Week 1: Python Fundamentals for Math Teachers

Data Science for Mathematics Teachers

November 11, 2025

Course Information

Course: Data Science for Mathematics Teachers
Series: Professional Development Series
Duration: 8 weeks
Level: Beginner To Intermediate
Target: Mathematics Teachers

1 Week 1: Python Fundamentals for Math Teachers

1.1 Learning Objectives

By the end of this week, you will be able to:

- Master Python fundamentals for mathematical applications
- Use NumPy for matrix operations and calculations
- Set up a Python environment for classroom use
- Create simple mathematical programs for teaching

1.2 Topics Covered This Week

- Python basics and mathematical applications
- NumPy for numerical calculations and matrices
- Setting up Python environment for education

1.3 Key Concepts You Will Work With

- Variables and data types (int, float, string, list)
- Basic arithmetic operations and mathematical functions
- NumPy arrays and array operations
- Matrix creation and manipulation with np.{array()}
- Mathematical functions: np.{sin()}, np.{cos()}, np.{sqrt()}
- Creating mathematical sequences with np.{arange()} and np.{linspace()}
- Installing Python packages with pip
- Using Jupyter notebooks for educational demonstrations

1.4 Practical Exercises

Difficulty Level: Beginner
Total Exercises: 3

Exercise 1: AI-Enhanced Challenge: Python basics and mathematical applications

Difficulty: Beginner
AI-Enhanced Programming Exercise
Task: Using Python, create a Python program using variables and data types for mathematical calculations.
Step-by-Step Instructions:

1. Define variables for different data types (integers, floats, strings)

2. Create lists to store multiple values like test scores

3. Practice variable naming conventions for educational contexts

4. Write functions that use these variables effectively

5. Test your variables with real classroom data examples

Technical Requirements:

- Use Variables and data types (int, float, string, list) in your implementation

- Use Basic arithmetic operations and mathematical functions in your implementation

- Use NumPy arrays and array operations in your implementation

Expected Output: A working Python script that mathematics teachers can run in their classroom to solve real educational problems.
Assessment: Your solution should be practical, well-commented, and directly applicable to teaching mathematics.
Teaching Context: Basic programming skills for math educators

Exercise 2: AI-Enhanced Challenge: NumPy for numerical calculations and matrices

Difficulty: Beginner
AI-Enhanced Programming Exercise
Task: Using Python, build a NumPy-based solution for matrix operations in educational contexts.
Step-by-Step Instructions:

1. Import NumPy and create arrays for mathematical data

2. Use array operations for efficient calculations

3. Apply mathematical functions (sin, cos, sqrt) to arrays

4. Create matrices for advanced mathematical concepts

5. Visualize results to help students understand the concepts

Technical Requirements:

- Use NumPy arrays and array operations in your implementation

- Use Matrix creation and manipulation with np.{array()} in your implementation

- Use Mathematical functions: np.{sin()}, np.{cos()}, np.{sqrt()} in your implementation

Expected Output: A working Python script that mathematics teachers can run in their classroom to solve real educational problems.
Assessment: Your solution should be practical, well-commented, and directly applicable to teaching mathematics.
Teaching Context: Basic programming skills for math educators

Exercise 3: Concept-Based Challenge: Setting up Python environment for education

Difficulty: Beginner
Task: Create a foundation Python program for mathematical calculations.
Specific Requirements:

- Use Mathematical functions: np.{sin()}, np.{cos()}, np.{sqrt()} to store and manipulate numerical data

- Implement Creating mathematical sequences with np.{arange()} and np.{linspace()} for classroom calculations

- Create functions that teachers can reuse

- Include error handling for invalid inputs

Deliverable: A Python script with examples that solve real math problems.
Teaching Context: Basic programming skills for math educators

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