Residuals

6 questions | 18 marks

Equivalent correct methods earn the corresponding marks.

1. For $\hat{y}=3+4x$ and the observation (2,13), find the residual. [3 marks]

Predicted response is $3+8=11$.

Residual $=13-11=2$.

Answer: 2.

2. For $\hat{y}=20-0.5x$ and the observation (6,15), find the residual. [3 marks]

Predicted response is 17.

Residual $=15-17=-2$.

Answer: -2.

3. A residual is -4 kg. Interpret its sign and unit. [3 marks]

Residuals retain response units.

Answer: The observation is 4 kg below the prediction, so the model overestimates mass by 4 kg.

4. Residuals are -0.4,0.6,-0.2,0.1,-0.1. Find their sum. Does a zero sum alone prove a good fit? [3 marks]

Add the signed residuals.

A zero sum can coexist with curvature or other unsuitable patterns.

Answer: Sum=0; no.

5. Residual spread grows as x increases. What feature needs investigation? [3 marks]

The fit may have non-constant error spread.

A single typical prediction error may not describe the whole range.

Answer: The variability of errors may increase with x.

6. A line was chosen by eye, not fitted by least squares. Must its residuals sum to zero? [3 marks]

A freely chosen line is not constrained by that fitting condition.

Answer: No. The zero-sum property applies to the least-squares intercept fit to the same data.