Class Exercise 4

Instructions

- Deadline: **Thursday, February 12 (11:30am)**
- Please show all of your work on your submission. Notation counts. Poor notation will result in a loss of marks.
- Please leave your answers as exact values. If using decimals, please report your answer to four decimal places.
- You are encouraged to ask your instructor for help, and/or discuss ideas with your classmates. However, you must produce fully explained individual solutions.
- Under no circumstances may you simply copy solutions obtained online or from a classmate. In unclear cases, you may be asked to explain your solutions in a Teams meeting, and your work may be refused altogether.

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1. **Multiple Choice**

   For each question below, select **all** the statements that are **correct**. Each question has **at least one correct answer, but not necessarily all options are correct**. You will receive **full credit** if and only if you select all correct answers and **no incorrect answers**. Selecting an incorrect option or missing a correct option may result in **partial credit or no credit**.

   A. A distribution of exam scores is approximately **normal** with mean

   $$\mu = 70 \quad \text{and} \quad \sigma = 8.$$

   Which of the following statements are correct according to the **Empirical Rule**?

   a. Approximately 68% of students scored between 60 and 80.
   b. Approximately 99.7% of students scored between 46 and 94.
   c. Approximately 32% of students scored outside the interval from 62 to 78.
   d. Approximately 2.5% of students scored above 86.

B. Which of the following statements about the **interquartile range (IQR)**, the **coefficient of quartile variation**, and the **Empirical Rule** are true?

a. The interquartile range (IQR) measures the spread of the middle 50% of the data.

b. A smaller coefficient of quartile variation indicates less relative variability in the middle half of the data.

c. The IQR is sensitive to extreme outliers.

d. The coefficient of quartile variation is a unitless measure of variability.

C. Which of the following statements about choosing appropriate measures of center and spread are true?

a. If a distribution is strongly right-skewed, the median is generally a better measure of center than the mean.

b. If a distribution contains a significant outlier, the standard deviation is usually preferred over the interquartile range (IQR) to describe spread.

c. If a distribution contains extreme values, the interquartile range (IQR) is typically a better measure of spread than the standard deviation.

d. If a distribution is approximately symmetric and unimodal with no outliers, the mean and standard deviation are appropriate summaries.

2. **Leaf Moisture Content**

Due to climate change, chemical changes in leaves are causing moisture levels in some tree species to decrease, making them more susceptible to burning. A group of trees was studied, and the average *leaf moisture content* (measured as a percentage) was recorded.

Leaf Moisture Content (%)	Number of Trees
$[0, 10)$	45
$[10, 20)$	47
$[20, 30)$	33
$[30, 40)$	25
$[40, 50)$	10

a. Calculate the mean leaf moisture content for this group of trees.

b. Calculate the sample variance and sample standard deviation of the leaf moisture content. Include units in your answers.

c. Using the Empirical Rule, determine the interval within which you would expect approximately 68% of the data to fall.

d. Compute IQR and the CQV for the data above, and interpret it in the context of the problem.