Pearson correlation and coefficient of determination

6 questions | 18 marks

Equivalent correct methods earn the corresponding marks.

1. Given $S_{xx} = 16, S_{yy} = 25$ and $S_{xy} = 18$, calculate r and r^2. [3 marks]

The denominator is $\sqrt{16 \times 25} = 20$.

Divide 18 by 20 and square the result.

Answer: $r = 0.9$; $r^2 = 0.81$.

2. A fit has $r = -0.75$. State its direction and percentage of response variation explained. [3 marks]

The sign gives negative association.

$100 \times (-0.75)^2 = 56.25$.

Answer: Negative direction; 56.25% explained.

3. A student reports $r = 1.12$. Explain the problem. [3 marks]

The theoretical range is $-1 \leq r \leq 1$.

Check data pairing, entry and the calculation.

Answer: A Pearson correlation cannot exceed 1.

4. A fitted model has $r^2 = 0.49$ and a negative slope. Find r. [3 marks]

Take the square root, giving magnitude 0.7.

Use the slope direction to choose the negative sign.

Answer: $r = -0.7$.

5. If every x-value is converted from metres to centimetres, what happens to r? [3 marks]

Multiplication by a positive constant changes scale, not linear correlation.

Answer: It stays the same.

6. All five response values are 7. Why is Pearson r undefined? [3 marks]

A standardised measure of shared variation cannot be calculated.

Answer: The response has zero variation, so $S_{yy} = 0$ and the denominator is zero.