

AP Precalculus  
Residuals and Model Validation

Residuals and Model Validation | APPC-U01-P25

96 problems · Four activity formats

|    |                            |              |
|----|----------------------------|--------------|
| 01 | Answer Bank Challenge      | 24 tasks     |
| 02 | Grid Rounds                | 24 tasks     |
| 03 | Match & Move               | 24 cards     |
| 04 | Error Analysis & Strategy  | 24 tasks     |
| 05 | Quick Answer Key           | 96 answers   |
| 06 | Full Worked Solutions      | 96 solutions |
| 07 | Teacher / Parent Use Guide | included     |
| 08 | Terms of Use & License     | included     |

Topic focus

Across 96 tasks this topic asks for compliance and violations, acceptability, qualified adequacy, evidence claim, consistency judgment and correction and correction and meaning.

8 PDFs and a README; 105 buyer pages.





## AP Precalculus

Residuals and  
Model Validation

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Class: \_\_\_\_\_

Begin at START. Answer the card, then find the matching final answer at the top of another card. Use the recording sheet for your reasoning. Visit each card once and continue to FINISH.

**Incoming:** Case A has 5% error and case B has 0.25%; the same 0.2-meter residual is much more consequential at the smaller scale.

Use the model to produce the residual-plot points.

Given: domain: warehouse demand; payload: columns: day, observed orders; model:  $P(t) = 50 + 8t$ ; rows: (0, 51); (2, 64); (5, 93); (9, 119)

Construct the requested table/graph using the given axes, units and domain.

| day | observed orders |
|-----|-----------------|
| 0   | 51              |
| 2   | 64              |
| 5   | 93              |
| 9   | 119             |

Your response: \_\_\_\_\_

**Incoming:** No. The positive residual +6 is an underprediction exceeding the five-unit limit; -7, +4, and -3 satisfy their direction-specific limits.

Does the model satisfy the temperature requirement?

Given: domain: food temperature; payload: requirement: each magnitude at most 1 degree; residuals: -1.2, 0.8, 1.5, -0.4; unit: degrees Celsius

Your response: \_\_\_\_\_

**Incoming:** Inputs 1 – 6 form a positive-negative-positive curve, indicating model-shape mismatch; input 7 adds a 12-kilowatt outlier beyond tolerance.

Calculate the residual-plot points.

Given: domain: sound level; payload: columns: distance meters, observed decibels; model:  $P(x) = 80 - 3x$ ; rows: (1, 76); (3, 72); (6, 64); (10, 47)

Construct the requested table/graph using the given axes, units and domain.

| distance meters | observed decibels |
|-----------------|-------------------|
| 1               | 76                |
| 3               | 72                |
| 6               | 64                |
| 10              | 47                |

Your response: \_\_\_\_\_

**Incoming:** Model B is more reasonable there; its errors stay within 3 decibels, while A's spread expands to 15 despite its smaller training errors.

List the residual-plot points against day.

Construct the requested table/graph using the given axes, units and domain.

| day | observed centimeters | predicted centimeters |
|-----|----------------------|-----------------------|
| 0   | 12                   | 11                    |
| 3   | 19                   | 21                    |
| 8   | 27                   | 24                    |
| 14  | 31                   | 35                    |

Your response: \_\_\_\_\_

**AP Precalculus****Residuals and  
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Evaluate the supplied statement or method. Say whether it is correct, repair it if it is not, and verify the result exactly. Not every prompt contains an error.

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Identify the logical gap and replace the claim with a defensible conclusion. Diagnose the extension from three exact historical fits to thirty future years, including the changed migration mechanism.

Given: domain: population forecast; payload: claim: The model fits three observed years exactly, so it will predict the next 30 years exactly.; evidence: future domain: 3 through 30; mechanism change: a migration policy begins in year 3; residuals: 0, 0, 0; sample years: 0, 1, 2

## Residuals and Model Validation

### Full Worked Solutions - excerpt

#### Worked example

**Problem.** Judge the model for each intended use.

Given: domain: map distance; payload: residual: 0.12; unit: kilometer; uses: hiking map limit: 0.25; survey limit: 0.02

**Answer.** The 0.12-kilometer error is acceptable for the hiking map but not the survey, whose tolerance is only 0.02 kilometer.

#### Explanation and check.

The same error is compared with different decision thresholds.

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#### Worked example

**Problem.** Recover the prediction and explain the negative residual.

Given: domain: reservoir depth; payload: definition: residual=observed-predicted; observed: 42.3; residual: -1.8; unit: meters

**Answer.** 44.1 meters; the prediction is 1.8 meters above the observation.

#### Explanation and check.

$\text{predicted} = \text{observed} - \text{residual} = 42.3 - (-1.8) = 44.1$ , consistent with overprediction.