## <u>Summary</u>

- When the values of one variable are associated with or influence by other variable, example, the age of husband and wife, the height of father and son, the supply and demand of a commodity and so on, Karl Pearson's coefficient of correlation can be used as a measure of linear relationship between them. But sometimes there is interrelation between many variables and the value of one variable may be influence by many others, example, the yield of crop per acre, say X<sub>1</sub> depends upon quality of seed say X<sub>2</sub>, fertility of soil, say X<sub>3</sub>, fertilizer used say X<sub>4</sub>, irrigation facilities say X<sub>5</sub>, weather conditions say X<sub>6</sub> and so on. Whenever we are interested in studying the joint effect of a group of variables upon a variable not included in that group, our study is that of multiple correlation and multiple regression.
- In tri-variate distribution in which each of the variables  $X_1$ ,  $X_2$ , and  $X_3$  has N observations, the multiple correlation coefficient between  $X_1$  on  $X_2$  and  $X_3$  is, usually denoted by  $R_{1.23}$  is the simple correlation coefficient between  $X_1$  and the joint effect of  $X_2$  and  $X_3$  on  $X_1$ . In other words  $R_{1.23}$  is the correlation coefficient between  $X_1$  and its estimated value as given by the plane of regression of  $X_1$  on  $X_2$  and  $X_3$ .
- Multiple correlation coefficient of 3 variables is given by,

 $R_{1.23}^{2} = \frac{r_{12}^{2} + r_{13}^{2} - 2r_{12}r_{13}r_{23}}{1 - r_{23}^{2}}$ , which expresses the multiple correlation

coefficient in terms of the total correlation coefficient between the pairs of variables.

- The multiple correlation coefficient in terms of total and partial correlation coefficient is given by,  $1 R_{123}^2 = (1 r_{12}^2)(1 r_{132}^2)$
- Multiple correlation coefficient measures the closeness of the association between the observed values and the expected values of a variable obtained from the multiple linear regression of that variable on other variables.