Probability and Statistics   **Spring 2022**
Instructor: Joon Yoo (joon.yoo@gachon.ac.kr)
Homework 3 - Problem
Due date: May 9, 23:59, Cyber campus

1. Given a continuous uniform distribution, show that

(a) $\mu = \frac{A+B}{2}$ and

(b) $\sigma^2 = \frac{(B-A)^2}{12}$.

2. Suppose X follows a continuous uniform distribution from 1 to 5. Determine the conditional probability $P(X>2.5 \mid X \le 4)$.

3. According to Chebyshev's theorem, the probability that any random variable assumes a value within 3 standard deviations of the mean is at least 8/9. If it is known that the probability distribution of a random variable X is normal with mean μ and variance σ^2, what is the exact value of $P(\mu - 3\sigma < X < \mu + 3\sigma)$?

4. The finished inside diameter of a piston ring is normally distributed with a mean of 10 centimeters and a standard deviation of 0.03 centimeter.
(a) What proportion of rings will have inside diameters exceeding 10.075 centimeters?
(b) What is the probability that a piston ring will have an inside diameter between 9.97 and 10.03 centimeters?
(c) Below what value of inside diameter will 15% of the piston rings fall?

5. A process yields 10% defective items. If 100 items are randomly selected from the process, what is the probability that the number of defectives
(a) exceeds 13?
(b) is less than 8?

6. The life, in years, of a certain type of electrical switch has an exponential distribution with an average life $\beta = 2$. If 100 of these switches are installed in different systems, what is the probability that at most 30 fail during the first year?

- **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.