Probability and Statistics   **Spring 2022**
Instructor: Joon Yoo (joon.yoo@gachon.ac.kr)
Homework 4 - Problem
Due date: Monday May 23, 23:59, Cyber campus

1. A soft-drink machine is regulated so that the amount of drink dispensed averages 240 milliliters with a standard deviation of 15 milliliters. Periodically, the machine is checked by taking a sample of 40 drinks and computing the average content. If the mean of the 40 drinks is a value within the interval $\mu_{\bar{X}} \pm 2\sigma_{\bar{X}}$, the machine is thought to be operating satisfactorily; otherwise, adjustments are made. In class we have discussed that the company official found the mean of 40 drinks to be $\bar{x} = 236$ milliliters and concluded that the machine needed no adjustment. Was this a reasonable decision? (Hint: Use sampling distributions of means)

2. If a certain machine makes electrical resistors having a mean resistance of 40 ohms and a standard deviation of 2 ohms, what is the probability that a random sample of 36 of these resistors will have a combined resistance of more than 1458 ohms?

3. The mean score for freshmen on an aptitude test at a certain college is 540, with a standard deviation of 50. Assume the means to be measured to any degree of accuracy. What is the probability that two groups selected at random, consisting of 32 and 50 students, respectively, will differ in their mean scores by
(a) more than 20 points?
(b) an amount between 5 and 10 points?

4. For a chi-squared distribution, find,
(a) $\chi^2_{0.005}$ when $v = 5$;
(b) $\chi^2_{0.05}$ when $v = 19$;
(c) $\chi^2_{0.01}$ when $v = 12$.

5. Assume the sample variances to be continuous measurements. Find the probability that a random sample of 25 observations, from a normal population with variance $\sigma^2 = 6$, will have a sample variance S^2
(a) greater than 9.1;
(b) between 3.462 and 10.745.

- 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!!!

7. For your own sake do not submit at the last minute. Sometimes the cyber campus may fail to upload your file, and you may get ZERO points. Submit at least several hours before the deadline.