Python Roadmap for Math Students

Weeks 1-4: Basic Math Concepts & Python Basics

Week 1: Introduction to Python & Arithmetic Operations

- Lecture 1: Introduction to Python, installing Python Lecture 2: Python basics: print, comments, intput Lecture 2: Python basics: print, comments, intput Lecture 2: Arithmetic operations (addition, subtraction, multiplication, division) Lecture 3: Operators: Comparison Operators, Assignment Operators

Week 2: Operators and Variables

Lecture 4: Operators: Logical Operators, Identity Operators, Membership Operators Lecture 5: Variables Lecture 6: Data Types

Week 3: Control Flow

Lecture 7: Conditional Statements (if, else, elif) Lecture 8: Conditional Statements (if, else, elif) Lecture 9: Looping Statements (for loop, while loop) Lecture 9: Looping Statements (for loop, while loop)

Week 4: Functions

Lecture 11: Functions: Defining and Calling Functions Lecture 12: Function Parameters and Return Values

Lecture 3: Python math functions (abs, round, pow, etc.)

Week 3: Linear Equations and Loops

Lecture 1: Introduction to linear equations, solving equations using Python

Lecture 2: Loops in Python (for, while)

Lecture 3: Applying loops to solve basic math problems (factorials, sequences)

Week 4: Basic Data Structures and Lists

Lecture 1: Introduction to lists, list operations (indexing, slicing)

Lecture 2: Using lists to store and manipulate mathematical data

Lecture 3: Practical exercises (using loops with lists, storing multiple values)

Weeks 5-8: Statistics Concepts

Week 5: Introduction to Statistics

Lecture 1: Descriptive statistics overview (mean, median, mode)

Lecture 2: Calculating measures of central tendency using Python

Lecture 3: Introduction to numpy library for numerical operations

Week 6: Variability and Spread

Lecture 1: Measures of dispersion (variance, standard deviation, range)

Lecture 2: Python code for calculating variance and standard deviation

Lecture 3: Introduction to probability and its applications in statistics

Week 7: Probability Distributions

Lecture 1: Introduction to probability distributions (normal, binomial)

Lecture 2: Generating and visualizing probability distributions using Python

Lecture 3: Introduction to matplotlib for visualizations

Week 8: Hypothesis Testing

Lecture 1: Introduction to hypothesis testing, null and alternative hypotheses

Lecture 2: t-tests and p-values in Python using scipy

Lecture 3: Analyzing results and interpreting statistical significance

Weeks 9-12: Data Visualization

Week 9: Basic Data Visualization in Python

Lecture 1: Introduction to matplotlib, creating basic plots (line, scatter)

Lecture 2: Plot customization (titles, labels, legends)

Lecture 3: Introduction to seaborn for statistical visualizations

Week 10: Visualizing Distributions and Relationships

Lecture 1: Histograms, bar plots, and box plots using matplotlib and seaborn

Lecture 2: Visualizing relationships between variables using scatter plots and pair plots

Lecture 3: Creating subplots and grid plots for multi-plot visualizations

Week 11: Advanced Visualization Techniques

Lecture 1: Heatmaps and correlation matrices using seaborn

Lecture 2: Time series data visualization using matplotlib

Lecture 3: Plotly and interactive visualizations

Week 12: Projects in Data Visualization

Lecture 1: Building a data dashboard using matplotlib

Lecture 2: Case study on visualizing real-world data (student project)

Lecture 3: Group presentations of visualization projects

Weeks 13-16: Data Analysis and Applications

Week 13: Introduction to Data Analysis

Lecture 1: Understanding datasets and data types (categorical, numerical)

Lecture 2: Importing and exploring datasets in Python (pandas library)

Lecture 3: Data cleaning techniques (handling missing data, outliers)

Week 14: Data Transformation and Aggregation

Lecture 1: Filtering, sorting, and transforming data in pandas

Lecture 2: Grouping and aggregating data for analysis

Lecture 3: Real-world application: Analyzing a dataset (e.g., student performance)

Week 15: Advanced Data Analysis Techniques

Lecture 1: Introduction to machine learning concepts (linear regression)

Lecture 2: Applying linear regression to datasets using Python

Lecture 3: Evaluating the results of regression models

Week 16: Final Project and Review

Lecture 1: Final project overview (students choose a dataset for analysis)

Lecture 2: Group work on final projects (Python code implementation)

Lecture 3: Final project presentations and course review

This plan integrates math, statistics, and Python programming for hands-on learning and data analysis.