Experiment -4

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* **Aim :-** Prepare a Bar-diagram and pie-chart for the given data.

* **Experiment :-** Draw a pie-chart & bar-diagram for the following data.

Year	Number of Students
2012	2015
2013	2075
2014	2100
2015	2000
2016	2200

* **Theory :-**

Bar Graph :- A bar graph is a graph that represents categorical data with rectangular bar and height or length of the

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bars is propotional to the value they represent. They can be plotted vertical or horizontal.

Pie-chart :- A pie chart is a circular statistical graph which is divided into slices to illustrate numerical portion. In pie chart the length of each slice is propotional to the quantity it represents.

* Procedure :- (a) for bar graph (b) for pie chart

(i) Enter data in Excel sheet.
(ii) Select the whole data
(iii) Go to the insert menu and click on chart option.
(iv) Click on

(a) Insert column or bar chart and select Bar diagram (2D) or column chart from chart menu. A bar graph will be inserted. Now right click on the graph and in

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add option, add the gridlines, axis values, axis title and chart title.

(b) Insert the pie-chart and add the details respectively.

* Interpretation :- After analysing the graph we can say

① Maximum number of students present in 2016.
② Minimum number of students present in 2015.

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* **Aim :-** Prepare a multiple bar graph for the following data.

* **Experiment :-** The following years give the number of students in various streams.

Prepare a multiple bar graph with the help of the given data.

Years	No. of Science Students	No of Arts Students	No. of Commerce Students
2012	650	400	700
2013	700	420	720
2014	820	500	800
2015	850	530	820
2016	900	520	810

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* Theory :- Multiple bar graph is used in comparing two or more series of data on the same variable. In this method bars of equal width are taken for the difference items of the series. The length of bar represents the value of the variable concerned.

* ~~Procedure~~ ✂

* Interpretation :-

① In the graph, we can see that the number of students is increasing along with the year.

② The maximum students in Science is in 2016 but the maximum students in Arts and Commerce are in 2015. There is little bit difference between 2015 & 2016 in students.

Experiment-6

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* **Aim :-** To compute Arithmetic Mean, Geometric Mean, Harmonic mean, Median, Mode. Also verify that $A.M \geq G.M. \geq H.M.$

* **Experiment :-** For the following distribution

Class Interval	Frequency
29 - 31	14
31 - 33	7
33 - 35	19
35 - 37	11
37 - 39	13
39 - 41	6

(a) Compute Arithmetic, Geometric & Harmonic mean.
(b) Verify $A.M. \geq G.M. \geq H.M.$
(c) Compute Median & Mode from the data.

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* Theory & Formula used :-

Arithmetic Mean :- Arithmetic mean of a set of observations is their sum divided by total number of observations.

$$\bar{x} = \frac{\sum_{i=1}^{n} f_i x_i}{N}$$ where x_i = mid value
f_i = frequency
$N = \sum_{i=1}^{n} f_i$

Geometric Mean :- G.M. of a set of ~~obse~~ observations is the product of observation raise to the power n^{th} root of number of observations.

$$G.M. = (x_1 \cdot x_2 \cdot x_3 \cdots x_n)^{\frac{1}{n}} \text{ or } \text{Antilog}\left[\frac{\sum f_i (\log x_i)}{N}\right]$$

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Harmonic Mean :- H.M. of n observations $x_1, x_2, x_3, \ldots, x_n$ is

$$H.M. = \frac{N}{\left(\sum f_i \times \left(\frac{1}{x_i}\right)\right)}$$

Median :- Median is a value that divides the whole data set into two equal parts. It is denoted by M_d.

$$M_d = l + \frac{\left(\frac{N}{2} - cf\right)}{f} \times h$$

Where l = lower limit of median class
f = frequency of median class.
h = magnitude of median class.
$N = \Sigma f$ = sum of all frequencies
cf = cumulative frequency of previous class.

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· Mode :- It is the value which occurs most frequently in a set of observation.

$$M_o = l + \frac{h(f_1 - f_0)}{2f_1 - f_0 - f_2}$$

Where l = lower limit of modal class.
h = magnitude of modal class.
f_0 = frequency of previous class.
f_1 = frequency of modal class
f_2 = frequency of next class

* Result :-

A.M. = 34.57 , G.M. = 34.42 ,
H.M. = 34.28 ,

M_d = 34.47 , M_o = 34.2

You can see very little bit difference between A.M., G.M., H.M.. So We can say [A.M. ≥ G.M. ≥ H.M.]

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* **Aim:-** Draw Histogram & Ogive of given data.

* **Experiment:-** The following data gives the marks distribution in the paper of statistics. ~~Perhaps~~ Prepare Histogram & Ogive.

Class Interval	Frequency
10 - 20	5
20 - 30	9
30 - 40	12
40 - 50	15
50 - 60	11
60 - 70	7
70 - 80	4
80 - 90	2

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* Theory :-

Histogram :- It is a graphical representation of a group frequency distribution. It consists of a set of continuous rectangles one over each class interval having their areas propational to the corresponding class frequency. The class interval taken on X-axis and class frequencies or densities are plotted against the Y-axis.

Ogive :- An ogive, sometimes called a cumulative frequency polygon that shows cumulative frequencies. In other words the cumulative percents are added on the graph from left to right.

* Interpretation :- After drawing the both Ogives we can say that Median ≈ 45

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* **Aim :-** To obtain quartile deviation & its coefficient.

* **Experiment :-** From the following frequency distribution, calculate quartile deviation and its coefficient.

Class Interval	Frequency
0 - 10	6
10 - 20	5
20 - 30	8
30 - 40	15
40 - 50	7
50 - 60	6
60 - 70	3

* **Theory & Formula used :-**

Quartile Deviation (Q.D.) :- Quartile Deviation is defined as

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the average amount by which by which the two quartiles differ from median.

$$Q.D. = \frac{Q_3 - Q_1}{2}$$

Q_1 = First Quartile
Q_3 = Third Quartile

$$\text{Coefficient of } Q.D. = \frac{Q_3 - Q_1}{Q_3 + Q_1}$$

* **Result :-**

Quartile Deviation (Q.D.) : 11.5625

Coefficient of Q.D. : 0.34579

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* **Aim :-** To prepare a frequency distribution table for the following data.

* **Experiment :-** The following numbers give the weights of 55 students. Prepare a suitable frequency table.

42	74	40	60	82	115	41	61	75	83	63
53	76	84	50	67	110	65	78	77	56	95
68	69	80	79	79	104	54	73	59	81	66
49	77	90	84	76	100	42	64	69	70	80
72	50	79	52	96	103	51	86	78	94	71

* **Theory & Formula used :-** A table showing the distribution of frequencies in different classes is called a frequency table and the manner in which the class frequencies are distributed over the class intervals is called the grouped frequency distribution of variables.

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Formula :

Range = Maximum value - Minimum value

No. of classes = $k = 1 + 3.22 \log_{10} N$ $\quad N = \Sigma f$

Class width = Range / k

* Result :-

Minimum value = 40

Maximum value = 115

Range = 75

$k = 6.78 \approx 7$

Class width = $11.06 \approx 11$

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* **Aim :-** To calculate combined mean and combined standard deviation of given data.

* **Experiment :-** The following data gives the arithmetic mean and standard deviation of three sub-groups. Calculate the combined arithmetic mean and standard deviation.

Groups	No. of persons	A.M.	S.D.
A	50	61	8
B	100	70	9
C	120	80.5	10

* **Theory & Formula used :-** The combined arithmetic mean for 'n' series can be computed by

$$\bar{x} = \frac{\sum n_i \bar{x}_i}{\sum n_i}$$

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where $\bar{x}_i$ = mean of the i^{th} observation
n_i = size of i^{th} observation

The combined standard deviation can be computed :-

$$\sigma = \sqrt{\frac{1}{\sum_{i=0}^{n} n_i} \left[\sum_{i=0}^{n} \left(n_i \left(\sigma_i^2 + d_i^2 \right) \right) \right]}$$

where $d_i = \bar{X}_i - \bar{X}$

$\bar{X}_i$ = mean of i^{th} group
$\bar{X}$ = combined mean

* **Result** :-

Combined mean = 73
Combined variance = 141.2963
Combined Standard Deviation = 11.8868

Experiment-15

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* **AIM :-** To compute the rank correlation coefficient for the following data.

* **Experiment :-** Ten competitors in a beauty contest are ranked by three judges as follows:

~~Judges~~

Judges	1	2	3	4	5	6	7	8	9	10
A	6	5	3	10	2	4	9	7	8	1
B	5	8	4	7	10	2	1	6	9	3
C	4	9	8	1	2	3	10	5	7	6

Which pairs of judges has the nearest approach to common tests of beauty.

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* Theory & Formula used :- Rank correlation coefficient is a technique which can be used to summarise the strength and direction (negative or positive) of a relationship between two variables. It yields a value between -1 to 1. It does not have a unit. The formula is :

$$\rho = 1 - \frac{6 \Sigma d_i^2}{n(n^2-1)}$$

where d_i = square of the differences of the ranks.

* Conclusion :- Since two pairs AB & AC have maximum value of correlation so we conclude that these pairs of judges have the nearest approach to common test of beauty.