

## Correlation Formulas

### Correlation (Pearson's r)

*Deviation Score – Not recommended for computation*

$$r = \frac{\sum xy}{nS_x S_y} \quad x = (X - \bar{X}) \quad y = (Y - \bar{Y})$$

$$S_x = \sqrt{\frac{\sum (X - \bar{X})^2}{n}} \quad S_y = \sqrt{\frac{\sum (Y - \bar{Y})^2}{n}}$$

*Raw Score*

$$r = \frac{\sum xy}{\sqrt{(SS_x)(SS_y)}} \quad \sum xy = \sum XY - \frac{(\sum X)(\sum Y)}{n}$$

$$SS_x = \sum X^2 - \frac{(\sum X)^2}{n} \quad SS_y = \sum Y^2 - \frac{(\sum Y)^2}{n}$$

### Rank Order (Spearman's r)

$$r_s = 1 - \frac{6 \sum D^2}{n(n^2 - 1)}$$

### Point Biserial

$$r_{bp} = \frac{n \sum Y_1 - n_1 \sum Y}{\sqrt{n_1 n_0 [n \sum Y^2 - (\sum Y)^2]}}$$