

R Textbook Companion for
Statistics for Management and Economics
by Gerald Keller¹

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Book Description

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R numbering policy used in this document and the relation to the above book.

Exa Example (Solved example)

Eqn Equation (Particular equation of the above book)

For example, Exa 3.51 means solved example 3.51 of this book. Sec 2.3 means an R code whose theory is explained in Section 2.3 of the book.

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Chapter 2

Graphical Descriptive Techniques I

R code Exa 2.1 Work Status in the GSS 2008 Survey

```
1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 2: Graphical Descriptive Techniques I
3 # Example 2.1 on Pg 18
4 # Work Status in the GSS 2008 Survey
5
6 # Complete dataset of 2021 observations could not be
  found on the
7 # website: https://www.cengage.com/cgi-wadsworth/
  course\_products\_wp.pl?fid=M20b&product\_isbn\_issn
  =9781285425450&template=nelson
8 # Partial data of 150 observations found in the book
  as given below:
9 data <- c(1, 1, 1, 1, 1, 7, 7, 1, 1, 5, 1, 5, 7, 1,
  1, 5, 7, 1, 5, 2, 5, 1, 5, 8, 1, 5, 7, 1, 4, 2,
  7, 1, 2,
10          1, 1, 2, 1, 7, 1, 7, 1, 2, 1, 1, 1, 1, 1,
  6, 5, 1, 1, 1, 1, 1, 2, 5, 2, 7, 2,
  7, 8, 1, 8, 1, 7, 1,
```

```

11         6, 7, 6, 1, 5, 1, 2, 2, 4, 1, 1, 1, 1, 1,
           6, 5, 5, 3, 2, 1, 1, 8 ,1 ,5, 1, 1,
           1, 1, 5, 5, 1, 5, 4,
12         7, 1, 1, 1, 4, 5, 2, 5, 6, 7 ,7, 1, 4, 2,
           1, 2, 6, 1, 1, 1, 1, 1, 1, 7, 4, 1,
           1, 1, 7, 8, 1, 3, 1,
13         1, 3, 1, 1, 1, 1, 1, 1, 2, 1, 5, 1, 1, 1,
           1, 1, 2, 1)
14
15 # factor() function divides the dataset into its
    levels
16 f <- factor(data)
17
18 # levels() function used for renaming
19 levels(f) <- c('Working full-time', 'Working part-
    time', 'Temporary no work', 'laid off',
20               'Retired', 'School', 'Keeping house',
                'Other')
21
22 # table() function displays the frequency table
23 c <- table(f)
24 print(c) #gives frequencies
25 rel_c <- paste(round(prop.table(c)*100,2), "%", sep=
    "") #gives relative frequencies in %
26 cbind(c, rel_c) #Table showing both frequencies and
    relative frequencies
27
28 # barplot() function plots the bar graph using the
    frequency table
29 barplot(c, main="Work Status", las=0)
30
31 # for pie-chart
32 # pie() function plots the pie chart using the
    frequency table
33 pct <- round(c/sum(c)*100) #computing percentages
34 lbls <- paste(levels(f), pct) #add percents to
    labels
35 lbls <- paste(lbls, "%", sep="") #add % to labels

```

```

36 pie(c, labels = lbls, main = "Pie Chart of Work
    Status")
37
38 #End

```

R code Exa 2.2 Energy Consumption in the United States in 2007

```

1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 2: Graphical Descriptive Techniques I
3 # Example 2.2 on Pg 24
4 # Energy Consumption in the United States in 2007
5
6
7 data1_source <- c("Petroleum", "NaturalGas", "Coal",
  "Nuclear", "Hydroelec",
8                   "Wood", "Biofuels", "Wind", "Waste
  ", "Geotherm", "Solar")
9 data1_BTU <- c(39.77, 23.64, 22.8, 8.42, 2.45, 2.14,
  1.02, 0.34, 0.43, 0.35, 0.08)
10
11 dev.off()
12
13 # the appropriate graphical technique, in describing
  the proportion of total energy consumption by
  all sources,
14 # is a pie-chart.
15 # pie-chart using pie() function
16 colors <- c("beige", "dodgerblue", "hotpink4", "navy
  ", "lawngreen", "lightslategrey", "purple3", "red
  ", "yellow", "black", "orange")
17 lbls <- paste(data1_BTU,"%", sep="")
18 pie_legend <- paste(data1_source, lbls)
19 pie(data1_BTU, main = "Pie Chart of Energy
  Consumption", cex=0.7, col=colors, labels = NA)

```

```

20 legend(x=0.75,y=0.75,legend =pie_legend, fill=colors
    , bty="n", cex=0.6)
21
22
23 #End

```

R code Exa 2.3 Per Capita Beer Consumption 10 Selected Countries

```

1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 2: Graphical Descriptive Techniques I
3 # Example 2.3 on Pg 26
4 # Per Capita Beer Consumption (10 Selected Countries
  )
5
6
7 Country <- c("Australia", "Austria", "Belgium", "Canada
  ", "Croatia", "Czech Republic", "Denmark", "Finland",
  "Germany",
8           "Hungary", "Ireland", "Luxembourg", "
  Netherlands", "New Zealand", "Poland",
  "Portugal", "Slovakia", "Spain",
9           "UK", "USA")
10
11 Beer_consumption <- c
  (119.2,106.3,93,68.3,81.2,138.1,89.9,85,147.8,75.3,
  138.3,84.4, 79, 77, 69.1, 59.6,
12           84.1, 83.8, 96.8, 81.6)
13
14 #bar chart for beer consumption
15 barchart <- barplot(Beer_consumption, names.arg =
  Country, ylim=c(0,160),axisnames = FALSE,
16           main=" Per Capita Beer
  Consumption (10 Selected
  Countries)")

```

```
17 text(x = barchart, y = Beer_consumption, label =  
    Beer_consumption, pos = 3, cex = 0.9, col = "red"  
    )  
18 text(x = barchart, y = par()$usr[3], label = Country  
    ,srt = 45, adj = c(1.1,1.1), xpd = TRUE) #  
    rotated x-axisnames  
19  
20 #End
```

Chapter 3

Graphical Descriptive Techniques II

Chapter 4

Numerical Descriptive Techniques

R code Exa 4.1 Mean Time Spent on the Internet

```
1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 4: Numerical Descriptive Techniques
3 # Example 4.1 on Pg 99
4 # Mean Time Spent on the Internet
5
6 Internet_hours <- c(0, 7, 12, 5, 33, 14, 8, 0, 9,
  22)
7
8 #manually computing the sample mean of Internet
  hours
9 mean1 <- sum(Internet_hours)/length(Internet_hours)
10
11 #computing mean using function
12 mean2 <- mean(Internet_hours)
13
14 #Answer: sample mean is 11
15
16 #End
```

R code Exa 4.3 Median Time Spent on Internet

```
1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 4: Numerical Descriptive Techniques
3 # Example 4.3 on Pg 100
4 # Median Time Spent on Internet
5
6 Internet_hours <- c(0, 7, 12, 5, 33, 14, 8, 0, 9,
  22)
7
8 #computing median using the function median()
9 median(Internet_hours)
10
11 #Answer: sample median is 8.5
12
13 #End
```

R code Exa 4.5 Mode Time Spent on Internet

```
1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 4: Numerical Descriptive Techniques
3 # Example 4.5 on Pg 102
4 # Mode Time Spent on Internet
5
6 Internet_hours <- c(0, 7, 12, 5, 33, 14, 8, 0, 9,
  22)
```



```

7
8 # there is no inbuilt function for calculating Mode
9 # So, a function is written to compute Mode. It
  works if the data is numeric.
10 # It creates a frequency table using the function
    table() and gives the index of the value occuring
        maximum
11 # times using the function which.max().
12 Mode <- function(x)
13 {
14   if (is.numeric(x))
15   {
16     x_table <- table(x)
17     return(as.numeric(names(x_table)[which.max(x_
        table)]))
18   }
19 }
20
21 Mode(Internet_hours)
22
23 #Answer: sample mode is 0
24
25 #End

```

R code Exa 4.7 Summer Jobs

```

1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 4: Numerical Descriptive Techniques
3 # Example 4.7 on Pg 110
4 # Summer Jobs
5
6 summer_job <- c(17, 15, 23, 7, 9, 13)

```

```

7
8 #Find the mean and variance of these data.
9
10 #Sample Mean
11 mean(summer_job)
12
13 #Sample Variance
14 var(summer_job)
15
16 #Answer: Mean is 14 & Variance is 33.2
17
18 #End

```

R code Exa 4.9 Using the Empirical Rule to Interpret Standard Deviation

```

1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 4: NUMERICAL DESCRIPTIVE TECHNIQUES
3 # Example 4.9 on Pg. 113
4 # Using the Empirical Rule to Interpret Standard
  Deviation
5
6
7 population_mean <- 0.1
8 population_sd <- 0.08
9 sd1 <- 1
10 sd2 <- 2
11 sd3 <- 3
12
13 lower_bound_one_SD <- population_mean - population_
  sd * sd1 #Answer: 2%
14 upper_bound_one_SD <- population_mean + population_
  sd * sd1 #Answer: 18%

```

```

15 probability_within_bounds1 <- pnorm(upper_bound_one_
    SD, population_mean, population_sd) - pnorm(lower
    _bound_one_SD, population_mean, population_sd)
16 #Answer: 68%
17
18 lower_bound_two_SD <- population_mean - population_
    sd * sd2 #Answer: -6%
19 upper_bound_two_SD <- population_mean + population_
    sd * sd2 #Answer: 26%
20 probability_within_bounds2 <- pnorm(upper_bound_two_
    SD, population_mean, population_sd) - pnorm(lower
    _bound_two_SD, population_mean, population_sd)
21 #Answer: 95%
22
23 lower_bound_three_SD <- population_mean - population
    _sd * sd3 #Answer: -14%
24 upper_bound_three_SD <- population_mean + population
    _sd * sd3 #Answer: 34%
25 probability_within_bounds3 <- pnorm(upper_bound_
    three_SD, population_mean, population_sd) - pnorm
    (lower_bound_three_SD, population_mean,
    population_sd)
26 #Answer: 99.7%
27
28 cat("Given the histogram is bell shaped, we can
    apply the Empirical Rule and say that:")
29 cat("1. Approximately", paste(round((probability_
    within_bounds1)*100,digits=0),"%",sep=""),
30     " of the returns on investment lie between",
    paste(round((lower_bound_one_SD)*100,digits
    =0),"%",sep=""),
31     " and",
32     paste(round((upper_bound_one_SD)*100,digits=0),"
    %",sep=""))
33
34 cat("2. Approximately", paste(round((probability_
    within_bounds2)*100,digits=0),"%",sep=""),
35     " of the returns on investment lie between",

```

```

    paste(round((lower_bound_two_SD)*100,digits
=0),"%",sep=""),
36  "and",
37  paste(round((upper_bound_two_SD)*100,digits=0),"
    %",sep=""))
38
39  cat("3. Approximately", paste(round((probability_
within_bounds3)*100,digits=1),"%",sep=""),
40  "of the returns on investment lie between",
    paste(round((lower_bound_three_SD)*100,digits
=0),"%",sep=""),
41  "and",
42  paste(round((upper_bound_three_SD)*100,digits=0)
    ,"%",sep=""))
43
44  #End

```

R code Exa 4.10 Using Chebysheffs Theorem to Interpret Standard Deviation

```

1  # Statistics for Management and Economics by Gerald
    Keller
2  # Chapter 4: NUMERICAL DESCRIPTIVE TECHNIQUES
3  # Example 4.10 on Pg. 114
4  # Using Chebysheff's Theorem to Interpret Standard
    Deviation
5
6
7  population_mean <- 28000
8  population_sd <- 3000
9
10 sd2 <- 2 #two standard deviations
11 sd3 <- 3 #three standard deviations
12 chebyshev_2 <- 1- 1/(sd2^2)
13 chebyshev_3 <- 1- 1/(sd3^2)

```

```

14
15 lower_bound_two_SD <- population_mean - population_
    sd * sd2 #Answer: $22,000
16 upper_bound_two_SD <- population_mean + population_
    sd * sd2 #Answer: $34,000
17
18 lower_bound_three_SD <- population_mean - population
    _sd * sd3 #Answer: $19,000
19 upper_bound_three_SD <- population_mean + population
    _sd * sd3 #Answer: $34,000
20
21 cat("Given the histogram is NOT bell shaped, we can
    only apply the Chebyshev's Thoerem and say that:"
    )
22
23 cat("1. Atleast", paste(round(chebyshev_2*100,digits
    =0),"%",sep=""),
24     "of the returns on investment lie between",
25     round(lower_bound_two_SD),
26     "and",
27     round(upper_bound_two_SD))
28 cat("2. Atleast", paste(round(chebyshev_3*100,digits
    =1),"%",sep=""),
29     "of the returns on investment lie between",
30     round(lower_bound_three_SD),
31     "and",
32     round(upper_bound_three_SD))
33 #End

```

R code Exa 4.11 Percentiles of Time Spent on Internet

```

1 # Statistics for Management and Economics by Gerald
    Keller

```

```

2 # Chapter 4: Numerical Descriptive Techniques
3 # Example 4.11 on Pg 118
4 # Percentiles of Time Spent on Internet
5
6 Internet_hours <- c(0, 7, 12, 5, 33, 14, 8, 0, 9,
7   22)
8 quantile(Internet_hours, probs = c(.25, .50, .75),
9   type=6)
10 #Answer: 25%    50%    75%
11           #3.75  8.50  16.00
12
13 #End

```

R code Exa 4.16 Calculating the Coefficient of Correlation

```

1 # Statistics for Management and Economics by Gerald
2   Keller
3 # Chapter 4: Numerical Descriptive Techniques
4 # Example 4.16 on Pg 129
5 # Calculating the Coefficient of Correlation
6
7 #Set 1
8 x1 <- c(2,6,7)
9 y1 <- c(13,20,27)
10 cor(x1,y1)

```

```
10 #Answer: Correlation coefficient for Set 1:
    0.9449112
11
12 #Set 2
13 x2 <- c(2,6,7)
14 y2 <- c(27,20,13)
15 cor(x2,y2)
16 #Answer: Correlation coefficient for Set 2:
    -0.9449112
17
18 #Set 3
19 x3 <- c(2,6,7)
20 y3 <- c(20,27,13)
21 cor(x3,y3)
22 #Answer: Correlation coefficient for Set 3:
    -0.1889822
23
24 #End
```

Chapter 5

Data Collection and Sampling

R code Exa 5.1 Random Sample of Income Tax Returns

```
1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 5: Data Collection and Sampling
3 # Example 5.1 on Pg. 168
4 # Random Sample of Income Tax Returns
5
6 sample(1:1000, 40, replace=TRUE) #random sample
  generation with replacement
7 sample(1:1000, 40, replace=FALSE) #random sample
  generation without replacement
8
9 #End
```

Chapter 6

Probability

R code Exa 6.1 Determinants of Success among Mutual Fund Managers
Part 1

```
1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 6: PROBABILITY
3 # Example 6.1 on Pg. 182
4 # Determinants of Success among Mutual Fund Managers
  -Part 1
5
6
7 #Denote:
8 #A1 = Fund manager graduated from a top-20 MBA
  program
9 #A2 = Fund manager did not graduate from a top-20
  MBA program
10 #B1 = Fund outperforms the market
11 #B2 = Fund does not outperform the market
12
13 #Given:
14 #P(A1 and B1) = 0.11
15 #P(A2 and B1) = 0.06
16 #P(A1 and B2) = 0.29
```

```

17 #P(A2 and B2) = 0.54
18
19 p_A1_B1 = 0.11
20 p_A2_B1 = 0.06
21 p_A1_B2 = 0.29
22 p_A2_B2 = 0.54
23
24 #P(A1) = P(A1 and B1) + P(A1 and B2)
25 p_A1 = p_A1_B1 + p_A1_B2
26 #Answer: P(A1) = 0.4
27
28 #P(A2) = P(A2 and B1) + P(A2 and B2)
29 p_A2 = p_A2_B1 + p_A2_B2
30 #Answer: P(A2) = 0.6
31
32 #P(B1) = P(A2 and B1) + P(A1 and B1)
33 p_B1 = p_A2_B1 + p_A1_B1
34 #Answer: P(B1) = 0.17
35
36 #P(B2) = P(A2 and B2) + P(A1 and B2)
37 p_B2 = p_A2_B2 + p_A1_B2
38 #Answer: P(B2) = 0.83
39
40
41 #End

```

R code Exa 6.2 Determinants of Success among Mutual Fund Managers
Part 2

```

1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 6: PROBABILITY
3 # Example 6.2 on Pg. 184
4 # Determinants of Success among Mutual Fund Managers
  -Part 2

```

```

5
6 #Denote:
7 #A1 = Fund manager graduated from a top-20 MBA
      program
8 #A2 = Fund manager did not graduate from a top-20
      MBA program
9 #B1 = Fund outperforms the market
10 #B2 = Fund does not outperform the market
11
12 #Given:
13 #P(A1 and B1) = 0.11
14 #P(A2 and B1) = 0.06
15 #P(A1 and B2) = 0.29
16 #P(A2 and B2) = 0.54
17
18 p_A1_B1 = 0.11
19 p_A2_B1 = 0.06
20 p_A1_B2 = 0.29
21 p_A2_B2 = 0.54
22
23 #Find P(A1/B2)
24
25 p_A1_given_B2 = p_A1_B2 / (p_A2_B2 + p_A1_B2)
26 #Answer: P(A1/B2) = 0.3494
27
28 cat("34.9% of all mutual funds that do not
      outperform the market are managed by top-20 MBA
      program graduates.")
29
30 #End

```

R code Exa 6.3 Determinants of Success among Mutual Fund Managers
Part 3

1 # Statistics for Management and Economics by Gerald

```

      Keller
2 # Chapter 6: PROBABILITY
3 # Example 6.3 on Pg. 185
4 # Determinants of Success among Mutual Fund Managers
   -Part 3
5
6
7 #Denote:
8 #A1 = Fund manager graduated from a top-20 MBA
   program
9 #A2 = Fund manager did not graduate from a top-20
   MBA program
10 #B1 = Fund outperforms the market
11 #B2 = Fund does not outperform the market
12
13 #Given:
14 #P(A1 and B1) = 0.11
15 #P(A2 and B1) = 0.06
16 #P(A1 and B2) = 0.29
17 #P(A2 and B2) = 0.54
18
19 p_A1_B1 = 0.11
20 p_A2_B1 = 0.06
21 p_A1_B2 = 0.29
22 p_A2_B2 = 0.54
23
24 #determine whether A1 and B1 are independent
25
26 p_A1_given_B1 = p_A1_B1 / (p_A2_B1 + p_A1_B1)
27 p_A1 = p_A1_B1 + p_A1_B2
28
29 cat("P(A1/B1) =", p_A1_given_B1)
30 cat("P(A1) =", p_A1)
31
32 if(p_A1 == p_A1_given_B1)
33 {cat("A1 and B1 are independent since P(A1/B1) and P
   (A1) have same value")}else
34   {cat("A1 and B1 are not independent since P(A1/

```

```
    B1) and P(A1) do not have same value"))}
35
36 #End
```

R code Exa 6.4 Determinants of Success among Mutual Fund Managers
Part 4

```
1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 6: PROBABILITY
3 # Example 6.4 on Pg. 186
4 # Determinants of Success among Mutual Fund Managers
  -Part 4
5
6
7 #Denote:
8 #A1 = Fund manager graduated from a top-20 MBA
  program
9 #A2 = Fund manager did not graduate from a top-20
  MBA program
10 #B1 = Fund outperforms the market
11 #B2 = Fund does not outperform the market
12
13 #Given:
14 #P(A1 and B1) = 0.11
15 #P(A2 and B1) = 0.06
16 #P(A1 and B2) = 0.29
17 #P(A2 and B2) = 0.54
18
19 p_A1_B1 = 0.11
20 p_A2_B1 = 0.06
21 p_A1_B2 = 0.29
22 p_A2_B2 = 0.54
23
24 #Find P(A1 or B1) i.e., P(A1 union B1)
```

```

25 #P(A1 or B1) = 1 - P(A2 and B2)
26
27 p_A1_or_B1 = 1 - p_A2_B2
28 #Answer: 0.46
29
30 cat("Thus,", paste(round(p_A1_or_B1*100), "%", sep="
    "), "of mutual funds either outperform the market
    or are managed by a top-20 MBA program graduate
31     or have both characteristics. ")
32
33 #End

```

R code Exa 6.5 Selecting Two Students without Replacement

```

1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 6: PROBABILITY
3 # Example 6.5 on Pg. 192
4 # Selecting Two Students without Replacement
5
6 #A is the event that the first student chosen is
  female
7 #B is the event that the second student chosen is
  also female.
8
9 #Find P(A and B) without replacement
10
11 #Given:
12 number_of_males = 7
13 number_of_females = 3
14
15 p_A = number_of_females / (number_of_females + number_
    of_males)
16 p_B_given_A = (number_of_females - 1) / ((number_of_
    females + number_of_males) - 1) #without

```

```

      replacement
17
18 p_A_and_B = p_A * p_B_given_A
19 #Answer: 0.06666667
20
21 cat("Probability that the two students chosen are
      female:", p_A_and_B)
22
23 #End

```

R code Exa 6.6 Selecting Two Students with Replacement

```

1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 6: PROBABILITY
3 # Example 6.6 on Pg. 193
4 # Selecting Two Students with Replacement
5
6 #A is the event that the first student chosen is
  female
7 #B is the event that the second student chosen is
  also female.
8
9 #Find P(A and B) with replacement
10
11 #Given:
12 number_of_males = 7
13 number_of_females = 3
14
15 p_A = number_of_females / (number_of_females + number_
  of_males)
16 p_B = number_of_females / (number_of_females + number_
  of_males) #with replacement
17
18 p_A_and_B = p_A * p_B

```

```

19 #Answer: 0.09
20
21 cat("Probability that the two students chosen are
      female:", p_A_and_B)
22
23 #End

```

R code Exa 6.7 Applying the Addition Rule

```

1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 6: PROBABILITY
3 # Example 6.7 on Pg. 194
4 # Applying the Addition Rule
5
6 #A = the household subscribes to the Sun
7 #B = the household subscribes to the Post
8
9 #Given  $P(A) = 0.22$ ,  $P(B) = 0.35$  and  $P(A \text{ and } B) =$ 
  0.06
10 #Find  $P(A \text{ union } B)$  i.e.,  $P(A \text{ or } B)$ 
11
12 p_A = 0.22
13 p_B = 0.35
14 p_A_and_B = 0.06
15
16 #Addition rule:  $P(A \text{ union } B) = P(A) + P(B) - P(A \text{ and } B)$ 
17 p_A_or_B = p_A + p_B - p_A_and_B
18 #Answer: 0.51
19
20 cat("The probability that a randomly selected
      household subscribes to either newspaper is", p_A
      _or_B)
21

```


22 #End

R code Exa 6.8 Probability of Passing the Bar Exam

```
1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 6: PROBABILITY
3 # Example 6.8 on Pg. 196
4 # Probability of Passing the Bar Exam
5
6 #Given:
7 #P(pass rate for first-time Bar Exam takers) = 0.72
8 #P(pass rate for second-time Bar Exam takers who
  failed first time) = 0.88
9
10 pass_1 = 0.72
11 fail_1 = 1-pass_1
12
13 pass2_Given_fail1 = 0.88
14 #fail_and_pass = P(Fail [on first exam] and Pass [on
  second exam])
15
16 fail1_and_pass2 = pass2_Given_fail1 * fail_1
17 #Answer: P(Fail [on first exam] and Pass [on second
  exam]) = 0.2464
18
19 #We need probability that a randomly selected law
  school graduate becomes a lawyer i.e.,
20 #we need to find probability of passing the first or
  second exam.
21
22 pass = pass_1 + fail1_and_pass2
23
24 cat("probability that a randomly selected law school
  graduate becomes a lawyer:", pass)
```

25
26 #End

R code Exa 6.9 Should an MBA Applicant Take a Preparatory Course

```
1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 6: PROBABILITY
3 # Example 6.9 on Pg. 199
4 # Should an MBA Applicant Take a Preparatory Course?
5
6 #A1 = GMAT score is 650 or more
7 #A2 = GMAT score less than 650
8 #B = Take preparatory course
9
10 #Given:
11 #P(B given A1) = .52
12 #P(A1) = p_A1 = 0.1
13 #P(B given A2) = .23
14
15 #Find P(A1/B)
16
17 p_A1 = 0.1
18 p_A2 = 1 - p_A1
19 p_B_given_A1 = 0.52
20 p_B_given_A2 = 0.23
21
22 #BAYE'S Rule:
23 #P(A1 given B) = P(A1)*P(B given A1) / (P(A1)*P(B
  given A1) + P(A2)*P(B given A2))
24
25 p_A1_given_B = (p_A1*p_B_given_A1) / (p_A1*p_B_given
  _A1 + p_A2*p_B_given_A2)
26 #Answer: 0.2007722
27
```

R code Exa 6.10 Probability of Prostate Cancer

```
1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 6: PROBABILITY
3 # Example 6.10 on Pg. 203
4 # Probability of Prostate Cancer
5
6 #Given:
7 #Prior: P(Has Prostrate Cancer) = .010
8 #Given Likelihood probabilities
9 #True negative: P(Negative test GIVEN No
  Prostrate Cancer) = 1 - .135 = .865
10 #False positive: P(Positive test GIVEN No
  Prostrate Cancer) = .135
11 #True positive: P(Positive test GIVEN Prostrate
  Cancer) = 1 - .300 = .700
12 #False negative: P(Negative test GIVEN Prostrate
  Cancer) = .300
13
14
15 #Function 'bayes_probability_tree' that creates a
  Probability Tree using Bayes Theorem
16
17 install.packages("DiagrammeR")
18 library(DiagrammeR)
19
20 bayes_probability_tree <- function(prior, true_
  positive, true_negative) {
21
22   if (!all(c(prior, true_positive, true_negative) >
    0) && !all(c(prior, true_positive, true_
    negative) < 1)) {
```

```

23     stop("probabilities must be greater than 0 and
24         less than 1.",
25         call. = FALSE)
26 }
27 c_prior <- 1 - prior
28 c_tp <- 1 - true_positive
29 c_tn <- 1 - true_negative
30
31 round4 <- purrr::partial(round, digits = 4)
32
33 b1 <- round4(prior * true_positive)
34 b2 <- round4(prior * c_tp)
35 b3 <- round4(c_prior * c_tn)
36 b4 <- round4(c_prior * true_negative)
37
38 bp <- round4(b1/(b1 + b3))
39
40 labs <- c("Cancer", prior, c_prior, true_positive,
41         c_tp, true_negative, c_tn, b1, b2, b4, b3)
42
43 tree <-
44   create_graph() %>%
45   add_n_nodes(
46     n = 11,
47     type = "path",
48     label = labs,
49     node_aes = node_aes(
50       shape = "circle",
51       height = 1,
52       width = 1,
53       x = c(0, 3, 3, 6, 6, 6, 6, 8, 8, 8, 8),
54       y = c(0, 2, -2, 3, 1, -3, -1, 3, 1, -3, -1))
55     ) %>%
56   add_edge(
57     from = 1,
58     to = 2,
59     edge_aes = edge_aes(
60       label = "Has Prostrate Cancer"

```

```

58     )
59 ) %>%
60 add_edge(
61     from = 1,
62     to = 3,
63     edge_aes = edge_aes(
64         label = "Does not have Prostrate Cancer"
65     )
66 ) %>%
67 add_edge(
68     from = 2,
69     to = 4,
70     edge_aes = edge_aes(
71         label = "True Positive: Positive test GIVEN
72             Cancer"
73     )
74 ) %>%
75 add_edge(
76     from = 2,
77     to = 5,
78     edge_aes = edge_aes(
79         label = "False Negative: Negative test GIVEN
80             Cancer"
81     )
82 ) %>%
83 add_edge(
84     from = 3,
85     to = 7,
86     edge_aes = edge_aes(
87         label = "False Positive: Positive test GIVEN
88             NO Cancer "
89     )
90 ) %>%
91 add_edge(
92     from = 3,
93     to = 6,
94     edge_aes = edge_aes(
95         label = "True Negative: Negative test GIVEN

```

```

          NO Cancer"
93     )
94     ) %>%
95     add_edge(
96         from = 4,
97         to = 8,
98         edge_aes = edge_aes(
99             label = "="
100        )
101    ) %>%
102    add_edge(
103        from = 5,
104        to = 9,
105        edge_aes = edge_aes(
106            label = "="
107        )
108    ) %>%
109    add_edge(
110        from = 7,
111        to = 11,
112        edge_aes = edge_aes(
113            label = "="
114        )
115    ) %>%
116    add_edge(
117        from = 6,
118        to = 10,
119        edge_aes = edge_aes(
120            label = "="
121        )
122    )
123    message(glue::glue("The probability that the man
        has prostate cancer given a positive test
        result is {bp}"))
124    print(render_graph(tree))
125    invisible(tree)
126 }
127

```

```
128 bayes_probability_tree(prior = 0.01, true_positive =  
    0.7, true_negative = (1-0.135))  
129  
130 #End
```

Chapter 7

Random Variables and Discrete Probability Distributions

R code Exa 7.1 Probability Distribution of Persons per Household

```
1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 7: RANDOM VARIABLES AND DISCRETE
  PROBABILITY DISTRIBUTIONS
3 # Example 7.1 on Pg. 220
4 # Probability Distribution of Persons per Household
5
6 #X is used to denote the random variable , the number
  of persons per household.
7 #Develop the probability distribution of X.
8
9 Number_of_Persons <- c(1,2,3,4,5,6,7)
10 Number_of_Households <- c(31.1, 38.6, 18.8, 16.2,
  7.2, 2.7, 1.4)
11
12 #we need Probability of X i.e., the relative
  frequency. Let it be denoted by P_X
13
14 P_X <- round(Number_of_Households/sum(Number_of_
```



```

    Households), digits=3)
15
16 #Answer: P(X): 0.268 0.333 0.162 0.140 0.062 0.023
    0.012
17
18 #End

```

R code Exa 7.2 Probability Distribution of the Number of Sales

```

1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 7: RANDOM VARIABLES AND DISCRETE
  PROBABILITY DISTRIBUTIONS
3 # Example 7.2 on Pg. 221
4 # Probability Distribution of the Number of Sales
5
6 # Denote:
7 # X = the number of sales
8 # prob = P(success) = 0.2
9 # q = P(failure) = 0.8
10 # three trials
11
12 ProbofSales <- function(q)
13 {
14   p = pbinom(q, size = 3, prob = 0.2, lower.tail =
    TRUE)
15   return(p)
16 }
17
18 #p_0 = P(X=0)
19 p_0 = ProbofSales(0)
20 #p_1 = P(X=1)
21 p_1 = ProbofSales(1) - p_0
22 #p_2 = P(X=2)
23 p_2 = ProbofSales(2) - ProbofSales(1)

```

```

24 #p_3 = P(X=3)
25 p_3 = ProbofSales(3) - ProbofSales(2)
26
27 cat("The Probability Distribution of number of Sales
      :")
28 cat("P(Number of Sales is 0):", p_0) #Answer: 0.512
29 cat("P(Number of Sales is 1):", p_1) #Answer: 0.384
30 cat("P(Number of Sales is 2):", p_2) #Answer: 0.096
31 cat("P(Number of Sales is 3):", p_3) #Answer: 0.008
32
33 #End

```

R code Exa 7.3 Describing the Population of the Number of Persons per Household

```

1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 7: RANDOM VARIABLES AND DISCRETE
  PROBABILITY DISTRIBUTIONS
3 # Example 7.3 on Pg. 224
4 # Describing the Population of the Number of Persons
  per Household
5
6
7 #X is used to denote the random variable , the number
  of persons per household.
8 #Find the mean, variance , and standard deviation for
  the population of the number of persons per
  household
9
10 Number_of_Persons <- c(1,2,3,4,5,6,7)
11 Number_of_Households <- c(31.1, 38.6, 18.8, 16.2,
  7.2, 2.7, 1.4)
12
13 #we need Probability of X i.e., the relative

```

```

    frequency. Let it be denoted by P_X
14 P_X <- round(Number_of_Households/sum(Number_of_
    Households), digits=3)
15
16 E_X <- sum(P_X*Number_of_Persons)
17 V_X <- sum(((Number_of_Persons-E_X)^2)*P_X)
18 STDEV <- sqrt(V_X)
19
20 #Answer: E(X) = 2.512
21           #Var(X) = 1.9539
22           #Std deviation (X) = 1.3978
23
24
25 #End

```

R code Exa 7.4 Describing the Population of Monthly Profits

```

1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 7: RANDOM VARIABLES AND DISCRETE
  PROBABILITY DISTRIBUTIONS
3 # Example 7.4 on Pg. 225
4 # Describing the Population of Monthly Profits
5
6 #Given:
7 mean_sales = 25000 #mean of monthly sales at a
  computer store
8 stdev_sales = 4000 #standard deviation of monthly
  sales at a computer store
9
10 #Given fixed cost:
11 fc = 6000
12
13 #Laws of Expected Value:  $E(c) = c$ ;  $E(X + c) = E(X) + c$ ;
   $E(cX) = c \cdot E(X)$ 

```

```

14 #Laws of Variance:  $V(X + c) = V(X)$ ;  $V(cX) = c^2 * V(X)$ 
    );  $V(c) = 0$ 
15
16 #Given: Profit =  $0.3 * \text{Sales} - \text{fixed cost}$ .
17
18 #Applying the laws of expected value,  $E(\text{Profit}) =$ 
     $0.3 * E(\text{Sales}) - 6000$ 
19 #Applying the laws of variance,  $V(\text{Profit}) = V(0.30($ 
     $\text{Sales}) - 6,000) = 0.09V(\text{Sales})$ 
20
21 expected_profit =  $0.3 * \text{mean\_sales} - \text{fc}$ 
22 #Answer: 1500
23 stdev_profit =  $\text{sqrt}(0.09 * \text{stdev\_sales}^2)$ 
24 #Answer: 1200
25
26 #End

```

R code Exa 7.5 Bivariate Distribution of the Number of House Sales

```

1 # Statistics for Management and Economics by Gerald
    Keller
2 # Chapter 7: RANDOM VARIABLES AND DISCRETE
    PROBABILITY DISTRIBUTIONS
3 # Example 7.5 on Pg. 230
4 # Bivariate Distribution of the Number of House
    Sales
5
6
7 # X = number of houses that Xavier will sell in a
    month
8 # Y = number of houses Yvette will sell in a month.
9
10 # bivariate probability distribution of X & Y
11 matr=matrix(c(0.12, 0.21, 0.07, 0.42, 0.06, 0.02,
    0.06, 0.03, 0.01),3,3)

```

```

12
13 #Marginal probabilities of Y
14 Y_marginal <- margin.table(matr, 1)
15 Y_marginaltable <- matrix(c(0,1,2, Y_marginal),3,2)
16 colnames(Y_marginaltable) <- c('Y', 'P(Y)')
17 rownames(Y_marginaltable) <- c('', '', '')
18 Y_marginaltable
19
20 #Expected value of Y, E(Y):
21 Expected_Y = X_marginaltable[1]*Y_marginaltable[4] +
      Y_marginaltable[2]*Y_marginaltable[5] +
22      Y_marginaltable[3]*Y_marginaltable[6]
23 Expected_Y
24 #Answer: 0.5
25
26 #Variance (Y):
27 Var_Y = (Y_marginaltable[1]-Expected_Y)^2*Y_
      marginaltable[4] +
28      (Y_marginaltable[2]-Expected_Y)^2*Y_
      marginaltable[5] +
29      (Y_marginaltable[3]-Expected_Y)^2*Y_
      marginaltable[6]
30 Var_Y
31 #Answer: 0.45
32
33 #Standard Deviation of Y
34 Std_Y = sqrt(Var_Y)
35 #Answer: 0.6708204
36
37 #####
38
39 #Marginal probabilities of X
40 X_marginal <- margin.table(matr, 2)
41 X_marginaltable <- matrix(c(0,1,2, X_marginal),3,2)
42 colnames(X_marginaltable) <- c('X', 'P(X)')
43 rownames(X_marginaltable) <- c('', '', '')
44 X_marginaltable
45

```

```

46 #Expected value of X, E(X):
47 Expected_X = X_marginaltable[1]*X_marginaltable[4] +
      X_marginaltable[2]*X_marginaltable[5] +
48   X_marginaltable[3]*X_marginaltable[6]
49 Expected_X
50 #Answer: 0.7
51
52 #Variance (X):
53 Var_X = (X_marginaltable[1]-Expected_X)^2*X_
      marginaltable[4] +
54   (X_marginaltable[2]-Expected_X)^2*X_marginaltable
      [5] +
55   (X_marginaltable[3]-Expected_X)^2*X_marginaltable
      [6]
56 Var_X
57 #Answer: 0.41
58
59 #Standard Deviation of X
60 Std_X = sqrt(Var_X)
61 #Answer: 0.6403124
62
63
64 #End

```

R code Exa 7.6 Describing the Bivariate Distribution

```

1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 7: RANDOM VARIABLES AND DISCRETE
  PROBABILITY DISTRIBUTIONS
3 # Example 7.6 on Pg. 232
4 # Describing the Bivariate Distribution
5
6
7 # X = number of houses that Xavier will sell in a

```

```

      month
8 # Y = number of houses Yvette will sell in a month.
9
10 # bivariate probability distribution of X & Y
11 matr=matrix(c(0.12, 0.21, 0.07, 0.42, 0.06, 0.02,
      0.06, 0.03, 0.01),3,3)
12
13 #Marginal probabilities of Y
14 Y_marginal <- margin.table(matr, 1)
15 Y_marginaltable <- matrix(c(0,1,2, Y_marginal),3,2)
16 colnames(Y_marginaltable) <- c('Y', 'P(Y)')
17 rownames(Y_marginaltable) <- c('', '', '')
18 Y_marginaltable
19
20 #Expected value of Y, E(Y):
21 Expected_Y = X_marginaltable[1]*Y_marginaltable[4] +
      Y_marginaltable[2]*Y_marginaltable[5] +
22   Y_marginaltable[3]*Y_marginaltable[6]
23 Expected_Y
24 #Answer: 0.5
25
26 #Variance(Y):
27 Var_Y = (Y_marginaltable[1]-Expected_Y)^2*Y_
      marginaltable[4] +
28   (Y_marginaltable[2]-Expected_Y)^2*Y_marginaltable
      [5] +
29   (Y_marginaltable[3]-Expected_Y)^2*Y_marginaltable
      [6]
30 Var_Y
31 #Answer: 0.45
32
33 #Standard Deviation of Y
34 Std_Y = sqrt(Var_Y)
35 #Answer: 0.6708204
36
37 #####
38
39 #Marginal probabilities of X

```

```

40 X_marginal <- margin.table(matr, 2)
41 X_marginaltable <- matrix(c(0,1,2, X_marginal),3,2)
42 colnames(X_marginaltable) <- c('X', 'P(X)')
43 rownames(X_marginaltable) <- c('', '', '')
44 X_marginaltable
45
46 #Expected value of X, E(X):
47 Expected_X = X_marginaltable[1]*X_marginaltable[4] +
      X_marginaltable[2]*X_marginaltable[5] +
48   X_marginaltable[3]*X_marginaltable[6]
49 Expected_X
50 #Answer: 0.7
51
52 #Variance(X):
53 Var_X = (X_marginaltable[1]-Expected_X)^2*X_
      marginaltable[4] +
54   (X_marginaltable[2]-Expected_X)^2*X_marginaltable
      [5] +
55   (X_marginaltable[3]-Expected_X)^2*X_marginaltable
      [6]
56 Var_X
57 #Answer: 0.41
58
59 #Standard Deviation of X
60 Std_X = sqrt(Var_X)
61 #Answer: 0.6403124
62
63
64 #####
65
66 #Covariance(X,Y):
67 cov_x_y = (Y_marginaltable[1]-Expected_Y)*(X_
      marginaltable[1]-Expected_X)*0.12+(Y_
      marginaltable[1]-Expected_Y)*(X_marginaltable[2]-
      Expected_X)*0.42+(Y_marginaltable[1]-Expected_Y)*
      (X_marginaltable[3]-Expected_X)*0.06+(Y_
      marginaltable[2]-Expected_Y)*(X_marginaltable[1]-
      Expected_X)*0.21+(Y_marginaltable[2]-Expected_Y)*

```



```

(X_marginaltable[2]-Expected_X)*0.06+(Y_
marginaltable[2]-Expected_Y)*(X_marginaltable[3]-
Expected_X)*0.03+(Y_marginaltable[3]-Expected_Y)*
(X_marginaltable[1]-Expected_X)*0.07+(Y_
marginaltable[3]-Expected_Y)*(X_marginaltable[2]-
Expected_X)*0.02+(Y_marginaltable[3]-Expected_Y)*
(X_marginaltable[3]-Expected_X)*0.01
68 cov_x_y
69 #Answer: -0.15
70
71
72 #Correlation(X,Y)
73 corr_x_y = cov_x_y/(Std_X*Std_Y)
74 corr_x_y
75 #Answer: -0.3492151
76
77
78 #End

```

R code Exa 7.7 Describing the Population of the Total Number of House Sales

```

1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 7: RANDOM VARIABLES AND DISCRETE
  PROBABILITY DISTRIBUTIONS
3 # Example 7.7 on Pg. 234
4 # Describing the Population of the Total Number of
  House Sales
5
6
7 # X = number of houses that Xavier will sell in a
  month
8 # Y = number of houses Yvette will sell in a month.
9

```

```

10 # bivariate probability distribution of X & Y
11 matr=matrix(c(0.12, 0.21, 0.07, 0.42, 0.06, 0.02,
12             0.06, 0.03, 0.01),3,3)
13 #Marginal probabilities of Y
14 Y_marginal <- margin.table(matr, 1)
15 Y_marginaltable <- matrix(c(0,1,2, Y_marginal),3,2)
16 colnames(Y_marginaltable) <- c('Y', 'P(Y)')
17 rownames(Y_marginaltable) <- c('', '', '')
18 Y_marginaltable
19
20 #Expected value of Y, E(Y):
21 Expected_Y = X_marginaltable[1]*Y_marginaltable[4] +
22             Y_marginaltable[2]*Y_marginaltable[5] +
23             Y_marginaltable[3]*Y_marginaltable[6]
24 Expected_Y
25 #Answer: 0.5
26 #Variance(Y):
27 Var_Y = (Y_marginaltable[1]-Expected_Y)^2*Y_
28         marginaltable[4] +
29         (Y_marginaltable[2]-Expected_Y)^2*Y_marginaltable
30         [5] +
31         (Y_marginaltable[3]-Expected_Y)^2*Y_marginaltable
32         [6]
33 Var_Y
34 #Answer: 0.45
35
36 #Standard Deviation of Y
37 Std_Y = sqrt(Var_Y)
38 #Answer: 0.6708204
39
40 #Marginal probabilities of X
41 X_marginal <- margin.table(matr, 2)
42 X_marginaltable <- matrix(c(0,1,2, X_marginal),3,2)
43 colnames(X_marginaltable) <- c('X', 'P(X)')
44 rownames(X_marginaltable) <- c('', '', '')

```

```

43 X_marginaltable
44
45 #Expected value of X, E(X):
46 Expected_X = X_marginaltable[1]*X_marginaltable[4] +
      X_marginaltable[2]*X_marginaltable[5] +
47   X_marginaltable[3]*X_marginaltable[6]
48 Expected_X
49 #Answer: 0.7
50
51 #Variance(X):
52 Var_X = (X_marginaltable[1]-Expected_X)^2*X_
      marginaltable[4] +
53   (X_marginaltable[2]-Expected_X)^2*X_marginaltable
      [5] +
54   (X_marginaltable[3]-Expected_X)^2*X_marginaltable
      [6]
55 Var_X
56 #Answer: 0.41
57
58 #Standard Deviation of X
59 Std_X = sqrt(Var_X)
60 #Answer: 0.6403124
61
62 #Covariance(X,Y):
63 cov_x_y = (Y_marginaltable[1]-Expected_Y)*(X_
      marginaltable[1]-Expected_X)*0.12+(Y_
      marginaltable[1]-Expected_Y)*(X_marginaltable[2]-
      Expected_X)*0.42+(Y_marginaltable[1]-Expected_Y)*
      (X_marginaltable[3]-Expected_X)*0.06+(Y_
      marginaltable[2]-Expected_Y)*(X_marginaltable[1]-
      Expected_X)*0.21+(Y_marginaltable[2]-Expected_Y)*
      (X_marginaltable[2]-Expected_X)*0.06+(Y_
      marginaltable[2]-Expected_Y)*(X_marginaltable[3]-
      Expected_X)*0.03+(Y_marginaltable[3]-Expected_Y)*
      (X_marginaltable[1]-Expected_X)*0.07+(Y_
      marginaltable[3]-Expected_Y)*(X_marginaltable[2]-
      Expected_X)*0.02+(Y_marginaltable[3]-Expected_Y)*
      (X_marginaltable[3]-Expected_X)*0.01

```

```

64 cov_x_y
65 #Answer: -0.15
66
67 #####
68 # Describing the Population of the Total Number of
    House Sales
69
70 # Laws of Expected Value:  $E(X + Y) = E(X) + E(Y)$ 
71 # Laws of Variance:  $V(X + Y) = V(X) + V(Y) + 2 * Cov(X,$ 
    Y)
72
73 #E(X+Y)
74 Exp_X_Y = Expected_X + Expected_Y
75 #Answer: 1.2
76
77 #Var(X+Y)
78 V_X_Y = Var_X + Var_Y + 2*cov_x_y
79 #Answer: 0.56
80
81
82 #End

```

R code Exa 7.8.a Describing the Population of the Returns on a Portfolio

```

1 # Statistics for Management and Economics by Gerald
    Keller
2 # Chapter 7: RANDOM VARIABLES AND DISCRETE
    PROBABILITY DISTRIBUTIONS
3 # Example 7.8a on Pg. 239
4 # Describing the Population of the Returns on a
    Portfolio
5
6 #Given w1, w2
7 w1 = .25
8 w2 = .75

```

```

9
10 E_R1 = .08 #Expected value of McDonalds stock given
11 E_R2 = .15 #Expected value of Cisco stock
12 E_Rp = w1*E_R1 + w2*E_R2 #Expected return of the
    Portfolio
13 #Answer: 0.1325
14
15 #End

```

R code Exa 7.8b Describing the Population of the Returns on a Portfolio

```

1 # Statistics for Management and Economics by Gerald
    Keller
2 # Chapter 7: RANDOM VARIABLES AND DISCRETE
    PROBABILITY DISTRIBUTIONS
3 # Example 7.8b on Pg. 239
4 # Describing the Population of the Returns on a
    Portfolio
5
6 #Given:
7
8 w1 = 0.25
9 w2 = 0.75
10 s1 = 0.12 #Standard Deviation of stock McD
11 s2 = 0.22 #Standard Deviation of stock Cisco
12
13 StandardDev <- function(Rho)
14 {
15   return(sqrt(w1^2*s1^2 + w2^2*s2^2 + 2*w1*w2*Rho*s1
    *s2))
16 }
17
18 cat ("standard deviation of the returns on the
    portfolio , when the two stocks ' returns are
    perfectly positively correlated , is:" ,

```

```

19     StandardDev(1))
20 #Answer: 0.195
21
22 cat ("standard deviation of the returns on the
      portfolio , when the coefficient of correlation is
      0.5, is:",
23     StandardDev(0.5))
24 #Answer: 0.1819
25
26 cat ("standard deviation of the returns on the
      portfolio , when the two stocks ' returns are
      uncorrelated , is:",
27     StandardDev(0))
28 #Answer: 0.1677
29
30 #End

```

R code Exa 7.9.a Pat Statsdud and the Statistics Quiz

```

1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 7: RANDOM VARIABLES AND DISCRETE
  PROBABILITY DISTRIBUTIONS
3 # Example 7.9a on Pg. 246
4 # Pat Statsdud and the Statistics Quiz
5
6
7 # What is the probability that Pat gets no answers
  correct?
8 # n=10 iid trials. probability of each success is 1/
  5. Binomial distribution is apt.
9
10 #dbinom() function for Binomial
11 ans <- dbinom(0, 10, 0.2) #x=0, n=10, p=0.2
12

```

```
13 cat("P(Pat gets no answers correct) =", ans)
14
15 #Answer: 0.10737
16
17 #End
```

R code Exa 7.9.b Pat Statsdud and the Statistics Quiz

```
1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 7: RANDOM VARIABLES AND DISCRETE
  PROBABILITY DISTRIBUTIONS
3 # Example 7.9a on Pg. 246
4 # Pat Statsdud and the Statistics Quiz
5
6
7 # What is the probability that Pat gets two answers
  correct?
8 # n=10 iid trials. probability of each success is 1/
  5. Binomial distribution is apt.
9
10 #dbinom() function for Binomial
11 ans <- dbinom(2, 10, 0.2) #x=2, n=10, p=0.2
12
13 cat("P(Pat gets two answers correct) =", ans)
14
15 #Answer: 0.30199
16
17 #End
```

R code Exa 7.10 Will Pat Fail the Quiz

```

1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 7: RANDOM VARIABLES AND DISCRETE
  PROBABILITY DISTRIBUTIONS
3 # Example 7.10 on Pg. 247
4 # Will Pat Fail the Quiz?
5
6
7 # Find the probability that Pat fails the quiz. A
  mark is considered a failure if it is less than
  50%
8 # n=10 iid trials. probability of each success is 1/
  5. Binomial distribution is apt.
9
10 #dbinom() function for Binomial
11 p0 <- dbinom(0, 10, 0.2) #x=0, n=10, p=0.2
12 p1 <- dbinom(1, 10, 0.2) #x=1, n=10, p=0.2
13 p2 <- dbinom(2, 10, 0.2) #x=2, n=10, p=0.2
14 p3 <- dbinom(3, 10, 0.2) #x=3, n=10, p=0.2
15 p4 <- dbinom(4, 10, 0.2) #x=4, n=10, p=0.2
16
17 cat("P(Pat fails the quiz) =", sum(p0,p1,p2,p3,p4))
18
19 #Answer: 0.96721
20
21 #End

```

R code Exa 7.11 Pat Statsdud Has Been Cloned

```

1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 7: RANDOM VARIABLES AND DISCRETE
  PROBABILITY DISTRIBUTIONS
3 # Example 7.11 on Pg. 249
4 # Pat Statsdud Has Been Cloned!

```



```

5
6 #mean n sd of a class with students like Pat?!
7
8 mean.function <- function(n,p)
9 {
10   return(n*p)
11 }
12
13 sd.function <- function(n,p)
14 {
15   return(sqrt(n*p*(1-p)))
16 }
17
18 #mean of binomial i.e., nxp
19 mean.function(10,0.2)
20
21 #variance of binomial i.e., nxpxq
22 sd.function(10,0.2)
23
24 #Answer: mean is 2
25 #          sd is 1.264911
26
27 #End

```

R code Exa 7.12 Probability of the Number of Typographical Errors in Textbooks

```

1 # Statistics for Management and Economics by Gerald
   Keller
2 # Chapter 7: RANDOM VARIABLES AND DISCRETE
   PROBABILITY DISTRIBUTIONS
3 # Example 7.12 on Pg. 252
4 # Probability of the Number of Typographical Errors
   in Textbooks
5

```

```

6
7 # Given the number of errors per 100 pages follows
   Poisson (1.5)
8
9 # P(there are no typographical errors in a sample of
   100 pages) is given as:
10
11 v <- dpois(0, 1.5)
12
13 cat("P(there are no typographical errors in a sample
   of 100 pages) =", v )
14
15 #Answer: 0.22313
16
17 #End

```

R code Exa 7.13.a Probability of the Number of Typographical Errors in 400 Pages

```

1 # Statistics for Management and Economics by Gerald
   Keller
2 # Chapter 7: RANDOM VARIABLES AND DISCRETE
   PROBABILITY DISTRIBUTIONS
3 # Example 7.13a on Pg. 253
4 # Probability of the Number of Typographical Errors
   in 400 Pages
5
6
7 # Given the number of errors per 100 pages follows
   Poisson (1.5).
8 # Probability of the Number of Typographical Errors
   in 400 Pages. Now, mean is 6 typos per 400 pages.
9
10 # P(there are no typographical errors in a sample of
   400 pages) is given as:

```

```

11
12 v <- dpois(0, 4*1.5)
13
14 #Answer: 0.0024788
15
16 cat("P(there are no typographical errors in a sample
      of 400 pages) =", v )
17
18 #End

```

R code Exa 7.13.b Probability of the Number of Typographical Errors in 400 Pages

```

1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 7: RANDOM VARIABLES AND DISCRETE
  PROBABILITY DISTRIBUTIONS
3 # Example 7.13b on Pg. 253
4 # Probability of the Number of Typographical Errors
  in 400 Pages
5
6
7 # Given the number of errors per 100 pages follows
  Poisson (1.5).
8 # Probability of the Number of Typographical Errors
  in 400 Pages. Now, mean is 6 typos per 400 pages.
9
10 # P(there are five or fewer typos) is given as:
11
12 p0 <- dpois(0, 4*1.5)
13 p1 <- dpois(1, 4*1.5)
14 p2 <- dpois(2, 4*1.5)
15 p3 <- dpois(3, 4*1.5)
16 p4 <- dpois(4, 4*1.5)
17 p5 <- dpois(5, 4*1.5)

```

```
18
19 cat("P(X <= 5) = P(0) + P(1) + P(2) + P(3) + P(4) +
      P(5) =", sum(p0,p1,p2,p3,p4,p5))
20
21 #Answer: 0.44568
22
23 #End
```

Chapter 8

Continuous Probability Distributions

R code Exa 8.1.a Uniformly Distributed Gasoline Sales

```
1 # Statistics for Management and Economics by Gerald
  Keller
2 # CONTINUOUS PROBABILITY DISTRIBUTIONS
3 # Example 8.1a on Pg 267
4 # Uniformly Distributed Gasoline Sales
5
6 #Uniformly Distributed Gasoline Sales ~ U(2000,5000)
7
8 #U(2000,5000) graph
9 curve(dunif(x, min = 2000, max = 5000), from = 0, to
      = 6000, ylab = "f(x)", main = "Uniform Density f
      (x)")
10
11 #a. Find the probability that daily sales will fall
      between 2,500 and 3,000 gallons
12 #denote  $p1 = P(2500 \leq X \leq 3000) = P(X \leq 3000) - P$ 
      (X < 2500)
13 # punif() gives the probability of Uniform dist
      below a specified number
```

```
14
15 p1 <- punif(3000, min=2000, max=5000) - punif(2500,
      min=2000, max=5000)
16
17 #Answer: 0.16667
18
19 #End
```

R code Exa 8.1.b Uniformly Distributed Gasoline Sales

```
1 # Statistics for Management and Economics by Gerald
  Keller
2 # CONTINUOUS PROBABILITY DISTRIBUTIONS
3 # Example 8.1b on Pg 267
4 # Uniformly Distributed Gasoline Sales
5
6
7 #Uniformly Distributed Gasoline Sales ~ U(2000,5000)
8
9 # What is the probability that the service station
  will sell at least 4,000 gallons?
10 # denote  $p2 = P(X \geq 4000) = 1 - P(X < 4000)$ 
11 # punif() gives the probability of Uniform dist
  below a specified number
12
13 p2 <- 1-punif(4000, min=2000, max=5000)
14
15 #Answer: 0.33333
16
17 #End
```

R code Exa 8.1.c Uniformly Distributed Gasoline Sales


```
12 #Find P(X <= 1100). Let 'p' denote this required
    probability
13
14 p <- pnorm(1100, mean=1000, sd=100)
15 #Answer: 0.8413
16
17 #End
```

R code Exa 8.3.a Probability of a Negative Return on Investment

```
1 # Statistics for Management and Economics by Gerald
    Keller
2 # Chapter 8: CONTINUOUS PROBABILITY DISTRIBUTIONS
3 # Example 8.3a on Pg 277
4 # Probability of a Negative Return on Investment
5
6 #an ROI variable ~ N(10,5)
7
8 #Probability of losing money. Denote it by 'p'
9
10 p <- pnorm(0, mean=10, sd=5)
11 cat("The probability of losing money:", p)
12
13 #Answer: 0.02275
14
15 #End
```

R code Exa 8.3.b Probability of a Negative Return on Investment

```
1 # Statistics for Management and Economics by Gerald
    Keller
2 # Chapter 8: CONTINUOUS PROBABILITY DISTRIBUTIONS
3 # Example 8.3b on Pg 277
```



```

4 # Probability of a Negative Return on Investment
5
6
7 # Find the probability of losing money when the
  standard deviation is equal to 10%.
8
9
10 p <- pnorm(0, mean=10, sd=10)
11 cat("The probability of losing money when the
  standard deviation is equal to 10%:", p)
12
13 #Answer: 0.1586553
14
15 #End

```

R code Exa 8.4 Finding Z 05

```

1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 8: CONTINUOUS PROBABILITY DISTRIBUTIONS
3 # Example 8.4 on Pg 279
4 # Finding Z .05
5
6
7 # Find the value of a standard normal random
  variable such that the
8 # probability that the random variable is greater
  than it is 5%.
9
10 p <- qnorm(0.95)
11 cat("Z:", p)
12
13 #Answer: 1.644854
14
15 #End

```

R code Exa 8.5 Finding Z 05

```
1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 8: CONTINUOUS PROBABILITY DISTRIBUTIONS
3 # Example 8.5 on Pg 280
4 # Finding Z  $-.05$ 
5
6
7 # Find the value of a standard normal random
  variable such that the
8 # probability that the random variable is less than
  it is 5%.
9
10 p <- qnorm(0.05)
11 cat("Z:", p)
12
13 #Answer:  $-1.644854$ 
14
15 #End
```

R code Exa 8.6 Determining the Reorder Point

```
1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 8: CONTINUOUS PROBABILITY DISTRIBUTIONS
3 # Example 8.6 on Pg 283
4 # Determining the Reorder Point
5
6 mu = 200
7 sd = 50
```

```
8 Z_0.05 = qnorm(0.95)
9
10 reorderpoint = sd*Z_0.05 + mu
11 #Answer: 282.2427
12
13 #End
```

R code Exa 8.7.a Lifetimes of Alkaline Batteries

```
1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 8: CONTINUOUS PROBABILITY DISTRIBUTIONS
3 # Example 8.7a on Pg 288
4 # Lifetimes of Alkaline Batteries
5
6 #The lifetime of an alkaline battery is exp(0.05)
  distributed.
7 lambda = 0.05
8 #a.What is the mean and standard deviation of the
  battery's lifetime?
9
10 cat("Mean of battery's lifetime in hours:", 1/lambda
  )
11 cat("Standard Deviation of battery's lifetime in
  hours:", 1/lambda)
12
13 #Answer: 20 hours
14
15 #End
```

R code Exa 8.7.b Lifetimes of Alkaline Batteries

```

1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 8: CONTINUOUS PROBABILITY DISTRIBUTIONS
3 # Example 8.7b on Pg 288
4 # Lifetimes of Alkaline Batteries
5
6 #The lifetime of an alkaline battery is exp(0.05)
  distributed.
7 lambda = 0.05
8 #b. Find the probability that a battery will last
  between 10 and 15 hours.
9
10 p = pexp(15, rate=lambda) - pexp(10, rate=lambda)
11 cat("P(10 < battery lifetime < 15):",p)
12
13 #Answer: 0.1341641
14
15 #End

```

R code Exa 8.7.c Lifetimes of Alkaline Batteries

```

1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 8: CONTINUOUS PROBABILITY DISTRIBUTIONS
3 # Example 8.7c on Pg 288
4 # Lifetimes of Alkaline Batteries
5
6
7 #The lifetime of an alkaline battery is exp(0.05)
  distributed.
8 lambda = 0.05
9
10 #c. What is the probability that a battery will last
  for more than 20 hours?
11

```

```
12 p = 1- pexp(20, rate=lambda)
13 cat("P(battery lifetime > 20):",p)
14
15 #Answer: 0.3678794
16
17 #End
```

R code Exa 8.8.a Supermarket Checkout Counter

```
1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 8: CONTINUOUS PROBABILITY DISTRIBUTIONS
3 # Example 8.8a on Pg 290
4 # Supermarket Checkout Counter
5
6
7 #a.Find the probability of service is completed in
  fewer than 5 minutes
8 #the random variable, service process,  $X \sim \exp(6/$ 
  hour) i.e.,  $X \sim \exp(0.1/\text{minute})$ 
9 lambda = 0.1 #lambda = 0.1/minute
10
11 p = pexp(5, rate=lambda)
12
13 cat("P(X < 5):",p)
14
15 #Answer:0.3934693
16
17 #End
```

R code Exa 8.8.b Supermarket Checkout Counter

```

1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 8: CONTINUOUS PROBABILITY DISTRIBUTIONS
3 # Example 8.8b on Pg 290
4 # Supermarket Checkout Counter
5
6
7 #b.Find the probability of customer leaving checkout
  counter more than 10 minutes after arriving
8
9 #the random variable , service process ,  $X \sim \exp(6/$ 
  hour) i.e.,  $X \sim \exp(0.1/\text{minute})$ 
10 lambda = 0.1 #lambda = 0.1/minute
11
12 p = 1 - pexp(10, rate=lambda) #P(X > 10) = 1 - P(X
  < 10)
13
14 cat("P(X > 10):",p)
15
16 #Answer:0.367879
17
18 #End

```

R code Exa 8.8.c Supermarket Checkout Counter

```

1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 8: CONTINUOUS PROBABILITY DISTRIBUTIONS
3 # Example 8.8b on Pg 290
4 # Supermarket Checkout Counter
5
6
7 #c.Find the probability of the service being
  completed in a time between 5 and 8 minutes
8

```

```
9 #the random variable, service process,  $X \sim \exp(6/\text{hour})$  i.e.,  $X \sim \exp(0.1/\text{minute})$ 
10 lambda = 0.1 #lambda = 0.1/minute
11
12 p = pexp(8, rate=lambda) - pexp(5, rate=lambda) #P
    (5 < X < 8) = P(X < 8) - P(X < 5)
13
14 cat("P(5 < X < 8):",p)
15
16 #Answer: 0.1572017
17
18 #End
```

Chapter 9

Sampling Distributions

R code Exa 9.1.a Contents of a 32 Ounce Bottle

```
1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 9: Sampling Distributions
3 # Example 9.1a on Pg 316
4 # Contents of a 32-Ounce Bottle
5
6 # random variable is amount of soda in each 32-ounce
  bottle denoted by X.  $X \sim N(32.2, 0.3)$ 
7
8 #Given:
9 mu = 32.2
10 sd = 0.3
11
12 # probability that one bottle will contain more than
  32 ounces.  $P(X > 32)$ . Lets denote by 'p'
13 # pnorm() gives  $P(X < x)$  when  $X \sim \text{Normal}$ 
14 p = 1- pnorm(32, mean=32.2, sd=0.3)
15 cat("P(X > 32):", p)
16
17 #Answer: 0.7475075
18
```



```
19 #Book's answer slightly different: 0.7486
20
21 #End
```

R code Exa 9.1.b Contents of a 32 Ounce Bottle

```
1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 9: Sampling Distributions
3 # Example 9.1b on Pg 316
4 # Contents of a 32-Ounce Bottle
5
6
7 # random variable is amount of soda in each 32-ounce
  bottle denoted by X.  $X \sim N(32.2, 0.3)$ 
8
9 #Given:
10 mu = 32.2
11 sd = 0.3
12
13 # what is the probability that the mean amount of
  the four bottles > 32 ounces.
14 # ( $\bar{X} > 32$ ). Lets denote by 'p'
15 # pnorm() gives  $P(X < x)$  when  $X \sim \text{Normal}$ 
16
17 p = 1 - pnorm(32, mean=32.2, sd=0.3/sqrt(4))
18 cat("P( $\bar{X} > 32$ ):", p)
19
20 #Answer: 0.9087888
21
22 #Book's answer slightly different: 0.9082
23
24 #End
```

R code Exa 9.2 Political Survey

```
1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 9: Sampling Distributions
3 # Example 9.2 on Pg 326
4 # Political Survey
5
6
7 # Given number of respondents who would vote ~
  Binomial(300,0.52)
8 n = 300
9 p = 0.52
10
11 # what is the probability that the sample proportion
  is greater than 50% i.e.,  $P(\hat{p} > 0.5)$ 
12 # We know that sample proportion ~ Normal(p, sd)
  where p = 0.52 and sd =  $\sqrt{p*(1-p)/n}$ 
13
14 sigma = sqrt(p*(1-p)/n)
15 #Answer: Sigma = 0.02884441
16
17 p1 = 1 - pnorm(0.5, mean=0.52, sd=sigma)
18 cat("P( $\hat{p} > 0.5$ ):", p1)
19
20 #Answer: 0.755963
21
22 #Book's answer slightly different: 0.7549
23
24 #End
```

R code Exa 9.3 Starting Salaries of MBAs

```

1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 9: Sampling Distributions
3 # Example 9.3 on Pg 328
4 # Starting Salaries of MBAs
5
6 # Given starting salaries of MBAs at WLU, X1 ~
  Normal(62000,14500)
7 mu1 = 62000
8 sd1 = 14500
9 v1 = sd1^2
10 n1 = 50
11
12 # Given starting salaries of MBAs at UWO, X2 ~
  Normal(60000,18300)
13 mu2 = 60000
14 sd2 = 18300
15 v2 = sd2^2
16 n2 = 60
17
18 # find probability that the sample mean starting
  salary of WLU graduates will exceed that of the
  UWO graduates
19 # i.e., find P (X1 - X2 > 0) denoted by 'p'
20 #we know X1-X2 ~ N(mu1-mu2, sqrt(v1/n1 + v2/n2))
21 p = 1 - pnorm(0, mean=mu1-mu2, sd=sqrt((v1/n1)+(v2/
  n2)))
22 cat("P(X1 - X2 > 0):", p)
23
24 #Answer: 0.7386917
25
26 #End

```

Chapter 10

Introduction to Estimation

R code Exa 10.1 Doll Computer Company

```
1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 10: Introduction to Estimation
3 # Example 10.1 on Pg 342
4 # Doll Computer Company
5
6 data1 <- c(235, 374, 309, 499, 253, 421, 361, 514,
  462, 369, 394, 439,
7           348, 344, 330, 261, 374, 302, 466, 535,
  386, 316, 296, 332, 334)
8 data1
9 mean1 <- mean(data1)
10 mean1
11 alpha = 0.05
12 library(stats)
13 std1 = 75
14 std2 <- sd(data1)
15 std2
16
17 ll <- mean1 - 1.96*75/(sqrt(25))
18 ul <- mean1 + 1.96*75/(sqrt(25))
```

```
19
20 cat("The 95% confidence interval is:", "(", ll, "ul,")"
    )
21
22 #End
```

Chapter 11

Introduction to Hypothesis Testing

Chapter 12

Inference About A Population

R code Exa 12.3 Consistency of a Container Filling Machine Part 1

```
1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 12: INFERENCE ABOUT A POPULATION
3 # Example 12.3 on Pg 415
4 # Consistency of a Container-Filling Machine, Part 1
5
6 data1 <- c(999.6, 1000.7, 999.3, 1000.1, 999.5,
7           1000.5, 999.7, 999.6, 999.1, 997.8,
8           1001.3, 1000.7, 999.4, 1000.0, 998.3,
9           999.5, 1000.1, 998.3, 999.2, 999.2,
10          1000.4, 1000.1, 1000.1, 999.6, 999.9)
11 data1
12 mean1 <- mean(data1)
13 mean1
14 popmean = 1 #Null Hypothesis: H0: population mean =
15             1 (sigma^2 =1)
16 n <- length(data1)
```

```

14 n #sample size = 25
15 library(stats)
16 stdev1 <- sd(data1)
17 stdev1 #Answer: 0.7958
18 stdev1^2 #Answer: 0.6333
19
20 chistat <- (n-1)*stdev1^2/popmean
21 chistat #Answer: Chi-square test statistic = 15.20
22
23 #One-Sample Chi-Squared Test On Variance, using
    varTest()
24 install.packages("EnvStats")
25 library(EnvStats)
26 result <- varTest(data1, alternative = "greater",
    conf.level = 0.95, sigma.squared = 1)
27
28 #Answer:
29
30 #Results of Hypothesis Test
31 #-----
32
33 #Null Hypothesis:                variance = 1
34 #Alternative Hypothesis:         True variance is
    greater than 1
35 #Test Name:                      Chi-Squared Test
    on Variance
36 #Estimated Parameter(s):         variance =
    0.6333333
37 #Data:                            data1
38 #Test Statistic:                  Chi-Squared = 15.2
39 #Test Statistic Parameter:       df = 24
40 #P-value:                         0.9147699
41 #95% Confidence Interval:         LCL = 0.4174101
    UCL =          Inf
42
43 if(result$p.value > 0.05)
44 {
45   print("there is NOT enough evidence to infer that

```



```

        the claim of sigmasquared = 1 is true.")
46 } else
47 {
48   print("there is enough evidence to infer that the
        claim of sigmasquared = 1 is true.")
49 }
50
51 #End

```

R code Exa 12.4 Consistency of a Container Filling Machine Part 2

```

1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 12: INFERENCE ABOUT A POPULATION
3 # Example 12.4 on Pg. 418
4 # Consistency of a Container-Filling Machine, Part 2
5
6 data1 <- c(999.6, 1000.7, 999.3, 1000.1, 999.5,
            1000.5, 999.7, 999.6, 999.1, 997.8,
7            1001.3, 1000.7, 999.4, 1000.0, 998.3,
            999.5, 1000.1, 998.3, 999.2, 999.2,
8            1000.4, 1000.1, 1000.1, 999.6, 999.9)
9 data1
10 mean1 <- mean(data1)
11 mean1
12 popmean = 1 #Null Hypothesis: H0: population mean =
  1
13 n <- length(data1)
14 n
15 library(stats)
16 stdev1 <- sd(data1)
17 stdev1
18
19 chistat <- (n-1)*stdev1^2/popmean
20 chistat

```

```
21
22 chisqalphaby2 <- qchisq(0.005, df=(n-1), lower.tail=
    FALSE)
23 chisq1minusalphaby2 <- qchisq(0.995, df=(n-1), lower
    .tail=FALSE)
24
25 lcl <- (n-1)*stdev1^2 / chisqalphaby2
26 lcl
27 ucl <- (n-1)*stdev1^2 / chisq1minusalphaby2
28 ucl
29
30 cat("The 99% confidence interval is:", "(", round(
    lcl,3), ", ", round(ucl,3), ")")
31 #Answer: (0.333, 1.537)
32
33 #End
```

Chapter 13

Inference About Comparing Two Populations

Chapter 14

Analysis of Variance

Chapter 15

Chi Squared Tests

R code Exa 15.1 Testing Market Shares

```
1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 15: CHI-SQUARED TESTS
3 # Example 15.1 on Pg 598
4 # Testing Market Shares
5
6 #Null Hypothesis , Ho:  $p_1 = .45$ ,  $p_2 = .40$ ,  $p_3 = .15$ 
7 #Alternative Hypothesis , H1: At least one  $p_i$  is not
  equal to its specified value
8
9 fabric <- c(102, 82, 16)
10 chi <- chisq.test(fabric, p = c(.45, .40, .15))
11 chi$statistic
12 chi$p.value #its less than 0.05 implying one can
  reject the Null hypothesis
13
14 tabchi <- qchisq(.95, df=2)
15
16 if(chi$statistic > tabchi)
17 {
18   print("Advertising campaigns do have an effect.")
```

```
        NULL Hypothesis is rejected.")
19 } else
20 {
21     print("Advertising campaigns do NOT have an effect
           .")
22 }
23
24 #End
```

Chapter 16

Simple Linear Regression And Correlation

R code Exa 16.1 Annual Bonus and Years of Experience

```
1 # Statistics for Management and Economics by Gerald
  Keller
2 # Chapter 16: SIMPLE LINEAR REGRESSION AND
  CORRELATION
3 # Example 16.1 on Pg 638
4 # Annual Bonus and Years of Experience
5
6
7 years_of_exp <- c(1,2,3,4,5,6) #years of experience
  - Explanatory variable
8 annual_bonus <- c(6,1,9,5,17,12) #annual bonus in
  1000s - Respone variable
9
10 #determine the straight line relationship between
  years of experience and annual bonus using least
  squares
11
12 regression_line <- lm(annual_bonus ~ years_of_exp) #
  gives regression line
```

```
13 summary(regression_line) #gives the Residuals , Std
    Error etc
14
15 plot(years_of_exp, annual_bonus) #scatter plot
16 abline(lm(annual_bonus ~ years_of_exp))
17
18 cat("The least squares or regression line is Y =",
19     regression_line$coefficients[1], "+", regression
20     _line$coefficients[2], "X",
21     " where Y is Annual Bonus and X is years of job
22     experience")
23
24 # The least squares line is  $Y = 0.934 + 2.114X$ 
#End
```

Chapter 17

Multiple Regression