Exercises series N°01

(UNDERSTANDING THE CONCEPTS)

Exercise 01. Identify the experimental units on which the following variables are measured:

1. Gender of a student.
2. Number of errors on a midterm exam.
3. Age of a cancer patient.
4. Number of flowers on an azalea plant.
5. Color of a car entering a parking lot.

Exercise 02. Identify each variable as quantitative or qualitative:

1. Amount of time it takes to assemble a simple puzzle.
2. Number of students in a first-grade classroom.
3. Rating of a newly elected politician (excellent, good, fair, poor).
4. State in which a person lives.

Exercise 03. Identify the following quantitative variables as discrete or continuous:

1. Population in a particular area of the United States.
2. Weight of newspapers recovered for recycling on a single day.
3. Time to complete a sociology exam.
4. Number of consumers in a poll of 1000 who consider nutritional labeling on food products to be important.

Exercise 04. An educational researcher wants to evaluate the effectiveness of a new method for teaching reading to deaf students. Achievement at the end of a period of teaching is measured by a student's score on a reading test.

a) What is the variable to be measured? What type of variable is it?
b) What is the experimental unit?
c) Identify the population of interest to the experimenter.

Exercise 05. Six vehicles are selected from the vehicles that are issued campus parking permits, and the following data are recorded:

a) What are the experimental units?
b) What are the variables being measured? What types of variables are they?

Vehicle	Type	Make	Carpool?	One-way Commute Distance (miles)	Age of Vehicle (years)
1	Car	Honda	No	23.6	6
2	Car	Toyota	No	17.2	3
3	Truck	Toyota	No	10.1	4
4	Van	Dodge	Yes	31.7	2
5	Motor- cycle	Harley-Davidson	No	25.5	1
6	Car	Chevrolet	No	5.4	9

Exercise 06. You are a candidate for your state legislature, and you want to survey voter attitudes regarding your chances of winning. Identify the population that is of interest to you and from which you would like to select your sample. How is this population dependent on time?

Key Concepts

1. **How data are generated**
    - Experimental units, variables, measurements.
    - Samples and population.
2. **Types of variables**
    - Qualitative or categorical.
    - Quantitative:
        a. Discrete.
        b. Continuous.

Exercises series N°02

(BASIC TECHNIQUES)

Exercise 01. Fifty people are grouped into four categories A, B, C, and D and the number of people who fall into each category is shown in the table:

Category	**A**	**B**	**C**	**D**
Frequency	**11**	**14**	**20**	**5**

1. What is the experimental unit?
2. What is the variable being measured? Is it qualitative or quantitative?
3. Construct a pie chart to describe the data.
4. Construct a bar chart to describe the data.
5. What *proportion* of the people are in category B, C, or D?
6. What *percentage of the people are not* in category B?

Exercise 02. A manufacturer of jeans has plants in California, Arizona, and Texas. A group of 25 pairs of jeans is randomly selected from the computerized database, and the state in which each is produced is recorded:

CA – AZ – AZ – TX – CA – CA – CA – TX – TX – TX – AZ – AZ – CA – AZ – TX – CA
AZ – TX – TX – TX – CA – AZ – AZ – CA – CA.

1. What is the experimental unit?
2. What is the variable being measured? Is it qualitative or quantitative?
3. Construct a pie chart to describe the data.
4. Construct a bar chart to describe the data.
5. What *proportion* of the jeans are made in Texas?
6. What state produced the most jeans in the group?
7. If you want to find out whether the three plants produced equal numbers of jeans, or whether one produced more jeans than the others, how can you use the charts from parts c and d to help you? What conclusions can *you* draw from these data?

Exercise 03. The following table is a frequency table for a data set consisting of the starting yearly salaries (to the nearest thousand dollars) of 42 recently graduated students in electrical engineering.

Starting Salary	**57**	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**66**	**67**	**70**
Frequency	**4**	**1**	**3**	**5**	**8**	**10**	**0**	**5**	**2**	**3**	**1**

1. What is the experimental unit?
2. What is the variable being measured? Is it qualitative or quantitative?

3. Construct a bar chart to describe the data.

Exercise 04. Consider this set of data:

3.1 – 4.9 – 2.8 – 3.6 – 2.5 – 4.5 – 3.5 – 3.7 – 4.1 – 4.9 – 2.9 – 2.1 – 3.5 – 4.0 – 3.7 – 2.7 – 4.0
4.4 – 3.7 – 4.2 – 3.8 – 6.2 – 2.5 – 2.9 – 2.8 – 5.1 – 1.8 – 5.6 – 2.2 – 3.4 – 2.5 – 3.6 – 5.1 – 4.8
1.6 – 3.6 – 6.1 – 4.7 – 3.9 – 3.9 – 4.3 – 5.7 – 3.7 – 4.6 – 4.0 – 5.6 – 4.9 – 4.2 – 3.1 – 3.9.

1. Approximately how many class intervals should you use?
2. Suppose you decide to use classes starting at 1.6 with a class width of 0.5 (i.e., 1.6 to 2.1, 2.1 to 2.6). Construct the statistical table and the relative frequency histogram for the data.
3. What fraction of the measurements are less than 5.1?
4. What fraction of the measurements are larger than 3.6?

Key Concepts

3. Graphs for Univariate data

A. Qualitative or categorical data:
   - Pie and Bar charts.

B. Quantitative data:
   - Pie charts and Relative frequency histograms.

Exercises series N°03

(BASIC TECHNIQUES)

Exercise 01. The number of raisins in each of 14 miniboxes (1/2-ounce size) was counted for a generic brand and for Sunmaid brand raisins. The two data sets are shown here:

Generic Brand	Sunmaid
25 – 26 – 25 – 28 – 26 – 28 – 28 – 27 – 26 – 27 – 24 – 25 – 26 – 26.	**25 – 29 – 24 – 24 – 28 – 24 – 28 – 22 – 25 – 28 – 30 – 27 – 28 – 24.**

1. What are the mean and standard deviation for the generic brand?
2. What are the mean and standard deviation for the Sunmaid brand?
3. Compare the centers and variabilities of the two brands using the results of parts 1 and 2.
4. Find the median, the upper and lower quartiles, and the IQR for each of the two data sets.

Exercise 02. The data listed here are the weights (in pounds) of 27 packages of ground beef in a supermarket meat display:

0.75 – 0.83 – 0.87 – 0.89 – 0.89 – 0.89 – 0.92 – 0.93 – 0.96 – 0.96 – 0.97 – 0.98 – 0.99 – 1.06 – 1.08 – 1.08 – 1.12 – 1.12 – 1.14 – 1.14 – 1.17 – 1.18 – 1.18 – 1.24 – 1.28 – 1.38 – 1.41

1. What is the variable being measured? Is it qualitative or quantitative?
2. Construct the statistical table with increasing end decreasing cumulative frequency.
3. Find the mean and standard deviation of the data set.
4. Find the mode and the median.
5. Find the five-number summary.

Exercise 03. A random sample of 100 foxes was examined by a team of veterinarians to determine the prevalence of a particular type of parasite. A frequency tabulation of the data is given here:

Number of Parasites	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Number of Foxes	**69**	**17**	**6**	**3**	**1**	**2**	**1**	**0**	**1**

1. Calculate the mean and *s* for the sample.
2. Find the mode and the median.
3. Find the five-number summary.

Key Concepts

1. **Measures of the Center:** Mean, Median, Mode.
2. **Measures of Variability:** Range, Variance, Standard deviation.
3. **The Five-Number Summary:** Min, $Q1$, Median, $Q3$, Max.