

# 2

## WRITING YOUR ESSAY USING R MARKDOWN: SOMETHING FOR EVERYONE

### 2.1 INTRODUCTION

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Almost all current R books start to teach R using one of the three following approaches:

- How to use R as a calculator
- How to use R to create graphs to visualize data
- How to use R to create or import data

While these approaches are useful in their own right, they are typically presented in a technical and detailed manner that beginners find challenging. This book, in contrast, starts with a task everyone is familiar with—writing an essay.

This chapter will begin with a very gentle introduction to writing essays using R and RStudio. You will learn how to use a free add-on package called R Markdown, a document writing program, to write essay assignments. This package, and the skills that you will learn in this chapter, can also be applied to the writing of papers, technical reports, novels, and so much more. In this chapter, you will learn to create your very first R Markdown or .Rmd file, in which you can weave images, computer code, graphs, web links, and text all into a formatted report.

With this new approach, you will find how accessible R can really be. You can use R to write essays that integrate text, graphs, and images, without needing to learn much programming at all. It is immediately empowering for first-time R learners to be able to deliver a report that integrates text and graphs, without having to climb a steep learning curve such as in other R books. Now, let's continue your R learning journey!

Through this chapter, you as first-time R users will accomplish the following objectives:

1. Understand why, when, and how to use R Markdown
2. Learn to create a .Rmd file using R Markdown and to write and format your text in R Markdown
3. Apply those skills to finish an essay assignment in R Markdown
4. Integrate graphs into the essay

## 2.2 THE PROS OF USING R MARKDOWN

R Markdown is an add-on package that serves as a document writing program in R. In short, R Markdown is like a software update for your regular version of R that allows you to write papers and formatted documents. R Markdown files can contain text, web links, images, R code, statistical output, and more.

Every R Markdown document contains something known as “Markdown formatting code.” This code deals with section headings, italics, boldings, and other document formatting features. The first part of formatting code that you see will be the YAML header. In simple terms, the YAML header contains the title, date, and author sections. Other than filling these out, you won’t need to mess with this code. The other Markdown code will be inserted by you as you write your document to bold words, create bulletpoints, and more. We can worry about this later.

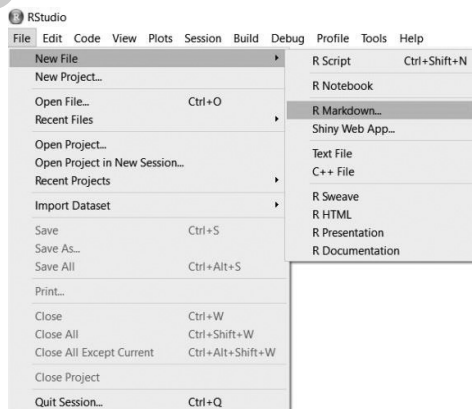
The rest of an R Markdown document is the text that you write and the programming code that you insert to create graphs and statistical output. Once you’re happy with your document, you will “knit” it—a fancy way of saying pressing the knit button in RStudio to print the formatted document to your screen. This effect is similar to what happens when you click on a link to download something.

The main pro of R Markdown is that you no longer have to deal with the hassle of trying to combine graphs created in one software with another software—similar to what often happens in other document writing programs. Instead, you can create everything in one document at one time.

Now let’s get started!

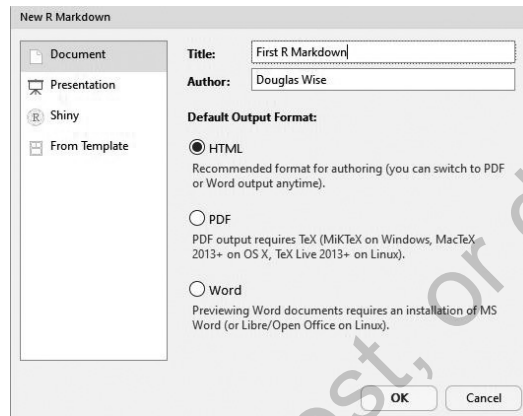
## 2.3 HOW TO CREATE AN R MARKDOWN FILE

Unlike other add-on packages, R Markdown doesn’t need to be installed manually in RStudio because it is installed automatically when you install RStudio. To create a new .Rmd, or R Markdown, file in RStudio, select **File, New File, R Markdown**, as shown below.



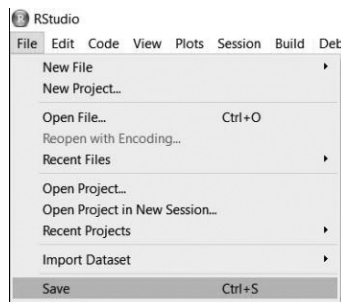
Once your new R Markdown document pops up, you will be prompted to type in the space for **Title** and **Author**. In the example below, you can see what an R Markdown document would look like with this information filled in.

After doing so, you will then select a **Default Output Format**. As shown, you can choose among HTML, PDF, and Word formats. HTML format is the easiest and most recommended output version because it only needs a browser (e.g., Internet Explorer or Safari); but PDF and Word formats both require that additional software be installed (e.g., MiKTeX for PDF and MS Office for Word). After you have chosen the output file format, click **OK**, and voila! You have just created a new R Markdown document.



Once you create your document, RStudio will automatically populate an R Markdown, or .Rmd, document template for you to work with. When the template shows up, you should immediately save the file. You can do so by selecting **File, Save**. You can also save the file by clicking the save icon at the top of the screen, or by pressing down two keys on your keyboard—**Ctrl** and **S**—together.

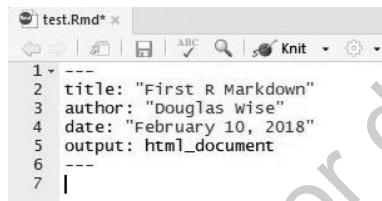
Be sure to title the document with something that relates to the document's content such as "English Homework." Also be sure to save the file in a file folder that you can find later on. It is best that you create a file folder for a set of files that serve the same purpose; for example, create a file folder called "homework" in the RStudio project folder you created in Chapter 1.



When saved, the file name at the top of the page will turn from red to black. It is important to note that R Markdown **does not** automatically save your work, so every now and then you should save your work just to be safe.

In the document template, the top section is enclosed by two `---` symbols. Between those two `---` symbols is the metadata or **YAML** header section, which includes the title, author, date, file type, and other options. The content in this **YAML** header tells you and future readers what the document is about, who created it, when they created it, and what the output format will be, so it's very important.

*For this section only, for simplicity, it is best that you delete the rest of the template and keep only the metadata or YAML header.* This will give you a cleaner and simpler document template to begin with. In the next section, you will learn how to work with the rest of the template.

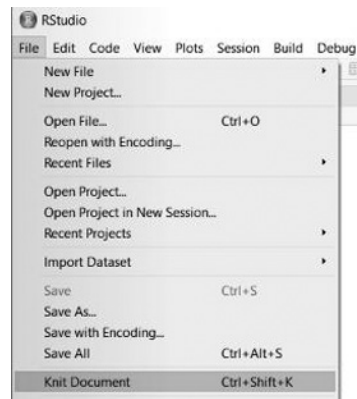


```
1 ---
2 title: "First R Markdown"
3 author: "douglas wise"
4 date: "February 10, 2018"
5 output: html_document
6 ---
7 |
```

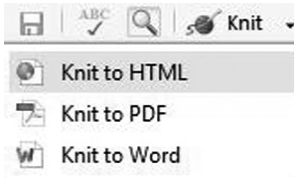
A really important function in R Markdown is the **Knit** function. The Knit function compiles the `.Rmd` file and produces a formatted document in the prechosen output file type (HTML, PDF, Word). We're going to use the HTML output format in the following example.

To **Knit** your document, you can either select **File, Knit Document**, or click **Knit** on the taskbar. This will prompt the program to compile your `.Rmd` file into a HTML document, and a new window will open up with the compiled HTML document.

While you don't have to do this, it is best that you **Knit** your document together every once in a while. This way, you can make sure that the completed report or assignment looks clean and correct and that all the graphs and paragraphs look just how you want them to look and are where you want them to be.



As noted, if you have the appropriate software installed, you can also choose to knit your document as a .PDF or Microsoft Word file. This is useful if you have a teacher, professor, or boss who prefers to see the report in a certain format.



Your knitted html document will look like the following:



## 2.4 HOW TO WRITE AND FORMAT TEXT IN R MARKDOWN

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After you create, save, and knit an .Rmd file, you may now add text to your document. You can start with the most basic word processing—simply typing your text below the YAML header section.

If you want to start a new paragraph, you can simply hit **Enter** twice on your keyboard, and begin writing again. This leaves a blank line between the two paragraphs, which is a nice feature to have when writing papers.

You can add section headings by using the pound or hashtag sign #. There are six levels of section headings. A single pound or hashtag indicates a Level 1 section heading (i.e., largest in size), two pound signs indicate a Level 2 section heading, and so on. An example is shown below.

```
# Level 1 section heading  
## Level 2 section heading
```

You can also **bold** and *italicize* the font of text by using asterisks as follows:

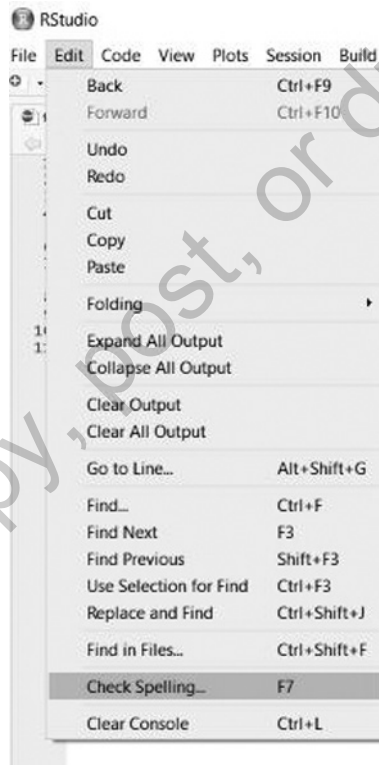
\*Italicized Text\* produces *Italicized Text*

\*\*Bold Text\*\* produces **Bold Text**

\*\*\*Italicized Bold Text\*\*\* produces ***Italicized Bold Text***

To insert parentheses like () and quotation marks like “”, simply type one parenthesis or quotation mark, and RStudio will auto complete the other one so as to save you time and reduce errors from parentheses and quotation marks that are never closed.

You can also check for spelling errors in your document. Similar to other word processing programs, R Markdown has a spell-check option. To spell-check your work, select **Edit, Check Spelling**. Or you could simply press **F7** on your keyboard, or click the **ABC** icon on the task bar (which is to the left of the **Knit** button).

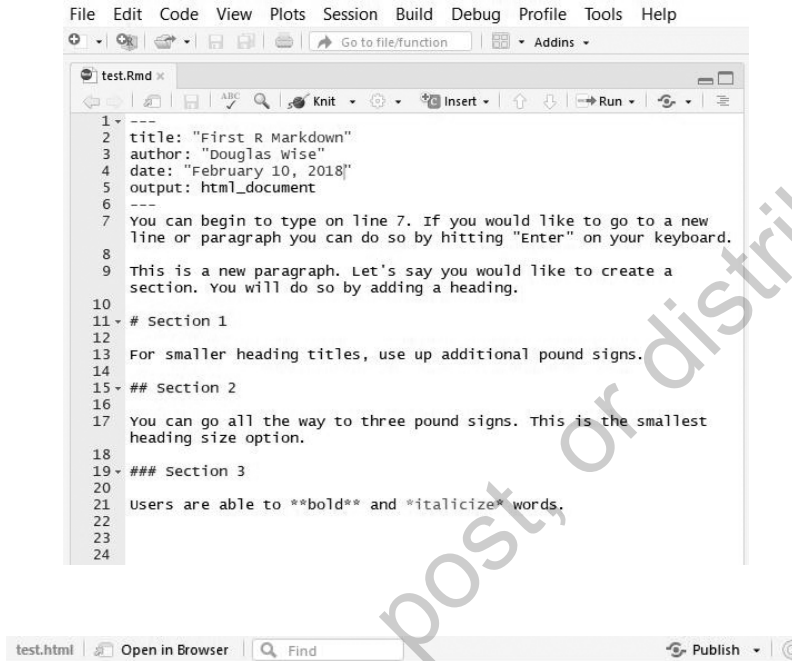


## 2.5 A SIMPLE EXAMPLE OF AN R MARKDOWN DOCUMENT

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Now that you have learned the basic bells and whistles, below you can find a simple .Rmd file followed by its knitted html document. You can use the following .Rmd file

as your writing template and revise it to suit your needs. In the example below, you can see that there is very little actual programming being done in the .Rmd file. In fact, the knitted document does not look that much different from what you would have produced using Word.



# First R Markdown

*Douglas Wise*

*February 10, 2018*

You can begin to type on line 7. If you would like to go to a new line or paragraph you can do so by hitting "Enter" on your keyboard.

This is a new paragraph. Let's say you would like to create a section. You will do so by adding a heading.

## Section 1

For smaller heading titles, use up additional pound signs.

## Section 2

You can go all the way to three pound signs. This is the smallest heading size option.

## Section 3

Users are able to **bold** and *italicize* words.

## 2.6 OTHER USEFUL FORMATTING TRICKS

### 2.6.1 Create Bullet Points and Numbered Lists

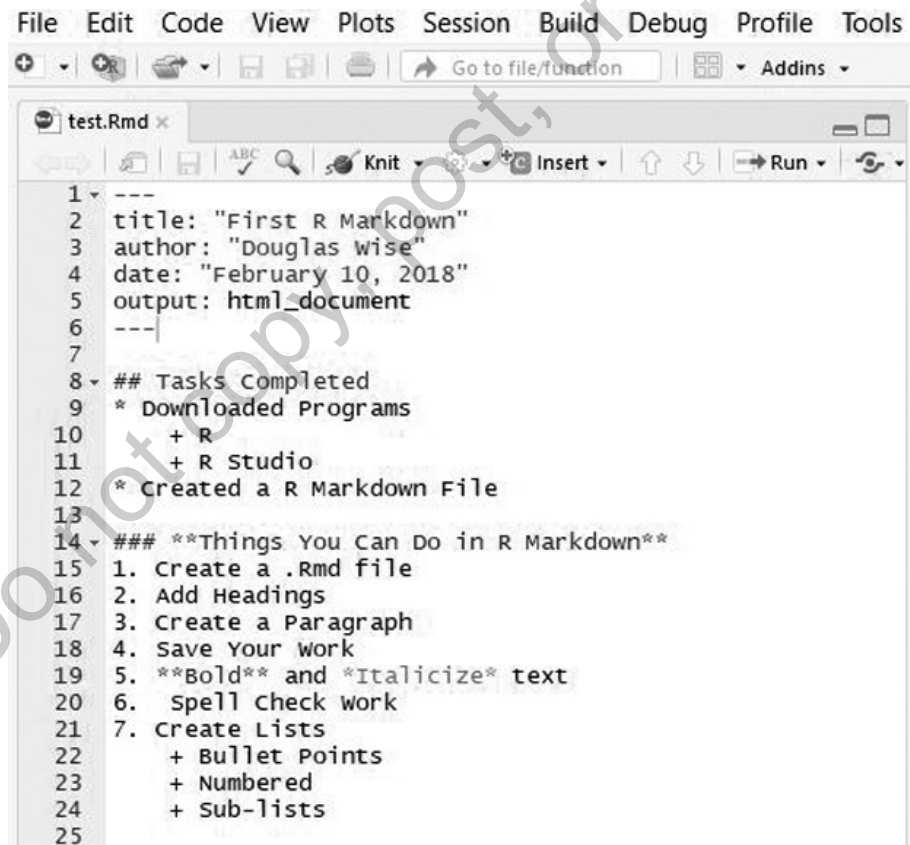
At times, you may want to show bullet points and lists within your document. Don't worry, this is actually pretty easy to achieve in R Markdown.

To create a **bullet point**, place an asterisk (\*), followed by a blank space, in front of a phrase or sentence.

For **sub-bullet points**, hit **Enter** on your keyboard to go to the line below the main bullet point, hit **Tab** on your keyboard twice, and add a plus sign (+). You are able to add multiple sub-bullet points and even tertiary sub-bullet points.

For a **numbered list**, simply begin an item with an integer number and a period.

The illustration below first shows you an .Rmd file with the formatting code for these features, and then its knitted output document.



The screenshot shows the RStudio interface with a file named 'test.Rmd' open. The editor displays the following R Markdown code:

```
1 ---
2 title: "First R Markdown"
3 author: "Douglas Wise"
4 date: "February 10, 2018"
5 output: html_document
6 ---
7
8 ## Tasks Completed
9 * Downloaded Programs
10 + R
11 + R Studio
12 * Created a R Markdown File
13
14 ### **Things You Can Do in R Markdown**
15 1. Create a .Rmd file
16 2. Add Headings
17 3. Create a Paragraph
18 4. Save Your work
19 5. Bold and italicize text
20 6. spell check work
21 7. Create Lists
22 + Bullet Points
23 + Numbered
24 + Sub-lists
25
```

The knitted output is shown below the code, displaying the rendered HTML document with the same formatting applied.



# First R Markdown

*Douglas Wise*

*February 10, 2018*

## Tasks Completed

- Downloaded Programs
  - R
  - R Studio
- Created a R Markdown File

## Things You Can Do in R Markdown

1. Create a .Rmd file
2. Add Headings
3. Create a Paragraph
4. Save Your Work
5. **Bold** and *Italicize* text
6. Spell Check Work
7. Create Lists
  - Bullet Points
  - Numbered
  - Sub-lists

### 2.6.2 Insert Web Links and Pictures

As you continue to polish your document, there may be times when you would like to add a web link or a picture to your document. You can add a web link by surrounding it with angle brackets like this:

<copy and paste your link here>

When inserting a web link, make sure to leave no space between your angle bracket and the web link.

To insert an image, you can follow the procedure described below. First, inside the folder containing your .Rmd file, create a subfolder called `Images` to store all relevant images. Second, place the following code example in your .Rmd file at the position where you want the image to be.

```
![Caption of My Image] (Images/image_file_name.file_type)
```

As shown, the image insertion in R Markdown is defined by the expression: `![]()`. Here is a description of the code for inserting an image inside the .Rmd file.

- !: exclamation mark indicating the insertion of an image.
- []: a pair of brackets indicating the caption of your image is inside. In the code example, the image to be inserted is called `Caption of My Image`.
- () : a pair of parentheses indicating the path and the name for the image file are inside. In the code example, the path is `Images/`, meaning the file is in the subfolder `Images` within the folder that contains the `.Rmd` file; the file name is `image_file_name.file_type`. Of course, you may store the image elsewhere on your computer, so long as the full file path is correctly listed inside the parentheses.

The illustration below shows an `.Rmd` file example and its knitted output document. Note how a longer path name is used to locate the image of Douglas Wise's dog Brewster.

<pre> 1 --- 2 title: "First R Markdown" 3 author: "Douglas wise" 4 date: "May 5, 2018" 5 output: html_document 6 --- 7 8 For this example, I will be using a picture of my dog 9 Brewster. Now that we have an image, let's put it in the 10 proper format. 11 12 ![My Dog Brewster](/Users/wise/Desktop/Brewster.jpg) </pre>	<h2>First R Markdown</h2> <p><i>Douglas Wise</i></p> <p><i>May 5, 2018</i></p> <p>For this example, I will be using a picture of my dog Brewster. Now that we have an image, let's put it in the proper format.</p>  <p>My Dog Brewster</p>
---	--

## 2.7 HOW TO USE R MARKDOWN FOR A WRITING ASSIGNMENT: A BARE-BONES EXAMPLE

Having learned all the bits and pieces that you need to know in order to format an R Markdown, or `.Rmd`, file, it is time for you to put that knowledge to use and to finish an assignment. Suppose that your teacher gives you the following prompt for a writing assignment:

*Write a short essay about Netflix to demonstrate how it has changed people's TV watching habits. Focus on the idea of "binge-watching."*

You probably already know how to write an essay in Word, but how do you write an essay in R Markdown? Here, you may begin with a bare-bones example for writing this essay assignment in R Markdown. To avoid any lingering confusion, there will be a lot of repetition of the materials discussed above so that you can refresh your memory.

Writing your essay in R Markdown might seem difficult at first, but once you get started, you'll find that it's actually a lot easier than you think. Once you install R and RStudio, and generate a default R Markdown or .Rmd file, you can begin word processing. At first, the default R Markdown or .Rmd template file in RStudio will look like this:

```
1 ---
2 title: "Untitled"
3 author: "Elizabeth Gohmert"
4 date: "1/31/2018"
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, and MS Word documents. For more details on
15 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 well as the output of any embedded R code
18 chunks within the document. You can embed an R code chunk like this:
19
20 ```{r cars}
21 summary(cars)
22 ```
23
24 ## Including Plots
25
26 You can also embed plots, for example:
27
28 ```{r pressure, echo=FALSE}
29 plot(pressure)
30 ```
```

We're going to take this .Rmd default template from RStudio and revise it along the lines discussed earlier: fill out the top YAML header section of the .Rmd file in terms of the title, author, date, and output file type.

Just to be sure, if you did not fill out the correct title earlier, now you should do so. In this example, where you see the words **title: "Untitled"**, replace the word "Untitled" with your desired document title. Whatever you name the title is going to show up at the top of your final document, so choose wisely. Once you choose a title, fill inside the quotation marks next to **author:** with your own name if you have not done so already. The chosen output file type is currently html.

Right below the YAML header section is the following three lines of code that are worth explaining:

```
```{r setup, include=FALSE}
knitr::opts_chunk$set(echo = TRUE)
```
```

The three lines of code form what is called one R code chunk. This one R code chunk contains the following elements:

``` : The three back ticks in the first line initiate this R code chunk, and the three back ticks in the third line ends this R code chunk.

{r setup, include=FALSE}: Inside the pair of braces are first the name of the R code chunk, separated by a comma, and followed by relevant chunk options. In this default .Rmd template in RStudio, this one code chunk is called “r setup,” and you may change it to any other name so long as it is different from other code chunk names in the .Rmd file. The chunk option `include=FALSE` means that the code chunk will be evaluated, but neither its R code (the second line) nor its output will be displayed in the output document. Conversely, `include=TRUE` means that the code chunk will be evaluated and both the R code itself and its output will be displayed in the output document.

`knitr::opts_chunk$set(echo = TRUE)`: This is the main line of R code inside this R code chunk. Since the current code chunk is the first code chunk in the whole document, `opts_chunk$set()` is used here to set up the global options, meaning that the options chosen here will be applied throughout the document and you do not have to retype them again and again later on. In this default .Rmd template, the option `echo = TRUE` means that the R code will be shown in the output document. Conversely, if you change it to `echo = FALSE`, then the R code will not be shown in the output document. `knitr::` means that you will use the knitr package to set the the global chunk option with `opts_chunk$set()`.

It is useful to know that you may add many other global options inside `opts_chunk$set()`. For example, you may add `warning=FALSE` to exclude any R warnings from the output document, and the default is `warning=TRUE`; you may also add `message=FALSE` to exclude any R messages from the output document, and the default is `message=TRUE`. Just make sure that you separate the different options inside the parenthesis with commas.

At this point, you may remove the rest of the .Rmd template before moving on, which will give you the following .Rmd file. As shown in the YAML header, the document is titled as “Chapter 1 HW”, the author is listed as one of the coauthors—“Elizabeth Gohmert”—the document is dated, and the output file type is listed as html. The first R code chunk for global options is kept from the default .Rmd template.

```
1 ---
2 title: "Chapter 1 HW"
3 author: "Elizabeth Gohmert"
4 date: "1/31/2018"
5 output: html_document
6 ---
7
8 - {r setup, include=FALSE}
9   knitr::opts_chunk$set(echo = TRUE)
10 -
11
```

Next, you may add your own text to the .Rmd file to complete the writing assignment. In the completed essay below, you will first see the .Rmd file and then the knitted output document. The .Rmd file can be used as a template for your own writing assignments.

```

1 ---
2 title: "Chapter 1 HW"
3 author: "Elizabeth Gohmert"
4 date: "2/3/2018"
5 output: html_document
6 ---
7
8 {r setup, include=FALSE}
9 knitr::opts_chunk$set(echo = TRUE)
10
11
12 ## Netflix and Binge-watching
13
14 **Prompt: Write a short essay about Netflix and how it has changed people's TV watching habits through the introduction of
15 "binge-watching".**
16
17 Gone are the days of Netflix being a place for people to watch movies; now it's the place that most people watch their television shows
18 too. Just like most Americans, I spend hours a day watching Netflix. I watch Netflix when I'm bored, when I'm doing my homework, and when I
19 just want to relax after a long day. Everyone has their go-to shows that they watch on Netflix. For me, I typically watch and re-watch shows
20 such as "Gilmore Girls", "House of Cards", "Glee", and "the Office". While every show on Netflix has a wide-following of dedicated fans, a
21 few Netflix were viewed more than any others in 2017.
22
23 The most binge-watched shows are as follows: 1. "American Vandal", 2. "3%", 3. "13 Reasons Why", 4. "Anne With an E", 5. "Riverdale", 6.
24 "Inferno", 7. "Travelers", 8. "The Keepers", 9. "The OA", and 10. "The Confession Tapes". Statistics like these are interesting to me
25 because they show just how wide and diverse people's Netflix watching interests are. Of those "top shows" I have only ever seen "13 Reasons
26 Why" and "Riverdale", and haven't even heard of many of the other shows listed, yet their popularity is unquestionable.
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100

```

While lists of popular shows are great, the bigger question is--what exactly is binge-watching and just how prevalent is it in today's society? "Binge-watching" is defined as watching multiple videos or episodes of a TV show in a short period of time. While the concept of "binge-watching" may have been invented in modern times, it is a phenomenon that affects all age groups. Statistics show that 72 percent of millennials, 73 percent of Generation X, 67 percent of Baby Boomers, and 56 percent of retirees have a Netflix subscription. Of the different age groups, 90 percent of millennials and 88 percent of Generation Z report regular binge-watching of a TV series. It just goes to show you that young or old, everybody loves a good Netflix binge.

While everyone, young and old, watches Netflix, there is a wide disparity in binge-watching habits based on gender. On weekdays, men binge-watched an average of 2.61 hours while women binge-watched an average of 2.37 hours. On weekends, men binge-watched an average of 3.75 hours, while women binge-watched an average of only 2.89 hours. While statistics don't explain this disparity, it's possible that women don't binge-watch as much as men do because they feel a greater responsibility to clean, run errands, and to take care of their children after work, while many men are less likely to have those same responsibilities.

While age and gender are factors that cause differing trends in a person's Netflix habits, every Netflix user can be united by their love of good TV, and good TV when they have time for it. Gone are the days of waiting to find out "what happens next", and here are the days of finding out who exactly is "the mother" in "How I Met Your Mother" at 3 o'clock in the morning after you spent all night furiously trying to see who Ted Mosby would finally end up with.

**\*\*Works Cited\*\***

Feldman, Dana. "The Most Binged Shows On Netflix In 2017." Forbes, Forbes Magazine, 12 Dec. 2017, [www.forbes.com/sites/danafeldman/2017/12/11/what-were-the-top-binged-shows-on-netflix-in-2017/#1bf1cfcc1bbe](http://www.forbes.com/sites/danafeldman/2017/12/11/what-were-the-top-binged-shows-on-netflix-in-2017/#1bf1cfcc1bbe).

Fuller, Steve. "Topic: Binge Watching in the U.S." Www.statista.com, [www.statista.com/topics/2508/binge-watching-in-the-us/](http://www.statista.com/topics/2508/binge-watching-in-the-us/).

Lynch, John. "Netflix Shared Its 10 Most Binge-Watched Shows of 2017." Business Insider, Business Insider, 11 Dec. 2017, [www.businessinsider.com/most-binge-watched-netflix-shows-of-2017-list-2017-12/](http://www.businessinsider.com/most-binge-watched-netflix-shows-of-2017-list-2017-12/).

## Chapter 1 HW

Elizabeth Gohmert

2/3/2018

### Netflix and Binge-watching

**Prompt: Write a short essay about Netflix and how it has changed people's TV watching habits through the introduction of "binge-watching".**

Gone are the days of Netflix being a place for people to watch movies; now it's the place that most people watch their television shows too. Just like most Americans, I spend hours a day watching Netflix. I watch Netflix when I'm bored, when I'm doing my homework, and when I just want to relax after a long day. Everyone has their go-to shows that they watch on Netflix. For me, I typically watch and re-watch shows such as *Gilmore Girls*, *House of Cards*, *Glee*, and *the Office*. While every show on Netflix has a wide-following of dedicated fans, a few Netflix were viewed more than any others in 2017.

The most binge-watched shows are as follows: 1. *American Vandal*, 2. *3%*, 3. *13 Reasons Why*, 4. *Anne With an E*, 5. *Riverdale*, 6. *Inferno*, 7. *Travelers*, 8. *The Keepers*, 9. *The OA*, and 10. *The Confession Tapes*. Statistics like these are interesting to me because they show just how wide and diverse people's Netflix watching interests are. Of those "top shows" I have only ever seen *13 Reasons Why* and *Riverdale*, and haven't even heard of many of the other shows listed, yet their popularity is unquestionable.

While lists of popular shows are great, the bigger question is—what exactly is binge-watching and just how prevalent is it in today's society? "Binge-watching" is defined as watching multiple videos or episodes of a TV show in a short period of time. While the concept of "binge-watching" may have been invented in modern times, it is a phenomenon that affects all age groups. Statistics show that 72 percent of millennials, 73 percent of Generation X, 67 percent of Baby Boomers, and 56 percent of retirees have a Netflix subscription. Of the different age groups, 90 percent of millennials and 88 percent of Generation Z report regular binge-watching of a TV series. It just goes to show you that young or old, everybody loves a good Netflix binge.

While everyone, young and old, watches Netflix, there is a wide disparity in binge-watching habits based on gender. On weekdays, men binge-watched an average of 2.61 hours while women binge-watched an average of 2.37 hours. On weekends, men binge-watched an average of 3.75 hours, while women binge-watched an average of only 2.89 hours. While statistics don't explain this disparity, it's possible that women don't binge-watch as much as men do because they feel a greater responsibility to clean, run errands, and to take care of their children after work, while many men are less likely to have those same responsibilities.

While age and gender are factors that cause differing trends in a person's Netflix habits, every Netflix user can be united by their love of good TV, and good TV when they have time for it. Gone are the days of waiting to find out "what happens next", and here are the days of finding out who exactly is "the mother" in *How I Met Your Mother* at 3 o'clock in the morning after you spent all night furiously trying to see who Ted Mosby would finally end up with.

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## 2.8 HOW TO REVISE AND IMPROVE YOUR BARE-BONES ESSAY

The bare-bones essay above is admittedly a little bit boring. Other than some boldings and italics here and there, it's just a lot of text. In this next example, we want to jazz things up a little. We're going to add some section headings and some charts to make things more visually appealing. The revised essay can be found below.

```
37 - ## Netflix and Binge-watching (With Graphs)
38
39 **Prompt: Write a short essay about Netflix and how it has changed people's TV watching habits through the introduction of
"binge-watching".**
40
41 - ###Introduction
42   Gone are the days of Netflix being a place for people to watch movies; now it's the place that most people watch their television shows
too. Just like most Americans, I spend hours a day watching Netflix. I watch Netflix when I'm bored, when I'm doing my homework, and when I
just want to relax after a long day. Everyone has their go-to shows that they watch on Netflix. For me, I typically watch and re-watch shows
such as *Gilmore Girls*, *House of Cards*, *Glee*, and *the Office*. While every show on Netflix has a wide-following of dedicated fans, a
few Netflix were viewed more than any others in 2017.
43
44 - ###Most Binge-watched Shows:
45   The most binge-watched shows are as follows:
46
47   1. *American Vandal*
48   2. *3%*
49   3. *13 Reasons Why*
50   4. *Anne With an E*
51   5. *Riverdale*
52   6. *Ingovernable*
53   7. *Travelers*
54   8. *The Keepers*
55   9. *The OA*
56   10. *The Confession Tapes*
57
58   Statistics like these are interesting to me because they show just how wide and diverse people's Netflix watching interests are. Of those
"top shows" I have only ever seen *13 Reasons Why* and *Riverdale*, and haven't even heard of many of the other shows listed, yet their
popularity is unquestionable.
```

```

60 - ###What is "binge-watching"?
61 While lists of popular shows are great, the bigger question is--what exactly is binge-watching and just how prevalent is it in today's
    society? "Binge-watching" is defined as watching multiple videos or episodes of a TV show in a short period of time. While the concept of
    "binge-watching" may have been invented in modern times, it is a phenomenon that affects all age groups.
62
63 - ###Binge-watching Trends:
64 Statistics show that 72 percent of millennials, 73 percent of Generation X, 67 percent of Baby Boomers, and 56 percent of retirees have a
    Netflix subscription.
65
66 - ```{r, echo=FALSE}
67   per = c(72,73,67,56)
68
69   barplot(per, ylim=c(0,100), names.arg=c("Millennials","Generation X","Baby Boomers","Retirees"), main="Netflix Subscriptions by Generation")
70 - ```
71

```

```

72 Of the different age groups, 90 percent of millennials and 88 percent of Generation Z report regular binge-watching of a TV series. It just
    goes to show you that young or old, everybody loves a good Netflix binge.
73
74 While everyone, young and old, watches Netflix, there is a wide disparity in binge-watching habits based on gender. On weekdays, men
    binge-watched an average of 2.61 hours while women binge-watched an average of 2.37 hours. On weekends, men binge-watched an average of 3.75
    hours, while women binge-watched an average of only 2.89 hours.
75
76 - ```{r, echo=FALSE}
77   binge = c(2.61, 2.37, 3.75, 2.89)
78
79   barplot(binge, ylim = c(0,4), names.arg=c("Male(Wkdy)", "Female(Wkdy)", "Male(Wknd)", "Female(Wknd)"), main="Binge-watching by Gender in
    Hours")
80 - ```
81

```

```

83 While statistics don't explain this disparity, it's possible that women don't binge-watch as much as men do because they
    feel a greater responsibility to clean, run errands, and to take care of their children after work, while many men are
    less likely to have those same responsibilities.
84
85 - ###Conclusion:
86 While age and gender are factors that cause differing trends in a person's Netflix habits, every Netflix user can be
    united by their love of good TV, and good TV when they have time for it. Gone are the days of waiting to find out "what
    happens next", and here are the days of finding out who exactly is "the mother" in "How I Met Your Mother" at 3 o'clock in
    the morning after you spent all night furiously trying to see who Ted Mosby would finally end up with. |
87
88 - ### Works Cited
89 Feldman, Dana. "The Most Binged Shows On Netflix In 2017." Forbes, Forbes Magazine, 12 Dec. 2017,
    www.forbes.com/sites/danafeldman/2017/12/11/what-were-the-top-binged-shows-on-netflix-in-2017/#1bf1fcc1bbe.
90
91 Fuller, Steve. "Topic: Binge Watching in the U.S." Www.statista.com,
    www.statista.com/topics/2508/binge-watching-in-the-us/.
92
93 Lynch, John. "Netflix Shared Its 10 Most Binge-Watched Shows of 2017." Business Insider, Business Insider, 11 Dec. 2017,
    www.businessinsider.com/most-binge-watched-netflix-shows-of-2017-list-2017-12/.
94

```

## Netflix and Binge-watching (With Graphs)

**Prompt:** Write a short essay about Netflix and how it has changed people's TV watching habits through the introduction of "binge-watching".

### Introduction

Gone are the days of Netflix being a place for people to watch movies; now it's the place that most people watch their television shows too. Just like most Americans, I spend hours a day watching Netflix. I watch Netflix when I'm bored, when I'm doing my homework, and when I just want to relax after a long day. Everyone has their go-to shows that they watch on Netflix. For me, I typically watch and re-watch shows such as *Gilmore Girls*, *House of Cards*, *Glee*, and *the Office*. While every show on Netflix has a wide-following of dedicated fans, a few Netflix were viewed more than any others in 2017.

### Most Binge-watched Shows:

The most binge-watched shows are as follows:

1. *American Vandal*
2. *3%*
3. *13 Reasons Why*
4. *Anne With an E*
5. *Riverdale*
6. *Ingobermable*
7. *Travelers*
8. *The Keepers*
9. *The OA*
10. *The Confession Tapes*

Statistics like these are interesting to me because they show just how wide and diverse people's Netflix watching interests are. Of those "top shows" I have only ever seen *13 Reasons Why* and *Riverdale*, and haven't even heard of many of the other shows listed, yet their popularity is unquestionable.

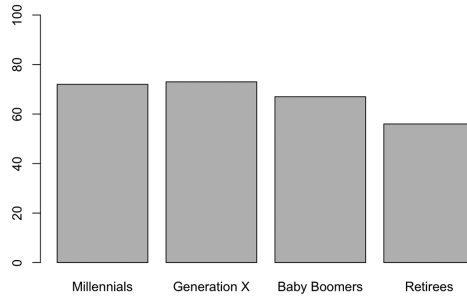
## What is "binge-watching"?

While lists of popular shows are great, the bigger question is—what exactly is binge-watching and just how prevalent is it in today's society? "Binge-watching" is defined as watching multiple videos or episodes of a TV show in a short period of time. While the concept of "binge-watching" may have been invented in modern times, it is a phenomenon that affects all age groups.

## Binge-watching Trends:

Statistics show that 72 percent of millennials, 73 percent of Generation X, 67 percent of Baby Boomers, and 56 percent of retirees have a Netflix subscription.

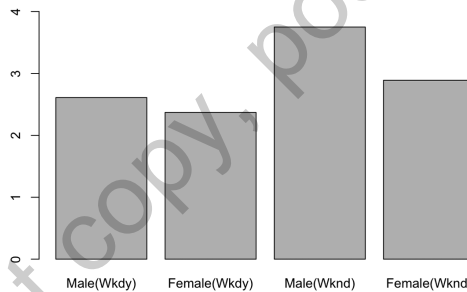
Netflix Subscriptions by Generation



Of the different age groups, 90 percent of millennials and 88 percent of Generation Z report regular binge-watching of a TV series. It just goes to show you that young or old, everybody loves a good Netflix binge.

While everyone, young and old, watches Netflix, there is a wide disparity in binge-watching habits based on gender. On weekdays, men binge-watched an average of 2.61 hours while women binge-watched an average of 2.37 hours. On weekends, men binge-watched an average of 3.75 hours, while women binge-watched an average of only 2.89 hours.

Binge-watching by Gender in Hours



While statistics don't explain this disparity, it's possible that women don't binge-watch as much as men do because they feel a greater responsibility to clean, run errands, and to take care of their children after work, while many men are less likely to have those same responsibilities.

## Conclusion:

While age and gender are factors that cause differing trends in a person's Netflix habits, every Netflix user can be united by their love of good TV, and good TV when they have time for it. Gone are the days of waiting to find out "what happens next", and here are the days of finding out who exactly is "the mother" in *How I Met Your Mother* at 3 o'clock in the morning after you spent all night furiously trying to see who Ted Mosby would finally end up with.

## Works Cited

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Lynch, John. "Netflix Shared Its 10 Most Binge-Watched Shows of 2017." *Business Insider*, Business Insider, 11 Dec. 2017, [www.businessinsider.com/most-binge-watched-netflix-shows-of-2017-list-2017-12/](http://www.businessinsider.com/most-binge-watched-netflix-shows-of-2017-list-2017-12/).



All the formatting above references things that were talked about in previous sections. If you got a little lost in all the YAML and formatting discussion, don't fret! You don't need to know all the different formatting tips and tricks right away to make an R Markdown document. For now, just focus on making documents, and the aesthetics of it will improve with time and more learning.

## 2.9 FOR MORE AMBITIOUS READERS

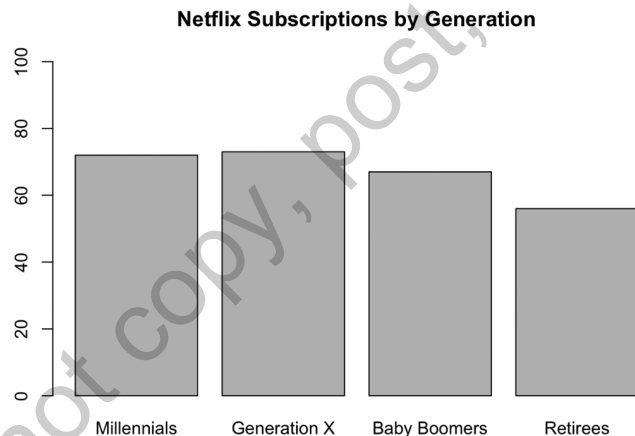
---

### 2.9.1 How to Construct the Two Figures in the Improved Essay Example

The more interesting essay example above contains two graphs to display the patterns present within data. While creating graphs in R Markdown may seem difficult, it's actually pretty easy once you know what to do.

#### 2.9.2 Graph 1

The first graph looks like this:



The R code for the first graph, which you can use as a template for yourself, is as follows:

```
```{r, echo=FALSE}
per = c(72, 73, 67, 56)

barplot(per, ylim=c(0, 100),
        names.arg=c("Millennials", "Generation X", "Baby Boomers", "Retirees"),
        main="Netflix Subscriptions by Generation")
```
```

Here are the steps for producing the relevant R code.

First, to insert an R code chunk in the .Rmd file, simply click **Code** and then **Insert Chunk**. Once you have done that, you will see inserted in your .Rmd file the following expression:

```
```{r}
```
```

The three back ticks, a pair of braces with `r` inside, and another three back ticks, together specify that whatever is in between those ticks will be processed as R program code. Inside the braces, add `echo=FALSE` to exclude the R code from the output document; notice how this reverses the `echo=TRUE` option displayed in the global option in the first R code chunk of the .Rmd file. Naturally, R code will be included in the final document if `echo=TRUE` is used instead (or if nothing is specified because the default is `echo=TRUE`).

The first line of R code above begins with `per`. This line of code creates a variable called `per`, whose values are defined by a `c()` function. The `c()` function says that 72, 73, 67, 56 are the four values or observations of the `per` variable. The output of the `c()` function is assigned to a variable named `per` via an assignment symbol `=`. One could also use `<-` to assign the output of the `c()` function to the variable `per`.

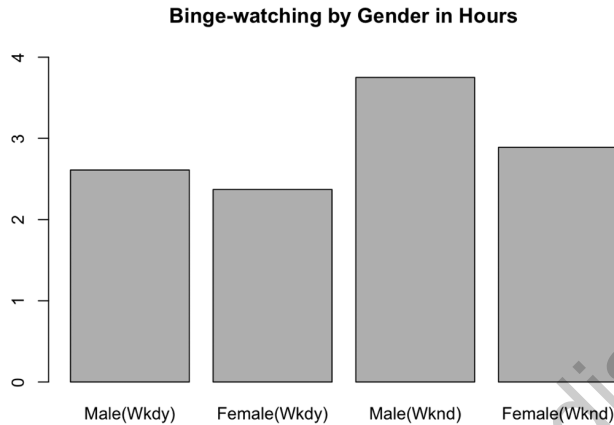
So, `per` stores the data for the percentage values for the first graph. Variables can be named as whatever you want except for special characters, but you should choose wisely to help keep better track of what each part of your code is doing.

The second line of R code begins with `barplot()`. It is a function or command for creating a bar graph. Inside the parentheses, provide various needed information for the plot.

- Identify the variable `per`, whose values are used in the plot.
- Set the increments on the vertical axis by setting `ylim` from 0 to 100, again via the `c()` function. Note how the values for the range of values along the vertical axis can be modified (e.g., 0–80 instead).
- Use `names.arg` to tell R what to name each of the columns. In this case, based on the text, the different percentages are named as “Millennials,” “Generation X,” “Baby Boomers,” and “Retirees,” respectively. Please make sure that these names appear in the order that matches with that of the numeric values of the `per` variable.
- Give the graph a title by setting `main` to equal “Netflix Subscriptions by Generation”.

### 2.9.3 Graph 2

The second graph in the improved essay looks like this:



The R code for Graph 2 is as follows:

```
```{r, echo=FALSE}
binge = c(2.61, 2.37, 3.75, 2.89)

barplot(binge, ylim=c(0, 4),
        names.arg=c("Male (Wkdy)", "Female (Wkdy)", "Male (Wknd)", "Female (Wknd)"),
        main="Binge-watching by Gender in Hours")
```
```

The R code chunk for Graph 2 mirrors the code chunk for Graph 1. Like for the previous graph, it tells R not to include the R code in the final output. It also tells R to create a new variable called `binge` for data on the number of hours that men and women binge-watch programs on weekdays or weekends. The code then tells R to create a `barplot` for the variable `binge`.

## 2.10 EXERCISE: TURNING KNOWLEDGE INTO RESULTS

---

We've covered a lot of different concepts in this chapter, so now let's take a moment to practice what you have learned so far.

In a new, blank, R Markdown document, practice what you have learned by completing the following tasks:

1. Fill in the title, the author name, and the date of the document.

2. Create three different sections. Title section 1 as “Food,” and then write three sentences about your favorite food. Title section 2 as “Movie,” and then write three sentences about your favorite movie. Title section 3 as “Holiday,” and then write three sentences about which holiday is your favorite, and why.
3. Format your text as you see fit.
4. Create a simple bar plot and insert it in the .Rmd file. Simply follow the following format:

```
VariableName = c(value for observation 1, value for observation 2, etc.)  
  
barplot(VariableName, ylim(0, desiredLimit), names.arg=c  
("FirstColumnName", "SecondColumnNameHere", "etc."), main="Desired Title  
For Graph")
```

5. Knit your .Rmd file into an html document.

Now that you have practiced completing a report, how well do you think you did? Could you remember all the bits and pieces, or were there a few things you struggled with? Feel free to review the sections above before moving on to the next chapter.

## 2.11 SUMMARY

---

In this chapter, you learned how to use R Markdown to complete a written assignment that integrates text, graphs, R code, images, and web links in one document. More concretely, you learned

- how to create an R Markdown or .Rmd file;
- how to write and format text in the .Rmd file;
- how to create bullet points and insert web links and images in the .Rmd file;
- how to write and revise an essay in R Markdown; and
- how to construct and integrate simple bar plots in the essay.

The main point of the chapter is to let you learn R in the most unexpected and yet familiar way:

### **by finishing an essay assignment in R with little programming involved**

No other R book teaches R by starting with a writing assignment, and yet writing and word processing are most familiar to even first-time R users. Being able to finish a writing assignment in R without any programming background should boost your confidence and interest in learning the materials in the rest of the book.

## 2.12 REFERENCES

---

The materials in this chapter draw on several useful references. They also provide additional readings through which you can better understand R Markdown and further improve your own document.

Grolemund, G. (2019). *R Markdown: Dynamic documents for R*. Retrieved from <https://support.rstudio.com/hc/en-us/articles/205368677-R-Markdown-Dynamic-Documents-for-R>

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