ADARSH COLLEGE

OMERGA, DIST. OSMANABAD

DEPARTMENT OF MICROBIOLOGY

CERTIFICATE

Practical paper – I   *Biostatistics and Computer Applications*

Certified that Shri / Miss_____

has satisfactorily completed the course of practical work in

M. Sc. I YEAR (SEMESTER I) prescribed by Dr. B. A. M. University,

Aurangabad under my supervision in the Microbiology Laboratory

during the academic year 20 – 20

Staff member incharge   **Head of the department**

Date: Date:

Signature of the Examiner

Date:

Exam Seat No. _____

Paper-I Biostatistics and Computer Applications

Sr. No.	Name of Experiment	Page No
1	Introduction to biostatistics	
2	Determination of Statistical averages/ central tendencies. a) Arithmetic mean b) Median c) Mode	
3	Determination of measures of Dispersion a) Mean deviation b) Standard deviation and coefficient of variation c) Quartile deviation	
4	Computer operations-getting acquainted with different parts of Computers. [DOS] and basics of operating a computer.	
5	Creating files, folders and directories.	
6	Applications of computers in biology using MS-Office. A] MS-Word B] Excel C] Power Point	
7	Creating an e-mail account, sending and receiving mails	
8	An introduction to INTERNET, search engines, websites, browsing and Downloading.	

Expt. No. 01   **Introduction to Biostatistics**   **Date**

- **Introduction of Statistics:**

    Statistics is the study of the collection, analysis, interpretation, presentation, and organization of data.

    In applying statistics to a problem, it is common practice to start with a population or process to be studied. Populations can be diverse topics such as "all persons living in a country". Ideally, statisticians compile data about the entire population. A chosen subset of the population called a sample is studied. Once a sample that is representative of the population is determined, data is collected for the sample members in an observational or experimental setting.

Two main statistical methodologies are used in data analysis:

    i.   Descriptive statistics
    ii.   Inferential statistics,

i.   **Descriptive statistics**

    This summarizes data from a sample using indexes such as the mean or standard deviation. Descriptive statistics are most often concerned with two sets of properties of a *distribution* (sample or population):

    a) *Central tendency* (or *location*) tries to find out to characterize the distribution's central or typical value.
    b) *Dispersion* (or *variability*) characterizes the extent to which members of the distribution depart from its center and each other.

    Descriptive statistics can be used to summarize the population data. Numerical descriptors include mean and standard deviation for continuous data types (like income), while frequency and percentage are more useful in terms of describing categorical data (like race). Descriptive statistics can be used to summarize the sample data.

ii. **Inferential statistics**

This draws conclusions from data that are subject to random variation (e.g., observational errors, sampling variation). To draw meaningful conclusions about the entire population, inferential statistics is needed. It uses patterns in the sample data to draw inferences about the population represented, accounting for randomness. These inferences may take the form of: answering yes/no questions about the data (hypothesis testing), estimating numerical characteristics of the data (estimation), describing associations within the data (correlation) and modeling relationships within the data (for example, using regression analysis). Inference can extend to forecasting, prediction and estimation of unobserved values either in or associated with the population being studied.

- **Introduction of Biostatistics**

Biostatistics is the application of statistics to a wide range of topics in biology. The science of biostatistics encompasses the design of biological experiments, especially in medicine, pharmacy, agriculture and fishery; the collection, summarization, and analysis of data from those experiments; and the interpretation of, and inference from, the results. A major branch of this is medical biostatistics,[1] which is exclusively concerned with medicine and health.

Applications of biostatistics

i.   Public health, including epidemiology, health services research, nutrition, environmental health and healthcare policy & management.
ii. Design and analysis of clinical trials in medicine.
iii. Assessment of severity state of a patient with prognosis of outcome of a disease.
iv. Population genetics and statistical genetics in order to link variation in genotype with a variation in phenotype. This has been used in agriculture to improve crops and farm animals (animal breeding). In biomedical research, this work can assist in finding candidates for gene alleles that can cause or influence predisposition to disease in human genetics.
v.   Analysis of genomics data, for example from microarray or proteomics experiments. Often concerning diseases or disease stages.
vi. Ecology, ecological forecasting.
vii. Biological sequence analysis.
viii. Systems biology for gene network inference or pathways analysis.

- **Data collection**

Sampling

      Statisticians collect sample data by developing specific experiment designs and survey samples. Statistics itself also provides tools for prediction and forecasting the use of data through statistical models. To use a sample as a guide to an entire population, it is important that it truly represents the overall population. Representative sampling assures that inferences and conclusions can safely extend from the sample to the population as a whole. A major problem lies in determining the extent that the sample chosen is actually representative.

Experimental and observational studies

      A common goal for a statistical research project is to investigate causality, and in particular to draw a conclusion on the effect of changes in the values of predictors or independent variables on dependent variables. There are two major types of causal statistical studies: experimental studies and observational studies. In both types of studies, the effect of differences of an independent variable (or variables) on the behavior of the dependent variable are observed.

      The difference between the two types lies in how the study is actually conducted. Each can be very effective. An **experimental study** involves taking measurements of the system under study, manipulating the system, and then taking additional measurements using the same procedure to determine if the manipulation has modified the values of the measurements. In contrast, an **observational study** does not involve experimental manipulation. Instead, data are gathered and correlations between predictors and response are investigated. While the tools of data analysis work best on data from randomized studies, they are also applied to other kinds of data – like natural experiments and observational studies – for which a statistician would use a modified, more structured estimation method (e.g., Difference in differences estimation and instrumental variables, among many others) that produce consistent estimators.

Experiments

The basic steps of a statistical experiment are:

1. Planning the research, including finding the number of replicates of the study, using the following information: preliminary estimates regarding the size of treatment effects, alternative hypotheses, and the estimated experimental variability. Consideration of the selection of experimental subjects and the ethics of research is necessary. Statisticians recommend that experiments compare (at least) one new treatment with a standard treatment or control, to allow an unbiased estimate of the difference in treatment effects.
2. Design of experiments, using blocking to reduce the influence of confounding variables, and randomized assignment of treatments to subjects to allow unbiased estimates of treatment effects and experimental error. At this stage, the experimenters and statisticians write the *experimental protocol* that will guide the performance of the experiment and which specifies the *primary analysis* of the experimental data.
3. Performing the experiment following the experimental protocol and analyzing the data following the experimental protocol.
4. Further examining the data set in secondary analyses, to suggest new hypotheses for future study.
5. Documenting and presenting the results of the study.

Observational study

An example of an observational study is one that explores the association between tobacco and lung cancer. This type of study typically uses a survey to collect observations about the area of interest and then performs statistical analysis. In this case, the researchers would collect observations of both tobacco users and non-tobacco users, perhaps through a case-control study, and then look for the number of cases of lung cancer in each group.

Expt. No. 02   **Date**

Representation of Statistical data by Histograms, Ogive Curves and Pie diagrams
----

Theory/Approach

One of the most convincing and appealing ways in which statistical results may be presented is through diagrams and graphs. Just one diagram is enough to represent a given data more effectively than thousand words.

A diagram is a visual form for presentation of statistical data, highlighting their basic facts and relationship. If we draw diagrams on the basis of the data collected they will easily be understood and appreciated by all. It is readily intelligible and save a considerable amount of time and energy.

Significance of Diagrams and Graphs:

Diagrams and graphs are extremely useful because of the following reasons.

1. They are attractive and impressive.
2. They make data simple and intelligible.
3. They make comparison possible
4. They save time and labour.
5. They have universal utility.
6. They give more information.
7. They have a great memorizing effect.

There are several ways in which data can be summarized in diagrams and graphs such as

1. Tables of numerical data
2. Line graphs
3. Bar graphs
4. Histograms
5. Frequency polygons
6. Ogive curves
7. Pie Charts

1. Representation of Statistical data by Histograms

A histogram is a graphical representation of a continuous frequency distribution i.e. grouped frequency distributions. It is a graph, including vertical rectangles, with no space between the rectangles. The class-intervals are taken along the horizontal axis and the respective class frequencies on the vertical axis using suitable scales on each axis. For each class, a rectangle is drawn with base as width of the class and height as the class frequency. The area of the rectangles must be proportional to the frequencies of the respective classes. Let us illustrate these with the help of examples.

Example-1

The following is the frequency distribution of weights of 30 students of class IX of a school. Draw a histogram to represent the data.

| Weight renge of students (Classes)	45-50	50-55	55-60	60-65	65-70	Total
Number of students (Frequency)	6	10	8	7	15	**46**

Solution: For drawing a histogram we go through the steps similar to those of a bar graph. They are given below:

Step 1: On a paper, we draw two perpendicular lines and call them horizontal and vertical axes.

Step 2: Along the horizontal axis, we take classes of equal width: 45-50, 50-55. As the axis starts from 45-50, we take one interval 40-45 before it and put a kink on axis before that.

Step 3: Choose a suitable scale on the vertical axis to represent the frequency. It can start from 0 to 16, with a step of 2, i.e., 0, 2, 4, 6, ..., 12, 14, 16,
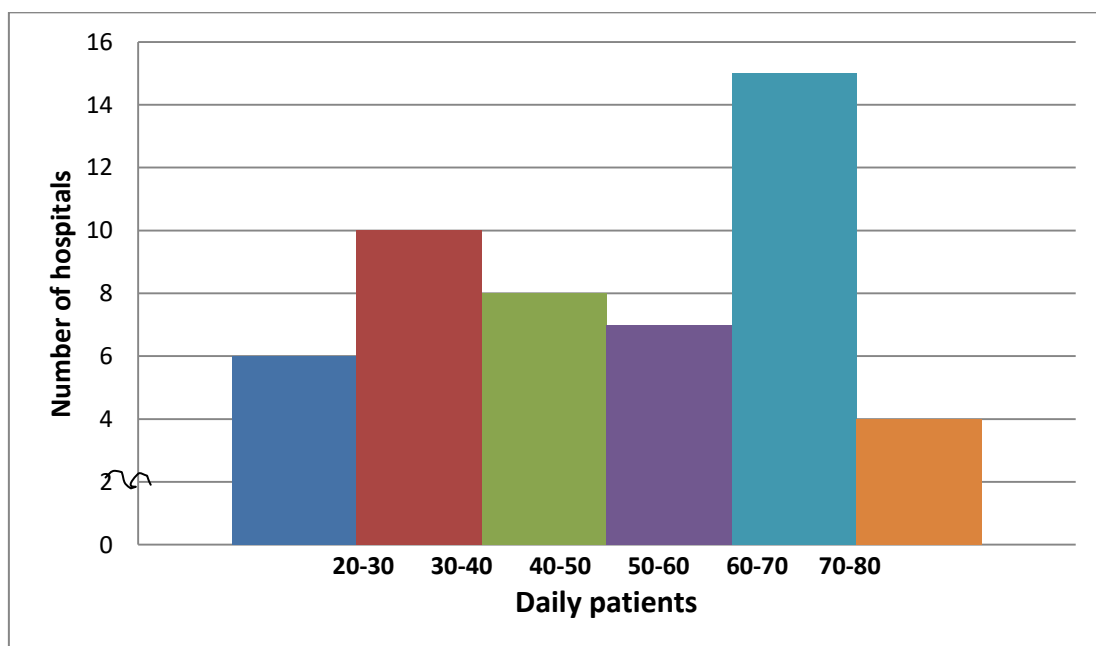
Step 4: Draw the rectangles as shown in Fig.
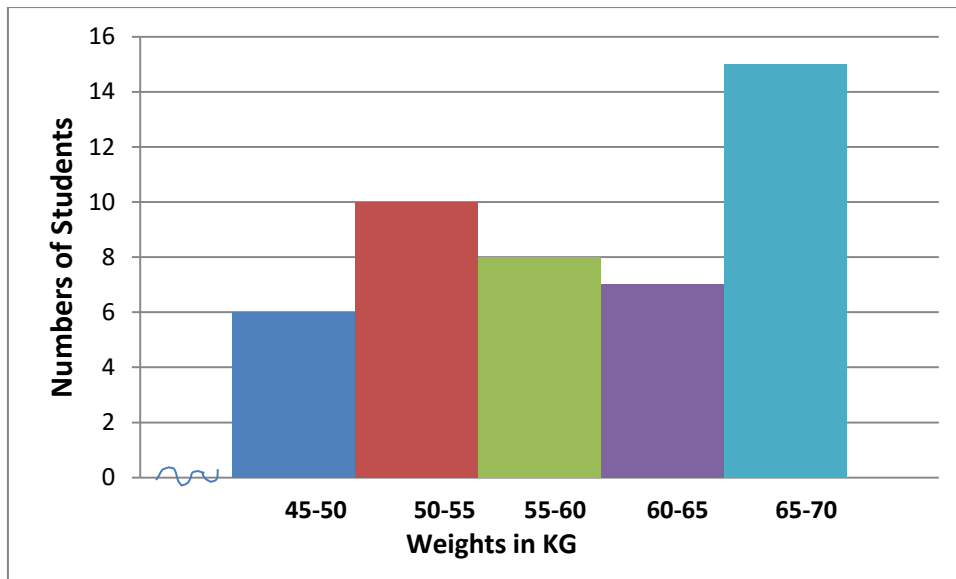
Example 2

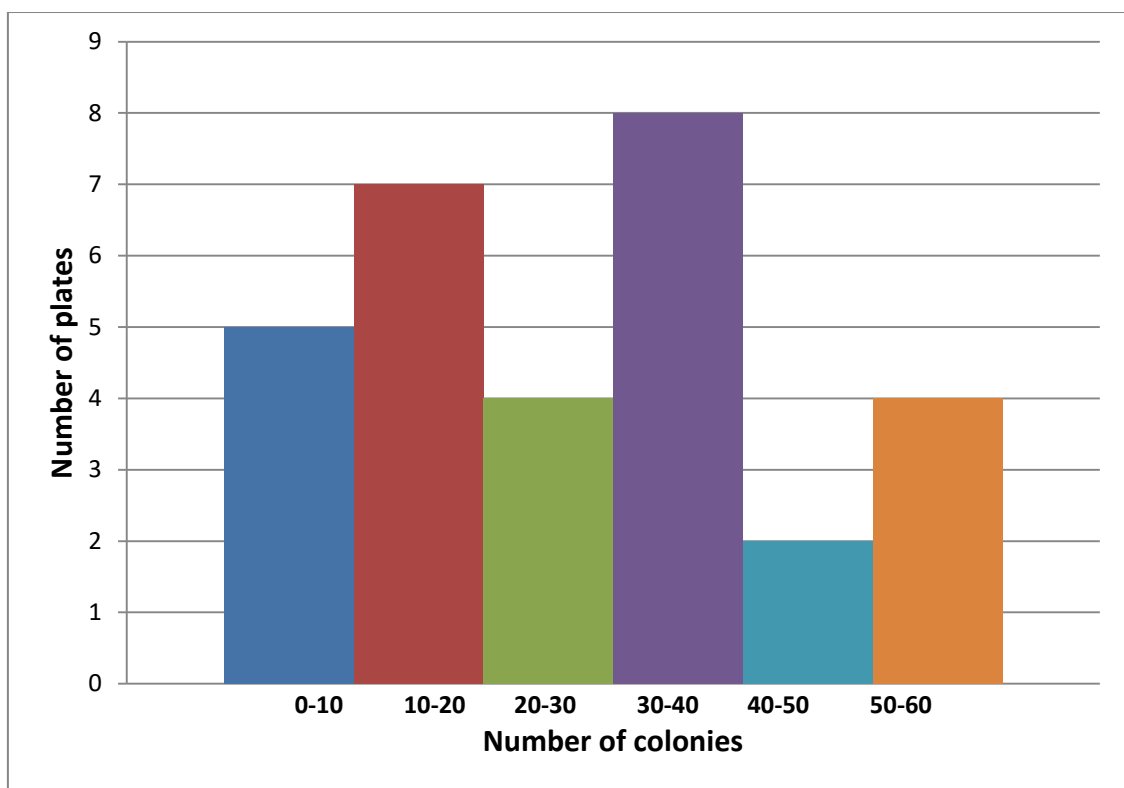The daily patients of 50 hospitals are given below

Daily patients (Classes)	20-30	30-40	40-50	50-60	60-70	70-80	Total
No. of Hospitals (Frequency)	6	10	8	7	15	4	**50**

Example 3

Number of colonies on 30 plates

Number of colonies (Classes)	0-10	10-20	20-30	30-40	40-50	50-60	Total
Number of plates (Frequency)	5	7	4	8	2	4	**30**

Example 4

Number of children immunized with Polio vaccine of age group 1 to 5 years of ward number 7 of Omerga city

Age group (Classes)	0-1	1-2	2-3	3-4	4-5	**Total**
Number of children (Frequency)	50	45	30	65	20	**210**
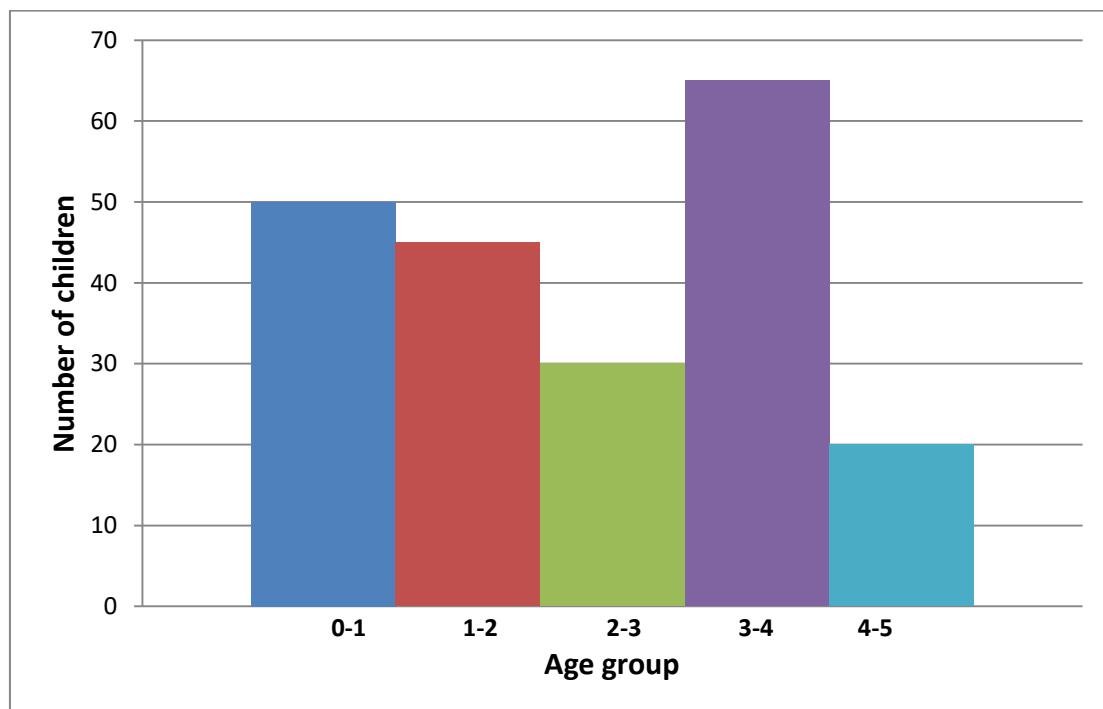
2. Representation of Statistical data by Ogive Curves (Cumulative frequency curve)

A curve that represents the cumulative frequency distribution of grouped data is called an ogive or cumulative frequency curve.

The two types of Ogives are more than type ogive and less than type ogive. An ogive representing a cumulative frequency distribution of 'more than' type is called a more than ogive. An ogive representing a cumulative frequency distribution of 'less than' type is called a less than ogive.

An Ogive (pronounced O-Jive) is a graph that represents the cumulative frequencies for the classes in a frequency distribution and it is a continuous frequency curve. Ogive has the shape of an elongated 'S' and is sometimes called a double curve with one portion being concave and the other being convex. While constructing, it is necessary to first have the frequency table. To plot an ogive, we need class boundaries and the cumulative frequencies. For grouped data, ogive is formed by plotting the cumulative frequency against the upper boundary of the class. For ungrouped data, cumulative frequency is plotted on the y-axis against the data which is on the x-axis.

Ogive is used to study the growth rate of data as it shows the accumulation of frequency. Representing data in the form of ogive curve makes it more effective to be understood as compared to arrangement that is represented using table.

Two different types of ogive can be drawn. They are less than type ogive and more then type ogive.

I.   Less than type ogive curve

Following steps are necessary to plot a **less than type ogive** curve:

1. Start from the upper limit of class intervals and then, add class frequencies to get cumulative frequency distribution.
2. Take upper limit in the x-axis direction and cumulative frequencies along the y-axis direction.

3. Plot the points (x, y), where 'x' is the upper limit of a class and 'y' is the corresponding cumulative frequency.
4. Join the points by a smooth curve.

The less than type ogive looks like an elongated 'S' and starts at the lowest boundary on the axis and ends at the highest class boundary which corresponds to the total frequency of the distribution.

II.   More than type ogive curve

Following steps are necessary to plot a **more than type ogive** curve:

1. Start from the lower limits of class intervals and the total frequency is subtracted from the frequency to get the cumulative frequency distribution.
2. In the graph, consider the lower limit in the x-axis direction and cumulative frequencies along y-axis direction.
3. Plot the points (x, y), where 'x' is the lower limit of a class and 'y' is the corresponding cumulative frequency.
4. Join the points by a smooth curve.

More than type ogive looks like an elongated 'S' turned upside down.
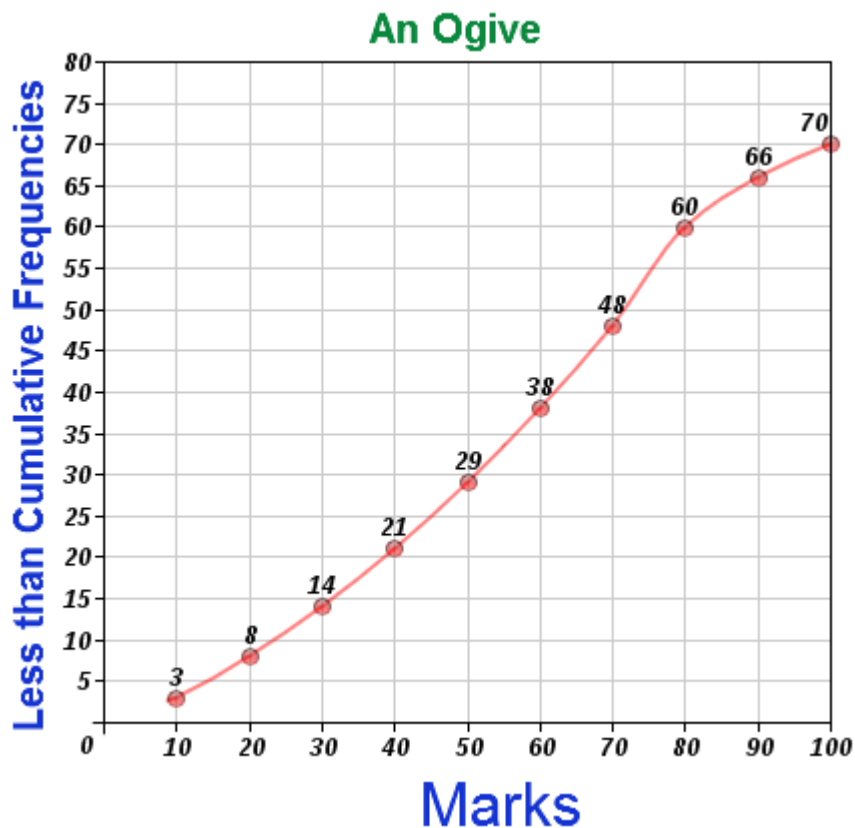
Example 1

Question: From the data marks obtained and number of students given below, construct a less than and more than cumulative frequency table and plot its ogive.

Marks	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80	80 - 90	90 -100
Frequency	3	5	6	7	8	9	10	12	6	4

Solution:

Marks	Frequency	Less than cumulative frequency	More than cumulative frequency
0 - 10	3	3	70
10 - 20	5	3+5 = 8	70-3= 67
20 - 30	6	8+6 = 14	67-5= 62
30 - 40	7	14+7 = 21	62-6= 56
40 - 50	8	21+8 = 29	56-7= 49
50 - 60	9	29+9 = 38	49-8= 41
60 - 70	10	38+10= 48	41-9= 32
70 - 80	12	48+12= 60	32-10= 22
80 - 90	6	60+6 = 66	22-12= 10
90 - 100	4	66+4 = 70	10-6= 4

Plot the points having abscissa as upper limits and ordinates as the cumulative frequencies (10, 3), (20, 8), (30, 14), (40, 21), (50, 29), (60, 38), (70, 48), (80, 60), (90, 66), (100, 70) and join the points by a smooth curve.

On the graph, plot the points (0, 70), (10, 67), (20, 62), (30, 56), (40, 49), (50, 41), (60, 32), (70, 22), (80, 10), (90, 4) and join the points by a smooth curve.
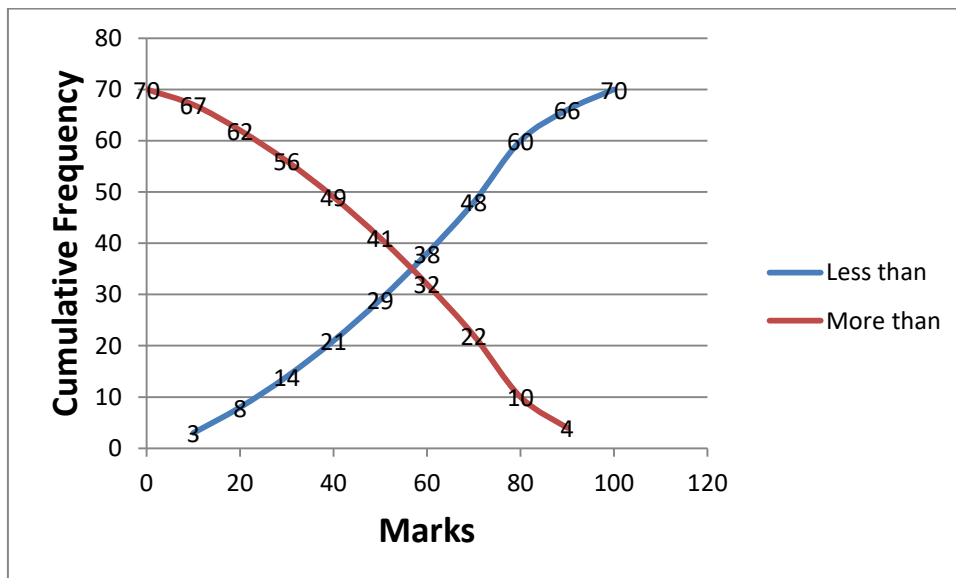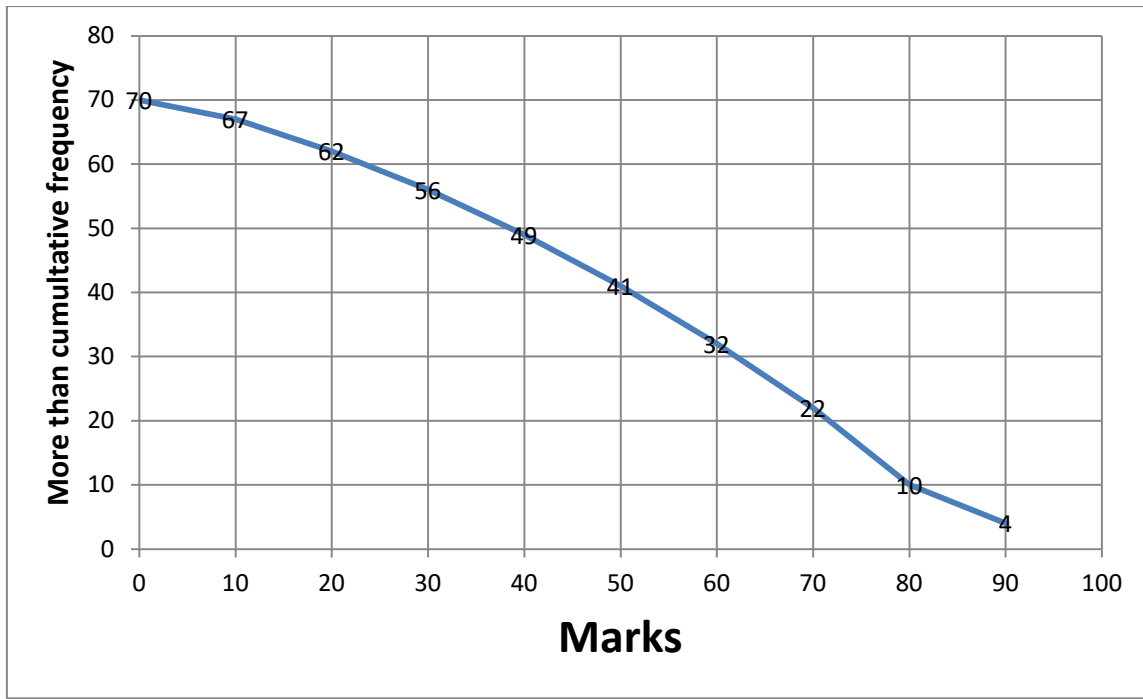
Median from above graph is 35

Example 2: Draw 'more than' and 'less than' ogive curves for the following data:

Class Interval	15-20	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60	60-65	65-70	70-75
Frequency	2	5	8	10	13	17	20	16	12	18	19	20

Solution:
Let us calculate cumulative frequencies as follows:

Class Interval	Frequency	Less than cumulative frequency	More than cumulative frequency
15 - 20	2	2	155
20 - 25	5	2 + 5 = 7	155 - 2 = 153
25 - 30	8	7 + 8 = 15	153 - 5 = 148
30 - 35	10	15 + 10 = 25	148 - 8 = 140
35 - 40	13	25 + 13 = 38	140 - 10 = 130
40 - 45	17	38 + 17 = 55	130 - 13 = 117
45 - 50	20	55 + 20 = 75	117 - 17 = 100
50 -55	16	75 + 16 = 91	100 - 20 = 80
55 - 60	12	91 + 12 = 103	80 -16 = 64
60 - 65	15	103 + 15 = 118	64 - 12 = 52
65 - 70	17	118 + 17 = 135	49 - 15 = 37
70 - 75	20	135 + 20 = 155	32 - 17 = 20

Less than ogive:

For **less than ogive**, plot the points, (20, 2), (25, 7), (30, 15), (35, 25), (40, 38), (45, 55), (50, 75), (55, 91), (60, 103), (65, 118), (70, 135), (75, 155) and join the points by a smooth curve.
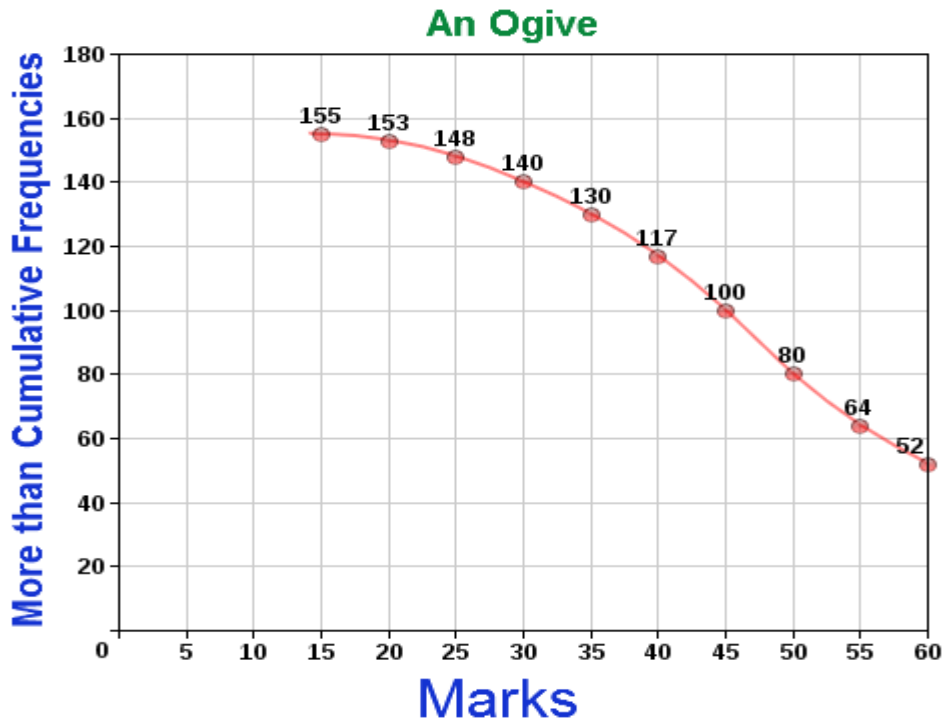Less than ogive plot for the given data is as follows:
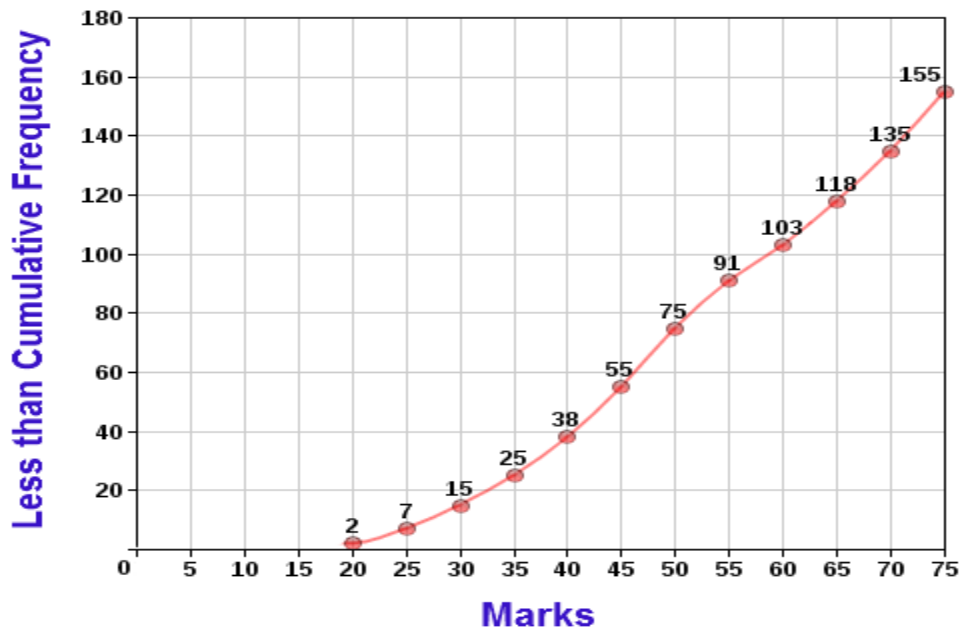
More than ogive:

For **more than ogive**, plot the points, (15, 155), (20, 153), (25, 148), (30, 140), (35, 130), (40, 117), (45, 100), (50, 80), (55, 64), (60, 52), (65, 37), (70, 20) and join the points by a smooth curve.

More than ogive plot for the given data is as follows:

Cumulative frequency of less than type is zero for the lowest given value of the variable and similarly cumulative frequency of greater than type is zero for the highest value of the variable considered. Using the data available from a production organisation, Ogives of both the types are drawn below for our ready reference.

Example 3

Determine the Median Wage by drawing less than and more than Ogives

Wages / payments (in Rs)	Cumultative Frequency	
	Less than type	**More than type**
30	0	50
40	6	44
50	20	30
52	25	25
60	40	10
70	47	03
80	50	00

Ogives (of both the types) drawn on the basis of the above data and determination of the median wage:
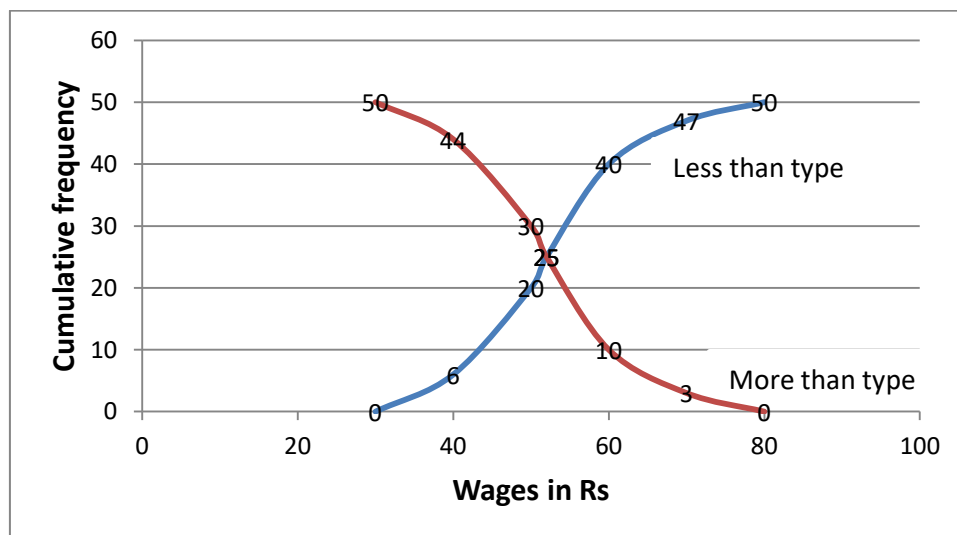
Here, being the middle-most value of the given wage rates, the median wage is found OB (= Rs. 52) because only at this wage rate the two cumulative frequency curves intersect at point A representing two cumulative frequencies (less-than and greater-than) of both the types exactly equal (AB = 25) with each other. Hence, the median wage is OB = Rs. 52.00.

3. Representation of Statistical data by Pie diagram

Pie Diagram:

A **pie chart** (or a **circle chart**) is a circular statistical graphic, which is divided into slices to illustrate numerical proportion. In a pie chart, the arc length of each slice (and consequently its central angle and area), is proportional to the quantity it represents. The independent variable is plotted around a circle in either a clockwise direction or a counterclockwise direction. The dependent variable (usually a percentage) is rendered as an arc whose measure is proportional to the magnitude of the quantity. Each arc is depicted by constructing radial lines from its ends to the center of the circle, creating a wedge-shaped "slice."The independent variable can attain a finite number of discrete values (for example, five).The dependent variable can attain any value from zero to 100 percent.

Pie charts are useful to compare different parts of a whole amount. They are often used to present financial information. E.g. A company's expenditure can be shown to be the sum of its parts including different expense categories such as salaries, borrowing interest, taxation and general running costs (i.e. rent, electricity, heating etc).

A pie chart is a circular chart in which the circle is divided into sectors. Each sector visually represents an item in a data set to match the amount of the item as a percentage or fraction of the total data set.

Here, the aggregate value of the variable is expressed as the total area of a circle with a reasonable radius. The entire area in the circle is subdivided into a number of parts by several radii which are separately related to the total area of the circle and also maintain the same proportional relation with the angle at the centre.

For drawing it correctly, we convert the particular given values of the variable as a percentage of the total value of the variable. As the angle at the centre is 360°, it is supposed to express 100 p.c. value of the variable where 1 p.c. value of the variable is equivalent to an angle of 3.6° at the centre.

We can thus easily convert the individual given values of the variable into the required angles at the centre. Then we draw a complete circle taking any standard radius and put the angles found from the numerical exercise separately at the centre. Each separate part in the circle signifies a particular section of the data. Let us represent a simple pie diagram below constructed with the usual

method prescribed and followed for its computation by converting the following information into that diagram.

Example - 1

A family's weekly expenditure on its house mortgage, food and fuel is as follows:

Expense	Rs
Mortgage	300
Food	225
Fuel	75

Draw a pie chart to display the information.

Solution:

The total weekly expenditure= 300 + 225 + 75 = 600

We can find what percentage of the total expenditure each item equals.

% =   Expenditure
     ----------------------   X 100
      Total expenditure

Angle = Percentage X 360
          ---------------------------   =   Percentage X 3.6
              100

Expenses	Expenditure	Percentage (%)	Angle at the center (^{o})
Mortgage	300	50	180
Food	225	37.5	135
Fuel	75	12.5	45
Total	**600**	**100**	**360**

To draw a pie chart, divide the circle into % and 360^0 parts. Then allocate the number of percentage and degree parts required for each item.

Pie chart
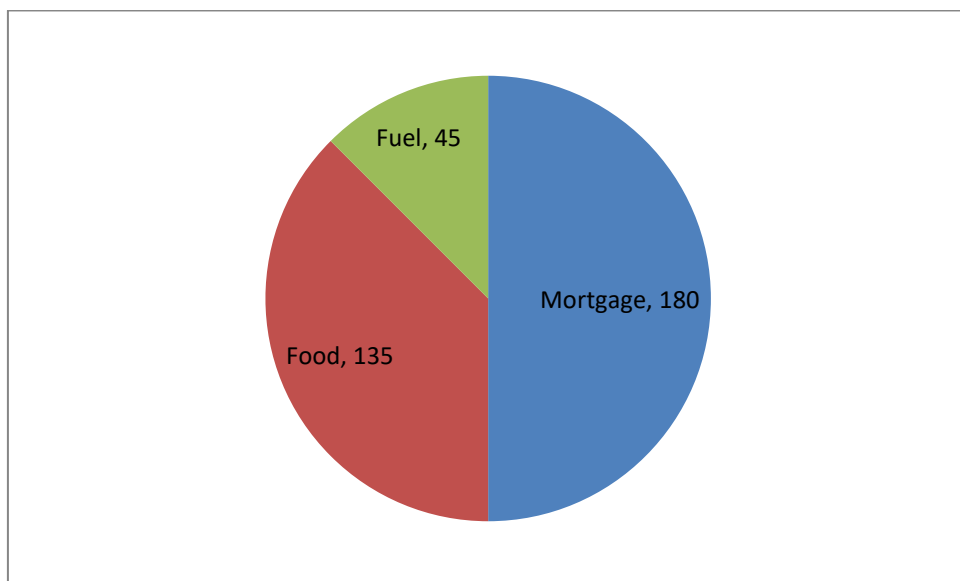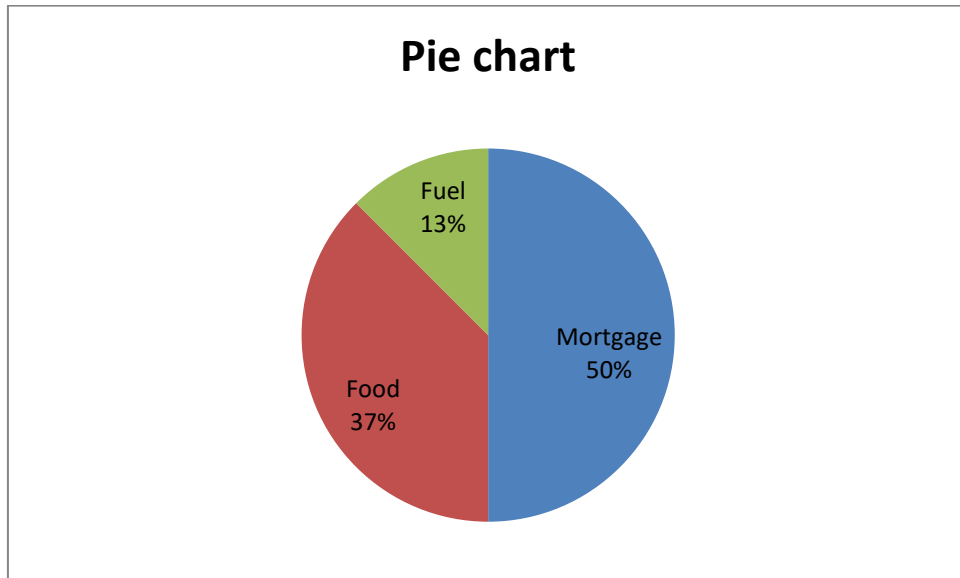
Example-2

Expenditure incurred by the Planning Commission of India on Education in the last 5-year economic plan.

Table: Educational Expenditure in the Last Five-year Economic Plan:

Stages of education	Total Expenditure (in Rs. Crores)
Primary	209
Secondary	88
Higher Education	82
Others	39
Total	**418**

Let us first convert the given data into respective percentages and then into the required angles to be shown at the centre in two more columns and represent them in the following way:

Stages of education	Total Expenditure (in Rs. Crores)	Percentage (%)	Angle at the center (^{o})
Primary	209	50	180
Secondary	88	21	75.6
Higher Education	82	20	72
Others	39	09	32.4
Total	**418**	**100**	**360**

% =   Expenditure
----------------------   X 100
**   Total expenditure**

Angle = Percentage X 3.6

Pie diagram drawn below on the basis of Table shows expenditure on education at various stages in the last 5-year economic plan.

Pie chart
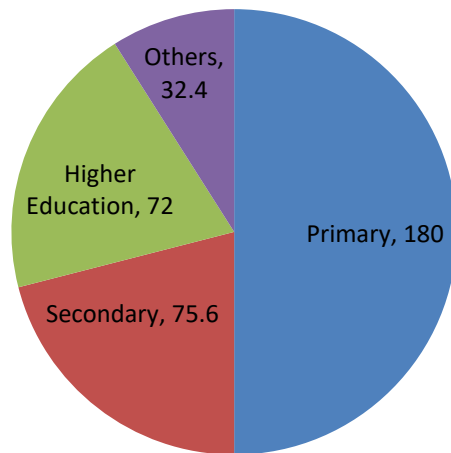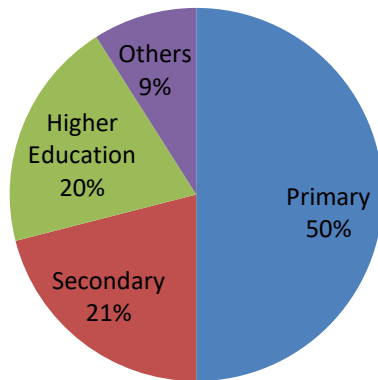
Others 9%
Higher Education 20%
Primary 50%
Secondary 21%

Others, 32.4
Higher Education, 72
Primary, 180
Secondary, 75.6

Expt. No. 2.   Date

<h1 style="text-align:center">Determination of Statistical averages/ central tendencies.</h1>
<h2 style="text-align:center">a) Arithmetic Mean b) Median c) Mode</h2>

Theory

The term "measures of central tendency" refers to finding the mean, median and mode.

The terms mean, median and mode are used to describe the central tendency of a large data set. Range provides provides context for the mean, median and mode. When working with a large data set, it can be useful to represent the entire data set with a single value that describes the "middle" or "average" value of the entire set. In statistics, that single value is called the central tendency and mean, median and mode are all ways to describe it.

❖ **Mean**

The mean is the average of all numbers and is sometimes called the arithmetic mean. To calculate mean, add together all of the numbers in a set and then divide the sum by the total count of numbers.

Average.
The sum of a set of data divided by the number of data.

The **arithmetic mean** (or **mean** or **average**) is the most commonly used and readily understood measure of central tendency. In statistics, the term average refers to any of the measures of central tendency. The arithmetic mean is defined as being equal to the sum of the numerical values of each and every observation divided by the total number of observations

Advantages:
 • Most popular measure in fields such as business, engineering and computer science.
 • It is unique - there is only one answer.
 • Useful when comparing sets of data.

Disadvantages:
 • Affected by extreme values

Example 1

In a data center rack, five <u>servers</u> consume 100 watts, 98 watts, 105 watts, 90 watts and 102 watts of power, respectively. The mean power use of that rack is calculated as

(100 + 98 + 105 + 90 + 102 W)/5 servers = a calculated mean of 99 W per server.

Example 2

Marks obtained in four tests: 15, 18, 22, 20

The sum is: 75

Divide 75 by 4: 18.75

The 'Mean' (Average) is 18.75

(Often rounded to 19)

Example 3

The Weight of 6 M.Sc. students in Kg are as follows. Calculate the mean:

```
            78
            66
            82
            89
            75
          + 74
      ----------------
            464
```

464 / 6 = 77.3

Hence,   77.3   is   the   mean   average   of   the   class.

Example 4

- **Find the mean for the following list of values:**

    13, 18, 13, 14, 13, 16, 14, 21, 13

The mean is the usual average, so:

$(13 + 18 + 13 + 14 + 13 + 16 + 14 + 21 + 13) \div 9 = 15$

Mean of discrete series

When data is given alongwith their frequencies. Following is an example of discrete series:

Items	5	10	20	30	40	50	60	70
Frequency	2	5	1	3	12	0	5	7

For discrete series, the Arithmetic Mean can be calculated using the following formula.

Formula

$$\overline{x} = \frac{f_1x_1 + f_2x_2 + f_3x_3 \ldots \ldots + f_nx_n}{N}$$

Alternatively, we can write same formula as follows:

$$\overline{x} = \frac{\sum f_x}{\sum f}$$

Where −

N = Number of observations

$f_1, f_2, f_3, \ldots, f_n$ = Different values of frequency f.

$x_1, x_2, x_3, \ldots, x_n$ = Different values of variable x.

Example

Problem Statement:

Calculate Arithmetic Mean for the following discrete data:

Items	14	36	45	70
Frequency	2	5	1	3

Solution:

Based on the given data, we have:

Items	Frequency f	fx
14	2	28
36	5	180
45	1	45
70	3	210
	$N=11$	$\sum fx=463$

Based on the above mentioned formula, Arithmetic Mean $\bar{x}$ will be:

$\bar{x}=463 / 11= 42.09$

The Arithmetic Mean of the given numbers is 42.09.

❖ **Median**

The "median" is the "middle" value in the list of numbers. To find the median, your numbers have to be listed in numerical order, so you may have to rewrite your list first.

The Median is the 'middle value' in your list. When the totals of the list are odd, the median is the middle entry in the list after sorting the list into increasing order. When the totals of the list are even, the median is equal to the sum of the two middle (after sorting the list into increasing order) numbers

divided by two. Thus, remember to line up your values, the middle number is the median.

Example: Odd amount of numbers

1. Find the Median of: 9, 3, 44, 17, 15 (Odd amount of numbers)
   Line up your numbers: 3, 9, **15,** 17, 44 (smallest to largest)

   The Median is: 15 (The number in the middle)

2. For the five servers in the rack, arrange the power consumption figures from lowest to highest: 90 W, 98 W, **100 W**, 102 W and 105 W.

   The median power consumption of the rack is 100 W.

3. Find the Median of: 13, 18, 13, 14, 13, 16, 14, 21, 13

   Line up your numbers: 13, 13, 13, 13, 14, 14, 16, 18, 21 (smallest to largest)

   There are nine numbers in the list, so the middle one will be the

   $(9 + 1) \div 2 = 10 \div 2 = $ 5th number:

   13, 13, 13, 13, **14**, 14, 16, 18, 21

   So the median is 14.

Example: Even amount of numbers

1. Find the Median of: 8, 3, 44, 17, 12, 6 (Even amount of numbers)

   Line up your numbers: 3, 6, 8, 12, 17, 44

   Add the 2 middles numbers and divide by 2: $8 + 12 = 20 \div 2 = 10$
   The Median is 10.

2. Calculate the median for the six servers in the rack, 90 W, 98 W, 100 W, 102 W, 105 W and 110 W.

Find the median by averaging the two middle numbers:

(100 + 102)/2 = 101 W.

3. **8, 9, 10, 10, 10, 11, 11, 11, 12, 13**

Average the fifth and sixth numbers to find the median:

(10 + 11) ÷ 2 = 21 ÷ 2 = 10.5

❖ **Mode**

The "mode" is the value that occurs most often. If no number is repeated, then there is no mode for the list.

The mode in a list of numbers refers to the numbers that occur most frequently. A trick to remember this one is to remember that mode starts with the same first two letters that most does.

Mode helps identify the most common or frequent occurrence of a characteristic. It is possible to have two modes (bimodal), three modes (trimodal) or more modes within larger sets of numbers.

Example1:

Find the mode of:
9, 3, 3, 44, 17 , 17, 44, 15, 15, 15, 27, 40, 8,

Put the numbers is order for ease:
3, 3, 8, 9, 15, 15, 15, 17, 17, 27, 40, 44, 44,

The Mode is 15 (15 occurs the most at 3 times)

*It is important to note that there can be more than one mode and if no number occurs more than once in the set, then there is no mode for that set of numbers.

Example 2

Find the mode of: **13, 18, 13, 14, 13, 16, 14, 21, 13**

Put the numbers is order for ease:

13, 13, 13, 13, 14, 14, 16, 18, 21

The Mode is 13 (13 occurs the most at 4 times)

Example 3

Find the mode of: **3, 8, 6, 14, 13, 16, 14, 21, 13**

Put the numbers is order for ease:

3, 6, 8, 13, 13, 14, 14, 16, 21

The Mode is 13 and 14 (13 and 14 occurs the most at 2 times)

Determination of measures of Dispersion
a) Mean deviation b) Standard deviation and coefficient of variation c) Quartile deviation

----

Theory

Measures of central tendency, Mean, Median, Mode, etc., indicate the central position of a series. They indicate the general magnitude of the data but fail to reveal all the peculiarities and characteristics of theseries. In other words, they fail to reveal the degree of the spread out or the extent of the variability inindividual items of the distribution. This can be explained by certain other measures, known as 'Measures of Dispersion' or Variation.

We can understand variation with the help of the following example:

Series 1	Series 11	Series III
10	2	10
10	8	12
10	20	8
$\sum X = 30$	30	30

In all three series, the value of arithmetic mean is 10. On the basis of this average, we can say that the series are alike. If we carefully examine the composition of three series, we find the following differences:

i.   In case of 1st series, three items are equal; but in 2nd and 3rd series, the items are unequal and do not follow any specific order.
ii. The magnitude of deviation, item-wise, is different for the 1st, 2nd and 3rd series. But all these deviations cannot be ascertained if the value of simple mean is taken into consideration.

iii.	In these three series, it is quite possible that the value of arithmetic mean is 10; but the value of median may differ from each other. This can be understood as follows ;

I	II	III
10	2	8
10 Median	8 Median	10 Median
10	20	12

The value of Median' in 1st series is 10, in 2nd series = 8 and in 3rd series = 10. Therefore, the value of the Mean and Median are not identical.

iv.	Even though the average remains the same, the nature and extent of the distribution of the size of the items may vary. In other words, the structure of the frequency distributions may differ even (though their means are identical.

What is Dispersion?

Simplest meaning that can be attached to the word 'dispersion' is a lack of uniformity in the sizes or quantities of the items of a group or series. According to Reiglemen, "Dispersion is the extent to which the magnitudes or quantities of the items differ, the degree of diversity." The word dispersion may also be used to indicate the spread of the data.

In all these definitions, we can find the basic property of dispersion as a value that indicates the extent to which all other values are dispersed about the central value in a particular distribution.

Properties of a good measure of Dispersion

There are certain pre-requisites for a good measure of dispersion:
1. It should be simple to understand.
2. It should be easy to compute.
3. It should be rigidly defined.
4. It should be based on each individual item of the distribution.
5. It should be capable of further algebraic treatment.
6. It should have sampling stability.
7. It should not be unduly affected by the extreme items.

The following are the various measures of dispersion:

1. Range
2. Mean Deviation
3. Standard Deviation and Variance
4. Coefficient of variation
5. Quartile Deviation

1. Range

Range: The simplest and the easiest method of measuring dispersion of the values of a variable is the Range. It is measured just as the difference between the highest and the lowest values of a variable. The extent of dispersion increases as the divergence between the highest and the lowest values of the variable increases.

We thus express the magnitude of Range as:

Range = (highest value – lowest value) of the variable.

For determining Range of a variable, it is necessary to arrange the values in an increasing order.

It will enable us to avoid mistakes in calculation and give us the best result.

Let us consider two separate examples below considering both the grouped and the ungrouped data separately.

Example 1:

Consider the following series of numbers:

1, 2, 4, 6, 8, 10, 12.

Solution:

Here, the highest value of the series is 12 and the lowest is 1.

Therefore, the Range = 12 – 1 = 11 i.e. the values of the variable are scattered within 11 units.

----

2. Mean deviation

The mean deviation is sometimes called the Mean Absolute Deviation (MAD) because it is the mean of the absolute deviations.

It is the Arithmetic mean of the absolute deviations of the individual values of the given variable from their average value (normally the mean or the median). It is thus considered as an Absolute Measure of Dispersion.

The mean deviation is the first measure of dispersion. It is the average of absolute differences between each value in a set of value, and the average of all the values of that set.

The mean deviation is calculated either from mean or median, but only median is preferred because when the signs are ignored, the sum of deviation of the sets taken from median is minimum.

The formula to calculate Mean deviation are as stated below:

$$\text{Mean deviation from mean} = \frac{\sum |X - \bar{X}|}{N}$$

$$\text{Mean deviation from median} = \frac{\sum |X - M|}{N}$$

Σ = Represents the summation.
X = Represents the observation
$\bar{x}$ = Represents the mean.
 N= Represents the number of observation.

Three steps:

1. Find the <u>mean</u> of all values

2. Find the **distance** of each value from that mean (subtract the mean from each value, ignore minus signs)

3. Then find the **mean of those distances**

Example: the Mean Deviation of 3, 6, 6, 7, 8, 11, 15, 16

Step 1: Find the **mean**:

$$\text{Mean} = \frac{3 + 6 + 6 + 7 + 8 + 11 + 15 + 16}{8} = \frac{72}{8} = 9$$

Step 2: Find the **distance** of each value from that mean:

Value	Distance from 9
3	6
6	3
6	3
7	2
8	1
11	2
15	6
16	7

Step 3. Find the **mean of those distances**:

$$\textbf{Mean Deviation} = \frac{6 + 3 + 3 + 2 + 1 + 2 + 6 + 7}{8} = \frac{30}{8} = \textbf{3.75}$$

So, the **mean = 9**, and the **mean deviation = 3.75**

Formula

The formula is:

$$\text{Mean Deviation} = \frac{\Sigma |x - \mu|}{N}$$

- **μ** is the mean (in our example **$\mu = 9$**)
- **x** is each value (such as 3 or 16)
- **N** is the number of values (in our example **N = 8**)

Absolute Deviation

Each distance we calculated is called an **Absolute Deviation**, because it is the Absolute Value of the deviation (how far from the mean).

To show "Absolute Value" we put "|" marks either side like this: **|-3| = 3**

For any value **x**:

Absolute Deviation = |x - μ|

From our example,

the value **16** has **Absolute Deviation =** **|x - μ| = |16 - 9| = |7| = 7**

And now let's add them all up ...

Sigma

The symbol for "Sum Up" is **Σ** (called Sigma Notation), so we have:

Sum of Absolute Deviations = Σ|x - μ|

Divide by how many values **N** and we have:

$$\text{Mean Deviation} = \frac{\Sigma|x - \mu|}{N}$$

Let's do our example again, using the proper symbols:

Example: the Mean Deviation of 3, 6, 6, 7, 8, 11, 15, 16

Step 1: Find the **mean**:

$$\mu = \frac{3 + 6 + 6 + 7 + 8 + 11 + 15 + 16}{8} = \frac{72}{8} = 9$$

Step 2: Find the **Absolute Deviations**:

x	|x - μ|
3	6
6	3
6	3
7	2
8	1
11	2
15	6
16	7
	Σ|x - μ| = 30

Step 3. Find the **Mean Deviation**:

$$\text{Mean Deviation} = \frac{\Sigma|x - \mu|}{N} = \frac{30}{8} = 3.75$$

----

3. Standard Deviation:

Standard deviation is a measure of the dispersion of a set of data from its mean. If the data points are further from the mean, there is higher deviation within the data set. Standard deviation is calculated as the square root of variance by determining the variation between each data point relative to the mean.

The standard deviation σ of a probability distribution is defined as the square root of the variance , σ^2

The Standard Deviation is a measure of how spread out numbers are.

Its symbol is **σ** (the greek letter sigma)

The formula is easy: it is the **square root** of the **Variance.**

The Variance is defined as:

The average of the **squared** differences from the Mean.

To calculate the variance follow these steps:

- Work out the <u>Mean</u> (the simple average of the numbers)
- Then for each number: subtract the Mean and square the result (the *squared difference*).
- Then work out the average of those squared differences.

Example1

The heights of dogs (in millimeters): 600mm, 470mm, 170mm, 430mm and 300mm. Find out the Mean, the Variance, and the Standard Deviation.

Solution

- Mean = *600 + 470 + 170 + 430 + 300 = 1970 /* **5** *= 394*

The mean (average) height is 394 mm.

Now we calculate each dog's difference from the Mean:

To calculate the Variance, take each difference, square it, and then average the result:

$$\text{Variance: } \sigma^2 = \frac{206^2 + 76^2 + (-224)^2 + 36^2 + (-94)^2}{5}$$

$$= \frac{42,436 + 5,776 + 50,176 + 1,296 + 8,836}{5}$$

$$= \frac{108,520}{5} = 21,704$$

So the Variance is **21,704**

And the Standard Deviation is just the square root of Variance, so:

Standard Deviation

σ = √21,704

= 147.32...

= 147 *(to the nearest mm)*

And the good thing about the Standard Deviation is that it is useful. Now we can show which heights are within one Standard Deviation (147mm) of the Mean:

So, using the Standard Deviation we have a "standard" way of knowing what is normal, and what is extra large or extra small.

Rottweilers **are** tall dogs. And Dachshunds **are** a bit short

But ... there is a small change with Sample Data

Our example was for a **Population** (the 5 dogs were the only dogs we were interested in).

But if the data is a **Sample** (a selection taken from a bigger Population), then the calculation changes!

When you have "N" data values that are:

- **The Population**: divide by **N** when calculating Variance (like we did)
- **A Sample**: divide by **N-1** when calculating Variance

All other calculations stay the same, including how we calculated the mean.

Example: if our 5 dogs were just a **sample** of a bigger population of dogs, we would divide by **4 instead of 5** like this:

Sample Variance = 108,520 / **4** = **27,130**
Sample Standard Deviation = √27,130 = **164** (to the nearest mm)

Here are the two formulas, explained at <u>Standard Deviation Formulas</u> if you want to know more:

The "**Population** Standard Deviation": $\quad \sigma = \sqrt{\dfrac{1}{N}\sum_{i=1}^{N}(x_i - \mu)^2}$

The "**Sample** Standard Deviation**": $\quad s = \sqrt{\dfrac{1}{N-1}\sum_{i=1}^{N}(x_i - \overline{x})^2}$

Looks complicated, but the important change is to divide by **N-1** (instead of **N**) when calculating a Sample Variance.

Overview of how to calculate standard deviation

The formula for standard deviation (SD) is

$$SD = \sqrt{\frac{\sum |x - \bar{x}|^2}{n}}$$

where $\sum$ means "sum of", x is a value in the data set, $\bar{x}$ is the mean of the data set, and n is the number of data points.

The formula may look confusing, but it will make sense after we break it down.

Step 1: Find the mean.
Step 2: For each data point, find the square of its distance to the mean.
Step 3: Sum the values from Step 2.
Step 4: Divide by the number of data points.
Step 5: Take the square root.

Example 2

Find SD of data 6,2,3,1

Step 1: Find the mean $\bar{x}$.

$$\bar{x} = \frac{6 + 2 + 3 + 1}{4} = \frac{12}{4} = 3$$

Step 2: Find the square of the distance from each data point to the mean $|x - \bar{x}|^2$.

x	$|x - \bar{x}|^2$
6	$|6 - 3|^2 = 3^2 = 9$
2	$|2 - 3|^2 = 1^2 = 1$
3	$|3 - 3|^2 = 0^2 = 0$
1	$|1 - 3|^2 = 2^2 = 4$

Steps 3, 4, and 5:

$$SD = \sqrt{\frac{\sum |x - \bar{x}|^2}{n}}$$

$$= \sqrt{\frac{9+1+0+4}{4}}$$

$$= \sqrt{\frac{14}{4}} \qquad \text{Sum the squares of the distances (Step 3).}$$

$$= \sqrt{3.5} \qquad \text{Divide by the number of data points (Step 4).}$$

$$\approx 1.87 \qquad \text{Take the square root (Step 5).}$$

Use of standard deviation

In finance, standard deviation is applied to the annual rate of return of an investment to measure the investment's volatility. Investment firms report the standard deviation of their mutual funds and other products. In the finance industry, standard deviation is one of the key fundamental risk measures that analysts, portfolio managers, wealth advisors and financial planners use. Also, because it is easy to understand, this statistic is often reported to the end clients and investors on a regular basis.

----

4. Coefficient of Variation (C.V.)

The coefficient of variation (CV) is the ratio of the standard deviation to the mean (average). For example, the expression "The standard deviation is 15% of the mean" is a CV. The CV is particularly useful when you want to compare results from two different surveys or tests that have different measures or values. For example, if you are comparing the results from two tests that have different scoring mechanisms.

Formula

The **formula for the coefficient of variation** is:

Coefficient of Variation = (Standard Deviation / Mean) * 100.

In symbols: CV = (SD /$\bar{x}$) * 100.

Multiplying the coefficient by 100 is an optional step to get a percentage, as opposed to a decimal.

Coefficient of Variation Example

A researcher is comparing two multiple-choice tests with different conditions. In the first test, a typical multiple-choice test is administered. In the second test, alternative choices (i.e. incorrect answers) are randomly assigned to test takers. The results from the two tests are:

	Regular Test	Randomized Answers
Mean	59.9	44.8
SD	10.2	12.7

Trying to compare the two test results is challenging. Comparing standard deviations doesn't really work, because the *means* are also different. Calculation using the formula CV=(SD/Mean) X100 helps to make sense of the data:

	Regular Test	Randomized Answers
Mean	59.9	44.8
SD	10.2	12.7
CV	17.03	28.35

Looking at the standard deviations of 10.2 and 12.7, you might think that the tests have similar results. However, when you adjust for the difference in the means, the results have more significance:

Regular test: CV = 17.03
Randomized answers: CV = 28.35

Use the following formula to calculate the CV by hand for a <u>population </u>or a <u>sample</u>.

CV for a population:

$$CV = \frac{\sigma}{\mu} * 100\%$$

CV for a sample:

$$CV = \frac{s}{\bar{x}} * 100\%$$

σ is the standard deviation for a population, which is the same as "s" for the sample.

μ is the mean for the population, which is the same as X Bar $\bar{x}$ (in the sample).

In other words, to find the coefficient of variation, divide the standard deviation by the mean and multiply by 100%.

Example -2

Sample question: Two versions of a test are given to students. One test has pre-set answers and a second test has randomized answers. Find the coefficient of variation.

	Regular Test	Randomized Answers
Mean	50.1	45.8
SD	11.2	12.9

Step 1: **Divide the standard deviation by the mean** for the first sample: 11.2 / 50.1 = 0.22355

Step 2: **Multiply Step 1 by 100**: 0.22355 X 100 = 22.355%

Step 3: **Divide the standard deviation by the mean** for the second sample: 12.9 / 45.8 = 0.28166

Step 4: **Multiply Step 3 by 100**: 0.28166 X 100 = 28.266%

----

5. Quartile Deviations (Q.D.)

Quartile Deviation (QD) means the semi variation between the upper quartiles (Q3) and lower quartiles (Q1) in a distribution. Q3 - Q1 is referred as the interquartile range.

Formula:
QD = Q3 - Q1/ 2

Example:

Calculate the QD for a group of data, 241, 521, 421, 250, 300, 365, 840, 958.

Solution:

Given data = { 241, 521, 421, 250, 300, 365, 840, 958 }

Step 1:

First, arrange the given digits in ascending order =

241, 250, 300, 365, 421, 521, 840, 958. Total number of given data (n) = 8.

Step 2:

Calculate the center value (n/2) for the given data

{241,250,300,365,421,521,840,958}. n=8

n/2 = 8/2
n/2 = 4.

From the given data, { 241, 250, 300, **365**, 421, 521, 840, 958 } the fourth value is 365

Step 3:

Now, find out the n/2+1 value. i.e n/2 +1 = 4+1=5 From the given data,

{ 241,250,300,365,**421**,521,840,958 } the fifth value is 421

Step 4:

From the given group of data, { 241, 250, 300, 365, 421, 521, 840, 958 }
Consider, First four values Q1 = 241,250,300,365

Last four values Q3 = 421, 521, 840, 958

Step 5:

Now, let us find the median value for Q1. Q1= {241, 250, 300, 365}

For Q1, total count (n) = 4

Q1(n/2) = Q1(4/2) = Q1

(2) i.e) Second value in Q1 is 250

Q1((n/2)+1) = Q1((4/2)+1) = Q1(2+1) = Q1

(3) i.e) Third value in Q1 is 300

Median (Q1) = (Q1(n/2) + Q1((n/2)+1)) / 2

(Q1) = 250+300/2 (Q1) = 550/2 = 275

Step 6:

Let us now calculate the median value for Q3.

Q3= {421,521,840,958} For Q3, total count (n) = 4

Q3(n/2) = Q3(4/2) = Q3(2)

 i.e) Second value in Q3 is 521 Q3((n/2)+1) = Q3((4/2)+1) = Q3(2+1) = Q3

(3) i.e) Third value in Q3 is 840.

Median (Q3) = (Q1(n/2) + Q1((n/2)+1)) / 2 (Q3) = (521 + 840) / 2 (Q3) =
1361/2 = 680.5

Step 7:

Now, find the median value between Q3 and Q1.

Quartile Deviation = Q3-Q1/2 = 680.5 - 275/2 = 202.75

Expt. No. 04   Date

Computer operations-getting acquainted with different parts of Computers. [DOS] and basics of operating a computer

==

Theory

This basic assembly is formed usually of a motherboard, a processor, central memory, hard disc drive, connections, the monitor as well as the keyboard, mouse or some kind of a touch pad.

A computer usually has six important parts:

1. A keyboard – that you use to type on and to give commands to the computer
2. A screen – where you can see your document and all the commands a programme offers
3. A hard drive with stiffy and CDRom ports – The hard drive is the actual computer where all programmes and information is stored. Stiffy disks or CDRom can be used to store your back-up files. They can also be used to transfer information from one computer to another.
4. A mouse – this is a tool you use to give orders to the programme by moving an arrow or line [cursor] that appears on the screen and clicking on command symbols or clicking on a letter or word where you want to work. You can use the mouse to highlight sections that you want to delete, move or format.
5. A printer – the printer is connected to the computer and prints paper copies of your documents
6. A modem – this can be connected to the computer or can be built in. It is used to make a phone call from your computer to another computer so that you can send information between the two - eMail and internet needs a modem.

Operating system (OS)

An **operating system (OS)** is system software that manages computer hardware and software resources and provides common services for computer programs. All computer programs, excluding firmware, require an operating system to function.

An **operating system** is the **most important software** that runs on a computer. It manages the computer's **memory** and **processes**, as well as all of its **software** and **hardware**. It also allows you to **communicate** with the

computer without knowing how to speak the computer's language. **Without an operating system, a computer is useless**.

Computer operating systems perform basic tasks, such as recognizing input from the keyboard, sending output to the display screen, keeping track of files and directories on the disk, and controlling peripheral devices such as printers.

For hardware functions such as input and output and memory allocation, the operating system acts as an intermediary between programs and the computer hardware, although the application code is usually executed directly by the hardware and frequently makes system calls to an OS function or is interrupted by it. Operating systems are found on many devices that contain a computer – from cellular phones and video game consoles to web servers and supercomputers.

The dominant desktop operating system is Microsoft Windows with a market share of around 85%. OS X by Apple Inc. is in second place (9%), and Linux is in third position (1.5%). In the mobile sector Android by Google is dominant with 63% and iOS by Apple is placed second with around 25%. Linux is dominant in the server and supercomputing sectors.

DOS (Disk Operating System)

DOS short for **disk operating system** is an acronym for several computer operating systems that are operated by using the command line.

MS-DOS dominated the IBM PC compatible(PC and PC Compatible) market between 1981 and 1995, or until about 2001 including the partially MS-DOS-based Microsoft Windows (95, 98, and Millennium Edition). "DOS" is used to describe the family of several very similar command-line systems, including MS-DOS, PC DOS, DR-DOS, Free-DOS, ROM-DOS, and PTS-DOS.

The term *DOS* can refer to any operating system, but it is most often used as shorthand for *MS-DOS* (*Microsoft disk operating system*). Originally developed by Microsoft for IBM, MS-DOS was the standard operating system for IBM-compatible personal computers.

DOS (Disk Operating System) is an operating system that runs from a hard disk drive. The term can also refer to a particular family of disk operating systems, most commonly MS-DOS (Microsoft Disk Operating System).

An operating system (OS) is the software that controls a computer's hardware and peripheral devices and allows other programs to function. Early computers did not have disk drives but were hard-wired to carry out specific computations. Later, computers were able to store instructions loaded into the computer's memory using punch cards and later magnetic tapes. Computer memory space was limited and when the instructions to control a computer were moved onto a disk drive, such as a floppy disk or internal hard drive, it was considered cutting-edge technology. Today, any modern operating system would be considered a disk operating system.

Disk operating system is also used to describe several very similar command line disk operating systems. PC-DOS (Personal Computer Disk Operating System) was the first widely-installed disk operating system used in personal computers running on Intel 8086 16-bit processors. It was developed for IBM by Microsoft Corporation, which also produced its own almost identical version called MS-DOS.

Expt. No. 5   Date

Creating files, folders and directories in Microsoft Windows

Theory

To create a new blank document / file:

- Click the Microsoft Office button.
- Select New. The New Document dialog box appears.
- Select Blank document under the Blank and recent section. It will be highlighted by default.
- Click Create. A new blank document appears in the Word window.
- Or Click the Microsoft Office button and select New. You can create blank documents and access templates from the dialog box that appears.

❖ **To create a folder**

There are a few ways to create a folder or subfolder (a folder within a folder, often referred to as a subdirectory) in Microsoft Windows. Below is a listing of these different methods.

My Computer or Windows Explorer

1. Open My Computer or Windows Explorer
2. Open the drive or folder in which you'd like to create the new folder; for example, the C: drive. If you do not want to create a folder in the root directory, browse to the location of your choosing.
3. On the menu bar, select File and then Folder. You can also right-click with your mouse on a blank portion of the folder, click new and then Folder, as shown in the image below.

Windows Desktop

1. Navigate to the Windows Desktop.
2. Right-click with your mouse on any blank portion of the Desktop.
3. In the menu that appears (like that shown in the picture to the right), click New and then Folder.
4. A new folder will appear. Type the name of the folder you want to use and then press Enter.

❖ **To create a directory in MS-DOS**

Tip: It is more appropriate to use "directory" instead of "folder" when referring to the command line.

To create a directory in MS-DOS or the Windows command line, use the md or mkdir MS-DOS command. For example, below we are creating a new directory called "hope" in the current directory.

You can also create multiple new directories in the current directory by using the md command. In the next example, we are creating three new directories, called "user1", "user2", and "user3", in the current directory.

Expt. 06   Date

Applications of computers in biology using MS-Office.
A] MS-Word B] Excel C] Power Point

Theory

 Computers in Biology and Medicine is a medium of international communication of the revolutionary advances being made in the application of the computer to the fields of bioscience and medicine. The use of computers encourages the exchange of important research, instruction, ideas and information on all aspects of the rapidly expanding area of computer usage in following fields.

(1) Writing, presentation and saving of data.
(2) Analysis of Biomedical Systems: Solutions of Equations
(3) Synthesis of Biomedical Systems: Simulations
(4) Special Medical Data Processing Methods
(5) Special Purpose Computers and Clinical Data Processing for Real Time, Clinical and Experimental Use
(6) Medical Diagnosis and Medical Record Processing.
(7) Biomedical Engineering
(8) Medical Informatics as well as Bioinformatics.
(9) Medical Applications of the Internet and World Wide Web
(10) Human Genomics
(11) Proteomics
(12) Functional Brain Studies.

A) MS-WORD

 Microsoft is a graphical word processing program that users can type with. It is made by the computer company Microsoft. The purpose of the MS Word is to allow the users to type and save documents. Similar to other word processors, it has helpful tools to make documents.

 Microsoft word, often called as word, carries with it a lot of benefits. Word is typically used to write reports and proposals in business, and research papers in educational institutions. Microsoft word is used to save documents.

The documents can be copied to flash drive which serves as an external memory for your computer. This allows you to use the saved documents conveniently taking with you anywhere.

It allows the users to make different formats in accordance with the need and importance. In addition to allowing you to create simple documents for business correspondence, it helps you greatly to create and design business cards, brochures, new letters and many more items that are needed. Besides, the use of fonts, shapes, clip art or smart art, charts has its own importance and value.

Microsoft Word can be integrated with other programs as well, such as, using Excel tables, rows and columns or calculations. PowerPoint can also be integrated with Microsoft Word for specific purposes.

MS Word features are Smart Art, Turn Data into Visual Charts, Make Your Document Interactive, Watermarks, Mail Merge, Headers & Footers, Cover Pages, Search & Replace, Spell Check, View Options (*Print Layout, Full Screen Reading, Web Layout, Outline, Draft*)

How to use MS-WORD

Switch on your computer and wait until a whole lot of picture symbols appear with a Start button on the bottom left of the screen. Use the left button on the mouse to click on the Start button. Then click on programmes and then double-click on the MSWORD programme. Some computers have a MSWORD symbol that will come up when your computer is on and you do not have to go to start – simply double click the left button of the mouse on the symbol.

The Microsoft word programme will appear on the screen.

There will be a blank screen called Document 1. Every thing you type is called a document

The File title

Click on this and a box with different sections will appear. This is your file organiser and you use the first section:

- To start a new document (click on new) You can use the block with a folder on it on the toolbar to do this more quickly. Use your mouse to click on it.)

- To open an old document (click on open) and then click on the name of the document you want to open
- To close a document. The computer will ask you if you want to save it before you close it and then you click on Yes or No.

The next section is to do with saving documents.

If you press save, the document will be saved under its heading in the general folder called My Documents. You can do this with the block on the toolbar showing stiffy disk. Click on it with your mouse.

Save as allows you to save a document under a new name in the folder of your choice.

Page set up allows you to change the margins of the page. Print preview allows you to see what the document will look like on a printed page. Print allows you to print the document if your computer is connected to a printer. The last section says Exit. If you click on this the MSWORD programme will shut down and you can return to Windows. If you have forgotten to save any documents the computer will ask you if you want to Save. Click on Yes or No. The Edit title

This section allows you to change or edit your work. The most useful tools in the list are Cut, Copy and Paste.

The Insert title

This is useful for inserting Page Breaks (that is, beginning a new page), page numbers, footnotes, pictures and so on.

You can also use this box to insert page numbers.

The Format title

This is useful for layout or making your document look attractive. There are various headings. Font, Paragraph, Bullets and Numbers, Borders and shading, Columns, Change case.

The Tools title

This has a helpful button to check the spelling in your whole document.

Insert Table allows you to make a new table

B) EXCEL

Microsoft Excel is a spreadsheet developed by Microsoft for Windows, It features calculation, graphing tools, pivot tables, and a macro programming language called Visual Basic for Applications.
Microsoft Excel is a program that provides worksheets comprised of rows and columns. Textual data can be stored in the workbook similarly to a Microsoft Word table, but the power of Excel is its ability to perform simple to complicated mathematical calculations.

Microsoft Excel has the basic features of all spreadsheets,[4] using a grid of *cells* arranged in numbered *rows* and letter-named *columns* to organize data manipulations like arithmetic operations. It has a battery of supplied functions to answer statistical, engineering and financial needs. In addition, it can display data as line graphs, histograms and charts, and with a very limited three-dimensional graphical display. It allows sectioning of data to view its dependencies on various factors for different perspectives (using *pivot tables* and the *scenario manager*).[5] It has a programming aspect, *Visual Basic for Applications*, allowing the user to employ a wide variety of numerical methods, for example, for solving differential equations of mathematical physics,[6][7] and then reporting the results back to the spreadsheet.

Excel supports charts, graphs, or histograms generated from specified groups of cells. The generated graphic component can either be embedded within the current sheet, or added as a separate object.

An Excel worksheet, or spreadsheet, is a two-dimensional grid with columns and rows. Look at the spreadsheet below. The column names are letters of the alphabet starting with A, and the rows are numbered chronologically starting with the number one. The cells in the first *row* are A1, B1, C1, and so on. And the cells in the first *column* are A1, A2, A3, and so on. These are called cell names or cell references.

We use cell references when creating math formulas or functions. For example, the formula to add the contents of cells B2 and B3 together is: =B2+B3.
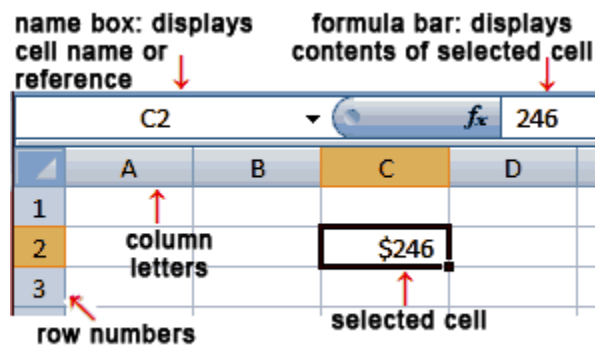
The Name Box is located in the area above Column A, and displays the cell reference of the selected cell - the cell where the cursor is resting. In our spreadsheet above, the selected cell is C2. Notice that the column letter (C) and the row number (2) change color.

The beginning of the Formula Bar can be seen in the area above Column D on our worksheet. The Formula Bar displays the contents of the selected cell.

A workbook is a collection of worksheets or spreadsheets. When the Excel program is opened, a workbook opens with three blank worksheets. The names of the worksheets are displayed on tabs at the bottom of the Excel window.

C) POWER POINT

Microsoft PowerPoint is a slide show presentation program currently developed by Microsoft. PowerPoint is useful for helping develop the slide-based presentation format, and is currently one of the most commonly used presentation programs available.

PowerPoint 2010 is a visual and graphical application, primarily used for creating presentations. With PowerPoint, you can create, view, and present slide shows that combine text, shapes, pictures, graphs, animation, charts, videos, and much more.

Create a presentation

1. Click the File tab, and then click New.
2. Do one of the following:
3. Click Blank Presentation, and then click Create.

Open a presentation

1. Click the File tab, and then click Open.
2. In the left pane of the Open dialog box, click the drive or folder that contains the presentation that you want.
3. In the right pane of the Open dialog box, open the folder that contains the presentation.
4. Click the presentation, and then click Open.

Save a presentation

1. Click the File tab, and then click Save As.
2. In the File name box, type a name for your PowerPoint presentation, and then click Save.

Insert a new slide

To insert a new slide into your presentation, do the following:

- On the Home tab, in the Slides group, click the arrow below New Slide, and then click the slide layout that you want.

View a slide show

To view your presentation in Slide Show view from the first slide, do the following:

- On the Slide Show tab, in the Start Slide Show group, click From Beginning.

To view your presentation in Slide Show view from the current slide, do the following:

- On the Slide Show tab, in the Start Slide Show group, click From Current Slide.

Print a presentation

1. Click the File tab, and then click Print.
2. Under Print What, do one of the following:
    o To print all slides, click All.
    o To print only the slide that is currently displayed, click Current Slide.
    o To print specific slides by number, click Custom Range of Slides, and then enter a list of individual slides, a range, or both.

Expt. No. 07   Date

Creating an e-mail account, sending and receiving mails

==

Theory

      Electronic mail is a method of exchanging digital messages between computer users. Email operates across computer networks. Today's email systems are based on a store-and-forward model. Email servers accept, forward, deliver, and store messages. Neither the users nor their computers are required to be online simultaneously; they need to connect only briefly, typically to a mail server, for as long as it takes to send or receive messages.

      Many email providers have a web-based email client (e.g. AOL Mail, Gmail, Outlook.com and Yahoo! Mail). This allows users to log in to the email account by using any compatible web browser to send and receive their email. Mail is typically not downloaded to the client, so can't be read without a current Internet connection.

      Email has been widely accepted by business, governments and non-governmental organizations in the developed world, and it is one of the key parts of an 'e-revolution' in workplace communication.

Setting up a Gmail account

      To create a **Gmail** address, you'll first need to create a **Google account.** Gmail will redirect you to the Google account signup page. You'll need to provide some basic information like your **name**, **birth date**, **gender**, and **location**. You will also need to choose a **name** for your new Gmail address. Once you create an account, you'll be able to start adding **contacts** and adjusting your **mail settings**..

To create an account:

1. Go to www.gmail.com.
2. Click **Create account.**

3. The **signup** form will appear. Follow the directions and enter the required information.

4. Review Google's Terms of Service and Privacy Policy, click the check box, then click **Next step**.

5. Here, you'll have an opportunity to set up **recovery options**. Recovery options are helpful if you forget your password or if someone tries to access your account. If you don't want to set up recovery options at this time, click **Done**.
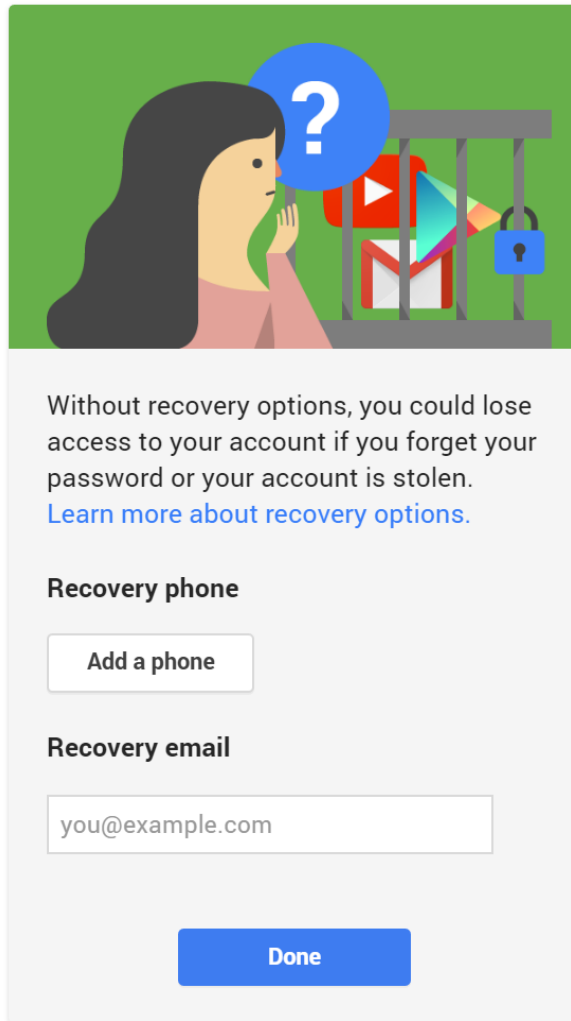
6. Your account will be created, and the Google welcome page will appear.
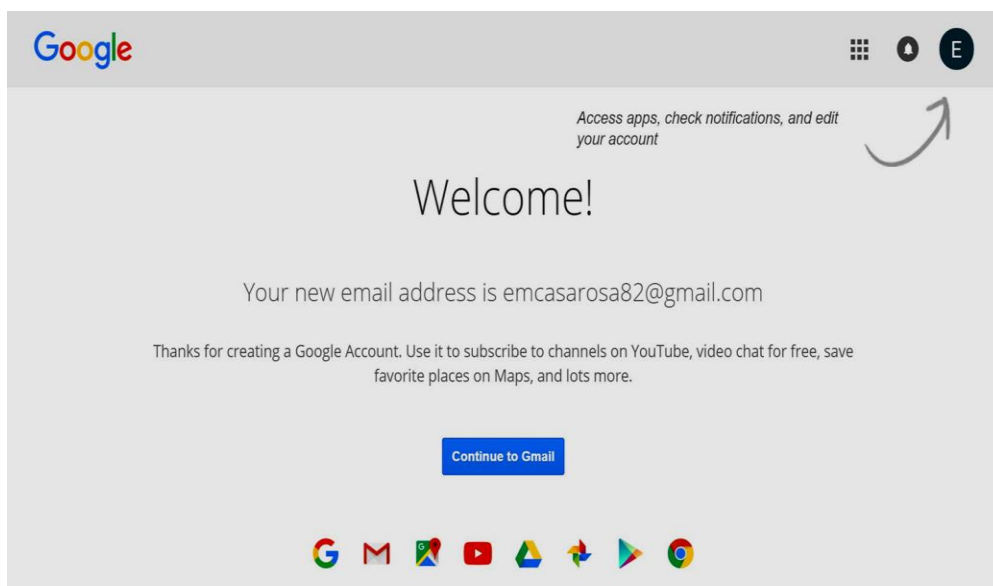
❖ SEND AN EMAIL

Step 1: Log in to your Gmail account so that you are on the dashboard (main page) of your mail account.

Step 2: Click Compose.

Step 3: A new blank email window will open up. In the 'To' box, type in the email address of the recipient**.**

Step 4: The subject field allows you to give the recipient an idea of the topic of your email, like a heading. You don't have to put anything in the subject box, but it can help when viewing and sorting email.

Step 5: Email text can be formatted in a similar way to text in a word document. You can change the font style, colour and size using the formatting icons. You can also create bullet points and check the spelling of your email. Choose your formatting from the menu shown.

Step 6: Type your message in the main body field of your email.

Step 7: When you're happy with your email, click the blue **Send** button at the bottom of the compose window.

Step 8: The email you've sent will now be stored in the 'Sent Mail' folder on your Gmail dashboard. You may have to run your mouse pointer over the Inbox folder link to see the other folders.

Step 9: You may start an email but then decide to come back to it later rather then sending it straightaway. Gmail saves your drafts automatically. So you can simply close the email and the unfinished email will be saved to your 'Drafts' folder. When you decide that you're ready to send it, you can retrieve it from the 'Drafts' folder by clicking **Drafts** and then clicking the correct item in the 'Drafts' folder list. Finish the email and click **Send** as normal.

❖ EMAIL A DOCUMENT

Step 1: Log in to your email account so that you are on the dashboard (front page) of your mail account.

Step 2: Click **Compose**. Alternatively, you can reply to an email that you've received by double-clicking on it in your list of received emails, then following the same steps.

Step 3: Once your new email is open, type your recipient's email address in the 'To' field. Then put a title for your email in the 'Subject' box and type your message.

Step 4: Click on the paper clip icon at the bottom of the compose window.

Step 5: Browse through your Windows folders until you reach the document you want to attach to your email. Highlight this by clicking on it and then click **Open**. This will add the document as an attachment to your email.

Step 6: You can tell that your document has been attached to you email by its file name appearing in blue text at the bottom of the compose window.

Step 7: If you want to attach another document, click the paperclip icon again and repeat **steps 4 and 5**.

Step 8: When you're ready to send your email, click **Send**.

❖ OPEN AN EMAIL

Step 1: Log into your Gmail account so that you are on the dashboard (main page) of your account.

Step 2: Go to your inbox.

Step 3: The inbox shows a list of emails received, arranged in columns. The one towards the left shows who the email is from, the one in the centre gives the subject of each email, and you'll find the time and date when each one was received in the right-hand column. If you haven't opened and read an email, this information will appear as bold text in the list. Once you've opened and read the

email and then returned to the inbox, the read email will be displayed in normal, non-bold text.

Gmail now categorises your emails into 'Primary' (what it deems to be important), 'Social' (updates from your social media accounts) and 'Promotions' (promotional emails from brands and companies). If you are expecting an email and it doesn't appear in your primary tab, do check the other tabs in case it has been incorrectly categorised by Gmail.

Step 4: Once you've identified an email you wish to open, click on the line that shows the information about that email.

Step 5: You can now read the content of the email and reply if you wish by clicking on the arrow at the top right hand of the email for reply or by clicking **Reply** underneath the message.

Step 6: When you've finished reading your email, click **back to inbox** icon to close the email and go back to the list of emails in your inbox.

❖ **OPEN AN ATTACHMENT IN EMAIL**

Step 1: Log in to your email account.

Step 2: Make sure you're in your inbox.

Step 3: An email with an attachment will have a paperclip icon next to it to show that there's something attached to the email you've received. Click on the icon.

Step 4: The email will open up with the attachment shown at the bottom.

Step 5: Hover over the attachment to see the download options. In this instance, you can open the document as a 'Google Doc' or download it to your computer. We will click the **down arrow** to download it to our computer.

Another box will pop up asking if you want to 'Open', 'Save' or 'Cancel' the download. Click **Save**.

Step 6: Find a place to save your document and download it to your computer. Once the document has been downloaded, you may be offered another dialogue

box with further options: open the document itself by clicking **Open**; or open the folder to which the document has been saved by clicking **Open folder**.

Step 7: Click **Back to Inbox** to go back to your list of received emails. You'll now be able to access through your Windows folders the attachment saved on your computer.

Expt No. 08   Date

An introduction to INTERNET, search engines, websites, browsing and Downloading.

❖ **INTERNET**

The internet is a telecommunications network that uses telephone lines, cables, satellites and wireless connections to connect computers and other devices to the World Wide Web. All modern computers can connect to the internet, as can many mobile phones and some televisions, video game consoles and other devices.

The internet can be used to:

- access a huge 'library' of information from the millions of websites around the world that make up the World Wide Web
- send and receive email messages
- share photographs and video clips with your friends and family
- buy goods and services (and often save money!)
- carry out online banking
- use Skype to make free phone calls to other computer users
- play games with other people online
- catch up on TV and radio programmes that you've missed – or watch them again
- learn something new with an online course.

❖ **WEB BROWSER**

A *web browser* is a program on your computer that allows you to access websites on the internet.

The web is written in a computer language called HTML (HyperText Markup Language). Browsers translate this so that we can read it easily.

There are many browsers available. If you're using a Windows PC, your machine probably came with the browser Internet Explorer. If you are using an Apple Mac, you'll have been supplied with Safari. No matter which browser you're using, you'll find that they all do more or less the same job.

Here are the most popular browsers:

- **Internet Explorer (Microsoft)**
- **Safari (Apple)**
- **Firefox (Mozilla)**
- **Chrome (Google)**

Browsers' benefits and key features

- They're free to download.
- You can have more than one on your computer.
- They all work in a similar way.
- They allow users to explore websites anywhere on the internet.
- Can be personalised by allowing users to add favourites or set a different home page (the first page that you see when you open your browser).

❖ **SEARCH ENGINES**

A search engine enables you to find specific information within the huge mass of data that's stored on the internet. It's usually a dedicated website, but it can take the form of an 'app' on a hand-held device or simply be a 'search window' on a website that can be about almost anything. Search engines work by matching inputted words with pages on the internet.

By typing words into the box on the home page of a search engine such as Google and clicking **Search**, a page will be displayed containing results – that is, links to web pages – related to the search terms (also known as 'key words') you've entered. These results, commonly known as 'hits', will usually be listed in order of relevance to the exact terms entered. Some search engines even display results that are tailored to your previous search activity.

There are many search engines available on the internet. Here are just a few of them:

- Google is probably the best-known search engine, so much so that in 2006 it became a verb in the Oxford English Dictionary!
- Bing, Microsoft's own search engine, is usually built into the Internet Explorer browser.
- Originally called 'Ask Jeeves', it was renamed as Ask.com in 2005. It was then relaunched recently as Ask Jeeves... again! It responds to full questions rather than to keywords.
- Yahoo! is also a popular search engine.

Using a search engine

Use the links above to access a search engine. Then all you have to do is enter keywords (or, in the case of Ask.com, a question) in the space provided – called the 'search box' – and click **Search**.

For example, if you put 'microorganisms' into the search box and click Search, you'll come up with page after page of information regarding microorganisms.

A search engine can be used to look for products, companies, people, information, images, directions and maps. You'll never again be frustrated by having that answers on the tip of your tongue … just Google the keywords!

❖ **WEB**

The web – or the 'World Wide Web' – is, in simplistic terms, a system of interlinked documents or web pages accessible via the internet. Using a web browser, you can access these documents and then navigate between them by clicking on highlighted bits of text known as 'hyperlinks'. To clarify: the web is a part of the internet. They are often considered interchangeable terms, but this is not the case.

❖ **WEBSITES**

A website, or 'site', is simply a collection of web pages that relate to each other and sit within the same internet domain – for instance, digitalunite.com. The main, or initial, page is known as the 'home page' and here you'll find hyperlinks (or 'links') to all the other 'subpages' contained within the website. These links are usually highlighted or made distinctive in some way, allowing you to find them easily so that you can click on them to get to another part of the site.

❖ **WEBPAGE**

A web page is what you see on your screen when you access the internet via a browser. There are billions of web pages on the internet that are connected by hyperlinks to other relevant pages or information resources. Web pages can be accessed by entering terms into a search engine, which will produce relevant

highlighted links for you to click on. When you click on such a link, the page should subsequently be displayed on your computer screen.

❖ HYPERLINK

A hyperlink – more commonly known as a 'link' – allows you to navigate your way around a website. It's a graphic or piece of text that literally links you directly to another web page or related information source. Hyperlinks are usually underlined, highlighted or coloured in some way to distinguish them from the rest of the text displayed, allowing you to click on them with your mouse to access this new page or additional information.

❖ DOWNLOADING

Downloading' is essentially copying data – music, text, images or other information – from a source on the internet and saving it to your computer. It usually involves a process as simple as clicking on a link and following instructions.

In computer networks, to **download** is to receive data from a remote system, typically a server[1] such as a web server, an FTP server, an email server, or other similar systems.

Download is a term used to describe the process of copying data from another computer, either over a network or modem. For example, each time you visit a web page on the Internet, you download the information on the page, including any pictures, to your computer. The term download is often associated with pictures, songs, videos, and programs. A good example of this is downloading a video from YouTube so that you can save it to your hard drive.

The speed at which your computer downloads a file depends largely on the speed of your Internet or network connection. A faster Internet or network connection typically results in a shorter amount of time to download a file.