

ENGR216 Fall 2019

Sections 501/502/503 – Prof Waer

Homework: Descriptive Statistics

DUE BY 4 p.m. Friday, October 4

Instructions: Complete and submit the following All-Class Assignment. You should feel comfortable discussing any aspect of the assignment with anyone in the course including developing conceptual insight or developing a solution. However, you are expected to prepare **your own solutions** for submission.

Reporting Format: Combination of handwritten solutions on paper and a single Python file. Please use comments in your Python file to separate work on one problem from work on another.

Deliverables: You will deliver one ~.pdf file with photos/scans of your handwritten work and one ~.py file with your Python codes for all problems

Solution Requirements:

For the following problems, you will use a combination paper tables and Python to obtain z scores or probability values. You must, however, document your work for full credit. So, for example, if you use Python to determine probabilities, you should write something like “from Python, probability = 0.87”. If you use a paper table, write something like “from table, P = 0.38”. In other words, document your process so that it does not appear that the solutions appeared out of thin air.

Note: A properly labeled figure of the normal distribution curve and x and z values is required for each part of each problem for full credit.

Practice Problems:

The following problems are for practice only. You do not have to turn in the solutions. The solutions will be posted. It is highly recommended that you use both types of paper tables and Python for each problem to ensure that you understand the process of using the z-tables. Be sure to draw a shaded and properly labeled sketch for each problem.

1. Find the area under the standard normal distribution curve between $Z = 0$ and $Z = 2.0$.
2. Find the area under the standard normal distribution curve to the right of $Z = 1.5$
3. Find the area under the standard normal distribution curve to the left of $Z = -1.75$
4. Find the area under the standard normal distribution curve between $Z = -2.78$ and $Z = 1.66$

(see next page for the Homework Problems)

Homework Problems:

Please handwrite and turn in solutions to the following problems. These problems are worth 20 points each. Please include a properly labeled and shaded figure for each problem. You may use Python to obtain probabilities. Put your work in a single `~.py` file with comments labeling your work.

1. You will find a `~.csv` file on eCampus representing patient body temperatures at a hospital on a particular day. The data is organized into two columns: patient temperature, patient age. Using code snippets available from the class lecture material, perform the following tasks with this data:
 - a. Read the data into Python
 - b. Determine the mean, mode, median, variance, and standard deviation for the patient temperatures. Please print from Python and write on your solution page.
 - c. Determine the mean, mode, median, variance, and standard deviation for the patient ages. Please print from Python and write on your solution page.

Note: You can try to find the mode of the age data, but Python will return an error. There are two equally-frequent values in the data set.

- d. Plot a histogram of the temperature data. Please include a title and proper axes labels.
2. If IQ scores are normally distributed with a mean of 100 and a standard deviation of 5, what is the probability that a person selected at random will have an IQ of 110 or greater?
3. The amount of hot chocolate dispensed by a hot chocolate machine is normally distributed with a mean of 16.0 oz. and a standard deviation of 2 oz. If the cups hold 18.0 oz., what is the probability that a selected cup will be overfilled?
4. A company manufactures light bulbs. The lifetime for these bulbs is 4,000 hours with a standard deviation of 200 hrs. What lifetime should the company promote for these bulbs, whereby only 2% burnout before the claimed lifetime?
5. The average life of a certain type of small motor is 10 years with a standard deviation of 2 years. The manufacturer replaces free all motors that fail while under guarantee. If she is willing to replace 3% of the motors that fail, how long a guarantee (in years) should she offer? You may assume that the lives of the batteries are normally distributed.