

Examples of SUMMATION NOTATION for the dataset

X	x_1 1	x_2 5
Y	y_1 4	y_2 10

$n = 2$ data points (x_i, y_i)

$$\sum X = \sum_{i=1}^2 X_i = X_1 + X_2 = 1 + 5 = \boxed{6}$$

$$\sum Y = \sum_{i=1}^2 Y_i = Y_1 + Y_2 = 4 + 10 = \boxed{14}$$

$$\bar{X} = \frac{\sum X_i}{n} = \frac{X_1 + X_2}{2} = \frac{1 + 5}{2} = \boxed{3}$$

$$\bar{Y} = \frac{\sum Y_i}{n} = \frac{Y_1 + Y_2}{2} = \frac{4 + 10}{2} = \boxed{7}$$

$$\sum X^2 = \sum_{i=1}^2 X_i^2 = X_1^2 + X_2^2 = 1^2 + 5^2 = 1 + 25 = \boxed{26}$$

$$(\sum X)^2 = \left(\sum_{i=1}^2 X_i \right)^2 = (X_1 + X_2)^2 = (1 + 5)^2 = 6^2 = \boxed{36}$$

note: these are different!

$$(\sum X)(\sum Y) = (X_1 + X_2)(Y_1 + Y_2) = (1 + 5)(4 + 10) = 6 \cdot 14 = \boxed{84}$$

$$\sum XY = X_1 Y_1 + X_2 Y_2 = 1 \cdot 4 + 5 \cdot 10 = 4 + 50 = \boxed{54}$$

note: these are different!

$$\sum (X - \bar{X})^2 = \sum_{i=1}^2 (X_i - \bar{X})^2 = (X_1 - \bar{X})^2 + (X_2 - \bar{X})^2 = (1 - 3)^2 + (5 - 3)^2 = (-2)^2 + 2^2 = 4 + 4 = \boxed{8}$$

$$\sum (X - \bar{X}) \cdot (Y - \bar{Y}) = \sum_{i=1}^2 (X_i - \bar{X})(Y_i - \bar{Y}) =$$

$$(X_1 - \bar{X}) \cdot (Y_1 - \bar{Y}) + (X_2 - \bar{X}) \cdot (Y_2 - \bar{Y}) =$$

$$(1 - 3) \cdot (4 - 7) + (5 - 3) \cdot (10 - 7) =$$

$$\begin{array}{ccccc} (-2) & (-3) & + & (2) & (3) \\ 6 & & + & 6 & = \boxed{12} \end{array}$$