Math Exam System Showcase

A Demonstration of All Capabilities

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1. Full Worksheet Demonstration

This section renders all questions from the showcase data file. It demonstrates the 'Modern Academic' theme, the structured 'Given/To Prove' blocks, and the pedagogical answer grid.

Question 1

2024 | Dr. Euclid

"Given:"

In the figure below, we are given that $AB \sim BC$ and $AD = CD$.

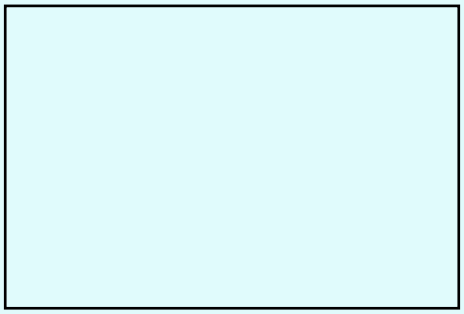

Figure 1: A diagram of the geometric setup.

"To Prove:"

Show that triangle ABD is congruent to triangle CBD. $\Delta ABD \cong \Delta CBD$

"Strategy Phase | Type: _____ | Tools: _____"	
"Statement"	"Justification"

Question 2

2024 | Prof. Newton

“Given:”
Use the rules of differentiation to find the derivative of the function below.

$$f(x) = \frac{x^2 + 1}{\sin x}$$

“To Prove:”
Find

$$\frac{d}{\mathrm{dx}} f(x)$$

.

“Strategy Phase | Type: _____ | Tools: _____”

“Statement”	“Justification”

Question 3

2023 | Prof. Gauss

“Given:”
Let S_n be the sum of the first n natural numbers.

$$S_n = \sum_{i=1}^{n} i = 1 + 2 + 3 + ... + n$$

“To Prove:”
Prove that the formula for S_n is $\frac{n(n+1)}{2}$.

“Strategy Phase | Type: _____ | Tools: _____”

“Statement”	“Justification”

Question 4

2024 | Dr. Euclid

"Given:"
Let the matrices A and B be defined as:

$$A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} \quad B = \begin{pmatrix} 5 & 6 \\ 7 & 8 \end{pmatrix}$$

"To Prove:"
Calculate the matrix product $C = AB$.

"Strategy Phase | Type: _____ | Tools: _____"

"Statement"	"Justification"

2. Filtering and Empty State

Here, we apply a filter to the question set that yields no results (`year: 2025`). This demonstrates the system's ability to handle empty data sets gracefully by displaying a warning message instead of crashing or rendering an empty page.

No questions found matching this filter.

3. Hints & Summary Page

The final section demonstrates the `render-hints` function. It compiles all hints from the showcase questions into a single, easy-to-read summary table. This also shows how custom functions from `utils.typ` (like `#hint-box`) are evaluated and rendered correctly.

Hints & Techniques

Question	Technique	Hint
1	Triangle Congruence	Consider the properties of an isosceles triangle and shared sides. Which congruence theorem applies here (SSS, SAS, ASA)?
2	Derivatives	You will need to use the **Quotient Rule**. Recall that for $f(x) = \frac{u}{v}$, the derivative is $f'(x) = \frac{u'v - uv'}{v^2}$.
3	Summations	This is a classic proof by induction.
4	Matrix Operations	Recall that for $C = AB$, the element c_{ij} is the dot product of the i-th row of A and the j-th column of B.