Advanced R

Hadley Wickham

Chief Scientist

RStudio

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HELLO

my name is

Hadley

Eric Hare

Graduate student

Iowa State University

Dean Attali

Graduate student
University of British Columbia

Your turn

Introduce yourself to your neighbours. Who are you and what are you using R for?

Outline

- ~~Introductions~~ & warm ups
- What makes a good function?
- Functional programming
- Object oriented programming (S3)
- Metaprogramming

Advanced R

- This day covers the most important parts of the “Advanced R” book.
- Online for free at http://adv-r.had.co.nz/
- Buy physical/kindle version from http://amzn.com/1466586966

Warmup

Your turn

What are the four common types of atomic vectors? (Bonus points for the two uncommon types)

Brainstorm with your neighbours for 1 minute.

character

double
integer

logical

raw

complex

```
as.character(c(T, F))
as.character(seq_len(5))
as.logical(c(0, 1, 100))
as.logical(c("T", "F", "a"))
as.double(c("A", "100"))
as.double(c(T, F))
```

When vectors of different types occur in an expression, they will be automatically coerced to the same type: character > numeric > logical

`typeof()`

`length()` A scalar is a vector of length 1

Technically, these are all **atomic** vectors

```
typeof(1:10)
typeof("a")
typeof(1.5)
```

```
# We'll talk about this later:
typeof(mtcars)
typeof(factor(1:10))
```

~~mode()~~

~~storage.mode()~~

Designed for S compatibility!

```r
# BEWARE!
# What does is.numeric() do?
x <- 1
y <- 1L
is.integer(x)
is.integer(y)
is.numeric(x)
is.numeric(x)
```

```r
# What does is.vector() do?
is.vector(x)
comment(x) <- "This is a comment!"
is.vector(x)

# Assume a is.*() does something surprising
# until proven otherwise (by reading the docs)
```

```
# Most useful coercion is from logical
# to numeric
x <- c(FALSE, TRUE, FALSE, TRUE, TRUE)
sum(x)
mean(x)

x <- sample(1e4, 1e3)
sum(x > 500)
mean(x > 500)
```

Your turn

What does `NA == NA` return? Why? What should you use instead?

What is `NA_real_`? `NA_integer_`? `NA_character_`?

```
# let x be John's age
x <- NA
# let y be Mary's age
y <- NA
# are Mary and John the same age?
x == y
```

```
is.na(x)
!is.na(x) && !is.na(y)

typeof(NA)
typeof(NA_real_)
typeof(NA_integer_)
typeof(NA_character_)
```

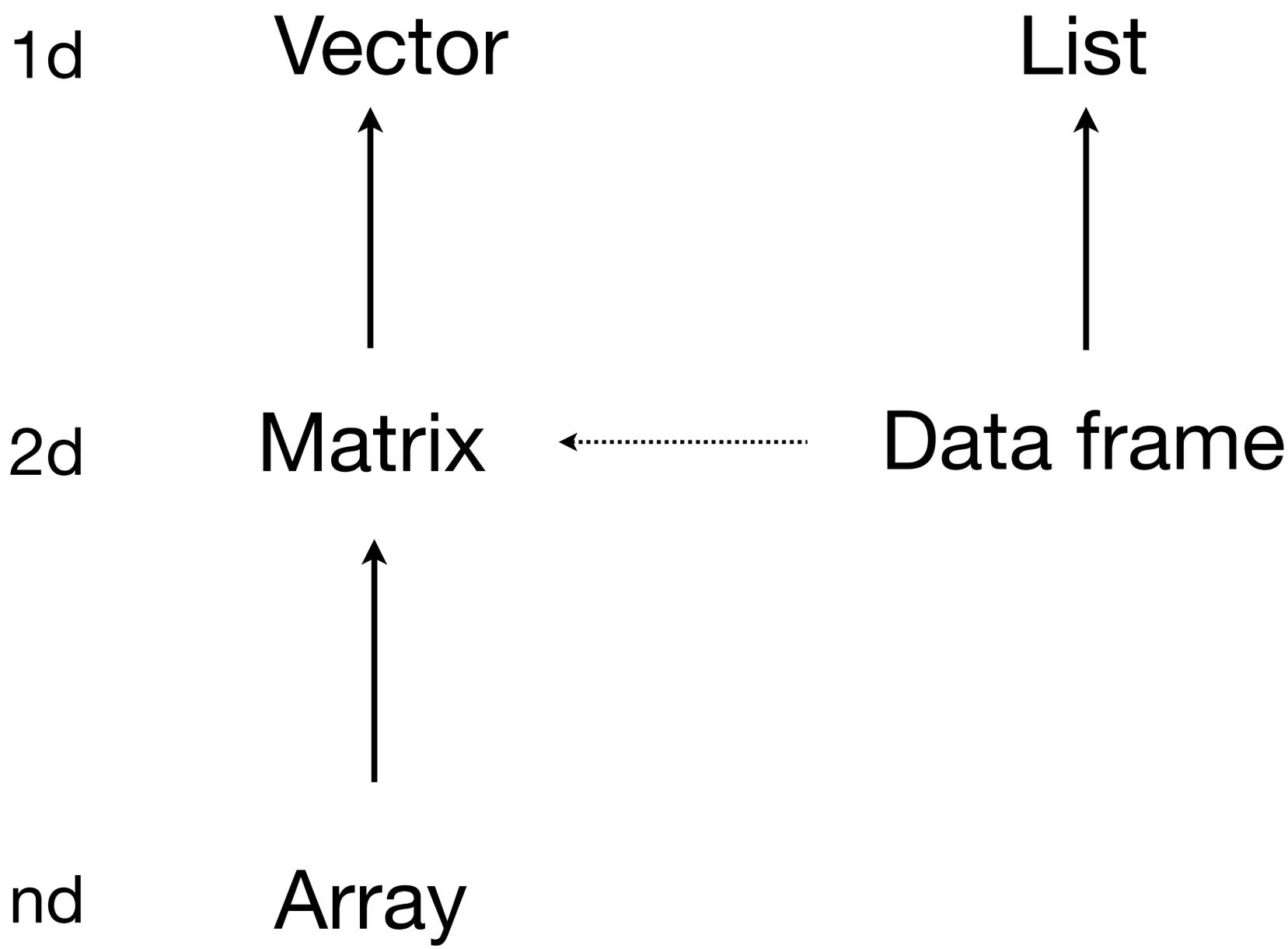
Your turn

How is a list different from an atomic vector?

How is a data frame different from a matrix?

How do you examine the structure of an object?

Brainstorm with your neighbours for 1 minute.


1d
Vector
List
2d
Matrix
Data frame
nd
Array
Same types
Different types

str()

Your turn

What are the six types of thing that you can put inside []?

What's the difference between `[`, `[[` and `$`? What does `drop = FALSE` do?

Brainstorm with your neighbour for 1 minutes.

blank	include all
integer	**+ve**: include **0**: drop all **-ve**: exclude
logical	keep TRUEs
character	lookup by name

	Simplifying	Preserving
Vectors	`x[[1]]`	`x[1:4]`
Matrices/ Data frame	`x[, 1]`	`x[, 1, drop = F]`
Lists	`x[[1]]` `x$name`	`x[1]`

If list `x` is a train carrying objects, then `x[[5]]` is the object in car 5; `x[4:6]` is a train of cars 4-6.

http://twitter.com/#!/RLangTip/status/118339256388304896

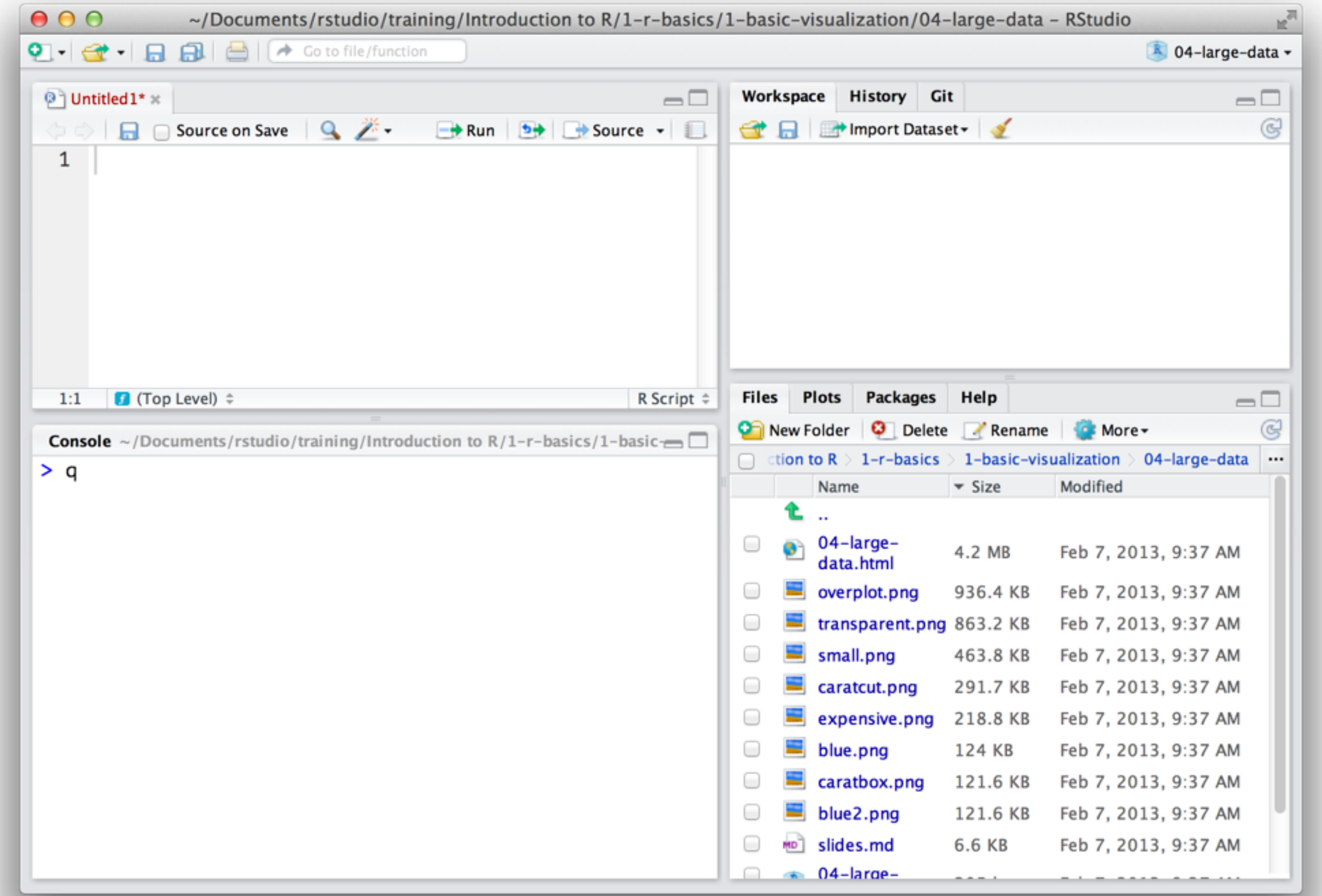
Special names

How do you see the source code of the `%in%` function? What about `diag<-`?

If you have a column named "`Income ($1000)`" in your data frame called `df`, how can you access it with `$`?

`%in%`
`diag<-`
df$`Income ($1000)`

Rstudio


~/Documents/rstudio/training/Introduction to R/1-r-basics/1-basic-visualization/04-large-data - RStudio
Go to file/function
04-large-data
Untitled1*
Source on Save
Run
Source
1
1:1
(Top Level)
R Script
Console ~/Documents/rstudio/training/Introduction to R/1-r-basics/1-basic-
> q
Workspace
History
Git
Import Dataset
Files
Plots
Packages
Help
New Folder
Delete
Rename
More
tion to R
1-r-basics
1-basic-visualization
04-large-data
Name
Size
Modified
..
04-large-data.html 4.2 MB Feb 7, 2013, 9:37 AM
overplot.png 936.4 KB Feb 7, 2013, 9:37 AM
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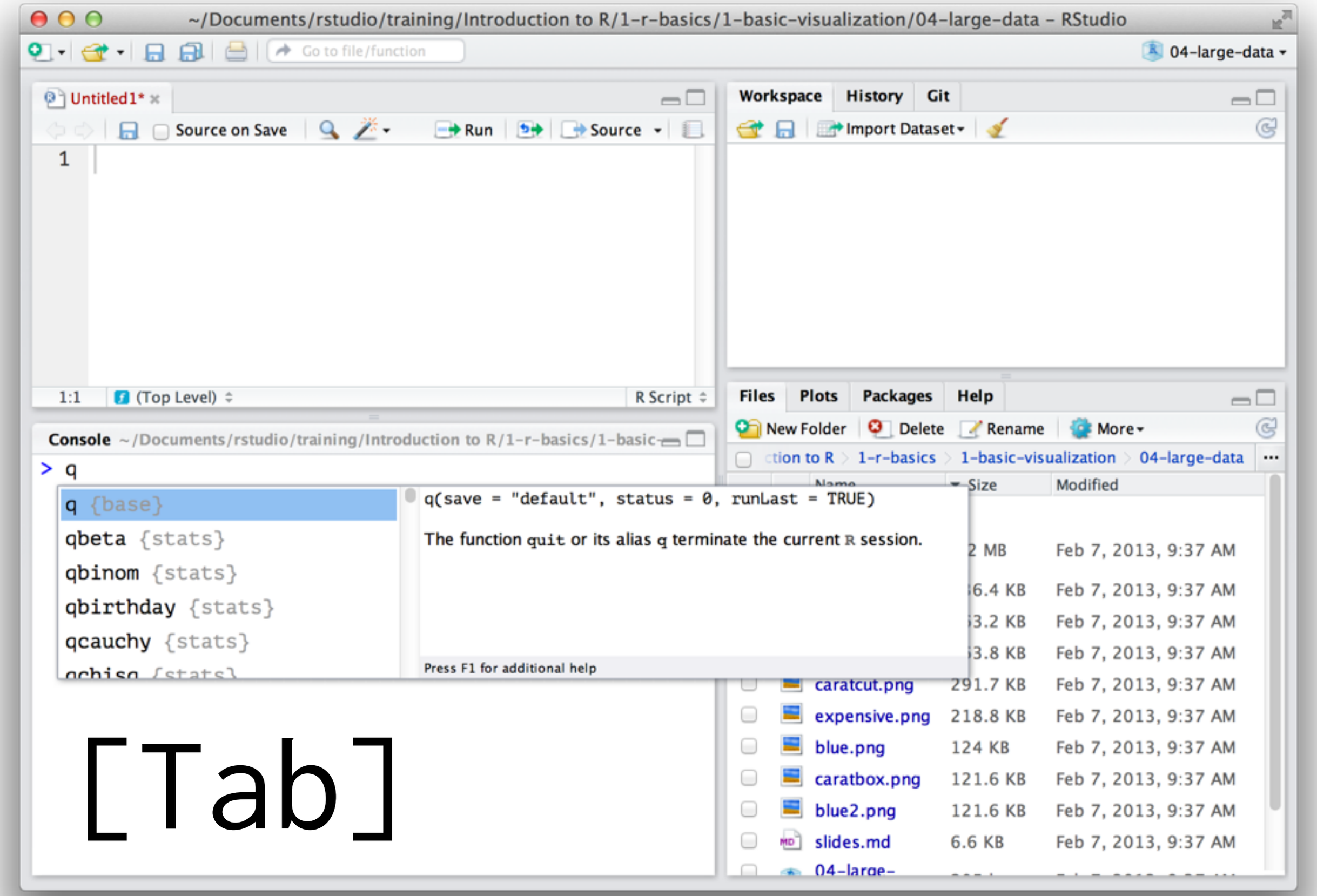
04-large-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Name
Size
Modified
Console ~/Documents/rstudio/training/Introduction to R/1-r-basics/1-basic-
> q
q {base}
qbeta {stats}
qbinom {stats}
qbirthday {stats}
qcauchy {stats}
q(save = "default", status = 0, runLast = TRUE)
The function quit or its alias q terminate the current R session.
Press F1 for additional help
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[Tab]

~/Documents/rstudio/training/Introduction to R/1-r-basics/1-basic-visualization/04-large-data - RStudio

Go to file/function

04-large-data

Untitled1*

Source on Save | Run | Source

```
qplot(table - depth, data = diamonds,
qplot(day, data = email)
qplot(day, mails, data = daily, geom = "line", colo
qplot(day, mails, data = daily, geom = "smooth", co
qplot(day, variants, data = daily, geom = "line", c
qplot(wday, hour, data = wh, size = freq)
qplot(mpg, wt, data = mtcars)
qplot(mpg, wt, data = mtcars, colour = cyl)
```

```
> q
```

Workspace | History | Git

Import Dataset

Files | Plots | Packages | Help

New Folder | Delete | Rename | More

ction to R > 1-r-basics > 1-basic-visualization > 04-large-data

Name	Size	Modified
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04-large-		

[Cmd/Ctrl + ↑]

~/Documents/rstudio/training/Introduction to R/1-r-basics/1-basic-visualization/04-large-data - RStudio

Go to file/function

04-large-data

Untitled1*

Source on Save

Run

Source

```
1  library(ggplot2)
```

1:17 (Top Level) R Script

Console ~/Documents/rstudio/training/Introduction to R/1-r-basics/1-basic-

```
>
```

Workspace History Git

Import Dataset

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New Folder Delete Rename More

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1  library(ggplot2)
```

[Cmd/ctrl + enter]

1:17 (Top Level) R Script

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```
> library(ggplot2)
>
```

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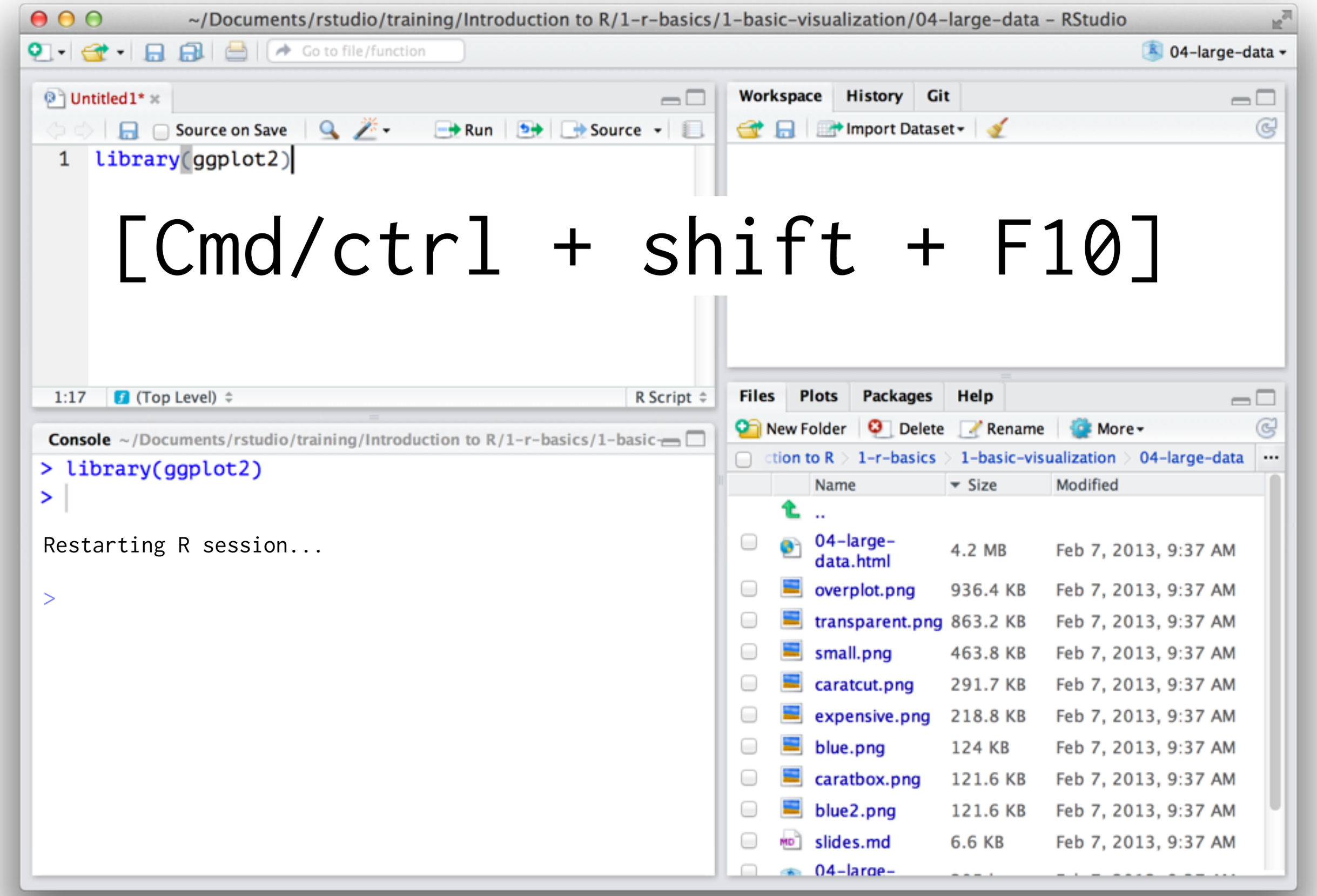
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[Cmd/ctrl + shift + F10]
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Console ~/Documents/rstudio/training/Introduction to R/1-r-basics/1-basic-
> library(ggplot2)
>
Restarting R session...
>
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Options

General

Code

Appearance

Pane Layout

Packages

Sweave

Spelling

Git/SVN

Publishing

Default working directory (when not in a project):

~ Browse...

☑ Restore most recently opened project at startup

☑ Restore previously open source documents at startup

☐ Restore .RData into workspace at startup

Save workspace to .RData on exit: Never

☑ Always save history (even when not saving .RData)

☑ Remove duplicate entries in history

☐ Use debug error handler only when my code contains errors

☐ Automatically expand tracebacks in error inspector

Default text encoding:

UTF-8 Change...

☑ Automatically notify me of updates to RStudio

OK Cancel Apply

Your turn

Skim https://twitter.com/rstudiotips – which one do you think is most useful?

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