Introduction

Statistics:

It means collecting data related to population census, number of births and deaths, or data related to weather such as temperature and relative humidity, etc., and then it began to include presenting this data in a concentrated manner in tables and graphs, but modern linked to scientific methods related to collecting, statistics is organizing, summarizing and presenting data for the purpose of inference for decision-making

Statistics is divided into two parts:

1. Descriptive statistics: It aims to integrate and summarize numerical data in order to transform it from a mere quantity of numbers into another form or image that can be understood and absorbed by simply looking. Most of the methods used in it are

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measures of central tendency, measures of dispersion, and measures of correlation and regression. The use of any of them depends on the type of data and the level of measurement, whether it is nominal, descriptive, ordinal, categorical, or proportional. The description function is considered one of the primary functions of statistics that is used to explore the facts of various phenomena (social, economic, geographical, etc.).

2. **Inferential Statistics:** This section of statistical methods is based on a set of quantitative statistical theories, the most important of which are probability theory and sampling theory, which represent the link between descriptive and inferential statistics. This type of statistical method seeks to reach quantitative estimates of the features and characteristics of study communities through the available graphic information about the sample

selected from those communities.

Applications of statistics: Statistics has various applications in all fields, including the engineering field. For example, in the field of civil engineering, it is used in structural designs and studying the nature of traffic to find appropriate ways to control it and in designing storage damages.

There are two positions to interpret any possibility:

1. Objective position: The objective position is applied to incidents that repeat themselves, such as the productivity of concrete molds in a prefabricated building factory.
2. Personalistic position: It depends partly on personal opinion, and in our curriculum, we do not deal with this position.

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Statistical terms

- **Sample:** A sample represents a specific group of elements of society. Twenty concrete wall blocks are considered a sample of the factory's productivity for a year or more, and one hundred individuals in a city are considered a sample of the population.
- **Random sample**: A sample is considered random if each element of the community is given the same opportunity to be selected to be part of this sample.

  This element may be a bearing force resulting from examining a concrete mold from the production of a prefabricated building factory.
- **Independent Sample:** Two samples are said to be independent if they are chosen randomly, i.e., each one of them is a random sample.

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- **Statistical Variable and Variate:** The statistical variable refers to specific characteristic of the data and is symbolized by (X). The specific variable is the specific value of the variable and is symbolized by (x). It may represent stress, strain, or discharge in rivers, and (X) represents the value that this variable takes.
- **Random Variable:** The value of a random variable is a number obtained as a result of an experiment and is either discrete or continuous. A discrete variable has a finite sample range and is called a discrete or distinct random variable. For example, the number of students in a lecture hall or the number of vehicles on a certain bridge are considered discrete variables because the determinant variable takes a specific range or specific numbers, unlike the sample range of a continuous random variable, which is not continuous and takes any value within the range of values.

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- **Independent and Dependent Variable:** Two variables are said to be independent if the result of one of them is not affected by the value of the other being

  fixed. When two coins are thrown into space, the direction that the first coins take when they settle on the ground does not affect the direction that the second coin takes. The direction is the variable and the two coins are the independent variables. However, when studying stress and strain in a concrete column, for each value of stress, the strain takes a specific result or value, so the stress is an independent variable and the strain is a dependent variable.

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Frequency Distributions

The studied statistical phenomena take many and repeated numerical values, and sometimes the observed results are not numerical, in these cases they can be converted to numerical values, for example, "yes" or "no" or "true" or "false" can be converted to "for" or "against" and thus to "1" or "zero", which allows us to form frequency tables.

Classifying and tabulating the studied data necessarily means arranging this data in ascending or descending order, which allows us to extract a clear picture of the range in which the data ranges over a number of categories, considering these categories as aspects of the studied phenomenon, where the information is unloaded on the basis of these categories, and then the number corresponding to

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each category is determined to deduce the frequencies of the numerical values within their categories, and

we call the table that includes the categories and their corresponding frequencies the (Frequency Distribution Table).

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Example (1):

The following readings represent the speed of vehicles measured to the nearest km/h for a sample on the Hilla-Baghdad Road. This is a simplified way to display the data in rows arranged in ascending or descending order.

37	61	76	40	54	74	37	48	47	53
40	63	63	68	57	55	59	54	52	56
87	74	51	54	57	59	46	41	44	58
65	67	64	60	82	51	50	54	51	55
67	57	59	84	66	50	50	56	56	32
47	45	61	40	63	60	53	54	52	51
70	45	73	76	67	43	50	61	71	55
57	53	65	61	55	41	77	56	64	52
36	50	59	62	42	72	73	68	48	69
46	55	60	70	70	58	65	53	71	78

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Solution/

32	43	50	52	54	57	60	63	68	73
36	44	50	52	55	57	60	64	68	74
37	45	50	53	55	57	60	64	69	74
37	45	50	53	55	57	61	65	70	76
40	46	50	53	55	58	61	65	70	76
40	46	51	53	55	58	61	65	70	77
40	47	51	54	56	59	61	66	71	78
41	47	51	54	56	59	62	67	71	82
41	48	51	54	56	59	63	67	72	84
42	48	52	54	56	59	63	67	73	87

As shown in the table above, the lowest value is (32) and the highest value is (87), so the difference between these two values represents the range.

Rang = Max - Min…… (1)

Rang = 87- 32= 55

We calculate the number of classes needed using the following equation

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N = 1 + 3.322log(n)…… (2)

When:

N= Number of classes

n= Number of values

N=1 + 3.322log (100)

N = 7.644 ≅ 8.

We calculate the length of the class

Class interval=Rang/N…… (3)

Class interval= 55/8=6.87 ≅ 7

Class Center = (max of class + min of class) /2) …… (4)

Relative frequency=Frequency/n …… (5)

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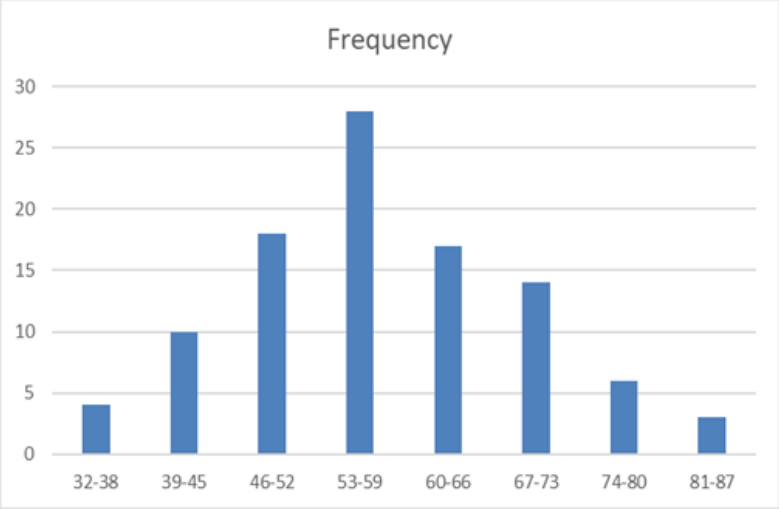
Class: two
Subject: Statistic engineering/ Code: UOMU027046
Lecturer: M.Sc. Zahraa ALjassar
2nd term – Lecture 1 (Introduction to Statistic, frequency distribution, relative frequency and cumulative frequency)

class	Frequency	Class Center	Relative frequency	Cumulative Frequency
32−38	4	35	0.04	4
39−45	10	42	0.1	14
46−52	18	49	0.18	32
53−59	28	56	0.28	60
60−66	17	63	0.17	77
67−73	14	70	0.14	91
74−80	6	77	0.06	97
81−87	3	84	0.03	100



Frequency histogram A frequency histogram is a set of adjacent rectangles with the same width representing the length of the equal categories, but with different lengths, where

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H.W/

A number of students in statistics obtained the following grades

37	61	76	40	54
74	37	48	47	53
40	63	63	68	57
55	59	54	52	56

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