## Linear Regression:

If two variables $x$ and $y$ are correlated, there exist an relationship between them, and if we draw the graph then it will be a curve. This curve is called curve of regression. In particular if the curve is straight line, then it is called line of regression. [In our syllabus only linear (line of regression) is required.

# In other words, a line of regression is the straight line which gives the best fit in the least square sense to the given frequency.

## Lines of Regression:

The line of regression of $y$ on $x$ is, $$y - \bar{y} = r \frac{\sigma_y}{\sigma_x}(x - \bar{x})$$

The line of regression of $x$ and $y$ is $$x - \bar{x} = r \frac{\sigma_x}{\sigma_y}(y - \bar{y})$$

where, $r\frac{\sigma_y}{\sigma_x}$ is called the regression co-efficient of y on x and is denoted by $b_{yx}$.

$r\frac{\sigma_x}{\sigma_y}$ is called the regression co-efficient of x on y and is denoted by $b_{xy}$

r is the correlation co-efficient between x and y.

# i.e., The line of regression of y on x is, $y - \bar{y} = b_{yx}(x - \bar{x})$, where $b_{yx} = r\frac{\sigma_y}{\sigma_x}$

# The line of regression of x on y is $x - \bar{x} = b_{xy}(y - \bar{y})$, where $b_{xy} = r\frac{\sigma_x}{\sigma_y}$.

Note: (i) If $r = 0$, then $y = \bar{y}$ and $x = \bar{x}$, i.e the lines are parallel to x and y axis passing through $\bar{y}$ and $\bar{x}$.

(ii) If $r = \pm 1$, the two lines of regression will coincide.

## ± Angle bet$^{n}$ two lines of regression

If $\theta$ is the ang bet$^{n}$ two regression lines in case of two variables $x$ and $y$, then, $\tan\theta = \frac{1 - r^2}{r} \frac{\sigma_x \sigma_y}{\sigma_x^2 + \sigma_y^2}$