

IPS9 in R: Introduction to Inference (Chapter 6)

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Introduction and background

These documents are intended to help describe how to undertake analyses introduced as examples in the Ninth Edition of *Introduction to the Practice of Statistics* (2017) by Moore, McCabe, and Craig.

More information about the book can be found [here](#). The data used in these documents can be found under Data Sets in the Student Site. This file as well as the associated R Markdown reproducible analysis source file used to create it can be found at <https://nhorton.people.amherst.edu/ips9/>.

This work leverages initiatives undertaken by Project MOSAIC (<http://www.mosaic-web.org>), an NSF-funded effort to improve the teaching of statistics, calculus, science and computing in the undergraduate curriculum. In particular, we utilize the `mosaic` package, which was written to simplify the use of R for introductory statistics courses. A short summary of the R needed to teach introductory statistics can be found in the mosaic package vignettes (<http://cran.r-project.org/web/packages/mosaic>). A paper describing the mosaic approach was published in the *R Journal*: <https://journal.r-project.org/archive/2017/RJ-2017-024>.

Chapter 6: Introduction to Inference

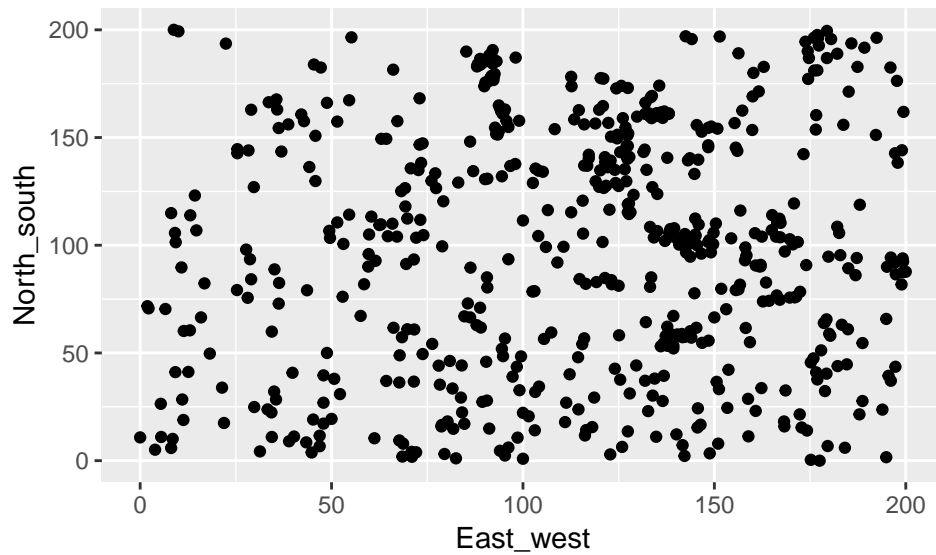
This file replicates the analyses from Chapter 6: Introduction to Inference.

First, load the packages that will be needed for this document:

```
library(mosaic)
library(readr)
```

Section 6.1: Estimating with Confidence

```
#Fig6.1
Wade <- read_csv("https://nhorton.people.amherst.edu/ips9/data/chapter06/EG06-01WADE.csv")
Wade %>%
  mutate(North_south = ns,
         East_west = ew) %>%
  gf_point(North_south ~ East_west, data = Wade)
```

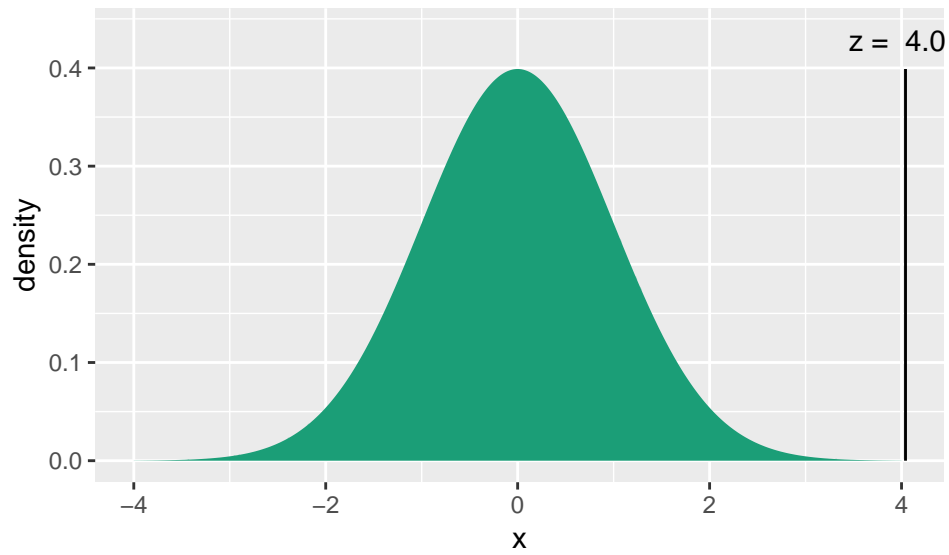


Section 6.2: Tests of Significance

Look at Ex6.17 in page 375. We will recreate the calculation as a function of the vector of observations, the population mean, and the known standard deviation. We then visualize it and get the probability of getting a z score equal or greater.

```
#pg375
z.test <- function(x, mu, sd){
  z = (mean(x) - mu) / (sd / sqrt(length(x)))
  return(z)
}
z <- z.test(x = c(15.84, 15.33, 15.58), mu = 15, sd = 0.25)
xpnorm(z)
```

```
##
## If  $X \sim N(0, 1)$ , then
##  $P(X \leq 4.041) = P(Z \leq 4.041) = 1$ 
##  $P(X > 4.041) = P(Z > 4.041) = 2.656e-05$ 
##
```



```
## [1] 0.9999734
```

#Ex6.18

```
z.confint <- function(x, mu, sd) {
  err <- qnorm(0.995)*sd/sqrt(length(x))
  lower <- mean(x) - err
  upper <- mean(x) + err
  return(c(lower, upper))
}
```

```
z.confint(x = c(15.84,15.33,15.58), mu = 15, sd = 0.25)
```

```
## [1] 15.21154 15.95512
```

Section 6.3: Use and abuse of tests

Section 6.4: Power and inference as a decision