Exercise 4

0316213 Yu-Wen Pu

2018-04-01

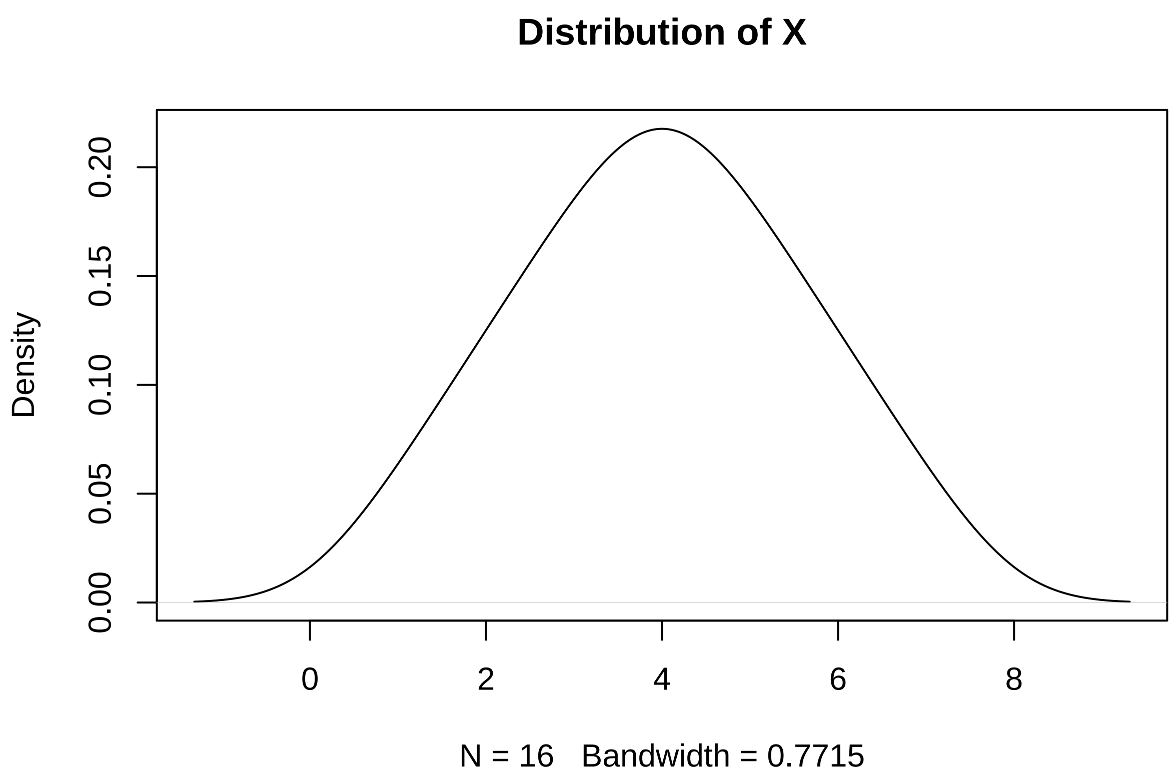
```
knitr::opts_chunk$set(results = "hold")
```

```
set.seed(1830)
```

```
# population standard deviation
pop_sd <- function(vec){
    ((sd(vec) ^ 2) * (length(vec) - 1) / length(vec)) ^ 0.5
}
```

6.1

```
X <- c(1, 2, 2, 3, 3, 3, 4, 4, 4, 4, 5, 5, 5, 6, 6, 7)
plot(density(X), main = "Distribution of X")
```




```
X2 = X - mean(X)
X2
```

```
##  [1] -3 -2 -2 -1 -1 -1  0  0  0  0  1  1  1  2  2  3
```

```
X3 = X2 / pop_sd(X)
X3
```

```
##  [1] -1.8973666 -1.2649111 -1.2649111 -0.6324555 -0.6324555 -0.6324555
##  [7]  0.0000000  0.0000000  0.0000000  0.0000000  0.6324555  0.6324555
```

```
## [13]  0.6324555  1.2649111  1.2649111  1.8973666
```

6.2

```r
cat("z score of", 2.5, "is", (2.5 - mean(X)) / pop_sd(X), fill = TRUE)
cat("z score of", 6.2, "is", (6.2 - mean(X)) / pop_sd(X), fill = TRUE)
cat("z score of", 9  , "is", (9   - mean(X)) / pop_sd(X), fill = TRUE)
```

```
## z score of 2.5 is -0.9486833
## z score of 6.2 is 1.391402
## z score of 9 is 3.162278
```

2.5 比平均小約一個標準差；*6.2* 比平均大約一點五個標準差；*9* 比平均大約三個標準差。

6.3

```r
mean_ <- 195
stddev <- 30
a <- pnorm(225, mean = mean_, sd = stddev) - pnorm(165, mean = mean_, sd = stddev)
b <- pnorm(195, mean = mean_, sd = stddev)
c <- pnorm(225, mean = mean_, sd = stddev)
cat("a)", a, "\nb)", b, "\nc)", c, fill = TRUE)
```

```
## a) 0.6826895
## b) 0.5
## c) 0.8413447
```

6.4

```r
ai <- qnorm(.25 , mean = mean_, sd = stddev)
af <- qnorm(.75 , mean = mean_, sd = stddev)
b  <- qnorm(.75 , mean = mean_, sd = stddev)
ci <- qnorm(.025, mean = mean_, sd = stddev)
cf <- qnorm(.975, mean = mean_, sd = stddev)
cat("a)", ai, af, "\nb)", b, "\nc)", ci, cf, fill = TRUE)
```

```
## a) 174.7653 215.2347
## b) 215.2347
## c) 136.2011 253.7989
```

6.9

```r
qnorm(.9, mean = 50, sd = 10)
```

```
## [1] 62.81552
```

6.10

```r
qnorm(.9 , mean = 2000, sd = 400)
qnorm(.05, mean = 2000, sd = 400)
```

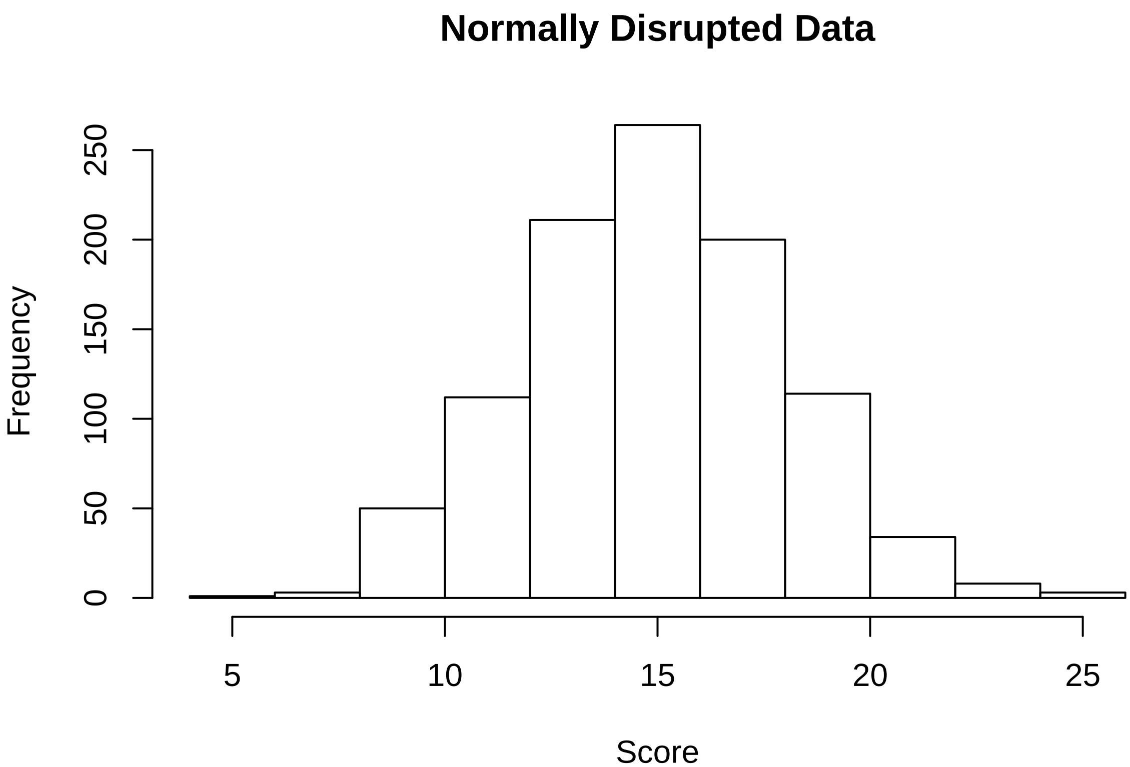
```
## [1] 2512.621
## [1] 1342.059
```

6.12

$$\text{Convert } x \text{ to } x'.$$
$$z = \frac{x - 48}{7}$$
$$x' = 10 \times z + 80$$

6.21

```r
X <- rnorm(1000, 15, 3)
hist(X, main = "Normally Disrupted Data", xlab = "Score", ylab = "Frequency")
```



7.2

a) $\frac{1}{1000}$
b) $\frac{1}{1000}$
c) $\frac{2}{1000}$

7.8

$$\frac{2}{24} \times \frac{3}{24} = \frac{1}{96} \approx 0.01$$