

$$\sum_{i=1}^n (y_i - \bar{y} + \hat{\beta}_1 \bar{x} - \hat{\beta}_1 x_i) x_i = 0$$

$$\sum_{i=1}^n (y_i - \bar{y}) + \hat{\beta}_1 (\bar{x} - x_i) = 0$$

$$\hat{\beta}_1 = \frac{\sum_{i=1}^n (y_i - \bar{y})}{\sum_{i=1}^n (x_i - \bar{x})}$$

$$\sum_{i=1}^n (x_i - \bar{x})$$

$$\hat{\beta}_1 = \frac{\sum_{i=1}^n (y_i - \bar{y})(x_i - \bar{x})}{\sum_{i=1}^n (x_i - \bar{x})^2}, \quad \bar{y} = \frac{\sum_{i=1}^n y_i}{n}, \quad \bar{x} = \frac{\sum_{i=1}^n x_i}{n}$$