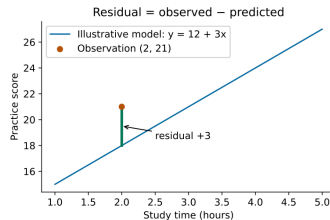


Scatterplots, model residuals and predictions

Original skill preparation; versioned source scope

Method and conditions



- A residual is observed minus predicted output.
- Linear functions; signed subtraction; scatterplot labels.

Worked method 1

Read and reason

A residual is observed minus predicted output. A journey model $T = 5 + 2d$ uses minutes for T and kilometres for d . $T(4) = 5 \text{ min} + (2 \text{ min/km})(4 \text{ km}) = 13 \text{ min}$. For observed time 16 minutes, $e = T_{obs} - T_{pred} = 16 \text{ min} - 13 \text{ min} = 3 \text{ min}$.

Original context 1

Read and reason

Task context

Read and reason

Each task below states its own complete data. Values may differ from the worked example.

Attempt 1.1

Read and reason

A fitted delivery model is $T = 8 + 1.5d$ minutes for observed distances 2–10 km. Interpret both parameters. At 6 km the observed time is 15 minutes; find its residual.

Reasoning 1.1

Read and reason

The intercept predicts 8 minutes at zero distance; zero lies outside the observed range, so this interpretation is extrapolated. The slope predicts an extra 1.5 minutes per kilometre. $T(6) = 8 \text{ min} + (1.5 \text{ min/km})(6 \text{ km}) = 17 \text{ min}$. Residual $e = 15 \text{ min} - 17 \text{ min} = -2 \text{ min}$, below the line.

Attempt 2.1

Read and reason

Predictions are requested at 7 km and 20 km. Classify each, and explain why a fitted slope does not prove distance alone causes all time variation.

Reasoning 2.1

Read and reason

Seven is inside 2–10, so interpolation. Twenty is outside, so extrapolation with weaker support. Traffic, loading and other conditions can influence time; a fitted association does not isolate their effects.

Attempt 3.1

Read and reason

At equally spaced inputs 0,1,2,3, outputs are 6,18,54,162. Choose a simple linear or exponential rule and predict at 4, stating the assumption.

Reasoning 3.1

Read and reason

Ratios are all 3, while differences vary. The exponential rule is $y = 6(3)^x$. Under continued factor-three growth, $y(4) = 6(3)^4 = 486$. This is a model-based extrapolation, not a guaranteed next observation.

Transfer and limits

Read and reason

Linear functions; signed subtraction; scatterplot labels.

Check yourself

Read and reason

Close the worked reasoning. Explain why the method fits the final transfer task, reconstruct its conclusion, and state a condition that would change your answer. Then check the full reasoning in the reference.