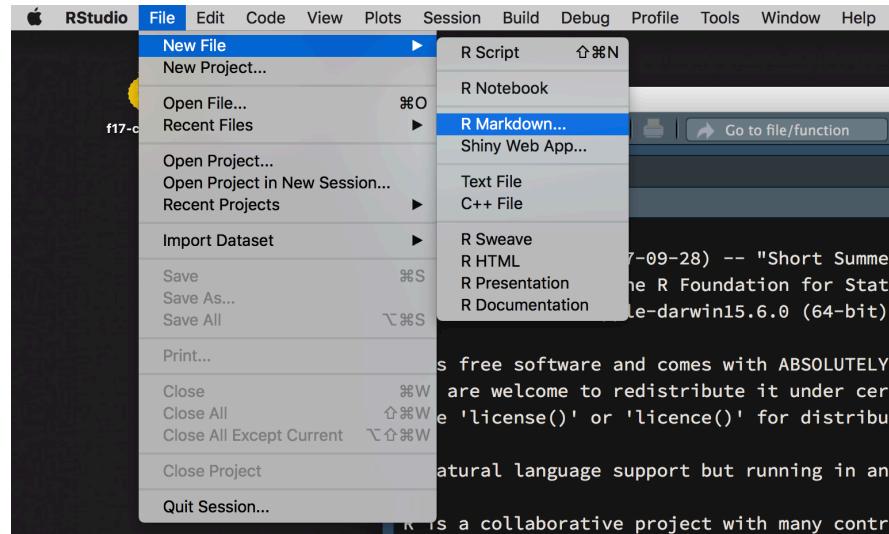
- RStudio is a free IDE for using the R statistical computing environment
- It has built-in support for using Markdown



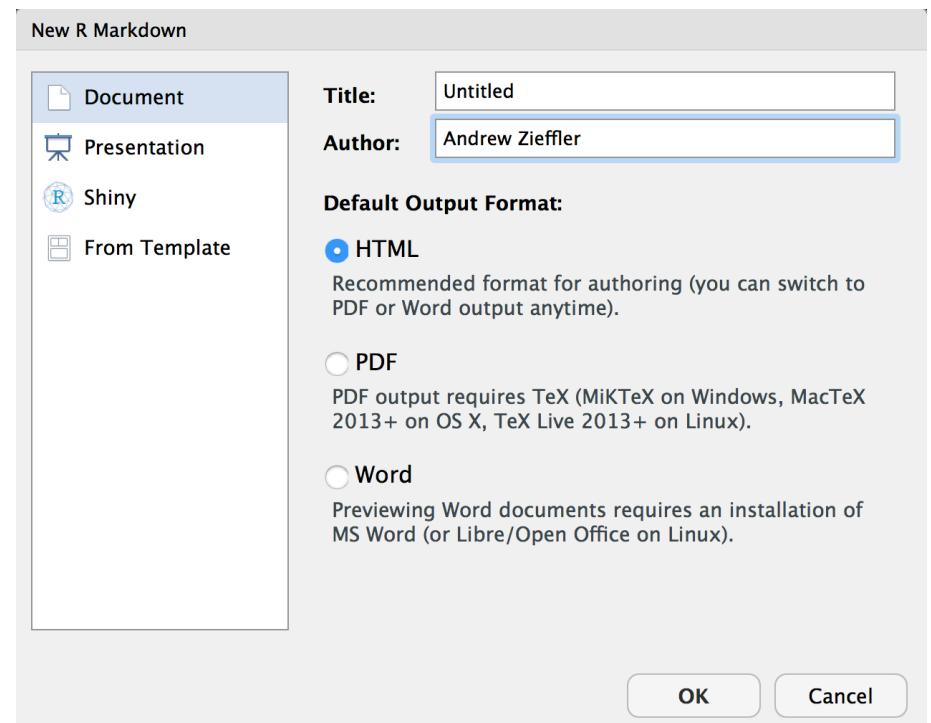
<http://rmarkdown.rstudio.com/>

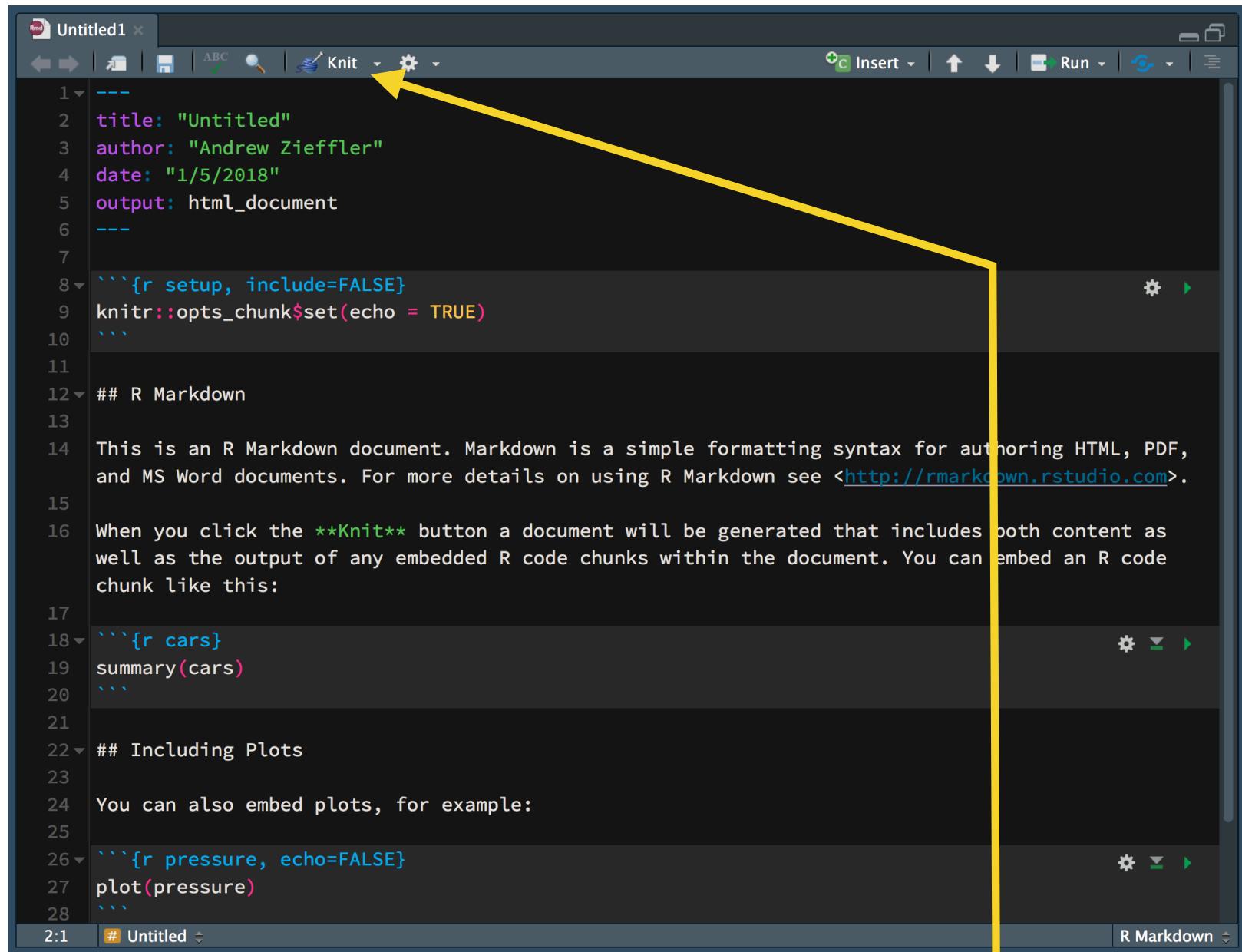
Create a New Markdown Document

- Under the File menu, select New File > R Markdown...



- Select Document
- Choose the HTML format
- Put your name in as Author:
- Click OK





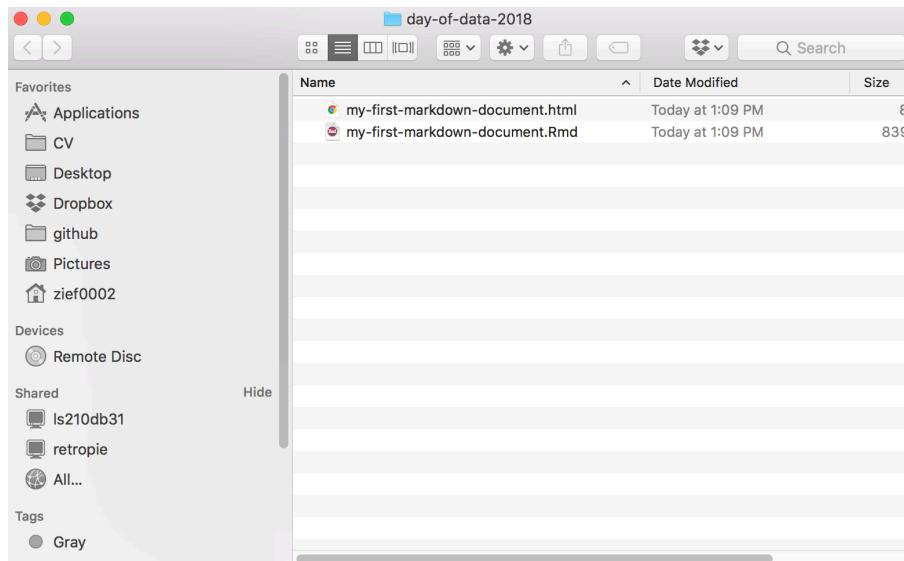
The screenshot shows the RStudio interface with an R Markdown document titled "Untitled1". The code editor displays the following content:

```
1 ---  
2 title: "Untitled"  
3 author: "Andrew Zieffler"  
4 date: "1/5/2018"  
5 output: html_document  
---  
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 Word documents. For more details on using R Markdown see <http://rmarkdown.rstudio.com>.  
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 ...
```

This will open a document that has some pre-included text and is formatted using Markdown.

Save this document (File > Save) on your computer. Then click the **Knit** button.

Knitting compiles the document and formats it according to the markdown you included (or that was pre-included for you).



~/Desktop/day-of-data-2018/my-first-markdown-document.html

my-first-markdown-document.html | Open in Browser | Find | Publish

Untitled

Andrew Zieffler
1/5/2018

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>.

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.: 56.00
## Max.   :25.0   Max.   :120.00
```

Including Plots

You can also embed plots, for example:

The actual file you saved has the **.Rmd** extension. The compiled, formatted document has the extension **.html**. The HTML file can be opened in any browser.

Working with Markdown

There are two major parts to your RMD document.

The first part is called YAML (YAML Ain't Markup Language) and is between the two sets of three hyphens. This constitutes meta-data for your document.

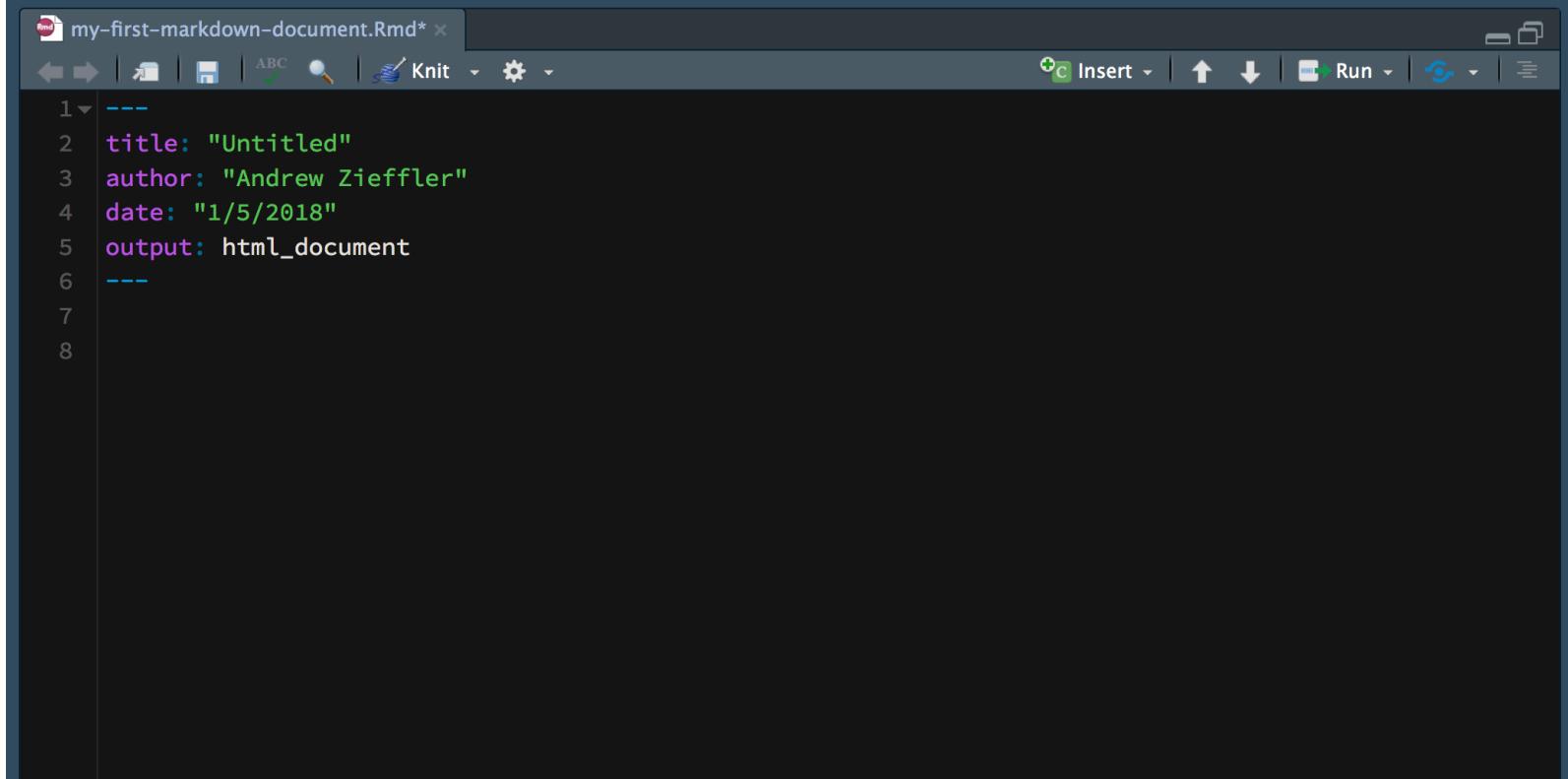
The second part is the main text and markdown formatting for your document.

The screenshot shows an RStudio interface with an R Markdown file titled "Untitled1". The code editor displays the following content:

```
1 ---  
2 title: "Untitled"  
3 author: "Andrew Zieffler"  
4 date: "1/5/2018"  
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,  
15 and MS Word documents. For more details on using R Markdown see <http://rmarkdown.rstudio.com>.  
16  
17 When you click the **Knit** button a document will be generated that includes both content as  
18 well as the output of any embedded R code chunks within the document. You can embed an R code  
19 chunk like this:  
20  
21  
22 ```{r cars}  
23 summary(cars)  
24 ...  
25  
26 ## Including Plots  
27  
28 You can also embed plots, for example:  
29  
30  
31 ```{r pressure, echo=FALSE}  
32 plot(pressure)  
33 ...  
34
```

The YAML metadata (lines 1-6) is highlighted with a yellow box. The main text and R code chunks (lines 7-34) are also highlighted with a larger yellow box.

Delete all the text in the main part of your document. KEEP THE YAML but delete everything else.



The screenshot shows the RStudio interface with a dark theme. The title bar reads "my-first-markdown-document.Rmd*". The toolbar includes standard file operations (New, Open, Save) and R Markdown specific tools (ABC, Knit, Run). The code editor displays the following YAML front matter:

```
1 ---  
2 title: "Untitled"  
3 author: "Andrew Zieffler"  
4 date: "1/5/2018"  
5 output: html_document  
6 ---  
7  
8
```

Below the YAML part of the document (skip a line or two) enter some text. You can freestyle this or copy-and-paste from an existing document. Don't worry about formatting it yet. (Generate some text from: <https://www.lipsum.com/>)

Then save the document and re-knit it.

Add a Heading

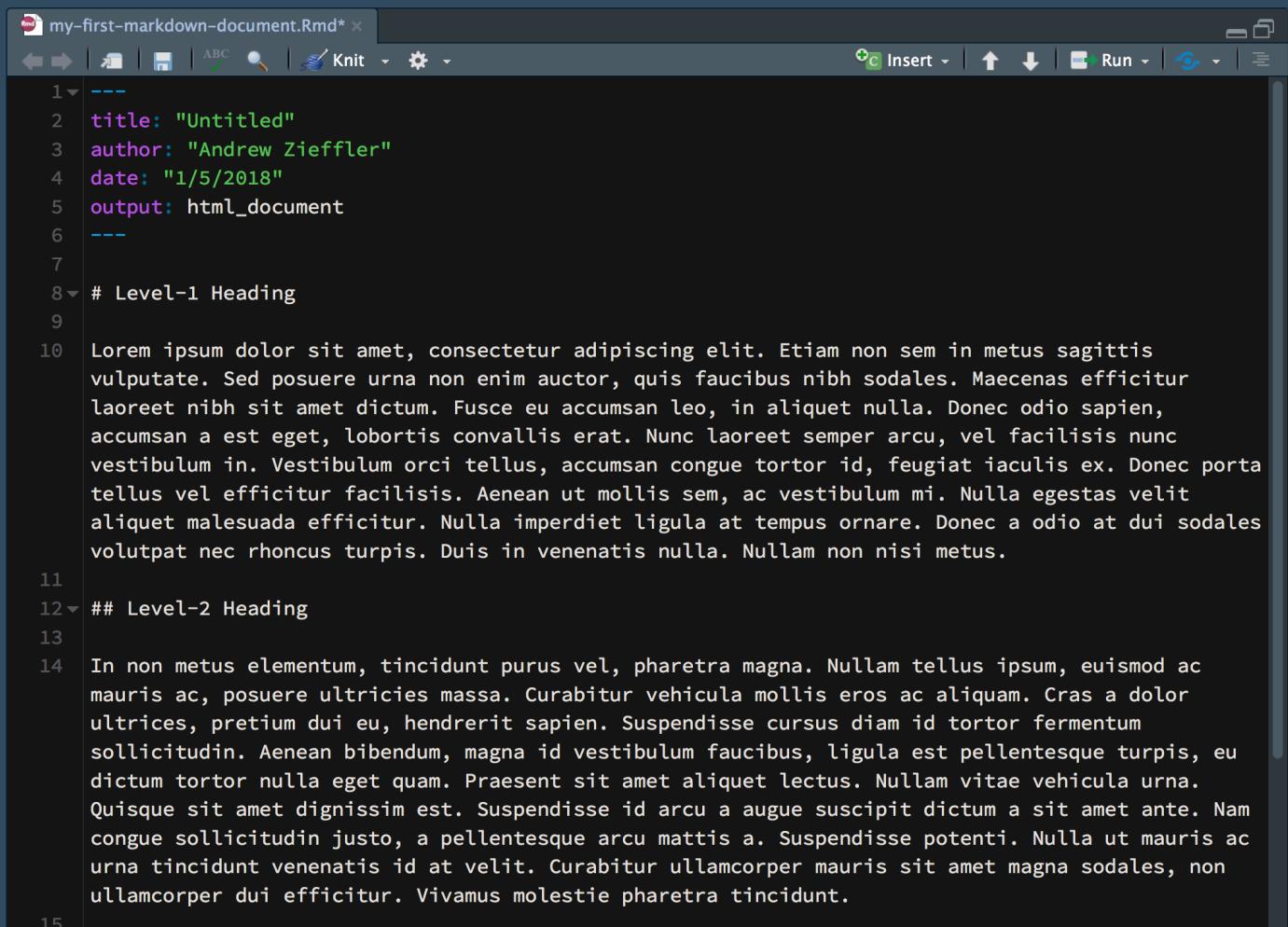
After the YAML (but before the text you just entered) let's put in a heading. To do this start the line with a single hashtag (#), then one space, then the text you want to use as a heading. For example:

```
my-first-markdown-document.Rmd*
1 ---  
2 title: "Untitled"  
3 author: "Andrew Zieffler"  
4 date: "1/5/2018"  
5 output: html_document  
6 ---  
7  
8 # My Heading  
9  
10 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam non sem in metus sagittis  
vulputate. Sed posuere urna non enim auctor, quis faucibus nibh sodales. Maecenas efficitur  
laoreet nibh sit amet dictum. Fusce eu accumsan leo, in aliquet nulla. Donec odio sapien,  
accumsan a est eget, lobortis convallis erat. Nunc laoreet semper arcu, vel facilisis nunc  
vestibulum in. Vestibulum orci tellus, accumsan congue tortor id, feugiat iaculis ex. Donec porta  
tellus vel efficitur facilisis. Aenean ut mollis sem, ac vestibulum mi. Nulla egestas velit  
aliquet malesuada efficitur. Nulla imperdiet ligula at tempus ornare. Donec a odio at dui sodales  
volutpat nec rhoncus turpis. Duis in venenatis nulla. Nullam non nisi metus.
```

You will need a blank line between your heading and text.

Re-knit the document. (*Protip*: Re-knitting will automatically save the document.)

The heading you created is a Level-1 heading. There are six different heading sizes. Level-1 is the largest. To create a Level-2 heading use two hashtags rather than one.



The screenshot shows an RStudio interface with the following content:

```
my-first-markdown-document.Rmd* 
1 ---
2 title: "Untitled"
3 author: "Andrew Zieffler"
4 date: "1/5/2018"
5 output: html_document
6 ---
7
8 # Level-1 Heading
9
10 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam non sem in metus sagittis
vulputate. Sed posuere urna non enim auctor, quis faucibus nibh sodales. Maecenas efficitur
laoreet nibh sit amet dictum. Fusce eu accumsan leo, in aliquet nulla. Donec odio sapien,
accumsan a est eget, lobortis convallis erat. Nunc laoreet semper arcu, vel facilisis nunc
vestibulum in. Vestibulum orci tellus, accumsan congue tortor id, feugiat iaculis ex. Donec porta
tellus vel efficitur facilisis. Aenean ut mollis sem, ac vestibulum mi. Nulla egestas velit
aliquet malesuada efficitur. Nulla imperdiet ligula at tempus ornare. Donec a odio at dui sodales
volutpat nec rhoncus turpis. Duis in venenatis nulla. Nullam non nisi metus.
11
12 ## Level-2 Heading
13
14 In non metus elementum, tincidunt purus vel, pharetra magna. Nullam tellus ipsum, euismod ac
mauris ac, posuere ultricies massa. Curabitur vehicula mollis eros ac aliquam. Cras a dolor
ultrices, pretium dui eu, hendrerit sapien. Suspendisse cursus diam id tortor fermentum
sollicitudin. Aenean bibendum, magna id vestibulum faucibus, ligula est pellentesque turpis, eu
dictum tortor nulla eget quam. Praesent sit amet aliquet lectus. Nullam vitae vehicula urna.
Quisque sit amet dignissim est. Suspendisse id arcu a augue suscipit dictum a sit amet ante. Nam
congue sollicitudin justo, a pellentesque arcu mattis a. Suspendisse potenti. Nulla ut mauris ac
urna tincidunt venenatis id at velit. Curabitur ullamcorper mauris sit amet magna sodales, non
ullamcorper dui efficitur. Vivamus molestie pharetra tincidunt.
15
```

Don't forget to separate new headings with blank lines.
Re-knit the document to see the difference.

Italic and Bold Text

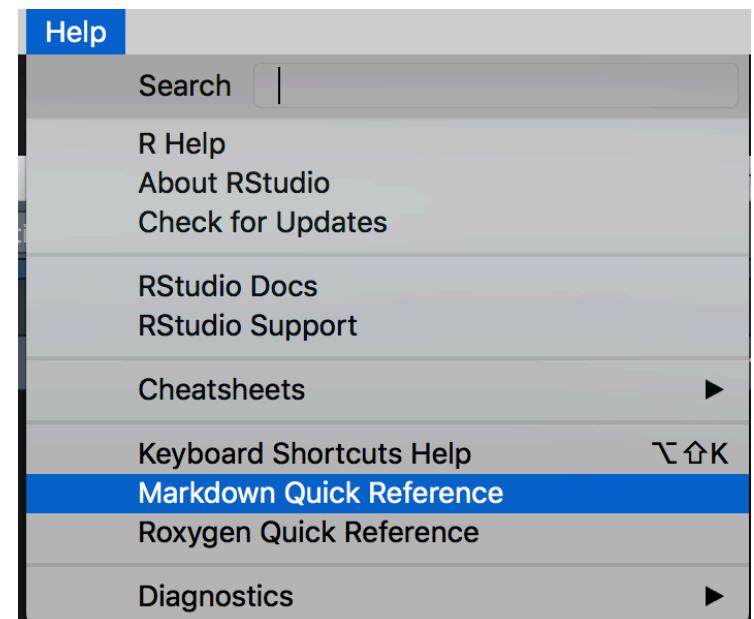
To set any of your text in italics surround the text with either a single asterisk or underscore. For bold text, use two asterisks or underscores.

```
*italic*    **bold**  
italic    __bold__
```

Try making some text both bold and italics.

What can be added to your document?

- Headers: *Six sizes*
- Text Emphasis: *Bold and italics*
- Lists: *Ordered or unordered; also nesting*
- Blockquotes
- Code: *Inline and block code*
- Fenced Code Blocks (non-indented blocks)
- Horizontal Rules
- Images
- Links and Email
- Footnotes
- Strikethrough
- Tables
- Anchors
- Equations: *Inline and block equations*



YAML: Changing Document-Level Metadata

YAML: The Header

YAML (*YAML ain't markup language*) is a human-friendly standard for describing the structure of data and embedded this structure within the data being described.

```
---
title: "Hello World"
author: "Andrew Zieffler"
date: "January 22, 2019"
output: html_document
---
```

All YAML metadata are **key-value combinations**, given as

key: value

YAML: Add a Table of Contents

```
---
title: "Hello World"
author: "Andrew Zieffler"
date: "January 22, 2019"
output:
  html_document:
    toc: true
---
```

Correctly structured YAML needs to be indented **exactly two spaces**.

```
---
```

```
title: "Hello World"
author: "Andrew Zieffler"
date: "January 22, 2019"
output:
  html_document:
    toc: true
    toc_float: true
```

```
---
```

Level-1 Heading

Level-2 Heading

Untitled

Andrew Zieffler

1/5/2018

Level-1 Heading

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam non sem in metus sagittis vulputate. Sed posuere urna non enim auctor, quis faucibus nibh sodales. Maecenas efficitur laoreet nibh sit amet dictum. Fusce eu accumsan leo, in aliquet nulla. Donec odio sapien, accumsan a est eget, lobortis convallis erat. Nunc laoreet semper arcu, vel facilisis nunc vestibulum in. Vestibulum orci tellus, accumsan congue tortor id, feugiat iaculis ex. Donec porta tellus vel efficitur facilisis. Aenean ut mollis sem, ac vestibulum mi. Nulla egestas velit aliquet malesuada efficitur. Nulla imperdiet ligula at tempus ornare. Donec a odio at dui sodales volutpat nec rhoncus turpis. Duis in venenatis nulla. Nullam non nisi metus.

```
##      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.: 56.00
##  Max.    :25.0   Max.    :120.00
```

```
---
```

```
title: "Hello World"
author: "Andrew Zieffler"
date: "January 22, 2019"
output:
  html_document:
    toc: true
    toc_float:
      collapsed: false
      smooth_scroll: false
  theme: united
  highlight: tango
```

```
---
```

The image shows a split-screen view of an R Markdown file. On the left, the YAML front matter is displayed, defining the title, author, date, and output parameters for an HTML document. On the right, the resulting HTML page is shown. The page features a header with a light gray background, a red navigation bar containing a 'Level-1 Heading' and a 'Level-2 Heading' button, and a main content area. The content area contains a 'Level-2 Heading' section with descriptive text and a code block at the bottom containing the command `plot(cars)`.

Level-1 Heading

Level-2 Heading

Level-2 Heading

In non metus elementum, tincidunt purus vel, pharetra magna. Nullam tellus ipsum, euismod ac mauris ac, posuere ultricies massa. Curabitur vehicula mollis eros ac aliquam. Cras a dolor ultrices, pretium dui eu, hendrerit sapien. Suspendisse cursus diam id tortor fermentum sollicitudin. Aenean bibendum, magna id vestibulum faucibus, ligula est pellentesque turpis, eu dictum tortor nulla eget quam. Praesent sit amet aliquet lectus. Nullam vitae vehicula urna. Quisque sit amet dignissim est. Suspendisse id arcu a augue suscipit dictum a sit amet ante. Nam congue sollicitudin justo, a pellentesque arcu mattis a. Suspendisse potenti. Nulla ut mauris ac urna tincidunt venenatis id at velit. Curabitur ullamcorper mauris sit amet magna sodales, non ullamcorper dui efficitur. Vivamus molestie pharetra tincidunt.

```
plot(cars)
```

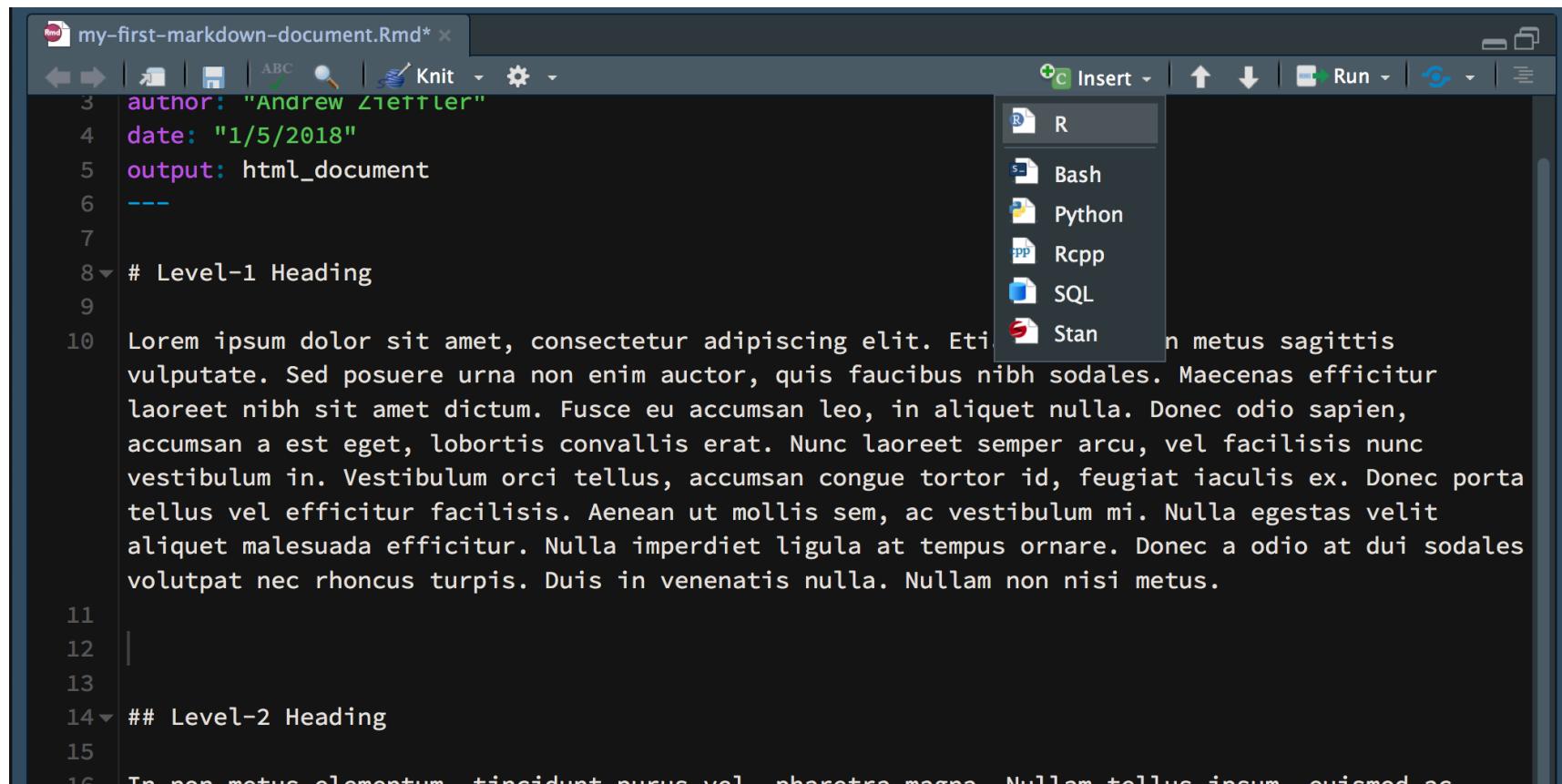
See many more YAML options at:
http://rmarkdown.rstudio.com/html_document_format.html

Including R Syntax in a Markdown Document

RMarkdown

RMarkdown allows us to embed and run R syntax directly in a markdown document.

We do this by inserting an **R code chunk**. Click in the text where you want to insert the code chunk (for me it is at Line 12) then select Insert > R



The screenshot shows the RStudio interface with a dark theme. A code editor window titled "my-first-markdown-document.Rmd*" is open, displaying R Markdown code. The code includes YAML front matter, a level-1 heading, and a level-2 heading. At line 12, there is a blank line where a code chunk is intended. A context menu is open over this line, with the "Insert" option highlighted. A submenu under "Insert" shows several language options: R, Bash, Python, Rcpp, SQL, and Stan. The "R" option is selected and highlighted with a blue border.

```
my-first-markdown-document.Rmd*
author: "Andrew Zettler"
date: "1/5/2018"
output: html_document
---
# Level-1 Heading
#
Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam metus sagittis
vulputate. Sed posuere urna non enim auctor, quis faucibus nibh sodales. Maecenas efficitur
laoreet nibh sit amet dictum. Fusce eu accumsan leo, in aliquet nulla. Donec odio sapien,
accumsan a est eget, lobortis convallis erat. Nunc laoreet semper arcu, vel facilisis nunc
vestibulum in. Vestibulum orci tellus, accumsan congue tortor id, feugiat iaculis ex. Donec porta
tellus vel efficitur facilisis. Aenean ut mollis sem, ac vestibulum mi. Nulla egestas velit
aliquet malesuada efficitur. Nulla imperdiet ligula at tempus ornare. Donec a odio at dui sodales
volutpat nec rhoncus turpis. Duis in venenatis nulla. Nullam non nisi metus.

## Level-2 Heading
#
To non netus elementum tincidunt purus vel pharetra magna. Nullam tellus ipsum quismodoc.
```

Code Chunks

```
```{r}  
Your R syntax goes here
```
```

Write the following R syntax in your code chunk:

```
summary(cars)
```

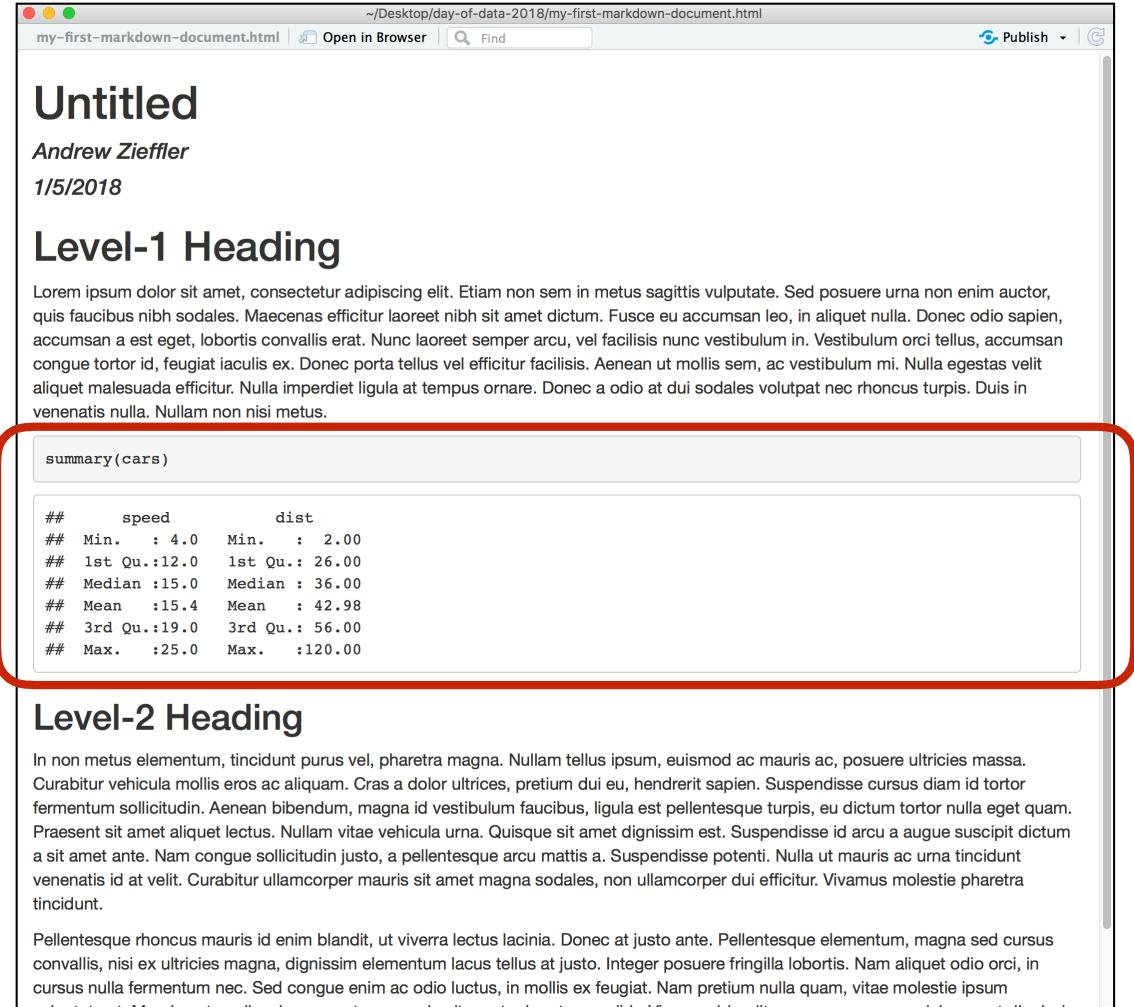
R is case sensitive, so upper and lowercase matter! This is all lowercase.

Code chunk:

```
```{r}  
summary(cars)
```
```

Re-knit your document

Knitting not only formats your Markdown, it also executes any R syntax embedded in a code chunk.



The screenshot shows a web browser window displaying a knitted R Markdown document titled "Untitled". The document includes author information ("Andrew Zieffler" and "1/5/2018"), a level-1 heading ("Level-1 Heading"), and a level-2 heading ("Level-2 Heading"). A red box highlights a code chunk within the level-1 heading section. The code chunk contains the following R output:

```
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.:56.00
## Max.   :25.0  Max.   :120.0
```

The level-2 heading section contains a large amount of placeholder text in Latin, likely used for demonstration purposes.

Code Chunk Options

```
```{r chunk_name, option1, option2, ...}
```

*Your R syntax goes here*

```
```
```

The **chunk name** (no spaces allowed in the name) goes in-between the curly braces after the r.

Code chunk **options** are then added and separated by commas.

Code chunk:

```
```{r my_summary, echo=FALSE}
```

```
summary(cars)
```

```
```
```

Re-knit your document

The option echo=FALSE hides the actual syntax, but still prints the output of the syntax.

A screenshot of a web browser window displaying a Markdown document titled "Untitled". The document includes author information ("Andrew Zieffler" and "1/5/2018"), a level-1 heading ("Level-1 Heading"), and a level-2 heading ("Level-2 Heading"). A red box highlights a code block containing statistical summary statistics for "speed" and "dist". Another red box highlights the text of the level-2 heading.

Untitled

Andrew Zieffler
1/5/2018

Level-1 Heading

Level-2 Heading

```
##      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.: 56.00
##  Max.   :25.0  Max.   :120.00
```

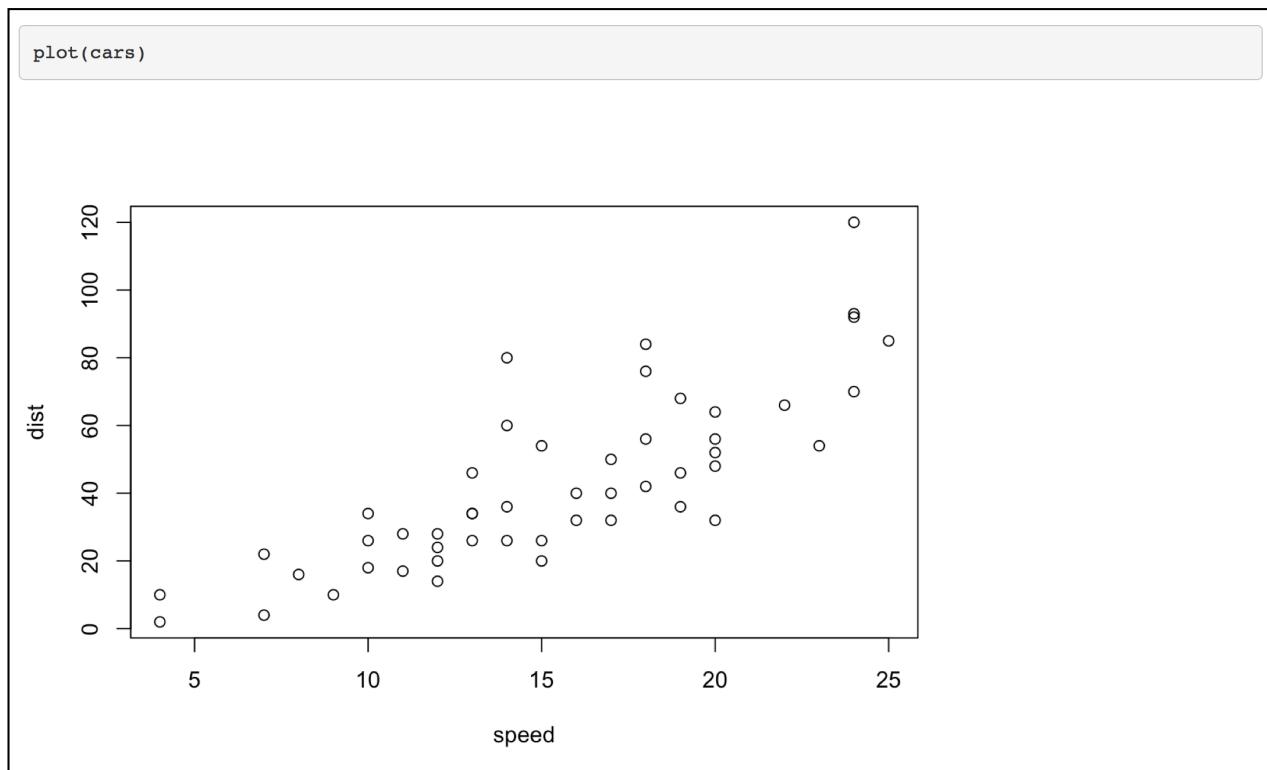
In non metus elementum, tincidunt purus vel, pharetra magna. Nullam tellus ipsum, euismod ac mauris ac, posuere ultricies massa. Curabitur vehicula mollis eros ac aliquam. Cras a dolor ultrices, pretium dui eu, hendrerit sapien. Suspendisse cursus diam id tortor fermentum sollicitudin. Aenean bibendum, magna id vestibulum faucibus, ligula est pellentesque turpis, eu dictum tortor nulla eget quam. Praesent sit amet aliquet lectus. Nullam vitae vehicula urna. Quisque sit amet dignissim est. Suspendisse id arcu a augue suscipit dictum a sit amet ante. Nam congue sollicitudin justo, a pellentesque arcu mattis a. Suspendisse potenti. Nulla ut mauris ac urna tincidunt venenatis id at velit. Curabitur ullamcorper mauris sit amet magna sodales, non ullamcorper dui efficitur. Vivamus molestie pharetra tincidunt.

Figures

Code chunk:

```
20  
21 -> ````{r figure_01}  
22 plot(cars)  
23 ````  
24
```

Output:



Some Figure Code Chunk Options

- `fig.cap = 'caption'` (put in quotes)
- `fig.align = 'center'` (put in quotes; 'left', 'right', 'center')

Set aspect ratio of figure

- `fig.width = 7` (numeric; in inches)
- `fig.height = 7` (numeric; in inches)

Set size of figure to appear in document

- `out.width = '600px'` (put in quotes; in pixels)
- `out.height = '600px'` (put in quotes; in pixels)

```
20
21 ▼ ````{r figure_01, fig.align='center', fig.cap='Hello. This is my figure.'}
22 plot(cars)
23 ````
```

Code Chunk Options

Find all of them and their descriptions at:

<https://yihui.name/knitr/>



knitr

Inline Code Chunks

``r Your R syntax goes here``

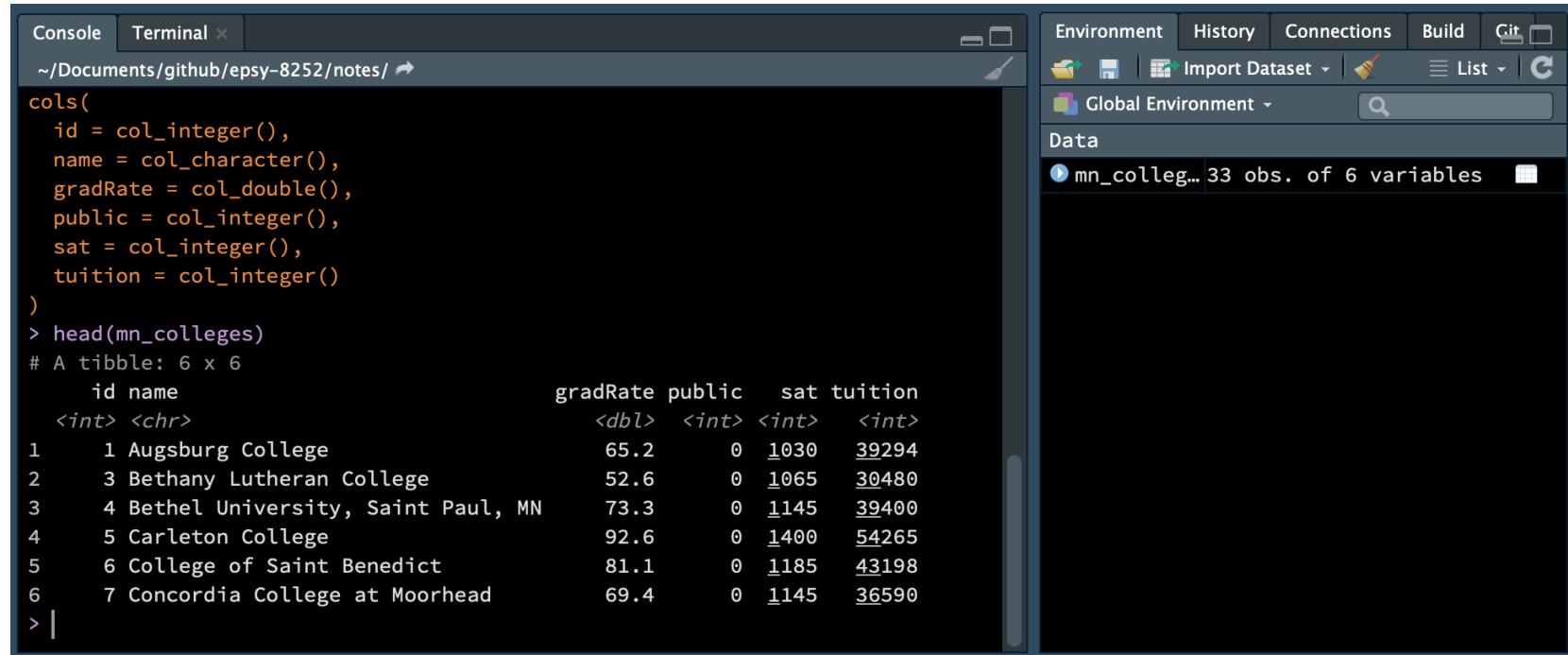
Code chunk:

Here is an example of an inline code chunk. The mean speed is ``r mean(cars$speed)``.

Output:

Here is an example of an inline code chunk. The mean speed is 15.4.

Environment and Markdown Document Independence

A screenshot of the RStudio interface. The left pane shows the R Console with the following session history:

```
Console Terminal ✘
~/Documents/github/epsy-8252/notes/ ↵
cols(
  id = col_integer(),
  name = col_character(),
  gradRate = col_double(),
  public = col_integer(),
  sat = col_integer(),
  tuition = col_integer()
)
> head(mn_colleges)
# A tibble: 6 x 6
  id      name          gradRate public    sat  tuition
  <int> <chr>        <dbl> <int> <int>   <dbl>
1 1 Augsburg College     65.2     0 1030 39294
2 3 Bethany Lutheran College 52.6     0 1065 30480
3 4 Bethel University, Saint Paul, MN 73.3     0 1145 39400
4 5 Carleton College     92.6     0 1400 54265
5 6 College of Saint Benedict 81.1     0 1185 43198
6 7 Concordia College at Moorhead 69.4     0 1145 36590
> |
```

The right pane shows the Global Environment, which lists a single dataset:

mn_colleges 33 obs. of 6 variables

| | id | name | gradRate | public | sat | tuition |
|---|-------|-----------------------------------|----------|--------|-------|---------|
| | <int> | <chr> | <dbl> | <int> | <int> | <dbl> |
| 1 | 1 | Augsburg College | 65.2 | 0 | 1030 | 39294 |
| 2 | 3 | Bethany Lutheran College | 52.6 | 0 | 1065 | 30480 |
| 3 | 4 | Bethel University, Saint Paul, MN | 73.3 | 0 | 1145 | 39400 |
| 4 | 5 | Carleton College | 92.6 | 0 | 1400 | 54265 |
| 5 | 6 | College of Saint Benedict | 81.1 | 0 | 1185 | 43198 |
| 6 | 7 | Concordia College at Moorhead | 69.4 | 0 | 1145 | 36590 |

When we create objects, they are stored in the R environment and we can operate on those objects. For example, here we read in some data and assigned it to `mn_colleges`. We then used the `head()` function on `mn_colleges` to display the data.

The screenshot shows the RStudio interface with an R Markdown document titled "Untitled.Rmd". The code in the editor is:

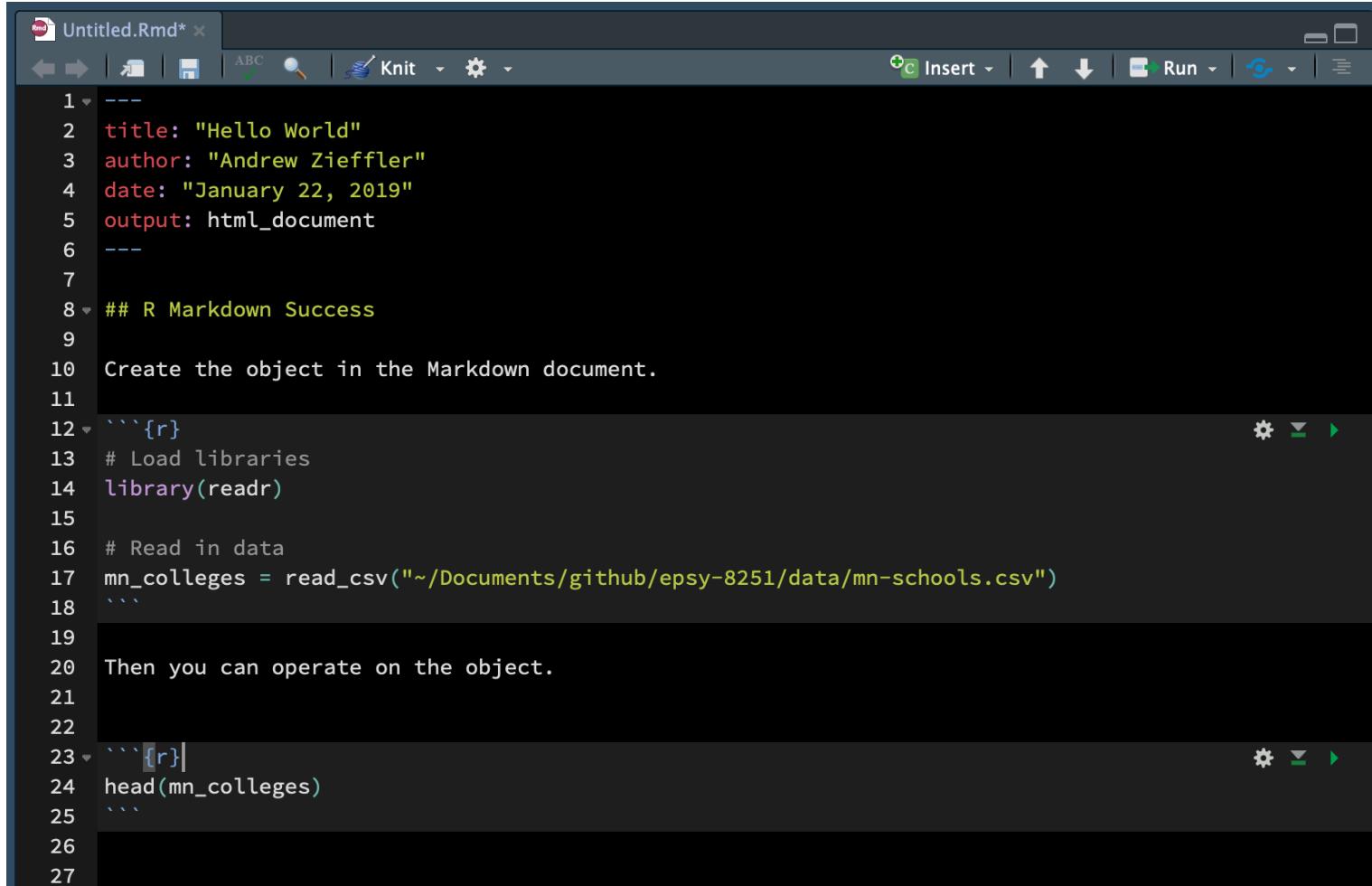
```
1 ---  
2 title: "Hello World"  
3 author: "Andrew Zieffler"  
4 date: "January 22, 2019"  
5 output: html_document  
6 ---  
7  
8 ## R Markdown Fail  
9  
10 Trying to operate on an object that we created in the R environment, but do not create in our  
document will lead to an error.  
11  
12 `r`  
13 head(mn_colleges)  
14  
15  
16
```

The R Markdown tab in the bottom navigation bar is selected. In the console tab, there is an error message:

```
8:1 # R Markdown Fail R Markdown  
Console Terminal R Markdown  
R.../my-first-markdown/Untitled.Rmd Output Issues  
✖ Line 13 Error in head(mn_colleges) : object 'mn_colleges' not found Calls: <Anonymous> ...  
withCallingHandlers -> withVisible -> eval -> eval -> head Execution halted
```

Trying to operate on an object that we created in the R environment, but do not create in our document will lead to an error.

If you want to operate on an object you have to create the object in the R Markdown document.



The screenshot shows an RStudio interface with an R Markdown file titled "Untitled.Rmd". The code in the editor is as follows:

```
1 ---  
2 title: "Hello World"  
3 author: "Andrew Zieffler"  
4 date: "January 22, 2019"  
5 output: html_document  
---  
7  
8 ## R Markdown Success  
9  
10 Create the object in the Markdown document.  
11  
12 ```{r}  
13 # Load libraries  
14 library(readr)  
15  
16 # Read in data  
17 mn_colleges = read_csv("~/Documents/github/epsy-8251/data/mn-schools.csv")  
18 ```  
19  
20 Then you can operate on the object.  
21  
22  
23 ```{r}  
24 head(mn_colleges)  
25  
26  
27
```

The code illustrates the creation of an R object named `mn_colleges` using the `read_csv` function from the `readr` package. It then demonstrates how to use the `head` function to operate on this object.

You will need to import datasets using syntax. You will not be able to use the Import Dataset button to import the data.

This is also true of loading libraries/ packages. They need to be loaded in the R Markdown document in order to be used in the R Markdown document.

protip

Use the first code chunk in your R Markdown document to load all the packages and datasets used in the document. This has the added advantage that others can immediately see what packages and datasets are needed to run the document.

Advanced Markdown

Equations

Inline equation: `$equation$`

Display equation: `$$equation$$`

MathML equation: `$equation$`

Markdown
syntax:

```
$$\hat{Y}_{ij} = \beta_0 + \beta_1(X_1) + \epsilon_{ij}$$
```

Output:

$$\hat{Y}_{ij} = \beta_0 + \beta_1(X_1) + \epsilon_{ij}$$

Unless you use MathML, there is no equation numbering support in RStudio currently....although it has already been added as a feature request.

Citations

To add citations, we need to:

- Create a BIB file that holds the metadata for our references.
- Save the BIB file to the same folder as our RMD file
- Include the bibliography: key in the YAML of our RMD document

```
---
title: "Hello World"
author: "Andrew Zieffler"
date: "January 22, 2019"
output:
  html_document:
    toc: true
    toc_float: true
bibliography: my_bibliography.bib
---
```

.bib Files

A *.bib* file is a plain-text file that contains a BibTeX database. The database is a list of references and their metadata. Reference managers (e.g., Papers, Zotero, Mendelay) can produce BibTeX entries.

```
@book{agresti,
  author = {Alan Agresti},
  title = {Categorical Data Analysis},
  publisher={Wiley},
  year={2002},
  edition={2nd},
  address={New York},
}

@article{algina,
  author = {J. Algina and H. J. Keselman and R. D. Penfield},
  title = {An Alternative to Cohen's Standardized Mean Difference Effect
          Size: A Robust Parameter and Confidence Interval in the Two
          Independent Groups Case},
  journal={Psychological Methods},
  year={2005},
  volume={10},
  number={3},
  pages={317--328},
```

.bib Files from the UMN Library

The screenshot shows a library catalog interface for an article titled "An Alternative to Cohen's Standardized Mean Difference Effect Size: A Robust Parameter and Confidence Interval in the Two Independent Groups Case" by Algina, James; Keselman, H. J.; Penfield, Randall D. from Psychological Methods, 2005, Vol.10(3), p.317-328 [Peer Reviewed Journal]. The interface includes sections for TOP, SEND TO, VIEW IT, DETAILS, LINKS, and FIND OR REQUEST. Under SEND TO, there are buttons for CITATION, COPY LINK, E-MAIL, EASYBIB, ENDNOTE BASIC, EXPORT BIBTEX (which is circled in red), and EXPOI. Under FIND OR REQUEST, there is a DOWNLOAD button (also circled in red). A yellow bar at the bottom left says "Sign in to request" and "Sign in". Below it, it says "Available at: PsycARTICLES" and "Available from 1996".

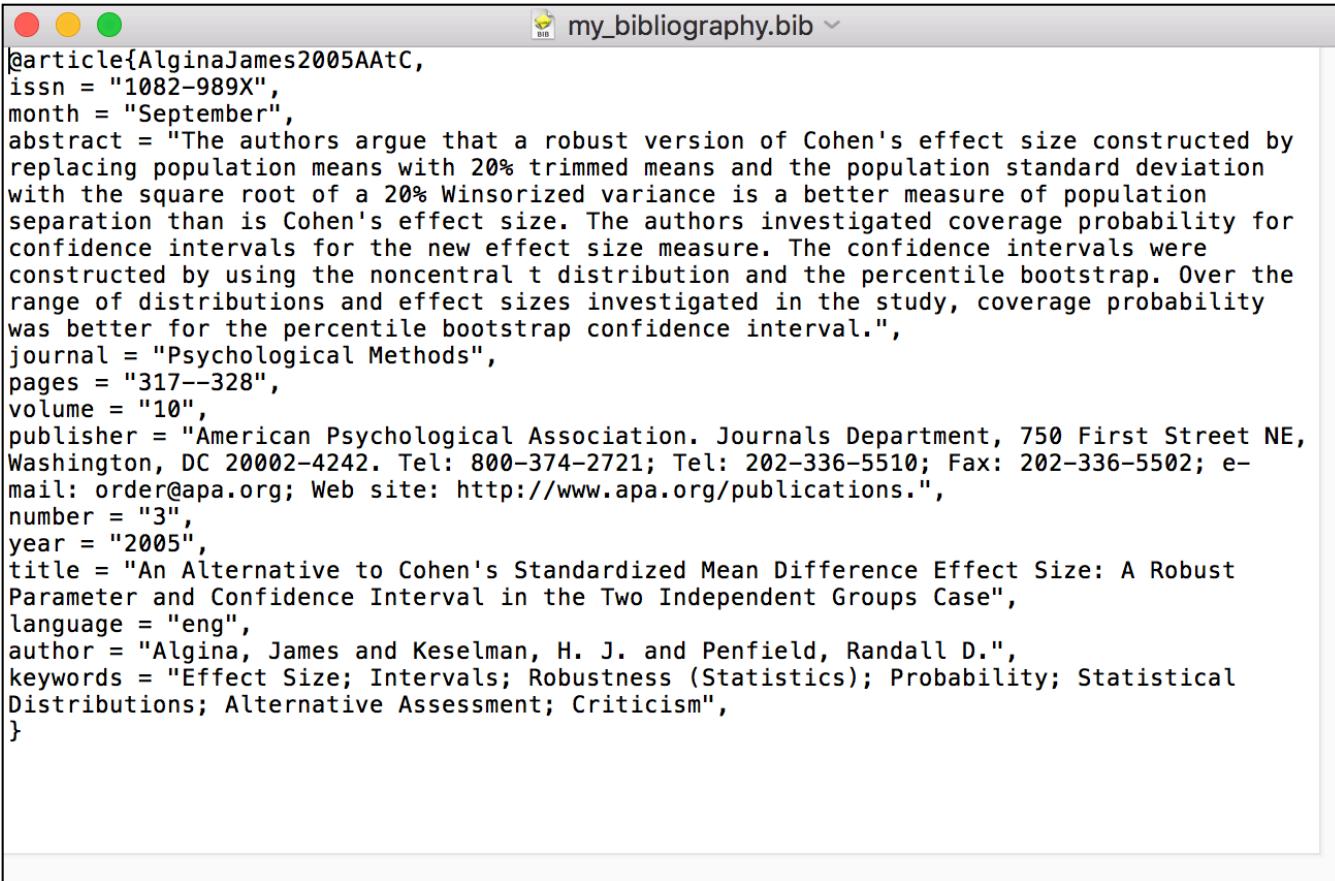
You can often get the BIB information from directly from the library.

- Click EXPORT BIBTEX
- Click DOWNLOAD

Rename the downloaded file `my_bibliography.bib` and place it in **the same folder** as your RMD document.

You can often get the BIB information from directly from the library.

Open the file using a plain text editor such as Notepad (PC) or Text Edit (Mac). Find the citation identifier—it is located immediately after the curly brace. This is how we will refer to the citation.



The screenshot shows a text editor window with a title bar "my_bibliography.bib". The content is a BibTeX entry:

```
@article{AlginaJames2005AAtC,
  issn = "1082-989X",
  month = "September",
  abstract = "The authors argue that a robust version of Cohen's effect size constructed by replacing population means with 20% trimmed means and the population standard deviation with the square root of a 20% Winsorized variance is a better measure of population separation than is Cohen's effect size. The authors investigated coverage probability for confidence intervals for the new effect size measure. The confidence intervals were constructed by using the noncentral t distribution and the percentile bootstrap. Over the range of distributions and effect sizes investigated in the study, coverage probability was better for the percentile bootstrap confidence interval.",
  journal = "Psychological Methods",
  pages = "317--328",
  volume = "10",
  publisher = "American Psychological Association. Journals Department, 750 First Street NE, Washington, DC 20002-4242. Tel: 800-374-2721; Tel: 202-336-5510; Fax: 202-336-5502; e-mail: order@apa.org; Web site: http://www.apa.org/publications.",
  number = "3",
  year = "2005",
  title = "An Alternative to Cohen's Standardized Mean Difference Effect Size: A Robust Parameter and Confidence Interval in the Two Independent Groups Case",
  language = "eng",
  author = "Algina, James and Keselman, H. J. and Penfield, Randall D.",
  keywords = "Effect Size; Intervals; Robustness (Statistics); Probability; Statistical Distributions; Alternative Assessment; Criticism",
}
```

The citation identifier here is: **AlginaJames2005AAtC**

Including Citations

Citations go inside square brackets and are separated by semicolons. Each citation must have a key, composed of '@' + the citation identifier from the database.

Here is some text and a citation [@AlginaJames2005AAtC].

Insert a level-1 heading called "References" at the end of your document.

Here is some text and a citation [@AlginaJames2005AAtC].

References

The knitted document now includes a citation and the reference.

Here is some text and a citation (Algina, Keselman, and Penfield 2005).

References

Algina, James, H. J. Keselman, and Randall D. Penfield. 2005. "An Alternative to Cohen's Standardized Mean Difference Effect Size: A Robust Parameter and Confidence Interval in the Two Independent Groups Case." *Psychological Methods* 10 (3). American Psychological Association. Journals Department, 750 First Street NE, Washington, DC 20002-4242. Tel: 800-374-2721; Tel: 202-336-5510; Fax: 202-336-5502; e-mail: order@apa.org; Web site: <http://www.apa.org/publications>.: 317–28.

Citations may optionally have a prefix, a locator, and a suffix.

Here is some text and a citation [see @AlginaJames2005AAtC, p. 317].

Here is some text and a citation (see Algina, Keselman, and Penfield 2005, 317).

They can also be used inline like this:

@AlginaJames2005AAtC say blah.

Algina, Keselman, and Penfield (2005) say blah.

See other options for citations here:

http://rmarkdown.rstudio.com/authoring_bibliographies_and_citations.html

Use APA Formatted Citations and References

By default, the Chicago style (author-date format) is used for citations and references. To use another style, you will need to:

- Download the appropriate CSL style file. (Find many at <https://zotero.org/styles>)
- Place the file in the same folder as the RMD file.
- Specify the name of the **CSL style file** in the `csl`: YAML field.

```
---
```

```
title: "Hello World"
author: "Andrew Zieffler"
date: "January 22, 2019"
output:
  html_document:
    toc: true
    toc_float: true
bibliography: my_bibliography.bib
csl: apa-single-spaced.csl
---
```

References

Algina, J., Keselman, H. J., & Penfield, R. D. (2005). An alternative to cohen's standardized mean difference effect size: A robust parameter and confidence interval in the two independent groups case. *Psychological Methods*, 10(3), 317–328.

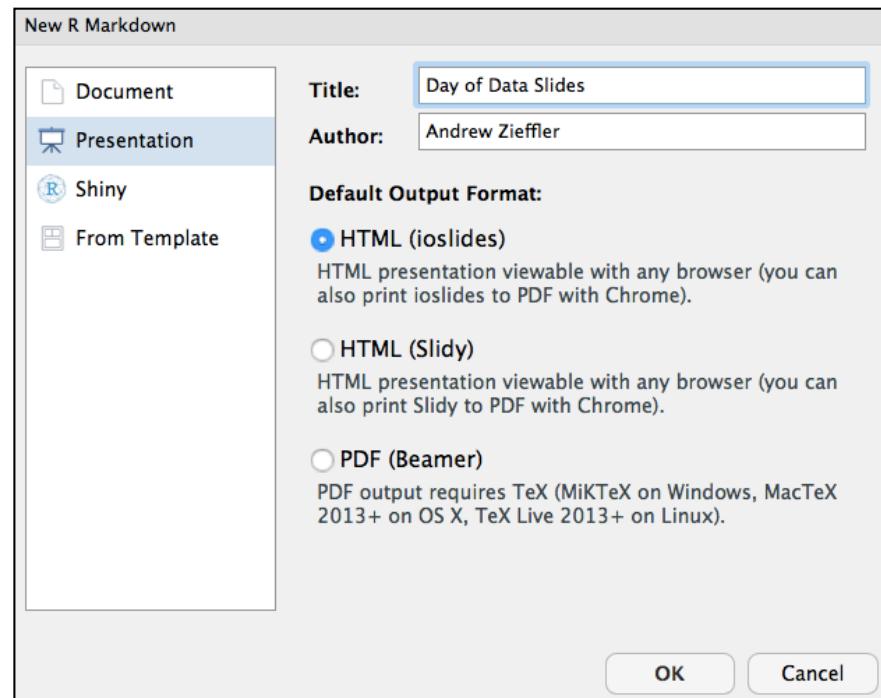
Unfortunately the references will not indent properly without some additional user-added syntax in the CSL style file.

R Projects

More Cool Stuff
with Markdown

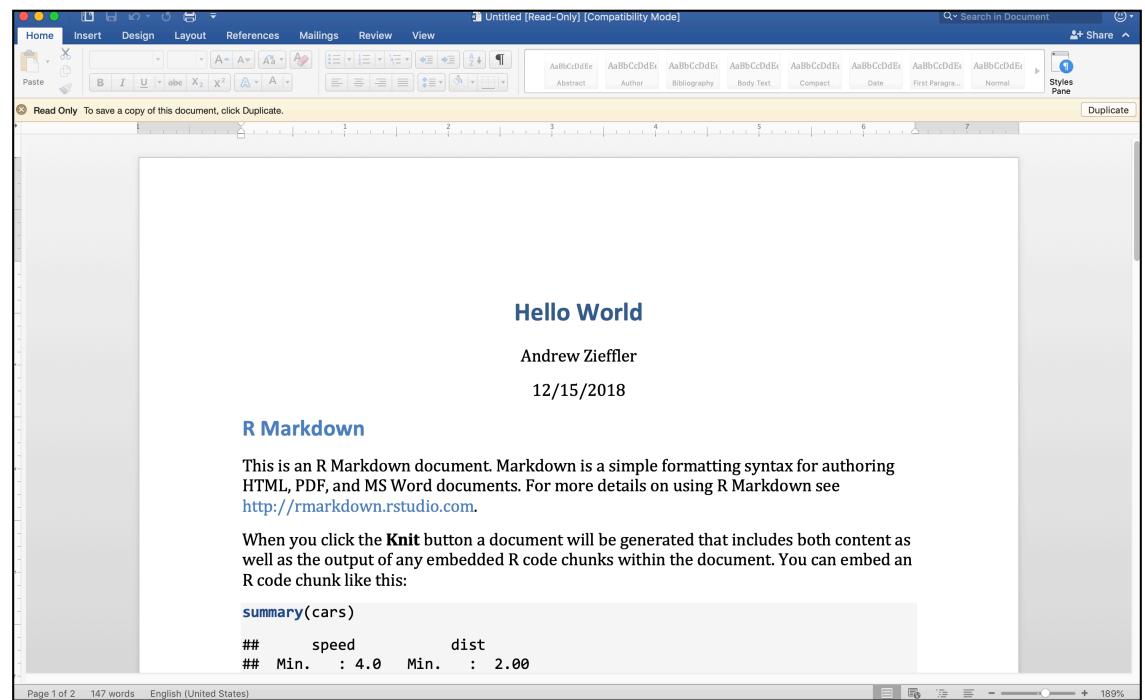
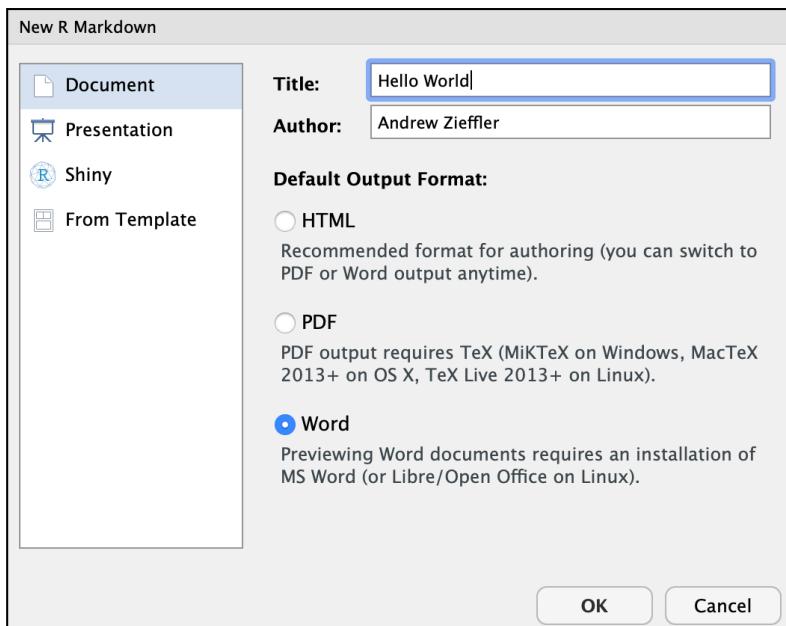
Slide Decks with Markdown

- Under the File menu, select New File > R Markdown...
- Select Presentation
- Choose one of the formats
- Put your name in as Author:
- Click OK

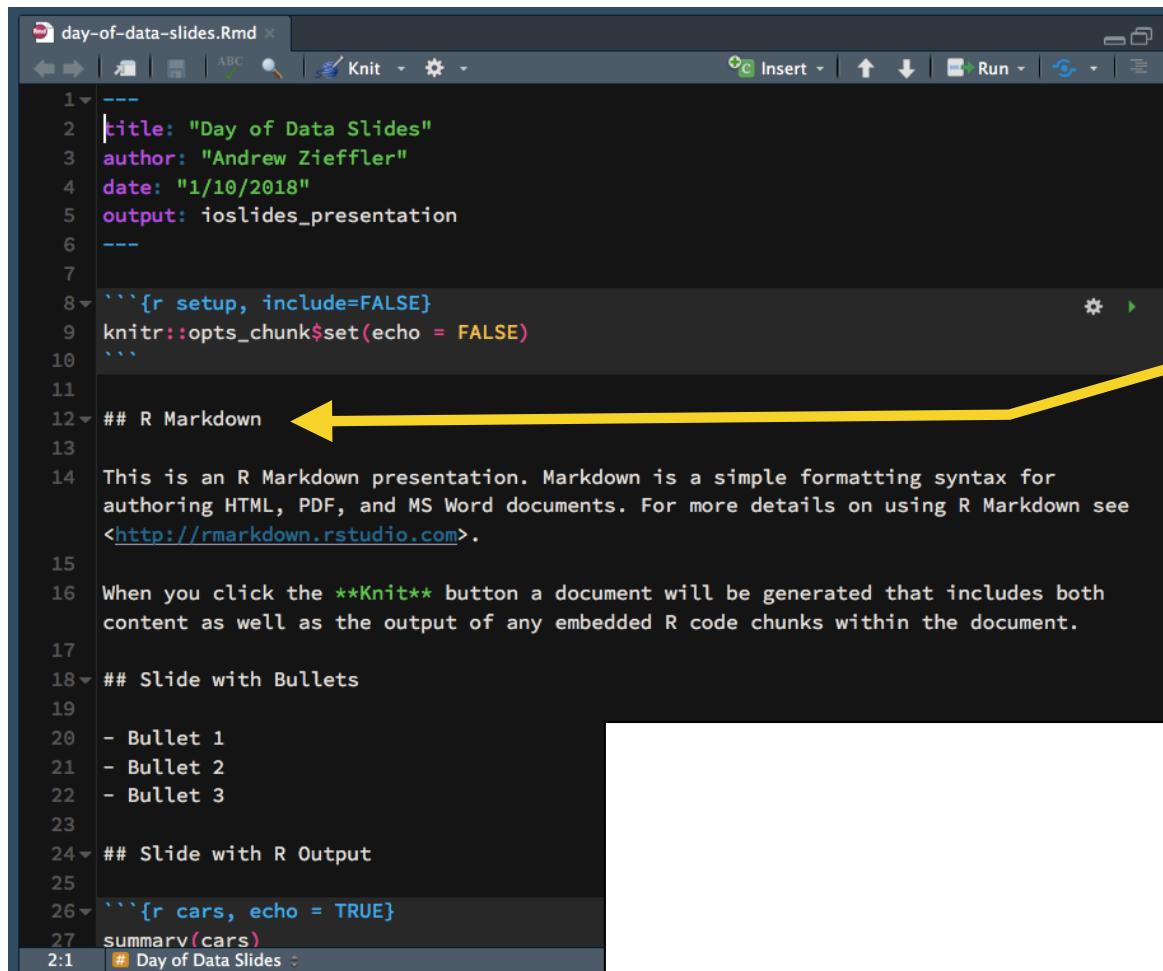


Markdown to Word

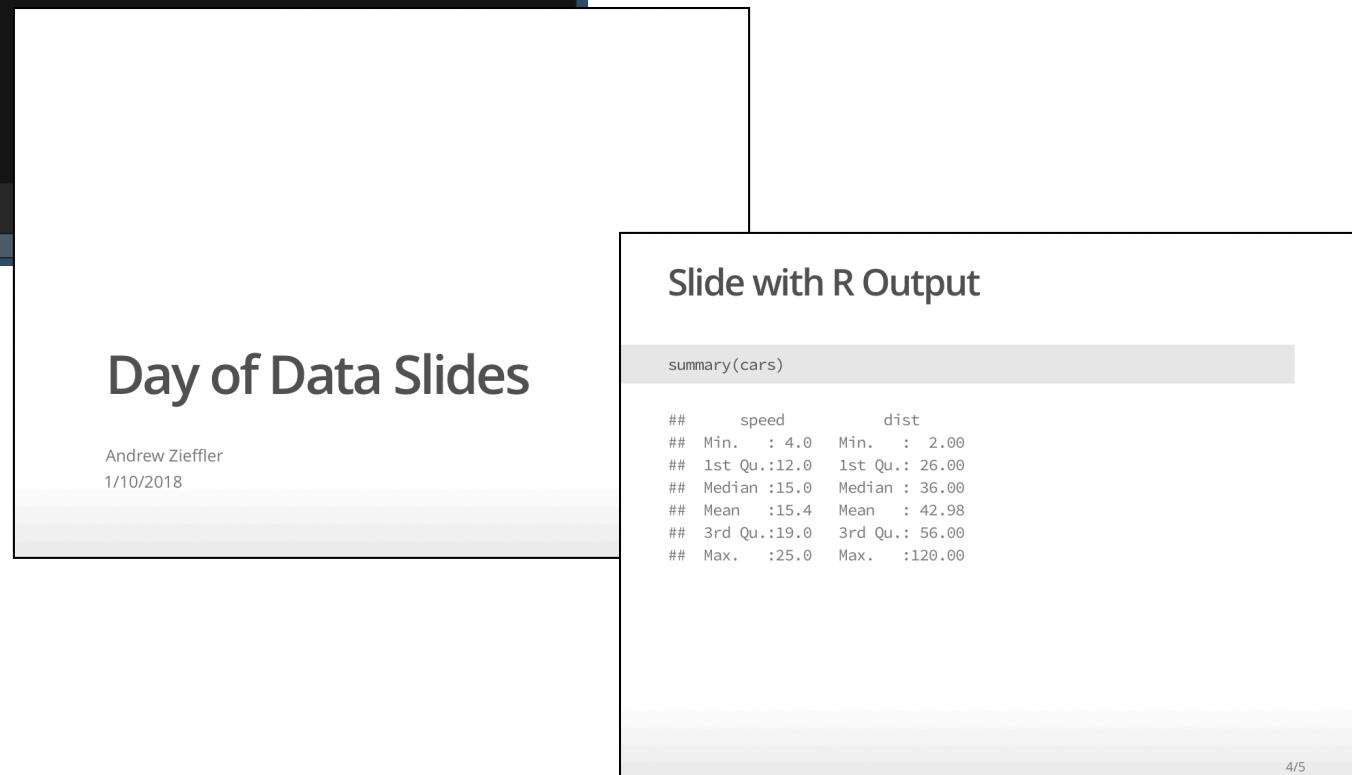
- Under the File menu, select New File > R Markdown...
- Select Word



The Word document will be Read-Only. To edit it using Word, you will need to save a copy of the document.



```
1 ---  
2 title: "Day of Data Slides"  
3 author: "Andrew Zieffler"  
4 date: "1/10/2018"  
5 output: ioslides_presentation  
6 ---  
7  
8 ```{r setup, include=FALSE}  
9 knitr::opts_chunk$set(echo = FALSE)  
10 ...  
11  
12 ## R Markdown ←  
13  
14 This is an R Markdown presentation. 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>.  
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.  
17  
18 ## Slide with Bullets  
19  
20 - Bullet 1  
21 - Bullet 2  
22 - Bullet 3  
23  
24 ## Slide with R Output  
25  
26 ```{r cars, echo = TRUE}  
27 summary(cars)  
2:1 Day of Data Slides
```



Day of Data Slides

Andrew Zieffler
1/10/2018

Slide with R Output

```
summary(cars)
```

| | speed | dist |
|------------|-------|----------------|
| ## Min. | 4.0 | 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.: 56.00 |
| ## Max. | 25.0 | Max. : 120.00 |

Heavily annotated with yellow arrows pointing to the R code, the slide title, and the generated R output table.

Heavily annotated with yellow arrows pointing to the R code, the slide title, and the generated R output table.

Markdown Templates

Overview

The `rticles` package provides a suite of custom R Markdown LaTeX formats and templates for various formats, including:

- JSS articles
- R Journal articles
- CTeX documents
- ACM articles
- ACS articles
- AMS articles
- PeerJ articles
- Elsevier journal submissions
- AEA journal submissions
- IEEE Transaction journal submissions
- Statistics in Medicine journal submissions
- Royal Society Open Science journal submissions
- Bulletin de l'AMQ journal submissions
- MDPI journal submissions

<https://github.com/rstudio/rticles>

The screenshot shows a document template with a dark header bar containing a save icon and the text "NAVTITLE". The main content area has a placeholder "INSERT_TITLE_HERE" at the top. Below it is a section labeled "AUTHOR • 2016-02-04". The body of the document contains several paragraphs of Star Trek dialogue from Star Trek: Deep Space Nine, followed by a section titled "Section Title" and a block of text about the year of fire.

Captain John Sheridan: You know, I just had a thought. You've been back and forth to your world so many times since you got here. How do I know you're the same Vorlon? Inside that encounter suit you could be anyone. Kosh Narane: I have always been here. Captain John Sheridan: Oh, yeah? You said that about me too. Kosh Narane: Yes. [starts to walk away] Captain John Sheridan: I really hate it when you do that. Kosh Narane: [turns around] Good! Delenn: I am Grey. I stand between the candle and the star. We are Grey. We stand between the darkness and the light. Lt. Corwin: Do we trust no-one then? Cmdr. Susan Ivanova: No, trust Ivanova, trust yourself, anybody else, shoot'em. Ta'Lor: Congratulations citizen G'Kar. You are now a religious icon. Susan Ivanova: So the next time we find out where the Shadows plan to strike, we can mine the area, and as soon as they come out of hyperspace... Citizen G'Kar: Then, as you so concisely say, Boom!

Section Title

G'Kar: It is said that the future is always born in pain. The history of war is the history of pain. If we are wise, what is born of that pain matures into the promise of a better world, because we learn that we can no longer afford the mistakes of the past. Dr. Stephen Franklin: Doesn't anyone listen to one damn word I say? Captain John Sheridan: No surrender, no retreat. [Opening narration, season 4] Lennier: It was the year of fire, Zack Allan: The year of destruction, Citizen G'Kar: The year we took back what was ours. Lyta Alexander: It was the year of rebirth, Ambassador Vir Cotto: The year of great sadness, Marcus Cole: The year of pain, Delenn: And a year of joy. Ambassador Londo Mollari: It was a new age. Dr. Stephen Franklin: It was the end of history. Susan Ivanova: It was the year everything changed. Michael Garibaldi: The year is 2261. Captain John Sheridan: The place, Babylon 5. Sinclair: They say God works in mysterious ways. Michael Garibaldi: Maybe so, but He's a con-man compared to the Vorlon.

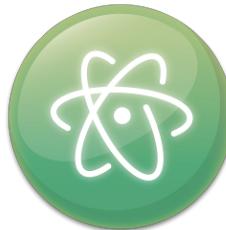
Figures

<https://github.com/hrbrmstr/markdowntemplates>

Other Markdown Editors



MacDown



Atom



Marked 2



StackEdit
(online editor)



Sublime Text



Scrivener



Mou



Dillinger
(online editor)

<https://github.com/mundimark/awesome-markdown-editors>

One Last Thing

Use Markdown in your email messages for quick, easy formatting.



Markdown Here: <https://markdown-here.com/>

New Message

Goldy Gopher (██████████)

Subject

| Name | Lunch order | Spicy | Owes |
|-------|-------------|--------|------|
| Joan | saag paneer | medium | \$11 |
| Sally | vindaloo | mild | \$14 |
| Erin | lamb madras | HOT | \$5 |

There are **multiple syntax highlighting themes** to choose from. Here's one of them:

```
```javascript
// All the code you will ever need
var hw = "Hello World!"
alert(hw);
```
--
```

Andrew Zieffler, Ph.D.
Educational Psychology
University of Minnesota

New Message

Goldy Gopher (██████████)

Subject

| Name | Lunch order | Spicy | Owes |
|-------|-------------|--------|------|
| Joan | saag paneer | medium | \$11 |
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```
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Andrew Zieffler, Ph.D.
Educational Psychology
University of Minnesota

Find Out More

- **Markdown Syntax:** <http://daringfireball.net/projects/markdown/syntax>
- **R Markdown:** <http://rmarkdown.rstudio.com/>
- **Knitr:** <http://yihui.name/knitr/>
- **BibTeX:** http://en.wikibooks.org/wiki/LaTeX/Bibliography_Management
- **Create a custom template:** http://rmarkdown.rstudio.com/tufte_handout_format.html