1: Basics of Python Programming

Day 1: Python Basics

- About Python
- Python Output/print function
- Python Data Types
- Python Variables
- Python comments
- Python Keywords and Identifiers
- Python User Input
- Python Type conversion
- Python Literals

Day 2: Python Operators + if-else + Loops

- Start of the session
- Python Operators
- Python if-else
- Python Modules
- Python While Loop
- Python for loop

Day 3: Python Strings

- Introduction
- Solving Loop problems
- Break, continue, pass statement in loops
- Strings
- String indexing
- String slicing
- Edit and delete a string
- Operations on String
- Common String functions

2: Python Data Types

Day 4: Python Lists

- Introduction
- Array vs List
- How lists are stored in a memory
- Characteristics of Python List
- Code Example of Lists

    Create and access a list

    append(), extend(), insert()

    Edit items in a list

    Deleting items from a list

    Arithmetic, membership and loop operations on a List

    Various List functions

    List comprehension

    2 Ways to traverse a list

    Zip() function

    Python List can store any kind of objects
- Disadvantages of Python list

Day 5: Tuples + Set + Dictionary

- **Tuple**

    Create and access a tuple

    Can we edit and add items to a tuple?

    Deletion

    Operations on tuple

    Tuple functions

    List vs tuple

    Tuple unpacking

    Zip () on tuple

Day 6 : Set & Dictionary

- **Set**
    - *Create and access a set*
    - *Can we edit and add items to a set?*
    - *Deletion*
    - *Operations on set*
    - *set functions*
    - *Frozen set (immutable set)*
    - *Set comprehension*
- **Dictionary**
    - *Create dictionary*
    - *Accessing items*
    - *Add, remove, edit key-value pairs*
    - *Operations on dictionary*
    - *Dictionary functions*
    - *Dictionary comprehension*
    - *Zip() on dictionary*
    - *Nested comprehension*

Day 7: Python Functions –1

- Create function
- Arguments and parameters
- args and kwargs
- How to access documentation of a function
- How functions are executed in a memory
- Variable scope

Day 8: Python Functions –2

- Nested functions with examples
- Functions are first class citizens
- Deletion of function
- Returning of function

- Advantages of functions
- Lambda functions
- Higher order functions
- map(), filter(), reduce()

3: Object Oriented Programming (OOP)

Day 9: OOP Part 1

- What is OOP?
- What are classes and Objects?
- Banking application coding
- Methods vs Functions
- Class diagram
- Magic/Dunder methods
- What is the true benefit of constructor?

Day 10: OOP Part 2

- Concept of 'self'
- Create Fraction Class
- __str__, __add__, __sub__ , __mul__ , __truediv__

Session 8: OOP Part2

- Revision of last session by solving problems
- How objects access attributes
- Attribute creation from outside of the class

Day 11: OOP Part 3

- Reference Variables
- Mutability of Object
- Encapsulation
- Collection of objects
- Static variables and methods

Day 12 - OOP Part 4

- Class Relationship
- Aggregation and aggregation class diagram
- Inheritance and Inheritance class diagram
- Constructor example
- Method Overriding
- Super keyword
- Super constructor
- Practice questions on Inheritance
- Types of Inheritance (Single, Multilevel, Hierarchical,Multiple)
- Hybrid Inheritance
- Code example and diamond problem

Day 13 - Session on Polymorphism **& Abstraction - OOP Part 5**

- Polymorphism
- Method Overriding and Method Overloading
- Operator Overloading
- What is Abstraction?
- Bank Example Hierarchy
- Abstract class
- Coding abstract class (BankApp Class)

Day 14 - How to Make a Trading Bot in just 1 hour - OOP Project

4: Advanced Python:

Day 15 - File Handling

- How File I/O is done
- Writing to a new text file
- What is open()?
- append()
- Writing many lines

- Saving a file
- Reading a file -> read() and readline()
- Using context manager -> with()

Day 16 - Serialization & Deserialization

- Reading big file in chunks
- Seek and tell
- Working with Binary file
- Serialization and Deserialization
- JSON module -> dump() and load()
- Serialization and Deserialization of tuple, nested dictionary and custom object
- Pickling
- Pickle vs JSON

Day 17 : Exception Handling

- Syntax Error with Examples
- Exception with Examples
- Why we need to handle Exception?
- Exception Handling (Try-Except-Else-Finally)
- Handling Specific Error
- Raise Exception
- Create custom Exception

Day 18: Namespaces

- Namespaces
- Scope and LEGB rule
- Hands-on local, enclosing, global and built-in scope

Day 19: Decorators

- Decorators with Examples

5: Numpy

Day 20 : Numpy Fundamentals

- Numpy Theory
- Numpy array
- Matrix in numpy
- Numpy array attributes
- Array operations
- Scalar and Vector operations
- Numpy array functions

    Dot product

    Log, exp, mean, median, std, prod, min, max, trigo, variance, ceil, floor, slicing, iteration

    Reshaping

    Stacking and splitting

Day 21: Advanced Numpy

- Numpy array vs Python List
- Advanced, Fancy and Boolean Indexing
- Broadcasting
- Mathematical operations in numpy
- Sigmoid in numpy
- Mean Squared Error in numpy
- Working with missing values
- Plotting graphs

Day 22: Plotting Charts & Special NumPy Functions

- Various numpy functions like sort, append, concatenate, percentile, flip, Set functions, etc.

6: Pandas

Day 23: Pandas Series

- What is Pandas?
- Introduction to Pandas Series
- Series Methods
- Series Math Methods

- Series with Python functionalities
- Boolean Indexing on Series
- Plotting graphs on series

Day 24: Pandas DataFrame

- Introduction Pandas DataFrame
- Creating DataFrame and read_csv()
- DataFrame attributes and methods
- Dataframe Math Methods
- Selecting cols and rows from dataframe
- Filtering a Dataframe
- Adding new columns
- Dataframe function – astype()

Day 25: Important DataFrame Methods

- Various DataFrame Methods
- Sort, index, reset_index, isnull, dropna, fillna, drop_duplicates, value_counts, apply, etc.

Day 26: End to End Stock Analysis Pandas Dataframes

7: Advanced Pandas

Day 27 : GroupBy Object - 1

- What is GroupBy?
- Applying builtin aggregation fuctions on groupby objects

Day 28 : GroupBy Object - 2

- GroupBy Attributes and Methods

Day 29 : Merging, Joining, Concatenating

- Pandas concat method
- Merge and join methods
- Practical implementations

8: Advanced Pandas Continued

Day 30 : MultiIndex Series and DataFrames

- About Multiindex objects
- Why to use Multiindex objects
- Stacking and unstacking
- Multiindex DataFrames
- Transpose Dataframes
- Swaplevel

Day 31 : Pivot table and Melt In Pandas

- Long vs wide data
- Pandas-melt
- Pivot table
- Agg functions

Day 32 : Vectorized String operations

- Vectorized String operations
- Common functions
- Pandas Datetime

9: Data Visualization

Day 33: Plotting Using Matplotlib - 1

- Get started with Matplotlib
- Plotting simple functions, labels, legends, multiple plots

Day 34: Plotting Using Matplotlib - 2

- About scatter plots
- Bar chart
- Histogram
- Pie chart (Day 34)
- Changing styles of plots

10: Descriptive Statistics

Day 35: Descriptive Statistics Part 1

- What is Statistics?
- Types of Statistics
- Population vs Sample
- Types of Data
- Measures of central tendency
- Measure of Dispersion
- Coefficient of variation
- Graphs for Univariate Analysis
- Frequency Distribution table
- Graphs for bivariate Analysis
- Categorical – Categorical Analysis
- Numerical – Numerical Analysis
- Categorical – Numerical Analysis

Day 36: Descriptive Statistics Part 2

- Quantiles and Percentiles
- Five Number Summary
- Boxplots
- Scatterplots
- Covariance
- Correlation
- Correlation vs Causation
- Visualizing multiple variables

Day 37 : Probability Distribution Functions (PDF, CDF, PMF)

- Random Variables

- Probability Distributions
- Probability Distribution Functions and its types
- Probability Mass Function (PMF)
- Cumulative Distribution Function (CDF) of PMF
- Probability Density Function (PDF)
- Density Estimation
- Parametric and Non-parametric Density Estimation
- Kernel Density Estimate (KDE)
- Cumulative Distribution Function (CDF) of PDF.

11: Probability Distributions

Day 38 : Normal Distribution

- How to use PDF in Data Science?
- 2D density plots
- Normal Distribution (importance, equation, parameter, intuition)
- Standard Normal Variate (importance, z-table, empirical rule)
- Properties of Normal Distribution
- Skewness
- CDF of Normal Distribution
- Use of Normal Distribution in Data Science

Day 39: Non-Gaussian Probability Distributions

- Kurtosis
- Excess Kurtosis and Types of kurtosis
- QQ plot
- Uniform Distribution
- Log-normal distribution
- Pareto Distribution
- Transformations
    1. *Mathematical Transformation*
    2. *Function Transformer*
    3. *Log Transform*
    4. *Reciprocal Transform / Square or sqrt Transform*
    5. *Power Transformer*
    6. *Box-Cox Transform*

7. *Yeo-Johnson Transformation*

12: Inferential Statistics

Day 40 : Central Limit Theorem

- Bernouli Distribution
- Binomial Distribution
    1. *PDF formula*
    2. *Graph of PDF*
    3. *Examples*
    4. *Criteria*
    5. *Application in Data Science*
- Sampling Distribution
- Intuition of Central Limit Theorem (CLT)
- CLT in code
- Case study
- Assumptions of making samples

Day 41 :Central Limit Theorem Proof

Day 42 : Confidence Intervals

- Population vs Sample
- Parameter vs Estimate
- Point Estimate
- Confidence Interval
    1. *Ways to calculate CI*
    2. *Applications of CI*
    3. *Assumptions of z-procedure*
    4. *Formula and Intuition of z-procedure*
    5. *Interpreting CI*
    6. *T-procedure and t-distribution*
    7. *Confidence Intervals in code*