統計學與實習上
第三次作業

1.資料集「score.csv」為 132 名學生的統計學期末考成績，包含五個欄位：學生編號(ID)、性別(Gender)、年級(Grade)、學院(College)、期末考成績(Final)，請回答以下問題（**By R**）（**1.5 points**）。

a.將資料讀入 R 中且命名為 score。製作一適當的列聯表，以觀察不同學院下學生性別比例的差異，並說明觀察結果（請注意社會科學領域中變數的位置，並將比例四捨五入至小數點下第二位）**(0.5 points)**。

b.請製作適當的列聯表，以呈現不同年級分別在不同學院的學生，性別比例的差異（請將比例四捨五入至小數點下第二位）**(0.5points)**。

c.請利用條件式計算出此組資料中成績介於 60 至 80 分的人數 **(0.5 points)**。

```r
# a.
table_1 <- table(gender = score$Gender, score = score$College)
table_1_p <- prop.table(table_1,margin = 2)
round(table_1_p,2)

# b.
table2 <- ftable(grade = score$Grade, college = score$College, gender = score$Gender)
table2_prop <- prop.table(table2,1)
round(table2_prop,2)
```

```
       score
gender Agriculture Liberal_arts Social_science
   F       0.59         0.88          0.41
   M       0.41         0.12          0.59
```

```
                        gender    F    M
grade college
1      Agriculture             0.33 0.67
       Liberal_arts            0.80 0.20
       Social_science          0.50 0.50
2      Agriculture             0.60 0.40
       Liberal_arts            0.95 0.05
       Social_science          0.30 0.70
3      Agriculture             0.67 0.33
       Liberal_arts            0.67 0.33
       Social_science          0.62 0.38
4      Agriculture             0.62 0.38
       Liberal_arts            1.00 0.00
       Social_science          0.20 0.80
```

```r
# c.
x <- which(score$Final <= 80 & score$Final >= 60)
length(x) # 56
```

2. (Text, p.161) Dr. Stallter has been teaching basic statistics for many years. She knows that 80% of the students will complete the assigned problems. She has also determined that among those who do their assignments, 90% will pass the course. Among those students who do not do their homework, 60% will pass. Mike Fishbaugh took statistics last semester from Dr. Stallter and received a passing grade. What is the probability that he completed the assignments? **(by hand) (0.6 points)**
Let A be the student completes assignment and B the student passes.

$$P(Ai/B) = \frac{P(Ai) * P(B/Ai)}{P(A1) * P(B/A1) + P(A2) * P(B/A2)}$$

0.8571, found by: $\dfrac{0.80 \times 0.90}{(0.80 \times 0.90) + (0.20 \times 0.60)}$

3. (Text, p.205) The Bank of Hawaii reports that 7% of its credit card holders will default at some time in their life. The Hilo branch just mailed out 12 new cards today. **(by hand) (0.6 points)**
a. How many of these new cardholders would you expect to default? What is the standard deviation?
b. What is the likelihood that none of the cardholders will default?
c. What is the likelihood at least one will default?

a. $\mu = 12(0.07) = 0.84$ and $\sigma = \sqrt{12(0.07)(0.93)} = 0.8839$

b. 0.4186, found by $\dfrac{12!}{0!12!}(0.07)^0(0.93)^{12}$

c. 0.5814, found by $1 - 0.4186$

4. (Text, p.214) Customers experiencing technical difficulty with their Internet cable service may call an 800 number for technical support. It takes the technician between 30 seconds and 10 minutes to resolve the problem. The distribution of this support time follows the uniform distribution. **(by hand) (0.6 points)**
a. What is the mean time to resolve the problem? What is the standard deviation of the time?
b. What percent of the problems take more than 5 minutes to resolve?
c. Suppose we wish to find the middle 50% of the problem-solving times. What are the end points of these two times?

a. Mean is 5.25, found by (0.5 + 10)/2

Standard deviation is 2.74, found by $\sqrt{\dfrac{(10 - 0.5)^2}{12}}$

b. 0.5263, found by [1/(10 – 0.5)]*(10 – 5)
c. 2.875, found from [1/(10 – 0.5)]*(x – 0.5) = 0.25
and 7.625 found from [1/(10 – 0.5)]*(10 – x) = 0.25

5. According to a Michigan State University researcher, Americans are becoming increasingly polarized on issues pertaining to the environment. Of 400 Democrats in a surveyed, 280 said they see signs of global warming, as compared to 120 out of 400 Republicans who feel the same.
a. Construct a contingency table that shows frequencies and relative frequencies for the variables Political Affiliation (Democrat or Republican) and Global Warming (yes or no). **(by hand) (0.5points)**
b. According to the contingency table, what do you find the relationship between political affiliation and attitudes toward global warming? Explain it. **(by hand) (0.2points)**
c. Find the probability that a person does not see signs of global warming. **(by hand) (0.2 points)**
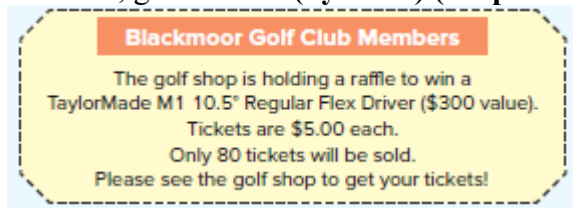
a.

Global Warming	Political Affiliation	Total

	Democrat (D)	Republican (R)	
Yes (Y)	280(70%)	120(30%)	400(50%)
No (N)	120(30%)	280(70%)	400(50%)
Total	400(100%)	400(100%)	800(100%)

b. Democrats are more likely to see signs of global warming.
c. $P(N) = 400/800 = 0.50$

6. (Text, p.204) The following notice appeared in the golf shop at a Myrtle Beach, South Carolina, golf course. **(by hand) (0.8 points)**

Blackmoor Golf Club Members

The golf shop is holding a raffle to win a
TaylorMade M1 10.5° Regular Flex Driver ($300 value).
Tickets are $5.00 each.
Only 80 tickets will be sold.
Please see the golf shop to get your tickets!

John Underpar buys a ticket.
a. What are John's possible monetary outcomes?
He either wins the driver (worth $295, found by $300 – 5) or has a worthless ticket (worth -$5).
b. What are the probabilities of the possible outcomes?
The probability of getting nothing is 79/80(0.9875) and the probability of winning the driver is 1/80(0.0125).
c. Summarize John's "experiment" as a probability distribution.

Outcome	Probability
$295	0.0125 or 1/80
-$5	0.9875 or 79/80

d. What is the mean or expected value of the probability distribution? Explain your result.
Multiply each outcome by its probability of occurrence. The expected value is -$1.25, found by [-5(79/80) +295(1/80)].
On average people who buy a ticket lose $1.25 for every ticket bought.