Probability and Statistics **Spring 2022**
Instructor: Joon Yoo (joon.yoo@gachon.ac.kr)
Homework 1 - Problem
Due date: Monday March 21, 23:59, Cyber campus

---

1. [Pre-lecture] **Sampling and sources of bias.** In 1936 US presidential election, the Literary Digest magazine polled 10 million people and got response from 2.4 million people. The poll showed Landon (Republican) will win over Roosevelt (Democrat) by 57% vs. 43%. However, the Roosevelt won the actual election by 62% vs. 38%. What source of sampling bias happened? Explain your answer.

2. **Descriptive Statistics.** A chemical engineer desiring to study the evaporation rate of water from brine evaporation beds obtained data on the number of inches of evaporation in each of 55 July days spread over 4 years. The data are given in the following stem and leaf plot, which shows that the smallest data value was .02 inches, and the largest .56 inches.

.0	2, 6
.1	1, 4
.2	1, 1, 1, 3, 3, 4, 5, 5, 5, 6, 9
.3	0, 0, 2, 2, 2, 3, 3, 3, 3, 4, 4, 5, 5, 5, 6, 6, 7, 8, 9
.4	0, 1, 2, 2, 2, 3, 4, 4, 4, 5, 5, 5, 7, 8, 8, 8, 9, 9
.5	2, 5, 6

Find the

(a) sample mean;

(b) sample median;

(c) sample standard deviation of these data.

(d) What percentage of data values are within 1 standard deviation of the mean?

3. **Permutation.** Four married couples have bought 8 seats in the same row for a concert. In how many different ways can they be seated

(a) with no restrictions?

(b) if each couple is to sit together?

(c) if all the men sit together to the right of all the women?

4. **Probability.** In a poker hand consisting of 5 cards, find the probability of holding

(a) 3 aces;

(b) 4 hearts and 1 club.

5. **Probability.** It is common in many industrial areas to use a filling machine to fill boxes full of product. This occurs in the food industry as well as other areas in which the product is used in the home, for example, detergent. These machines are not perfect, and indeed they may A, fill to specification, B, underfill, and C, overfill. Generally, the practice of underfilling is that which one hopes to avoid. Let P(B) = 0.001 while P(A) = 0.990.

(a) Give P(C).

(b) What is the probability that the machine does not underfill?

(c) What is the probability that the machine either overfills or underfills?

- Homework guidelines: (read carefully!)

1. Please write the answer and the solution process in detail.

2. Write in English.

3. Cheating is not accepted. (Do not copy any answer from the Internet, other students. All copied homework will result in ZERO points.)

4. Write down your answers in a single WORD file OR you may handwrite your answers and scan/copy&paste onto the word file.

5. The word file name MUST be "확률통계-학번-이름.docx".

6. You will get severely degraded if you do not follow the above five guidelines!!!