

Ex-1 — Karl Pearson's Correlation

Data

x: 10, 14, 18, 22, 26, 30

y: 18, 12, 24, 6, 30, 36

$$r = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sqrt{\sum (x - \bar{x})^2 \sum (y - \bar{y})^2}} = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sqrt{\sum (x - \bar{x})^2 \sum (y - \bar{y})^2}} = 0.60$$

Answer: $r = 0.6$

Ex-2 — Correlation from Regression Lines

Given lines

$$x + 6y = 6, 3x + 2y = 10 \quad \text{and} \quad 3x + 2y = 10, x + 6y = 6$$

Convert to:

$$y = 1 - \frac{x}{6}, x = 10 - \frac{2}{3}y \quad \text{and} \quad y = 1 - \frac{x}{6}, x = 10 - \frac{2}{3}y$$
$$b_{yx} = -\frac{1}{6}, b_{xy} = -\frac{2}{3} \quad \text{and} \quad b_{yx} = -\frac{1}{6}, b_{xy} = -\frac{2}{3}$$
$$r = \frac{b_{yx}}{\sqrt{b_{yx}^2 + b_{xy}^2}} = \frac{-\frac{1}{6}}{\sqrt{\left(-\frac{1}{6}\right)^2 + \left(-\frac{2}{3}\right)^2}} = -\frac{1}{\sqrt{5}}$$

Answer: $r = -\frac{1}{\sqrt{5}}$

Ex-3 — (Partially Destroyed Record)

This one needs the correct equation signs (\pm before 10y and 18y).

Please confirm the exact form of both regression equations — then I'll solve it fully.

Ex-4 — Rank Correlation (3 Judges)

Pairwise Spearman correlations:

Judges	ρ
1 & 2	-0.212
1 & 3	0.636
2 & 3	-0.297

Nearest agreement: Judge-1 & Judge-3

Ex-5 — Pearson's Coefficient of Skewness

Mode = 32 (highest frequency)

$$\bar{x}=25.712, \sigma=6.332 \quad \bar{x} = 25.712, \quad \sigma = 6.332$$

$$Sk = \frac{\text{Mean} - \text{Mode}}{\sigma} = \frac{25.712 - 32}{6.332} = -0.993$$

Answer: $Sk \approx -0.993$

Ex-6 — Correlation

$$r = 0.603$$

Answer: $r \approx 0.603$

Ex-7 — Regression Lines

$$y = x + 288, \quad 4y = x + 389$$

Means = intersection

$$(\bar{x}, \bar{y}) = (162, 50)$$

(i) Estimate y when x=99

$$y = x + 288 \Rightarrow y = 99 + 288 = 387$$

(ii) Estimate x when y=30

From $x=4y-38$ $x = 4y-38$

$$x=4(30)-38=82 \quad x = 4(30)-38 = 82 \quad x=4(30)-38=82$$

Answers:

$$y(99)=43, x(30)=82, \bar{x}=162, \bar{y}=50 \quad y(99)=43, \quad x(30)=82, \quad \bar{x}=162, \quad \bar{y}=50$$

Ex-8 — Skewness

$$\begin{aligned} \bar{x} &= 45.2, \quad \bar{x} = \frac{452}{10} = 45.2, \quad \bar{x} = 45.2 \\ \sigma &= \sqrt{\frac{\sum x^2}{n} - \bar{x}^2} = 19.595, \quad \sigma = \sqrt{\frac{\sum x^2}{n} - \bar{x}^2} = 19.595 \\ S_k &= \frac{\bar{x} - 43.7}{\sigma} = \frac{45.2 - 43.7}{19.595} = 0.0766, \quad S_k = \frac{45.2 - 43.7}{19.595} = 0.0766 \end{aligned}$$

Answer: $S_k \approx 0.077$

Ex-9 — Correlation

Data symmetric about origin (U-shape)

$$r=0 \quad r = 0$$

Answer: $r=0$

Ex-10 — Regression Lines & Estimate yyy at x=65

$$\begin{aligned} \bar{x} &= 60, \quad \bar{y} = 69, \quad \bar{x} = 60, \quad \bar{y} = 69 \\ b_{yx} &= \frac{\sum xy}{\sum x^2} = 0.667, \quad b_{yx} = 0.667 \\ b_{xy} &= \frac{\sum xy}{\sum y^2} = 0.545, \quad b_{xy} = 0.545 \end{aligned}$$

Estimate yyy when x=65

$$y = 69 + 23(5) = 72.33, \quad y = 69 + \frac{2}{3}(5) = 72.33$$

Answers

Regression of yyy on xxx:

$$y = 69 + 23(x - 60) \quad y = 69 + \frac{2}{3}(x - 60) \quad y = 69 + 32(x - 60)$$

Regression of xxx on yyy:

$$x = 60 + 0.545(y - 69) \quad x = 60 + 0.545(y - 69) \quad x = 60 + 0.545(y - 69) \quad y(65) = 72.33 \quad y(65) = 72.33 \quad y(65) = 72.33$$

Ex-11 — Rank Correlation (2 Judges)

$$\rho = -0.481 \quad \rho = -0.481 \quad \rho = -0.481$$

Answer: $\rho \approx -0.481$ $\rho \approx -0.481$ $\rho \approx -0.481$

Ex-12 — Regression of Performance on Experience

Regression of xxx on yyy:

$$x = -29.381 + 11.4286y \quad x = -29.381 + 11.4286y \quad x = -29.381 + 11.4286y$$

$$\text{For } y = 11 \quad y = 11 \quad y = 11$$

$$x = 96.33 \quad x = 96.33 \quad x = 96.33$$

Answers

Regression line:

$$x = -29.38 + 11.43y \quad x = -29.38 + 11.43y \quad x = -29.38 + 11.43y$$

Estimated performance at 11 years:

$$\hat{x} = 96.33 \quad \hat{x} = 96.33 \quad \hat{x} = 96.33$$