

PYTHON PANDAS NOTES (CBSE class XII Informatics Practices 2025-26)

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pandas:

- Powerful data analysis
- 3 data structures: Series, DataFrame, Panel
- Most famous Python package for data science
- Named from "Panel Data", and "Python Data Analysis"
- created by Wes McKinney in 2008
- Open source

matplotlib

- Powerful and versatile plotting library
- Used for visualization
- Can create static, animated and interacting visualization
- Customization of visualization with color, font, line style etc.
- Can create: Line chart, bar chart, pie chart, area chart, histogram, scatter chart
- created by John D. Hunter.
- Open source

Series

- Series is a data structure in Pandas
- 1 Dimensional
- Homogeneous
- Default indexes assigned to each elements
- Default indexes are 0,1,2,3...
- Index can be set numerical or alphabetical keys
- Numerical index overwrites the default index.
- Created with `pandas.Series()` function
- Accepts two arguments data and index.
- Index argument is optional.
- Size mutable
- A one-dimensional labeled array capable of holding any data type
- Can be created from List, Dict, Array, Scalar value etc.
- Syntax:
`<seriesname>=pandas.Series(<list/tupe/dictionary/scalar value/ndarray>,index=<list>)`
- Example: Creating series from list
`S1=pandas.Series([10,20,30,40])`

0	10
1	20
2	30
3	40

DataFrame

- DataFrame is a data structure in Pandas
- 2 Dimensional
- Data stored in rows and columns
- Rows and columns are labeled
- Size mutable
- Heterogeneous
- Created with `pandas.DataFrame()` function
- Many functionalities like max, min, average etc available
- Syntax
`<DataFramename>=pandas.DataFrame(<dict/list/Series>,column=<list>,index=<list>)`
- Example
`df1=pandas.DataFrame({'Eco':[77,95],'IP':[88,96]})`

	Eco	IP
0	77	88
1	95	96

Mathematical operations on Series

→ Adding a value to Series

- Adding a value to series object will add that value to all the elements of Series.
- Try what happens:
S1 series is 10,20,30,40.
S2=S1+2

10	}	+	2
20			
30			
40			

→ Adding a Series to another Series

- It will find the same indexes and perform operation
- If index match not found, it will assign NaN to that index in result.
- Try what happens:
S1 series is 10,20,30,40 with index a,b,c,d
S2 series is 2,4,5,7 with index b,c,d,e
S3=S1+S2

a	10	}	+	
b	20			
c	30			
d	40			

b	2
c	4
d	5
e	7

head() function:

- Returns top/first N records
- Default value of N is 5
- Return type is Series.
- Ex: SeriesName.head(10) will return top/first 10 records in series form.

tail() function:

- Returns bottom/last N records
- Default value of N is 5
- Return type is Series.
- Ex: SeriesName.tail(10) will return bottom/last 10 records in series form.

Selection/slicing

- We can get some selected elements of Series.
- Index will be used
- Ex: Series S1 has 10,20,30,40,50,60,70,80,90,100 with default index.
S1[index] will return element of given index.
S1[start:stop] will return elements from "start" to "stop" index.
S1[start:stop:step] will return elements from "start" to "stop" index with given step.
- Series.loc[] can be used similarly.

Indexes in DataFrame

- Default index of rows and column will be 0,1,2,...
- If creating from Dictionary, then the keys of dictionary will become column titles.
- Column names can be set using "column" argument.
- "column" argument can accept list.
- Rows indexes can be set using "index" argument.
- "index" argument can accept list.
- Rows index can be numerical or string.
- If index are assigned numerical, the default index will be overwritten.

DataFrame can be created from

(1) Dictionary of Series

- Create some Series
- Pass them to a dictionary
- Pass the dictionary to DataFrame
- Dictionary keys will become column titles.
- Each Series will become a column in DataFrame.

(2) List of Dictionaries

- Create some dictionaries with same keys
- Pass these dictionaries to a List
- Pass the list to DataFrame.
- Dictionary keys will become column titles.
- Each dictionary will become a row in DataFrame.

(3) Dictionary of Lists (Similar to “Dictionary of Series”)

(4) List of Lists

- Create some lists
- Pass these lists to a main list.
- Pass the main list to DataFrame.
- Each sub list will become rows of DataFrame.
- Column title to be given manually.