LAB. METEOROLOGICAL STATISTICS & METEOROLOGICAL DATA ANALYSIS

FOURTH STAGE

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Lecturers :

Dr. Khawla zaki , Dr. Farah haseeb , *As.pro. Ruaa mazin* L. Luma mahdi, L. Yasamin qusay, L. Salwa salman, L. Shiemaa Awda , A.L.Zahraa Abdul Razzaq, A.L. Hala ali

Preparing by: Dr. Farah Haseeb, As.pro. Ruaa mazin , L. Luma Mahdi

((The First Lecture))

Basics of statistics

Statistics science :It is the science of collecting, analyzing, displaying and interpreting different data. Meteorological statistics is the study of statistics and its relationship to atmospheric sciences in particular, and how to use it in weather forecasting sciences. When collecting primary data (row data) for the study of a phenomenon, it is usually not possible to benefit from it, and it is in this way that it is placed in simplified tables or expressed in the form of figures or graphs in order to facilitate its study and analysis.

Despite the fact that the common belief among most people that atmospheric science is a science that depends only on guesswork, the fact that the production of statistical analysis is intense and for a long period of time, while atmospheric data collects different stations, whether surface or upper stations, as well as from radiosond and other atmospheric data, So we need science that helps us deal with this data in different ways.

Microsoft office Excel:

it is a program used to create spreadsheets, lists, budgets and charts. It is used for data processing and may be used to perform advanced arithmetic operations.The program is designed by Microsoft Corporation and is considered one of the most widely used programs in the world for its ease of use. The program recognizes different patterns and organizes data to save time. It allows you to create files, view them, edit them and share them with others easily and quickly and other useful and important information. The relationship of statistics with the Excel program will be Use the program in the practical part.

Tabular display

It means that the data of interest to the study is summarized and categorized in the form of tables that express the values that the variable takes through the data collected and the frequency of each of those values. There are two types of statistical tables: Simple table and Compound table .In our study, we will take a simple table As in the table in the following example, which shows the number of students and their weights (kg).

number of students	Class weight (kg)
5	62-60
15	65-63
45	68-66
27	71-69
8	74-72
100	total

Frequency Distribution or Frequency Table :

Frequency tells you how often something happened. The frequency of an observation tells you the number of times the observation occurs in the data.

Construction of a Frequency Table

Ungrouped data: raw data that were collected and not tabulated Grouped data: These are data that are tabulated and organized into a frequency distribution table

***Steps to follow when writing a frequency distribution table*:**

1- Range (R) :

R = X max – X min

Whereas :

X max : The largest value in the data.

X min : The lowest value in the data.

2- number of categories (k): (desired number of class interval).

There are several formulas for finding categories, including:

K= 1+ 3.3 log n

Whereas : **n** represents the number of data .

3- Compute for C (class size): C= Range \k

4- Class Mark represented by Xi: It is computed by getting the average of the Class Interval.

5- Category repeat : If we denote the frequency of the categories with symbols F1 , f2 , ……, fn , F1+f2 + …..fm = n

In general, it is preferred that the frequency distribution be characterized by the following:

Example: Calculate the frequency table for a set of ungrouped data using Excel.

98	97	92	90	87
82	85	99	93	91
90	89	81	76	88
87	81	83	88	89
90	92	90	89	77
80	90	85	86	95

***Solution*:**

extract the range:

Range = highest value- Lowest value = 99 – 76 = 23

1- We extract the number of categories (k) K = 1 + 3.3 log n

where the number of data n = 30

K = 1 + 3.3 log (30)

= 5.87 ≅ 6

3- We extract the length of the class (c)

C = Range \ k = 23 ÷ 6 = 3.83 ≅ 4

4- We extract the classes to form the table by (minimum value + class length) = 76+ 3

* Class limits can have an increment of 0.5 or a decrement of 0.5.

Class	**k**
76 – 79	
80 – 83	
84 – 87	
88 – 91	
92 – 95	
96 – 99	

5- We extract the center of the categories Xi ((**bin) :**

Categories Center = (first class limit + The second limit of the category) / 2

For example:

$$\mathbf{Xi} = \frac{76+79}{2} = \frac{155}{2} = \mathbf{77.5}$$

Class	**Xi**
76 – 79	77.5
80 – 83	81.5
84 – 87	85.5
88 – 91	89.5
92 – 95	93.5
96 – 99	97 .5

6- We extract the iteration through the function **frequency**.

= **frequency** (data , bin)

7- Construct the less than**(F<)** and greater than cumulative frequency**(F>).**

8- Construct the relative frequency and relative frequency percentage. Relative frequency **(rf)** is computed by dividing each individual frequency by the total frequency. While the rf% is computed by multiplying rf by **100**.

Example: The following table shows the yield (tons/ha) of wheat in 40 farms. Calculate the frequency table for a set of ungrouped data using Excel.

3	3.7	3.2	2	3.5	4.1	2.2	2.6
2.4	3.1	3.8	3.3	3.1	1.6	3.4	3.7
3.6	3.3	2.9	3.6	3.4	4.3	2.5	3.1
1.9	4.1	3.2	4.4	3.7	3.1	3.3	3.4
4.2	3	3.9	2.6	3.2	3.8	2.4	3.5