Data Basics

01-Getting-started.Rmd | 02-Data-basics.Rmd

Knit | Insert | Run

```
---
title: "Data Basics"
output: html_document
---

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```{r setup}
library(tidyverse)
library(haven)
library(readxl)
```

```

01-Getting-started.Rmd | 02-Data-basics.Rmd

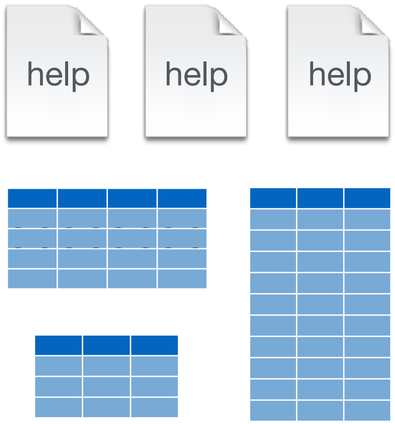
Knit | Insert | Run

```
1 ---
2 title: "Data Basics"
3 output: html_document
4 ---
5
6 <!-- This file by Charlotte Wickham is licensed under a Creative
   Commons Attribution 4.0 International License. -->
7
8
9   rse)
10
11   )
12
13
14
15
16   see much difference between these two in this
                                   one is a tibble and one is a data frame:
17
18
```

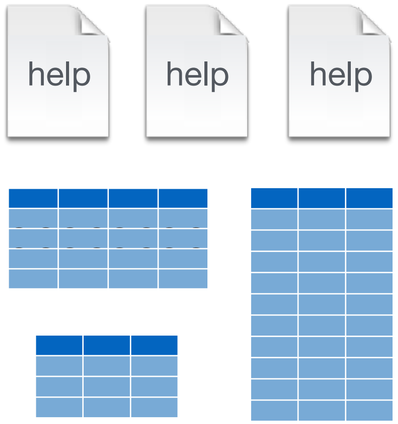
- **Data Basics**
- Chunk 1: setup
- **Tabular Data**
  - Chunk 2
  - Chunk 3
  - **Your turn 1**
  - **Your turn 2**
    - Chunk 4
  - **Your turn 3**
    - Chunk 5
    - Chunk 6
  - **Your turn 4**

23:1 | Chunk 3 | R Markdown

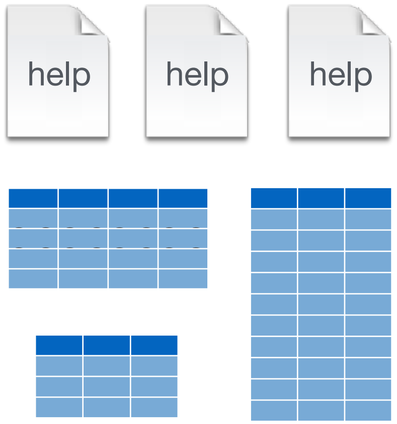
R Packages



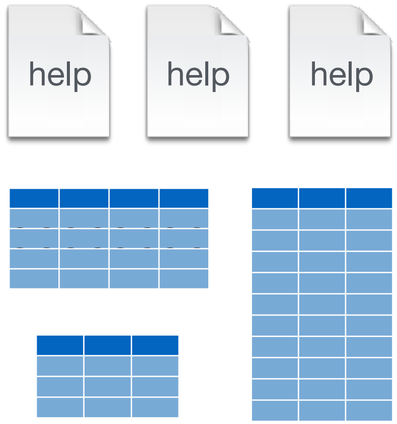
function1()
function2()
function3()
function4()



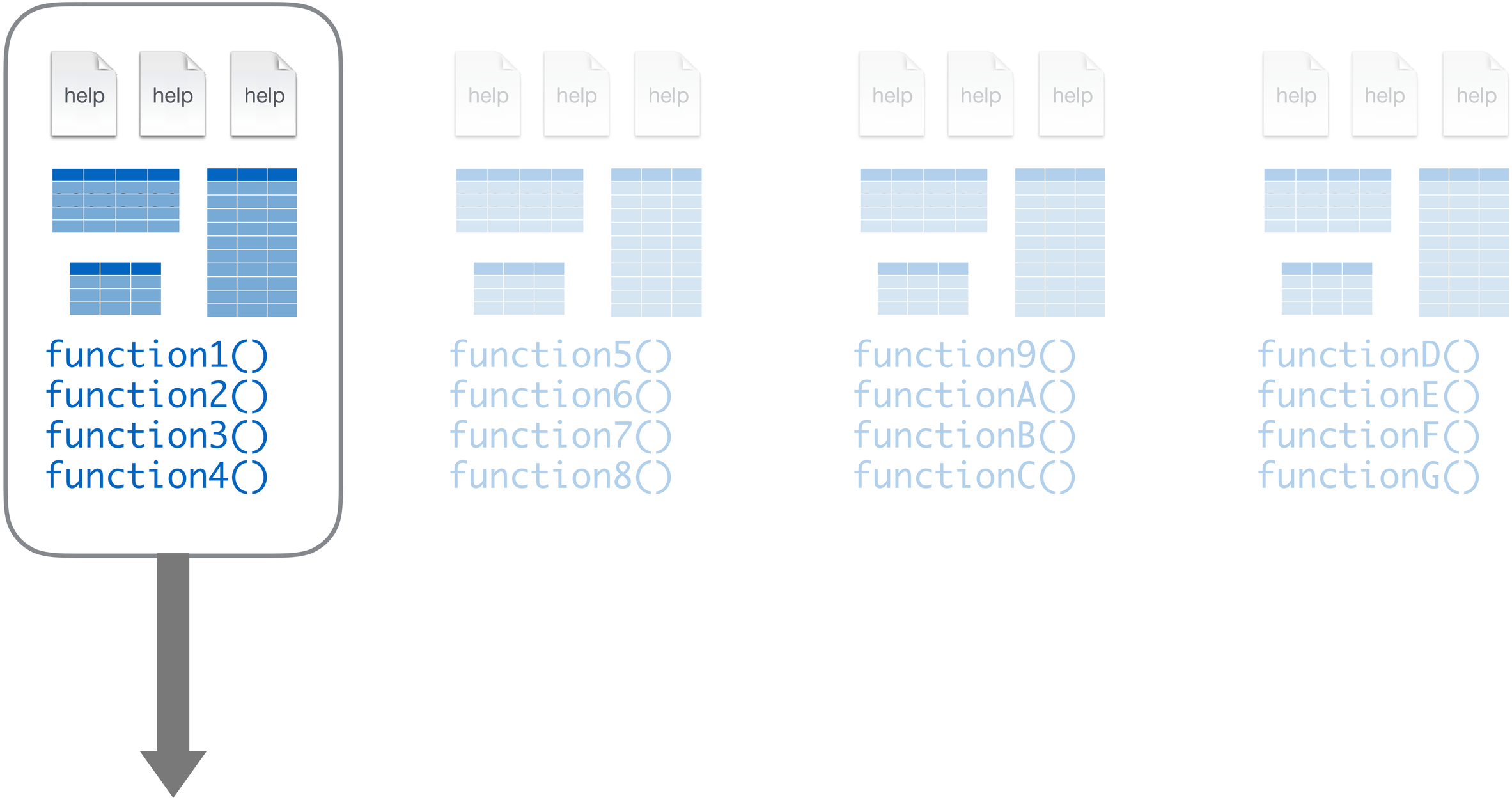
function5()
function6()
function7()
function8()



function9()
functionA()
functionB()
functionC()



functionD()
functionE()
functionF()
functionG()


help
help
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function1()
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function9()
functionA()
functionB()
functionC()
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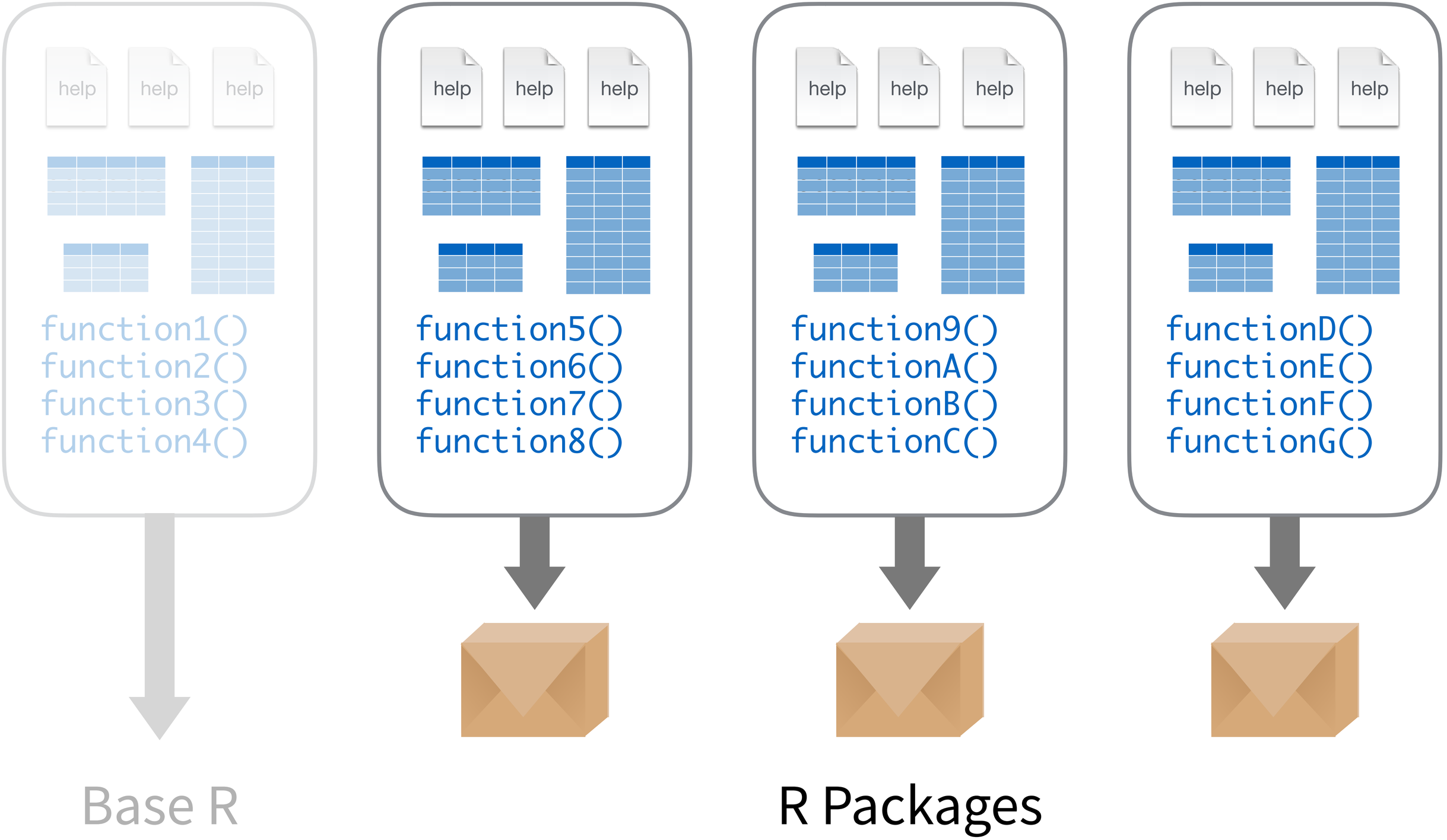
functionD()
functionE()
functionF()
functionG()

Base R


help
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function1()
function2()
function3()
function4()
Base R
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function5()
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function8()
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functionA()
functionB()
functionC()
help
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help
functionD()
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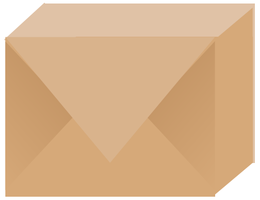
functionF()
functionG()
R Packages

tidyverse



An R package that serves as a short cut for installing and loading the components of the tidyverse.

```
library("tidyverse")
```

Using packages

1

```
install.packages("foo")
```

Downloads files to computer

1 x per computer

2

```
library("foo")
```

Loads package

1 x per R Session

```r
install.packages("tidyverse")
```

does the equivalent of

```r
install.packages("ggplot2")
install.packages("dplyr")
install.packages("tidyr")
install.packages("readr")
install.packages("purrr")
install.packages("tibble")
install.packages("stringr")
install.packages("forcats")
install.packages("lubridate")
install.packages("hms")
install.packages("DBI")
install.packages("haven")
install.packages("httr")
install.packages("jsonlite")
install.packages("readxl")
install.packages("rvest")
install.packages("xml2")
install.packages("modelr")
install.packages("broom")
```

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install.packages("tidyverse")
```

does the equivalent of

```r
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install.packages("tidyr")
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does the equivalent of

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library("purrr")
library("tibble")
library("stringr")
library("forcats")
```

Tabular Data

Data frames and tibbles

The most common kind of data objects, for rectangular data

Data frames - a type of object native to R

Tibbles - a.k.a `tbl` - a type of data frame common in the tidyverse

Tibbles have slightly different default behaviour than data frames, but in Rmarkdowm you mostly won't notice a difference.

Your Turn 1

Take a look at these two datasets, by typing their names into the **console**:

```
quakes
```

```
mpg
```

What do you notice about the difference in the way they are displayed?

quakes is a data frame

```
191  -20.02 184.09   234 5.3       71
192  -18.56 169.31   223 4.7       35
193  -17.87 182.00   569 4.6       12
194  -24.08 179.50   605 4.1       21
195  -32.20 179.61   422 4.6       41
196  -20.36 181.19   637 4.2       23
197  -23.85 182.53   204 4.6       27
198  -24.00 182.75   175 4.5       14
199  -20.41 181.74   538 4.3       31
200  -17.72 180.30   595 5.2       74
 [ reached getOption("max.print") -- omitted 800 rows ]
>
```

mpg is a tibble

```
> mpg
# A tibble: 234 x 11
   manufacturer      model displ  year   cyl      trans
          <chr>      <chr> <dbl> <int> <int>      <chr>
 1         audi         a4   1.8  1999     4   auto(l5)
 2         audi         a4   1.8  1999     4 manual(m5)
 3         audi         a4   2.0  2008     4 manual(m6)
 4         audi         a4   2.0  2008     4   auto(av)
 5         audi         a4   2.8  1999     6   auto(l5)
 6         audi         a4   2.8  1999     6 manual(m5)
 7         audi         a4   3.1  2008     6   auto(av)
 8         audi a4 quattro   1.8  1999     4 manual(m5)
 9         audi a4 quattro   1.8  1999     4   auto(l5)
10         audi a4 quattro   2.0  2008     4 manual(m6)
# ... with 224 more rows, and 5 more variables: drv <chr>,
#   cty <int>, hwy <int>, fl <chr>, class <chr>
```

Your Turn 2

Run the code in the chunk line by line with shortcut Crtl/Cmd + Enter

```
dim(x = mpg)
names(x = mpg)
glimpse(x = mpg)
View(x = mpg)
```

What do each of these functions do?

Getting an overview of data frames/tibbles

```
dim(x = mpg)      # Dimensions of data
names(x = mpg)    # Variable names
glimpse(x = mpg) # Nice overview
View(x = mpg)     # Open Viewer pane
```

Your Turn 3

Write code in the empty chunks to find:

- The number of rows in quakes.
- The names of the variables in quakes.

```
dim(x = quakes)
```

```
names(x = quakes)
```

?

for help on data

quakes and mpg are **built-in** datasets, they come with a package.

You can also use:

```
?data_name
```

to get more info on built in data

Your Turn 4

Try

```
?mpg
```

What is this data?

Vector Data

Vectors

In R vectors hold data all of the same type.

They can be constructed with `c()`

```
c(1, 3, 2, 1, 1)
```

But, you'll usually want to assign them to something

```
my_numbers <- c(1, 3, 2, 1, 1)
```

Basic data types

Integer	Whole numbers	`c(1L, 2L, 3L, 4L)`
Double	Numbers	`c(1, 2, 3, 4)`
Character	Text	`c("1", "2", "3", "4")`
Logical	True or False	`c(TRUE, FALSE, FALSE, TRUE)`

Your Turn 5

Take another look at mpg.

What kind of data is in each column?

```{r}
mpg
```

manufacturer	model	displ	year	cyl	trans	drv	cty	hwy	fl
<chr>	<chr>	<dbl>	<int>	<int>	<chr>	<chr>	<int>	<int>	<chr>

Importing Data

readr

Simple, consistent functions for working with (mostly) plain text data.

```
# install.packages("tidyverse")
library(tidyverse)
```

haven

Simple, consistent functions for working with SAS, SPSS and Stata data

```
# install.packages("tidyverse")
library(haven)
```

readxl

Simple, consistent functions for working Excel data

```
# install.packages("tidyverse")
library(readxl)
```

Other types of data

package	accesses
jsonlite	json
xml2	xml
httr	web API's
rvest	web pages (web scraping)
DBI	databases
sparklyr	data loaded into spark

readr

```
df <- read_csv("path/to/file.csv", ...)
```

object to save output into

path from working directory to file

readr

```
df <- read_csv("path/to/file.csv", ...)
```

haven

```
df <- read_spss("path/to/file.sav", ...)
```

readxl

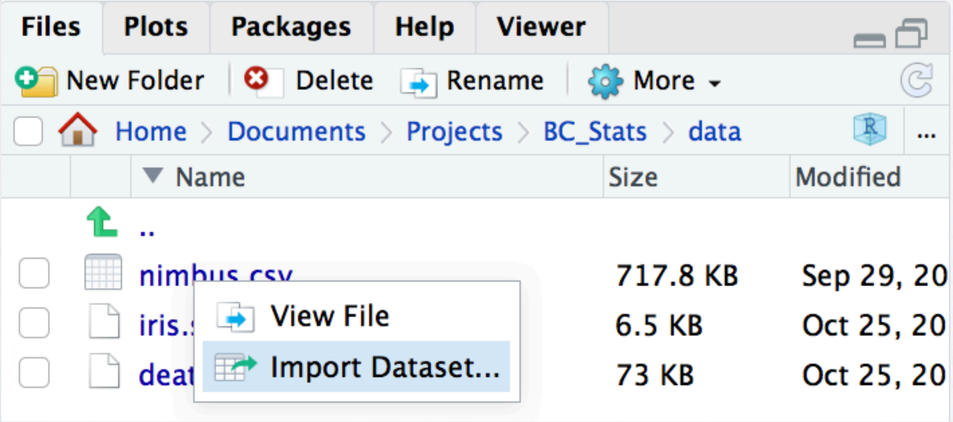
```
df <- read_excel("path/to/file.xls", ...)
```

Your Turn 6

Take a look in the `data/` directory.

Try reading in each file with the appropriate function.

(Alternatively, try the Import Data tool)



When import goes wrong...

And it will.

Check:

- data type of each column is correct
- basic summaries seem reasonable (e.g. number of rows, min and max of columns)

Try to identify the problem, then read the help for the import function for a solution.

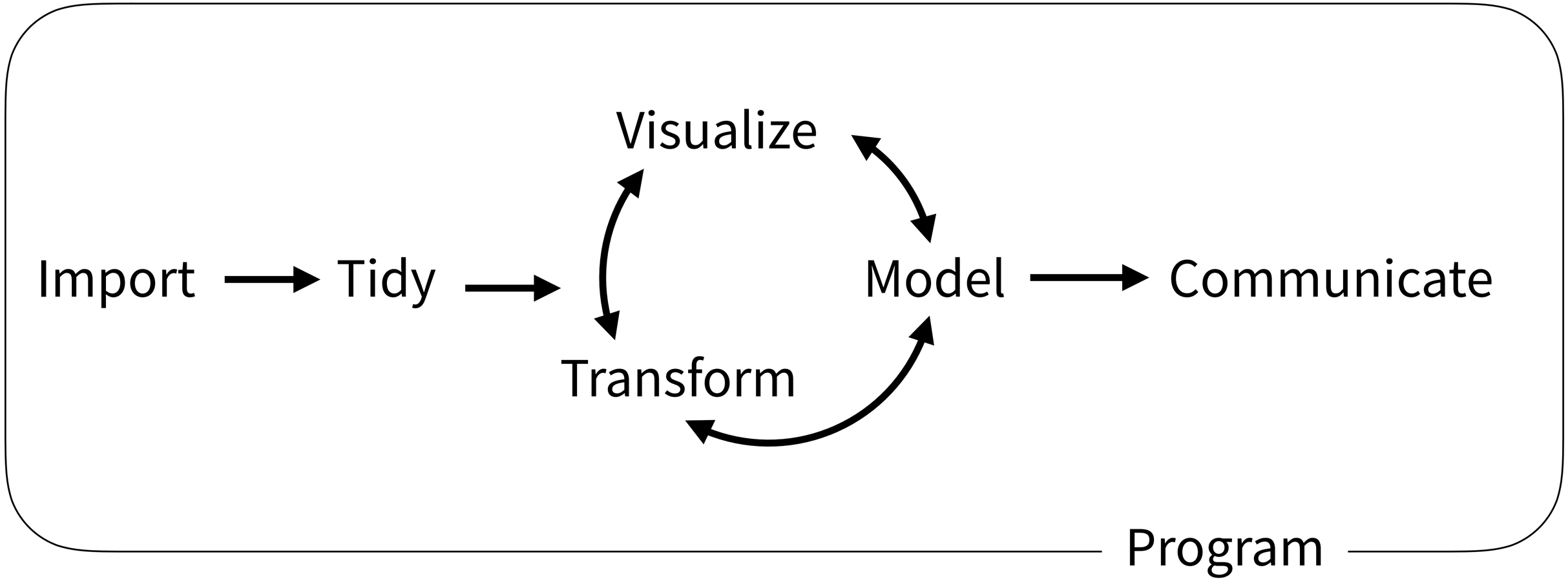
Your Turn 7

Can you see what is wrong with the Excel file when it is imported?

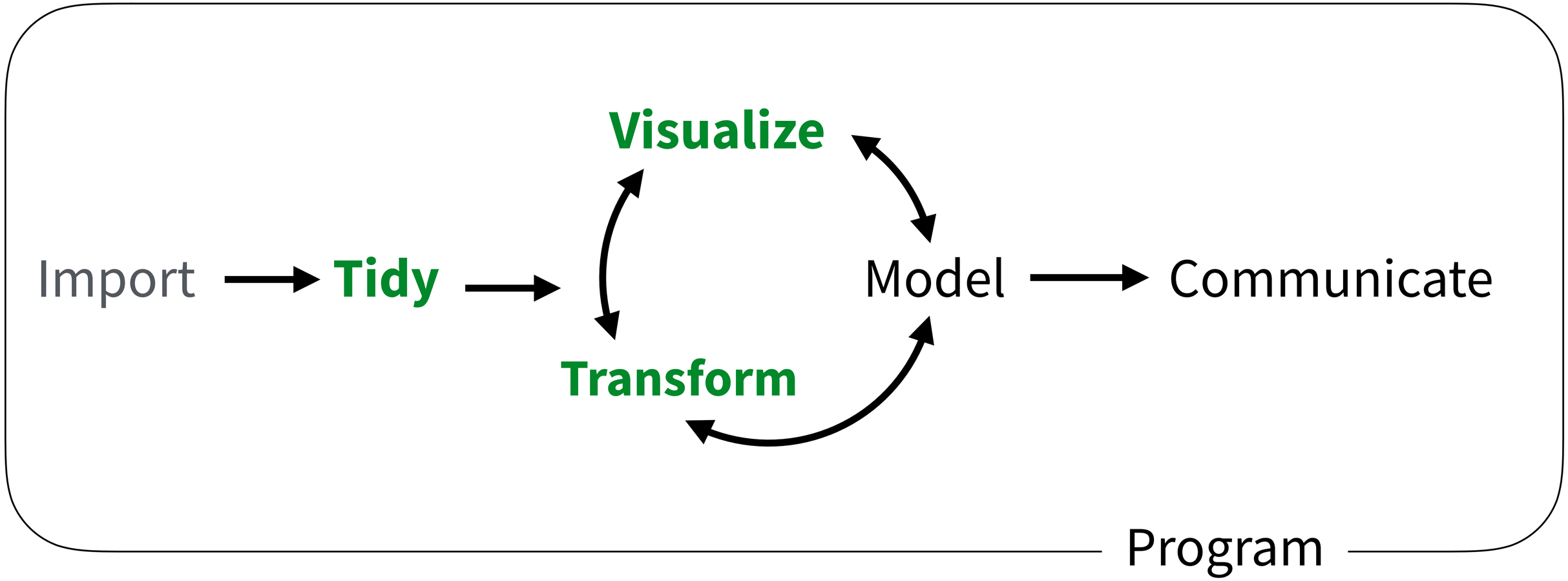
Scan the *Arguments* section of `?read_excel`, can you find an argument that might help? Try it!

Wrapping Up

(Applied) **Data Science**



(Applied) **Data Science**



Tomorrow

```
ggplot(data = mpg) +
  geom_point(mapping = aes(x = cty, y = hwy), alpha = 0.2)
```