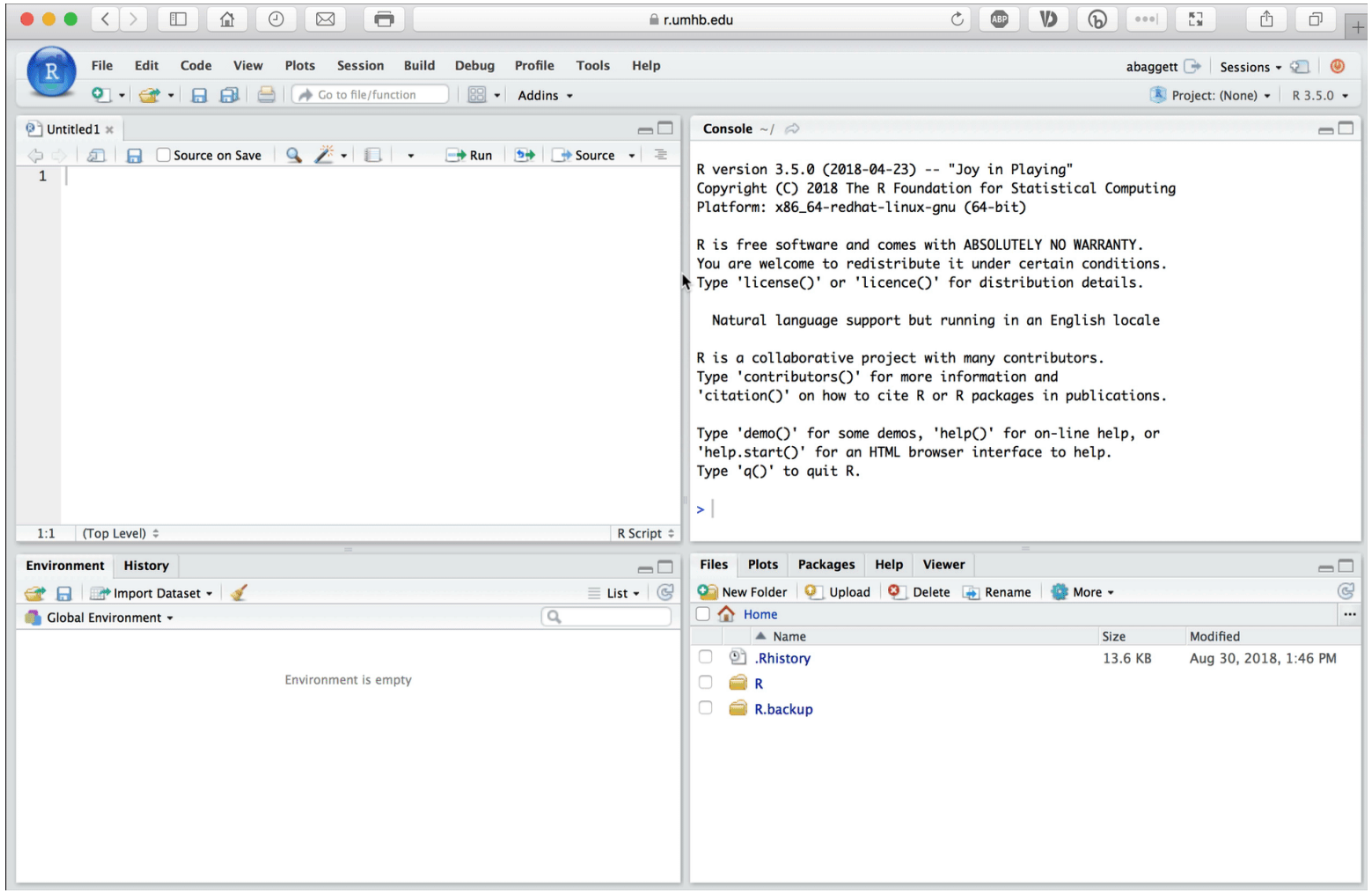
WELCOME!

- **Before we get started:**
  - Login to r.umhb.edu
    - Use your UMHB email address and password
  - *File > New File > R Script*
  - Make yours look like this



Introduction to R

Basics of Data Manipulation, Visualization, and Analysis

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University of Mary Hardin-Baylor
PSYC 2316: Statistics for the Social Sciences
September 12, 2018

A Gentle Introduction to R

Basics of Data Manipulation, Visualization, and Analysis

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WHAT IS R?

WHAT IS R?

- R is:
  - A powerful, flexible statistics and data software program
  - Free and open source
  - Surging in adoption worldwide
    - 1 of 3 statistics and data programming languages in the top 20[1]
  - Able to read *any* data file

[1] TIOBE Programming Index, http://bit.ly/2x4TQGh

WHO USES R?

WARBY PARKER

STITCH FIX™

NBA

NFL

WHO ELSE USES R?

You do!

R YOU READY?

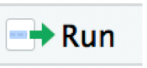
LET'S GET STARTED

- R is like a big calculator with a huge memory
- One advantage:
  - We can store input inside **names** or **objects**
- Let's try it

LET'S GET STARTED

- In your R Script type the following:

```
a <- 2 * 5
b <- 0:10
c <- a + b
```

- Send all three lines to the R Console to run a, b, and c
  - Hint: Highlight and click 

NYC FLIGHT DATA, 2013

NYC FLIGHTS

- Most of the time, we want to work with real data sets using powerful tools
- In your script, add this code and run it to the console:

```
# Load tidyverse package
library(tidyverse)

# Read in nycflights data
nycflights <- url("http://bit.ly/nyc_flights")
load(nycflights)

# View nycflights data in viewer
View(nycflights)
```

nycflights Glimpse

	month	dep_time	dep_delay	arr_time	arr_delay	carrier	dest
1	6	940	15	1216	-4	VX	LAX
2	5	1657	-3	2104	10	DL	SJU
3	12	859	-1	1238	11	DL	LAX
4	5	1841	-4	2122	-34	DL	TPA
5	7	1102	-3	1230	-8	9E	ORF
6	1	1817	-3	2008	3	AA	ORD
---	---	---	---	---	---	---	---
32730	1	706	36	909	22	EV	IND
32731	10	752	-8	921	-28	9E	PIT
32732	7	812	-3	1043	8	DL	LAS
32733	9	1057	-1	1319	-19	UA	IAH
32734	10	844	56	1045	60	B6	CHS
32735	3	1813	-3	1942	-23	UA	CLE

NYC FLIGHTS

- Flight delays are always a hassle
- Let's examine all departure delays (`dep_delay`)
- First, a little tutorial:

```
# General framework for summarizing
data %>%
  summarize(
    object_name = mean(outcome),
    object_name = sd(outcome))
```

NYC FLIGHTS

- Flight delays are always a hassle
- Let's examine all departure delays (`dep_delay`)
- Ready?

```
# Calculate mean and SD departure delays
nycflights %>%
  summarize(
    mean_dd = mean(dep_delay),
    sd_dd = sd(dep_delay))
```

NYC FLIGHTS

- On average, flights departing NYC airports in 2013 were delayed by about 13 minutes (*SD* = 40 minutes).

```
# Calculate mean and SD departure delays
nycflights %>%
  summarize(
    mean_dd = mean(dep_delay),
    sd_dd = sd(dep_delay))
```

```
##    mean_dd    sd_dd
## 1 12.70515 40.40743
```

EXPLAINING DEPARTURE DELAYS

VARIABILITY IN DEPARTURES

- What factors might explain variability in departure delays?

VARIABILITY IN DEPARTURES

- What factors might explain variability in departure delays?
  - Weather
  - Time of year
  - Etc.

VARIABILITY IN DEPARTURES

- Let's reexamine departure delays
- This time, we will account for the time of year (`month`)
- What do you think we will find?

VARIABILITY IN DEPARTURES

- Let's add two more lines to our previous section

```
# General framework for summarizing with grouping
data %>%
  group_by(grouping_var) %>%
  summarize(
    object_name = mean(outcome),
    object_name = sd(outcome)) %>%
  arrange(desc(sorted_var))
```

VARIABILITY IN DEPARTURES

- Let's add two more lines to our previous section

```
# General framework for summarizing with grouping
data %>%
  group_by(grouping_var) %>%
  summarize(
    object_name = mean(outcome),
    object_name = sd(outcome)) %>%
  arrange(desc(sorted_var))
```

VARIABILITY IN DEPARTURES

- To what extent to departure delays vary by month of travel?
- Ready?

```
# Departure delays by month
month_dd <- nycflights %>%
  group_by(month) %>%
  summarize(
    mean_dd = mean(dep_delay),
    sd_dd = sd(dep_delay)) %>%
  arrange(desc(mean_dd))
```

VARIABILITY IN DEPARTURES

- Longer travel delays appear to occur during the mid-summer and Christmas season.

```
## # A tibble: 12 x 3
##    month mean_dd sd_dd
##    <int>   <dbl> <dbl>
##  1     7   20.8   47.8
##  2     6   20.4   53.5
##  3    12   17.4   43.0
##  4     4   14.6   43.4
##  5     3   13.5   40.3
##  6     5   13.3   38.3
##  7     8   12.6   39.2
##  8     2   10.7   33.1
##  9     1   10.2   42.4
## 10     9    6.87  35.3
## 11    11    6.10  27.6
## 12    10    5.88  29.4
```

VISUALIZING DEPARTURE DELAYS

VISUALIZING DELAY PATTERNS

- Let's visualize these the pattern of the departure delays
- First, a little tutorial:

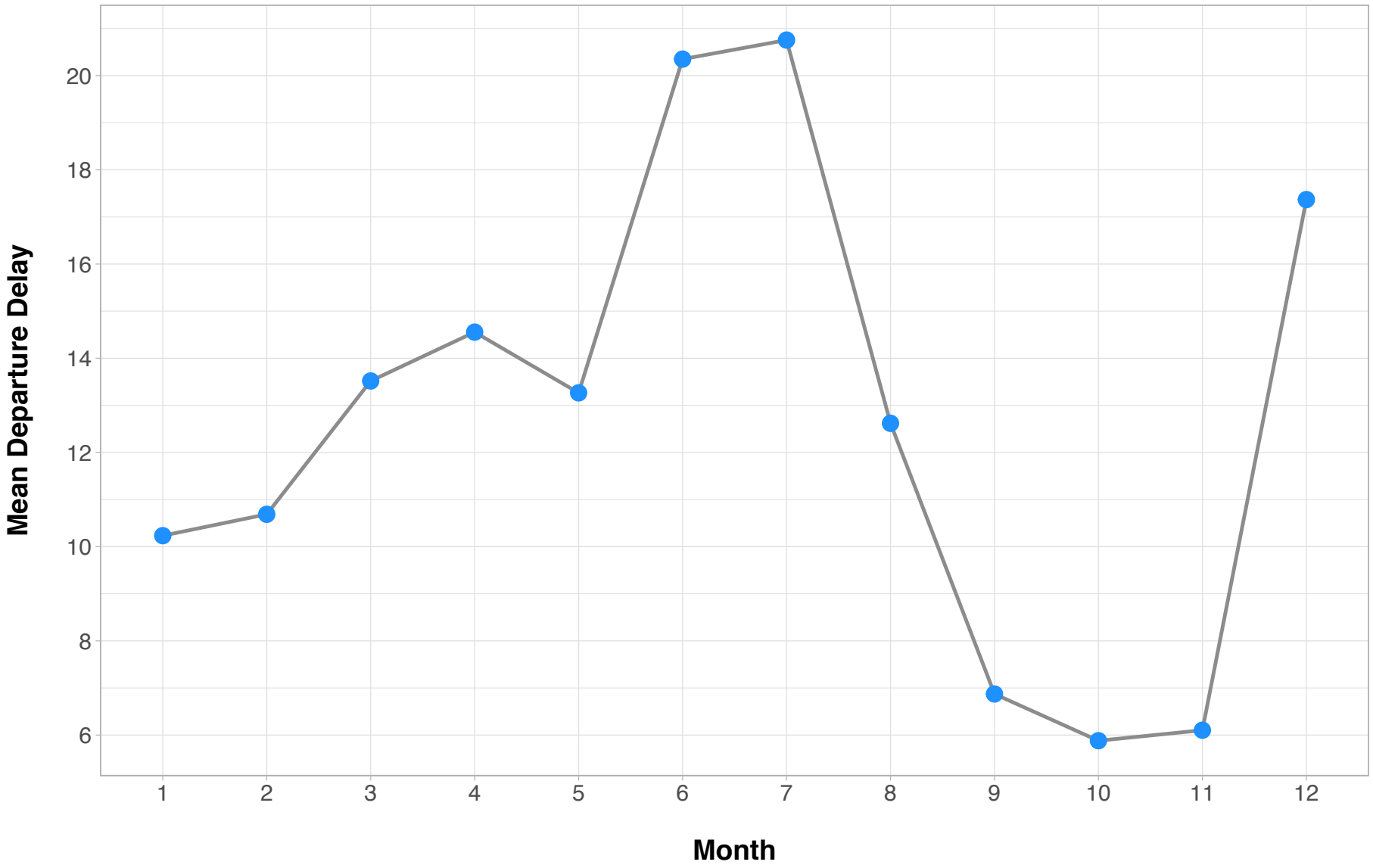
```
ggplot(data = data,
  aes(x = factor, y = outcome, group = 1)) +
  geom_point() +
  geom_line()
```

VISUALIZING DELAY PATTERNS

- Let's visualize these the pattern of the departure delays
- Ready?

```
ggplot(data = month_dd,
  aes(x = month, y = mean_dd, group = 1)) +
  geom_point() +
  geom_line()
```

VISUALIZING DELAY PATTERNS



RECAP

RECAP

- Steep learning curve at first
- Flexibility in and power in variety of tools
- Makes analysis reproducible
- Adoption surging

QUESTIONS?

GET IN TOUCH

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