

Ex-1 — Karl Pearson's Correlation

Data

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

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

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

Answer: $r = 0.60$

Ex-2 — Correlation from Regression Lines

Given lines

$$x+6y=6, 3x+2y=10 \quad x+6y=6, 3x+2y=10$$

Convert to:

$$y=1-x/6, x=10-3y \quad x=(10-3y)/6, y=1-x/6$$
$$byx=-16, bxy=-23 \quad b_{xy}=-\frac{1}{6}, b_{yx}=-\frac{23}{6}$$
$$r=\text{sign}(b_{xy})\sqrt{b_{xy}b_{yx}} = -\sqrt{\frac{1}{6} \cdot \frac{23}{6}} = -\frac{1}{\sqrt{13}}$$
$$r=\text{sign}(b_{xy})\sqrt{b_{xy}b_{yx}} = -\frac{1}{\sqrt{13}}$$

Answer: $r = -\frac{1}{\sqrt{13}} = -\frac{1}{3.605} = -0.276$

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)

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

Answer: $Sk \approx -0.993 \approx -0.993$

Ex-6 — Correlation

$$r = 0.603 \approx 0.603$$

Answer: $r \approx 0.603 \approx 0.603$

Ex-7 — Regression Lines

$$9y = x + 288, 4y = x + 389 \quad \text{Mean} = 162.50$$

Means = intersection

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

(i) Estimate y when $x=99$

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

(ii) Estimate x when $y=30$

From $x=4y-38$

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

Answers:

$$y=43, x=82, \bar{x}=162, \bar{y}=50$$

Ex-8 — Skewness

$$\bar{x}=45.2$$

$$\sigma=\sqrt{\frac{\sum(x-\bar{x})^2}{n}}=19.595$$

$$Sk=\frac{45.2-43.7}{19.595}=0.0766$$

Answer: $Sk \approx 0.077$

Ex-9 — Correlation

Data symmetric about origin (U-shape)

$$r=0$$

Answer: $r=0$

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

$$\bar{x}=60, \bar{y}=69$$

$$b_{yx} = \frac{\sum(x-\bar{x})(y-\bar{y})}{\sum(x-\bar{x})^2} = 0.667$$

$$y - 69 = 0.667(x - 60)$$

$$y = 0.667x + 69 - 0.667 \cdot 60 = 0.667x + 23$$

Estimate y when $x=65$

$$y = 0.667 \cdot 65 + 23 = 72.33$$

Answers

Regression of y on x :

$$y = 69 + 23(x - 60)$$

Regression of xxx on yyy:

$$x = 60 + 0.545(y - 69)$$

Ex-11 — Rank Correlation (2 Judges)

$$\rho = -0.481$$

Answer: $\rho \approx -0.481$

Ex-12 — Regression of Performance on Experience

Regression of xxx on yyy:

$$x = -29.381 + 11.4286y$$

For $y=11$

$$x = 96.33$$

Answers

Regression line:

$$x = -29.38 + 11.43y$$

Estimated performance at 11 years:

$$x = 96.33$$