```
In [1]:  #1.Pandas: It is a core library for data manipulation and data analysi
         s. Pandas stands for Panel Data.
         # It consists of single and multi-dimensional data structures for data
          manipulation.
```

```
In [2]:  #Type of Pandas Data Structures: (i)- Series Object (Single-Dimensiona
         l) and (ii)- Data Frame (Multi-Dimensional)
```

```
In [3]:  #(i). Series Object: Series object is one dimensional labelled array.
```

```
In [4]:  #Example-01:
```

```
In [5]:  import pandas as pd
         n1 = pd.Series([2,4,6,8,10,12,14])
         n1
```

```
Out[5]:  0      2
         1      4
         2      6
         3      8
         4      10
         5      12
         6      14
         dtype: int64
```

```
In [6]:  type(n1)
```

```
Out[6]:  pandas.core.series.Series
```

```
In [7]:  #Example-02:
```

```
In [8]:  n2 = pd.Series((10,20,30,40,50))
         n2
```

```
Out[8]: 0    10
        1    20
        2    30
        3    40
        4    50
        dtype: int64
```

```
In [9]: type(n2)
```

```
Out[9]: pandas.core.series.Series
```

```
In [10]: #Example-03:
```

```
In [11]: n3 = pd.Series({'k1':10,'k2':20,'k3':30,'k4':40})
         n3
```

```
Out[11]: k1    10
         k2    20
         k3    30
         k4    40
         dtype: int64
```

```
In [12]: type(n3)
```

```
Out[12]: pandas.core.series.Series
```

```
In [13]: #a.Changing index of a series:
```

```
In [14]: #Example-01:
```

```
In [15]: n1 = pd.Series([10,20,30,40,50])
         n1
```

```
Out[15]: 0    10
         1    20
         2    30
         3    40
```

```
4      50
dtype: int64
```

In [16]:
```python
n1 = pd.Series([10,20,30,40,50],index = ['A','B','C','D','E'])
n1
```

Out[16]:
```
A      10
B      20
C      30
D      40
E      50
dtype: int64
```

In [17]:
```python
#Example-02:
```

In [18]:
```python
n2 = pd.Series((900,800,700,600,500,400))
n2
```

Out[18]:
```
0      900
1      800
2      700
3      600
4      500
5      400
dtype: int64
```

In [19]:
```python
n2 = pd.Series((900,800,700,600,500,400),index=['Apple','Mango','Orang
e','Grapes','Lemon','Guava'])
n2
```

Out[19]:
```
Apple      900
Mango      800
Orange     700
Grapes     600
Lemon      500
Guava      400
dtype: int64
```

```
In [20]: #Example-03:
```

```
In [21]: n3 = pd.Series({'x1':450,'x2':550,'x3':650,'x4':750,'x5':850})
         n3
```

```
Out[21]: x1    450
         x2    550
         x3    650
         x4    750
         x5    850
         dtype: int64
```

```
In [22]: n3 = pd.Series({'x1':450,'x2':550,'x3':650,'x4':750,'x5':850},index=['x
         3','x6','x2','x1','x7','x4','x5'])
         n3
```

```
Out[22]: x3    650.0
         x6      NaN
         x2    550.0
         x1    450.0
         x7      NaN
         x4    750.0
         x5    850.0
         dtype: float64
```

```
In [23]: #b.Extracting elements from a series:
```

```
In [24]: #Example-01:
```

```
In [25]: s1 = pd.Series((10,20,30,40,50,60,70,80,90))
         s1
```

```
Out[25]: 0    10
         1    20
         2    30
         3    40
         4    50
         5    60
```

```
6     70
7     80
8     90
dtype: int64
```

In [26]: `s1[0]`

Out[26]: 10

In [27]: `s1[:]`

Out[27]:
```
0     10
1     20
2     30
3     40
4     50
5     60
6     70
7     80
8     90
dtype: int64
```

In [28]: `s1[::1]`

Out[28]:
```
0     10
1     20
2     30
3     40
4     50
5     60
6     70
7     80
8     90
dtype: int64
```

In [29]: `s1[2:6]`

Out[29]: 2   30

```
3    40
4    50
5    60
dtype: int64
```

In [30]: `s1[::-1]`

Out[30]:
```
8    90
7    80
6    70
5    60
4    50
3    40
2    30
1    20
0    10
dtype: int64
```

In [31]: `s1[::3]`

Out[31]:
```
0    10
3    40
6    70
dtype: int64
```

In [32]: `s1[-4:]`

Out[32]:
```
5    60
6    70
7    80
8    90
dtype: int64
```

In [33]: `s1[::-2]`

Out[33]:
```
8    90
6    70
4    50
```

```
2    30
0    10
dtype: int64
```

In [34]: `s1[-6:-2:3]`

Out[34]:
```
3    40
6    70
dtype: int64
```

In [35]: `#Example-02:`

In [36]:
```
s2 = pd.Series([-95,-75,-85,-25,-55,-15,-35,-45,-65])
s2
```

Out[36]:
```
0    -95
1    -75
2    -85
3    -25
4    -55
5    -15
6    -35
7    -45
8    -65
dtype: int64
```

In [37]: `s2[:]`

Out[37]:
```
0    -95
1    -75
2    -85
3    -25
4    -55
5    -15
6    -35
7    -45
8    -65
dtype: int64
```

```
In [38]: s2[::-3]
```

Out[38]: 8   -65
         5   -15
         2   -85
         dtype: int64

```
In [39]: s2[::4]
```

Out[39]: 0   -95
         4   -55
         8   -65
         dtype: int64

```
In [40]: s2[9:3:-2]
```

Out[40]: 8   -65
         6   -35
         4   -55
         dtype: int64

```
In [41]: #Example-03:
```

```
In [42]: s3 = pd.Series({'k1':13,'k2':23,'k3':33,'k4':43,'k5':53,'k6':63,'k7':73
         ,'k8':83})
         s3
```

Out[42]: k1   13
         k2   23
         k3   33
         k4   43
         k5   53
         k6   63
         k7   73
         k8   83
         dtype: int64

```
In [43]:  s3['k5']
```

Out[43]: 53

```
In [44]:  s3['k2':'k7']
```

Out[44]: k2   23
          k3   33
          k4   43
          k5   53
          k6   63
          k7   73
          dtype: int64

```
In [45]:  s3[::-1]
```

Out[45]: k8   83
          k7   73
          k6   63
          k5   53
          k4   43
          k3   33
          k2   23
          k1   13
          dtype: int64

```
In [46]:  s3[::-3]
```

Out[46]: k8   83
          k5   53
          k2   23
          dtype: int64

```
In [47]:  s3[:'k5':-1]
```

Out[47]: k8   83
          k7   73
          k6   63
```

```
k5     53
dtype: int64
```

In [48]: `s3[:'k5':-2]`

Out[48]:
```
k8     83
k6     63
dtype: int64
```

In [49]: `s3[-5:]`

Out[49]:
```
k4     43
k5     53
k6     63
k7     73
k8     83
dtype: int64
```

In [50]: `s3[:5]`

Out[50]:
```
k1     13
k2     23
k3     33
k4     43
k5     53
dtype: int64
```

In [51]: `s3[::4]`

Out[51]:
```
k1     13
k5     53
dtype: int64
```

In [52]: `s3[::-4]`

Out[52]:
```
k8     83
k4     43
dtype: int64
```

```python
In [53]: #c.Basic Mathematics Operations(Addition,Subtraction,Multiplication & D
         ivision):-
```

```python
In [54]: #Example-01:
```

```python
In [55]: s1 = pd.Series((11,12,13,14,15,16,17,18))
         s1
```

```
Out[55]: 0    11
         1    12
         2    13
         3    14
         4    15
         5    16
         6    17
         7    18
         dtype: int64
```

```python
In [56]: s2 = pd.Series((100,200,300,400,500,600,700,800))
         s2
```

```
Out[56]: 0    100
         1    200
         2    300
         3    400
         4    500
         5    600
         6    700
         7    800
         dtype: int64
```

```python
In [57]: x = s1 + 25
         x
```

```
Out[57]: 0    36
         1    37
         2    38
```

```
3    39
4    40
5    41
6    42
7    43
dtype: int64
```

In [58]:
```
y = s1 - 25
y
```

Out[58]:
```
0    -14
1    -13
2    -12
3    -11
4    -10
5     -9
6     -8
7     -7
dtype: int64
```

In [59]:
```
s1
```

Out[59]:
```
0    11
1    12
2    13
3    14
4    15
5    16
6    17
7    18
dtype: int64
```

In [60]:
```
z = s1*2
z
```

Out[60]:
```
0    22
1    24
2    26
3    28
```

```
4     30
5     32
6     34
7     36
dtype: int64
```

In [61]:
```
w = s1/2
w
```

Out[61]:
```
0     5.5
1     6.0
2     6.5
3     7.0
4     7.5
5     8.0
6     8.5
7     9.0
dtype: float64
```

In [62]:
```
p = s1 + s2
p
```

Out[62]:
```
0     111
1     212
2     313
3     414
4     515
5     616
6     717
7     818
dtype: int64
```

In [63]:
```
q = s1 - s2
q
```

Out[63]:
```
0     -89
1     -188
2     -287
3     -386
```

```
4    -485
5    -584
6    -683
7    -782
dtype: int64
```

In [64]:
```
r = s1*s2
r
```

Out[64]:
```
0     1100
1     2400
2     3900
3     5600
4     7500
5     9600
6    11900
7    14400
dtype: int64
```

In [65]:
```
s = s2/s1
s
```

Out[65]:
```
0     9.090909
1    16.666667
2    23.076923
3    28.571429
4    33.333333
5    37.500000
6    41.176471
7    44.444444
dtype: float64
```

In [66]:
```
#Example-02:
```

In [67]:
```
s3 = pd.Series([120,140,160,180,220,240,260])
s3
```

Out[67]:   0   120

```
1    140
2    160
3    180
4    220
5    240
6    260
dtype: int64
```

In [68]:
```
s4 = pd.Series([-1,-2,-3,-4,-5,-6,-7])
s4
```

Out[68]:
```
0   -1
1   -2
2   -3
3   -4
4   -5
5   -6
6   -7
dtype: int64
```

In [69]:
```
x = s3 + 800
x
```

Out[69]:
```
0     920
1     940
2     960
3     980
4    1020
5    1040
6    1060
dtype: int64
```

In [70]:
```
y = s3 - 20
y
```

Out[70]:
```
0    100
1    120
2    140
3    160
```

```
4     200
5     220
6     240
dtype: int64
```

In [71]:
```
z = s3 * 2
z
```

Out[71]:
```
0     240
1     280
2     320
3     360
4     440
5     480
6     520
dtype: int64
```

In [72]:
```
w = s3/3
w
```

Out[72]:
```
0     40.000000
1     46.666667
2     53.333333
3     60.000000
4     73.333333
5     80.000000
6     86.666667
dtype: float64
```

In [73]:
```
m = s3 + s4
m
```

Out[73]:
```
0     119
1     138
2     157
3     176
4     215
5     234
```

```
6     253
dtype: int64
```

In [74]:
```
n = s3 - s4
n
```

Out[74]:
```
0    121
1    142
2    163
3    184
4    225
5    246
6    267
dtype: int64
```

In [75]:
```
p = s4 - s3
p
```

Out[75]:
```
0    -121
1    -142
2    -163
3    -184
4    -225
5    -246
6    -267
dtype: int64
```

In [76]:
```
r = s3 * s4
r
```

Out[76]:
```
0     -120
1     -280
2     -480
3     -720
4    -1100
5    -1440
6    -1820
dtype: int64
```

```
In [77]: s = s4/s3
         s
```

```
Out[77]: 0    -0.008333
         1    -0.014286
         2    -0.018750
         3    -0.022222
         4    -0.022727
         5    -0.025000
         6    -0.026923
         dtype: float64
```

```
In [78]: #Example-03:
```

```
In [79]: s5 = pd.Series({'k1':10,'k2':20,'k3':30,'k4':40,'k5':50})
         s5
```

```
Out[79]: k1    10
         k2    20
         k3    30
         k4    40
         k5    50
         dtype: int64
```

```
In [80]: s6 = pd.Series({'x1':11,'x2':12,'x3':13,'x4':14,'x5':50})
         s6
```

```
Out[80]: x1    11
         x2    12
         x3    13
         x4    14
         x5    50
         dtype: int64
```

```
In [81]: x = s5 + 500
         x
```

```
Out[81]: k1    510
```

```
k2      520
k3      530
k4      540
k5      550
dtype: int64
```

In [82]:
```
y = s6 + 250
y
```

Out[82]:
```
x1      261
x2      262
x3      263
x4      264
x5      300
dtype: int64
```

In [83]:
```
z = s5 - 2
z
```

Out[83]:
```
k1       8
k2      18
k3      28
k4      38
k5      48
dtype: int64
```

In [84]:
```
p = s6 - 900
p
```

Out[84]:
```
x1     -889
x2     -888
x3     -887
x4     -886
x5     -850
dtype: int64
```

In [85]:
```
q = s5 * 2
q
```

```
Out[85]: k1      20
         k2      40
         k3      60
         k4      80
         k5     100
         dtype: int64
```

```
In [86]: r = s6 * 3
         r
```

```
Out[86]: x1      33
         x2      36
         x3      39
         x4      42
         x5     150
         dtype: int64
```

```
In [87]: s = s5 / 2
         s
```

```
Out[87]: k1      5.0
         k2     10.0
         k3     15.0
         k4     20.0
         k5     25.0
         dtype: float64
```

```
In [88]: t = s6/3
         t
```

```
Out[88]: x1      3.666667
         x2      4.000000
         x3      4.333333
         x4      4.666667
         x5     16.666667
         dtype: float64
```

```
In [89]: #(ii). Data-Frame Object: A dataframe object is a two dimensional label
```

```
led data structure.
# A data frame comprises of rows and columns.
```

In [90]: `#Example-01:`

In [91]:
```
d1 = pd.DataFrame(('Name',('A','B','C','D'),'Marks',(10,20,30,40)))
d1
```

Out[91]:

	0
0	Name
1	(A, B, C, D)
2	Marks
3	(10, 20, 30, 40)

In [92]: `#Example-02:`

In [93]:
```
d2 = pd.DataFrame({'Name':('A','B','C','D'),'Marks':(10,20,30,40)})
d2
```

Out[93]:

	Name	Marks
0	A	10
1	B	20
2	C	30
3	D	40

In [94]: `#Example-03:`

In [95]:
```
d3 = pd.DataFrame({'Name':['A','B','C','D'],'Marks':[10,20,30,40]})
d3
```

Out[95]:

	Name	Marks
0	A	10
1	B	20
2	C	30
3	D	40

In [96]:
```
#a.DataFrame with In-Built functions:- i)head(),ii) tail(), iii) shape
(), and iv) describe()
```

In [97]:
```
#(i). head()=> It gives the first five rows of any dataframe.
#(ii). tail()=> It gives the last five rows of any dataframe.
#(iii). shape()=> It gives the number of rows and columns of a datafram
e.
#(iv). describe()=>It gives the general informations of any dataframe.
# To load iris data => pd.read_csv("iris.csv")
```

In [98]:
```
#Loading Iris File:
```

In [99]:
```
pwd
```

Out[99]: `'C:\\Users\\Badshah'`

In [100]:
```
iris = pd.read_csv("iris.csv")
iris
```

Out[100]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa

	sepal_length	sepal_width	petal_length	petal_width	species
...	...	...	...	...	...
145	6.7	3.0	5.2	2.3	virginica
146	6.3	2.5	5.0	1.9	virginica
147	6.5	3.0	5.2	2.0	virginica
148	6.2	3.4	5.4	2.3	virginica
149	5.9	3.0	5.1	1.8	virginica

150 rows × 5 columns

In [101]:
```python
#a.For head():
```

In [102]:
```python
d1 = iris.head()
d1
```

Out[102]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa

In [103]:
```python
d2 = iris.head(15)
d2
```

Out[103]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa

	sepal_length	sepal_width	petal_length	petal_width	species
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa
5	5.4	3.9	1.7	0.4	setosa
6	4.6	3.4	1.4	0.3	setosa
7	5.0	3.4	1.5	0.2	setosa
8	4.4	2.9	1.4	0.2	setosa
9	4.9	3.1	1.5	0.1	setosa
10	5.4	3.7	1.5	0.2	setosa
11	4.8	3.4	1.6	0.2	setosa
12	4.8	3.0	1.4	0.1	setosa
13	4.3	3.0	1.1	0.1	setosa
14	5.8	4.0	1.2	0.2	setosa

In [104]:
```python
d3 = iris.head(-1)
d3
```

Out[104]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa
...	...	...	...	...	...
144	6.7	3.3	5.7	2.5	virginica

	sepal_length	sepal_width	petal_length	petal_width	species
145	6.7	3.0	5.2	2.3	virginica
146	6.3	2.5	5.0	1.9	virginica
147	6.5	3.0	5.2	2.0	virginica
148	6.2	3.4	5.4	2.3	virginica

149 rows × 5 columns

In [105]:
```python
d4 = iris.head(25)
d4
```

Out[105]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa
5	5.4	3.9	1.7	0.4	setosa
6	4.6	3.4	1.4	0.3	setosa
7	5.0	3.4	1.5	0.2	setosa
8	4.4	2.9	1.4	0.2	setosa
9	4.9	3.1	1.5	0.1	setosa
10	5.4	3.7	1.5	0.2	setosa
11	4.8	3.4	1.6	0.2	setosa
12	4.8	3.0	1.4	0.1	setosa
13	4.3	3.0	1.1	0.1	setosa
14	5.8	4.0	1.2	0.2	setosa

	sepal_length	sepal_width	petal_length	petal_width	species
15	5.7	4.4	1.5	0.4	setosa
16	5.4	3.9	1.3	0.4	setosa
17	5.1	3.5	1.4	0.3	setosa
18	5.7	3.8	1.7	0.3	setosa
19	5.1	3.8	1.5	0.3	setosa
20	5.4	3.4	1.7	0.2	setosa
21	5.1	3.7	1.5	0.4	setosa
22	4.6	3.6	1.0	0.2	setosa
23	5.1	3.3	1.7	0.5	setosa
24	4.8	3.4	1.9	0.2	setosa

In [106]:
```python
d5 = iris.head(-10)
d5
```

Out[106]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa
...	...	...	...	...	...
135	7.7	3.0	6.1	2.3	virginica
136	6.3	3.4	5.6	2.4	virginica
137	6.4	3.1	5.5	1.8	virginica
138	6.0	3.0	4.8	1.8	virginica
139	6.9	3.1	5.4	2.1	virginica

140 rows × 5 columns

In [108]:
```
d1 = iris.tail()
d1
```

Out[108]:

	sepal_length	sepal_width	petal_length	petal_width	species
145	6.7	3.0	5.2	2.3	virginica
146	6.3	2.5	5.0	1.9	virginica
147	6.5	3.0	5.2	2.0	virginica
148	6.2	3.4	5.4	2.3	virginica
149	5.9	3.0	5.1	1.8	virginica

In [109]:
```
d2 = iris.tail(15)
d2
```

Out[109]:

	sepal_length	sepal_width	petal_length	petal_width	species
135	7.7	3.0	6.1	2.3	virginica
136	6.3	3.4	5.6	2.4	virginica
137	6.4	3.1	5.5	1.8	virginica
138	6.0	3.0	4.8	1.8	virginica
139	6.9	3.1	5.4	2.1	virginica
140	6.7	3.1	5.6	2.4	virginica
141	6.9	3.1	5.1	2.3	virginica
142	5.8	2.7	5.1	1.9	virginica
143	6.8	3.2	5.9	2.3	virginica
144	6.7	3.3	5.7	2.5	virginica

	sepal_length	sepal_width	petal_length	petal_width	species
145	6.7	3.0	5.2	2.3	virginica
146	6.3	2.5	5.0	1.9	virginica
147	6.5	3.0	5.2	2.0	virginica
148	6.2	3.4	5.4	2.3	virginica
149	5.9	3.0	5.1	1.8	virginica

In [110]:
```python
d3 = iris.tail(25)
d3
```

Out[110]:

	sepal_length	sepal_width	petal_length	petal_width	species
125	7.2	3.2	6.0	1.8	virginica
126	6.2	2.8	4.8	1.8	virginica
127	6.1	3.0	4.9	1.8	virginica
128	6.4	2.8	5.6	2.1	virginica
129	7.2	3.0	5.8	1.6	virginica
130	7.4	2.8	6.1	1.9	virginica
131	7.9	3.8	6.4	2.0	virginica
132	6.4	2.8	5.6	2.2	virginica
133	6.3	2.8	5.1	1.5	virginica
134	6.1	2.6	5.6	1.4	virginica
135	7.7	3.0	6.1	2.3	virginica
136	6.3	3.4	5.6	2.4	virginica
137	6.4	3.1	5.5	1.8	virginica
138	6.0	3.0	4.8	1.8	virginica
139	6.9	3.1	5.4	2.1	virginica

	sepal_length	sepal_width	petal_length	petal_width	species
140	6.7	3.1	5.6	2.4	virginica
141	6.9	3.1	5.1	2.3	virginica
142	5.8	2.7	5.1	1.9	virginica
143	6.8	3.2	5.9	2.3	virginica
144	6.7	3.3	5.7	2.5	virginica
145	6.7	3.0	5.2	2.3	virginica
146	6.3	2.5	5.0	1.9	virginica
147	6.5	3.0	5.2	2.0	virginica
148	6.2	3.4	5.4	2.3	virginica
149	5.9	3.0	5.1	1.8	virginica

In [111]:
```python
d4 = iris.tail(-10)
d4
```

Out[111]:

	sepal_length	sepal_width	petal_length	petal_width	species
10	5.4	3.7	1.5	0.2	setosa
11	4.8	3.4	1.6	0.2	setosa
12	4.8	3.0	1.4	0.1	setosa
13	4.3	3.0	1.1	0.1	setosa
14	5.8	4.0	1.2	0.2	setosa
...	...	...	...	...	...
145	6.7	3.0	5.2	2.3	virginica
146	6.3	2.5	5.0	1.9	virginica
147	6.5	3.0	5.2	2.0	virginica
148	6.2	3.4	5.4	2.3	virginica
149	5.9	3.0	5.1	1.8	virginica

140 rows × 5 columns

In [112]:
```
d5 = iris.tail(-25)
d5
```

Out[112]:

	sepal_length	sepal_width	petal_length	petal_width	species
25	5.0	3.0	1.6	0.2	setosa
26	5.0	3.4	1.6	0.4	setosa
27	5.2	3.5	1.5	0.2	setosa
28	5.2	3.4	1.4	0.2	setosa
29	4.7	3.2	1.6	0.2	setosa
...	...	...	...	...	...
145	6.7	3.0	5.2	2.3	virginica
146	6.3	2.5	5.0	1.9	virginica
147	6.5	3.0	5.2	2.0	virginica
148	6.2	3.4	5.4	2.3	virginica
149	5.9	3.0	5.1	1.8	virginica

125 rows × 5 columns

In [113]:
```
#c.For shape():
```

In [114]:
```
d = iris.shape
d
```

Out[114]: (150, 5)

In [115]:
```
#d.For describe:
```

In [116]:
```
d = iris.describe()
```

```
d
```

Out[116]:

	sepal_length	sepal_width	petal_length	petal_width
count	150.000000	150.000000	150.000000	150.000000
mean	5.843333	3.057333	3.758000	1.199333
std	0.828066	0.435866	1.765298	0.762238
min	4.300000	2.000000	1.000000	0.100000
25%	5.100000	2.800000	1.600000	0.300000
50%	5.800000	3.000000	4.350000	1.300000
75%	6.400000	3.300000	5.100000	1.800000
max	7.900000	4.400000	6.900000	2.500000

In [117]: `#e. iloc[]:- It is used to extract data/values from datafram`

In [118]: `#Example-01:`

In [119]:
```
d1 = iris.iloc[:]
d1
```

Out[119]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa
...	...	...	...	...	...
145	6.7	3.0	5.2	2.3	virginica
146	6.3	2.5	5.0	1.9	virginica

	sepal_length	sepal_width	petal_length	petal_width	species
147	6.5	3.0	5.2	2.0	virginica
148	6.2	3.4	5.4	2.3	virginica
149	5.9	3.0	5.1	1.8	virginica

150 rows × 5 columns

In [120]: `#Example-02:`

In [121]:
```
d2 = iris.iloc[2:12,2:]
d2
```

Out[121]:

	petal_length	petal_width	species
2	1.3	0.2	setosa
3	1.5	0.2	setosa
4	1.4	0.2	setosa
5	1.7	0.4	setosa
6	1.4	0.3	setosa
7	1.5	0.2	setosa
8	1.4	0.2	setosa
9	1.5	0.1	setosa
10	1.5	0.2	setosa
11	1.6	0.2	setosa

In [122]: `#Example-03:`

In [123]:
```
d3 = iris.iloc[::2,::2]
d3
```

`Out[123]:`

	sepal_length	petal_length	species
0	5.1	1.4	setosa
2	4.7	1.3	setosa
4	5.0	1.4	setosa
6	4.6	1.4	setosa
8	4.4	1.4	setosa
...	...	...	...
140	6.7	5.6	virginica
142	5.8	5.1	virginica
144	6.7	5.7	virginica
146	6.3	5.0	virginica
148	6.2	5.4	virginica

75 rows × 3 columns

`In [124]:` *#Example-04:*

`In [125]:`
```
d4 = iris.iloc[::-1,::-1]
d4
```

`Out[125]:`

	species	petal_width	petal_length	sepal_width	sepal_length
149	virginica	1.8	5.1	3.0	5.9
148	virginica	2.3	5.4	3.4	6.2
147	virginica	2.0	5.2	3.0	6.5
146	virginica	1.9	5.0	2.5	6.3
145	virginica	2.3	5.2	3.0	6.7
...	...	...	...	...	...

	species	petal_width	petal_length	sepal_width	sepal_length
4	setosa	0.2	1.4	3.6	5.0
3	setosa	0.2	1.5	3.1	4.6
2	setosa	0.2	1.3	3.2	4.7
1	setosa	0.2	1.4	3.0	4.9
0	setosa	0.2	1.4	3.5	5.1

150 rows × 5 columns

In [126]: `#Example-05:`

In [127]:
```
d5 = iris.iloc[::-2,::-2]
d5
```

Out[127]:

	species	petal_length	sepal_length
149	virginica	5.1	5.9
147	virginica	5.2	6.5
145	virginica	5.2	6.7
143	virginica	5.9	6.8
141	virginica	5.1	6.9
...	...	...	...
9	setosa	1.5	4.9
7	setosa	1.5	5.0
5	setosa	1.7	5.4
3	setosa	1.5	4.6
1	setosa	1.4	4.9

75 rows × 3 columns

In [128]: #f.loc[]:- It is used to extract data/values from datafram where separate columns can be extracted and last of of row is inclusive.

In [129]: #Example-01:

In [130]:
```
d1 = iris.loc[0:8,('sepal_length','species')]
d1
```

Out[130]:

	sepal_length	species
0	5.1	setosa
1	4.9	setosa
2	4.7	setosa
3	4.6	setosa
4	5.0	setosa
5	5.4	setosa
6	4.6	setosa
7	5.0	setosa
8	4.4	setosa

In [131]: #Example-02:

In [132]:
```
d2 = iris.loc[2:100,('sepal_width','petal_length','species')]
d2
```

Out[132]:

	sepal_width	petal_length	species
2	3.2	1.3	setosa
3	3.1	1.5	setosa
4	3.6	1.4	setosa

	sepal_width	petal_length	species
5	3.9	1.7	setosa
6	3.4	1.4	setosa
...	...	...	...
96	2.9	4.2	versicolor
97	2.9	4.3	versicolor
98	2.5	3.0	versicolor
99	2.8	4.1	versicolor
100	3.3	6.0	virginica

99 rows × 3 columns

In [133]: *#Example-03:*

In [134]:
```python
d3 = iris.loc[4:120:5,('sepal_length','petal_width','species')]
d3
```

Out[134]:

	sepal_length	petal_width	species
4	5.0	0.2	setosa
9	4.9	0.1	setosa
14	5.8	0.2	setosa
19	5.1	0.3	setosa
24	4.8	0.2	setosa
29	4.7	0.2	setosa
34	4.9	0.2	setosa
39	5.1	0.2	setosa
44	5.1	0.4	setosa

	sepal_length	petal_width	species
49	5.0	0.2	setosa
54	6.5	1.5	versicolor
59	5.2	1.4	versicolor
64	5.6	1.3	versicolor
69	5.6	1.1	versicolor
74	6.4	1.3	versicolor
79	5.7	1.0	versicolor
84	5.4	1.5	versicolor
89	5.5	1.3	versicolor
94	5.6	1.3	versicolor
99	5.7	1.3	versicolor
104	6.5	2.2	virginica
109	7.2	2.5	virginica
114	5.8	2.4	virginica
119	6.0	1.5	virginica

In [135]: `#Example-04:`

In [136]:
```python
d4 = iris.loc[::-1,('sepal_length','species','petal_width')]
d4
```

Out[136]:

	sepal_length	species	petal_width
149	5.9	virginica	1.8
148	6.2	virginica	2.3
147	6.5	virginica	2.0
146	6.3	virginica	1.9

	sepal_length	species	petal_width
145	6.7	virginica	2.3
...	...	...	...
4	5.0	setosa	0.2
3	4.6	setosa	0.2
2	4.7	setosa	0.2
1	4.9	setosa	0.2
0	5.1	setosa	0.2

150 rows × 3 columns

In [137]:
```
#Example-05:
```

In [138]:
```
d5 = iris.loc[::-4,('sepal_length','species','petal_width')]
d5
```

Out[138]:

	sepal_length	species	petal_width
149	5.9	virginica	1.8
145	6.7	virginica	2.3
141	6.9	virginica	2.3
137	6.4	virginica	1.8
133	6.3	virginica	1.5
129	7.2	virginica	1.6
125	7.2	virginica	1.8
121	5.6	virginica	2.0
117	7.7	virginica	2.2
113	5.7	virginica	2.0

	sepal_length	species	petal_width
109	7.2	virginica	2.5
105	7.6	virginica	2.1
101	5.8	virginica	1.9
97	6.2	versicolor	1.3
93	5.0	versicolor	1.0
89	5.5	versicolor	1.3
85	6.0	versicolor	1.6
81	5.5	versicolor	1.0
77	6.7	versicolor	1.7
73	6.1	versicolor	1.2
69	5.6	versicolor	1.1
65	6.7	versicolor	1.4
61	5.9	versicolor	1.5
57	4.9	versicolor	1.0
53	5.5	versicolor	1.3
49	5.0	setosa	0.2
45	4.8	setosa	0.3
41	4.5	setosa	0.3
37	4.9	setosa	0.1
33	5.5	setosa	0.2
29	4.7	setosa	0.2
25	5.0	setosa	0.2
21	5.1	setosa	0.4
17	5.1	setosa	0.3
13	4.3	setosa	0.1

	sepal_length	species	petal_width
9	4.9	setosa	0.1
5	5.4	setosa	0.4
1	4.9	setosa	0.2

In [139]: `#Example-06:`

In [140]:
```python
d6 = iris.loc[110:11:-3,('sepal_length','species','petal_width')]
d6
```

Out[140]:

	sepal_length	species	petal_width
110	6.5	virginica	2.0
107	7.3	virginica	1.8
104	6.5	virginica	2.2
101	5.8	virginica	1.9
98	5.1	versicolor	1.1
95	5.7	versicolor	1.2
92	5.8	versicolor	1.2
89	5.5	versicolor	1.3
86	6.7	versicolor	1.5
83	6.0	versicolor	1.6
80	5.5	versicolor	1.1
77	6.7	versicolor	1.7
74	6.4	versicolor	1.3
71	6.1	versicolor	1.3
68	6.2	versicolor	1.5
65	6.7	versicolor	1.4

	sepal_length	species	petal_width
62	6.0	versicolor	1.0
59	5.2	versicolor	1.4
56	6.3	versicolor	1.6
53	5.5	versicolor	1.3
50	7.0	versicolor	1.4
47	4.6	setosa	0.2
44	5.1	setosa	0.4
41	4.5	setosa	0.3
38	4.4	setosa	0.2
35	5.0	setosa	0.2
32	5.2	setosa	0.1
29	4.7	setosa	0.2
26	5.0	setosa	0.4
23	5.1	setosa	0.5
20	5.4	setosa	0.2
17	5.1	setosa	0.3
14	5.8	setosa	0.2
11	4.8	setosa	0.2

In [141]: `#g.Dropping row(s):`

In [142]: `#Example-01:`

In [143]:
```
d1 = iris.head(20)
d1
```

Out[143]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa
5	5.4	3.9	1.7	0.4	setosa
6	4.6	3.4	1.4	0.3	setosa
7	5.0	3.4	1.5	0.2	setosa
8	4.4	2.9	1.4	0.2	setosa
9	4.9	3.1	1.5	0.1	setosa
10	5.4	3.7	1.5	0.2	setosa
11	4.8	3.4	1.6	0.2	setosa
12	4.8	3.0	1.4	0.1	setosa
13	4.3	3.0	1.1	0.1	setosa
14	5.8	4.0	1.2	0.2	setosa
15	5.7	4.4	1.5	0.4	setosa
16	5.4	3.9	1.3	0.4	setosa
17	5.1	3.5	1.4	0.3	setosa
18	5.7	3.8	1.7	0.3	setosa
19	5.1	3.8	1.5	0.3	setosa

```
In [144]: d1 = iris.drop([2],axis=0)
          d1
```

Out[144]:

	sepal_length	sepal_width	petal_length	petal_width	species

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa
5	5.4	3.9	1.7	0.4	setosa
...	...	...	...	...	...
145	6.7	3.0	5.2	2.3	virginica
146	6.3	2.5	5.0	1.9	virginica
147	6.5	3.0	5.2	2.0	virginica
148	6.2	3.4	5.4	2.3	virginica
149	5.9	3.0	5.1	1.8	virginica

149 rows × 5 columns

In [145]: `#Example-02:`

In [146]:
```python
d2 = iris.head(15)
d2
```

Out[146]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa
5	5.4	3.9	1.7	0.4	setosa

	sepal_length	sepal_width	petal_length	petal_width	species
6	4.6	3.4	1.4	0.3	setosa
7	5.0	3.4	1.5	0.2	setosa
8	4.4	2.9	1.4	0.2	setosa
9	4.9	3.1	1.5	0.1	setosa
10	5.4	3.7	1.5	0.2	setosa
11	4.8	3.4	1.6	0.2	setosa
12	4.8	3.0	1.4	0.1	setosa
13	4.3	3.0	1.1	0.1	setosa
14	5.8	4.0	1.2	0.2	setosa

In [147]:
```
d2 = iris.drop([2,4,6,8],axis=0)
d2
```

Out[147]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
5	5.4	3.9	1.7	0.4	setosa
7	5.0	3.4	1.5	0.2	setosa
...	...	...	...	...	...
145	6.7	3.0	5.2	2.3	virginica
146	6.3	2.5	5.0	1.9	virginica
147	6.5	3.0	5.2	2.0	virginica
148	6.2	3.4	5.4	2.3	virginica
149	5.9	3.0	5.1	1.8	virginica

146 rows × 5 columns

In [148]: `#Example-03:`

In [149]:
```
d3 = iris.head(12)
d3
```

Out[149]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa
5	5.4	3.9	1.7	0.4	setosa
6	4.6	3.4	1.4	0.3	setosa
7	5.0	3.4	1.5	0.2	setosa
8	4.4	2.9	1.4	0.2	setosa
9	4.9	3.1	1.5	0.1	setosa
10	5.4	3.7	1.5	0.2	setosa
11	4.8	3.4	1.6	0.2	setosa

In [150]:
```
d3 = iris.drop([1,2,3,4,5,6,7,8,9,10],axis = 0)
d3
```

Out[150]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
11	4.8	3.4	1.6	0.2	setosa
12	4.8	3.0	1.4	0.1	setosa

	sepal_length	sepal_width	petal_length	petal_width	species
13	4.3	3.0	1.1	0.1	setosa
14	5.8	4.0	1.2	0.2	setosa
...	...	...	...	...	...
145	6.7	3.0	5.2	2.3	virginica
146	6.3	2.5	5.0	1.9	virginica
147	6.5	3.0	5.2	2.0	virginica
148	6.2	3.4	5.4	2.3	virginica
149	5.9	3.0	5.1	1.8	virginica

140 rows × 5 columns

In [151]: `#h.Dropping column(s):`

In [152]: `#Example-01:`

In [153]:
```
d1 = iris.head(10)
d1
```

Out[153]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa
5	5.4	3.9	1.7	0.4	setosa
6	4.6	3.4	1.4	0.3	setosa
7	5.0	3.4	1.5	0.2	setosa

	sepal_length	sepal_width	petal_length	petal_width	species
8	4.4	2.9	1.4	0.2	setosa
9	4.9	3.1	1.5	0.1	setosa

In [154]:
```python
d1 = iris.drop(['sepal_length'],axis=1)
d1
```

Out[154]:

	sepal_width	petal_length	petal_width	species
0	3.5	1.4	0.2	setosa
1	3.0	1.4	0.2	setosa
2	3.2	1.3	0.2	setosa
3	3.1	1.5	0.2	setosa
4	3.6	1.4	0.2	setosa
...	...	...	...	...
145	3.0	5.2	2.3	virginica
146	2.5	5.0	1.9	virginica
147	3.0	5.2	2.0	virginica
148	3.4	5.4	2.3	virginica
149	3.0	5.1	1.8	virginica

150 rows × 4 columns

In [155]:
```python
#Example-02:
```

In [156]:
```python
d2 = iris.head(10)
d2
```

Out[156]:

	sepal_length	sepal_width	petal_length	petal_width	species

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa
5	5.4	3.9	1.7	0.4	setosa
6	4.6	3.4	1.4	0.3	setosa
7	5.0	3.4	1.5	0.2	setosa
8	4.4	2.9	1.4	0.2	setosa
9	4.9	3.1	1.5	0.1	setosa

In [157]:
```python
d2 = iris.drop(["sepal_width",'petal_width','species'],axis = 1)
d2
```

Out[157]:

	sepal_length	petal_length
0	5.1	1.4
1	4.9	1.4
2	4.7	1.3
3	4.6	1.5
4	5.0	1.4
...	...	...
145	6.7	5.2
146	6.3	5.0
147	6.5	5.2
148	6.2	5.4

	sepal_length	petal_length
149	5.9	5.1

150 rows × 2 columns

In [158]: `#Example-03:`

In [159]:
```python
d3 = iris.head(10)
d3
```

Out[159]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa
5	5.4	3.9	1.7	0.4	setosa
6	4.6	3.4	1.4	0.3	setosa
7	5.0	3.4	1.5	0.2	setosa
8	4.4	2.9	1.4	0.2	setosa
9	4.9	3.1	1.5	0.1	setosa

In [160]:
```python
d3 = iris.drop(['sepal_length','sepal_width','petal_width','species'],axis=1)
d3
```

Out[160]:

	petal_length
0	1.4
1	1.4
2	1.3

	petal_length
3	1.5
4	1.4
...	...
145	5.2
146	5.0
147	5.2
148	5.4
149	5.1

150 rows × 1 columns

In [161]: `#i. Pandas basic functions:`

In [162]: `#i.(i).Minimum value:`

In [163]: `#Example:`

In [164]:
```
iris.min()
```

Out[164]:
```
sepal_length       4.3
sepal_width          2
petal_length         1
petal_width        0.1
species         setosa
dtype: object
```

In [165]: `#i.(ii).Maximum value:`

In [166]: `#Example:`

```python
In [167]: iris.max()
```

```
Out[167]: sepal_length        7.9
          sepal_width         4.4
          petal_length        6.9
          petal_width         2.5
          species        virginica
          dtype: object
```

```python
In [168]: #i.(iii).Mean value:
```

```python
In [169]: #Example:
```

```python
In [170]: iris.mean()
```

```
Out[170]: sepal_length    5.843333
          sepal_width     3.057333
          petal_length    3.758000
          petal_width     1.199333
          dtype: float64
```

```python
In [171]: #i.(iv).Median value:
```

```python
In [172]: #Example:
```

```python
In [173]: iris.median()
```

```
Out[173]: sepal_length    5.80
          sepal_width     3.00
          petal_length    4.35
          petal_width     1.30
          dtype: float64
```

```python
In [174]: #i.(v).Standard Deviation:
```

```python
In [175]: #Example:
```

```
In [176]: iris.std()
```

```
Out[176]: sepal_length    0.828066
          sepal_width     0.435866
          petal_length    1.765298
          petal_width     0.762238
          dtype: float64
```

```
In [177]: #j.Apply:
```

```
In [178]: #Example-01.(i):
```

```
In [179]: d1 = iris.head(20)
          d1
```

Out[179]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa
5	5.4	3.9	1.7	0.4	setosa
6	4.6	3.4	1.4	0.3	setosa
7	5.0	3.4	1.5	0.2	setosa
8	4.4	2.9	1.4	0.2	setosa
9	4.9	3.1	1.5	0.1	setosa
10	5.4	3.7	1.5	0.2	setosa
11	4.8	3.4	1.6	0.2	setosa
12	4.8	3.0	1.4	0.1	setosa

	sepal_length	sepal_width	petal_length	petal_width	species
13	4.3	3.0	1.1	0.1	setosa
14	5.8	4.0	1.2	0.2	setosa
15	5.7	4.4	1.5	0.4	setosa
16	5.4	3.9	1.3	0.4	setosa
17	5.1	3.5	1.4	0.3	setosa
18	5.7	3.8	1.7	0.3	setosa
19	5.1	3.8	1.5	0.3	setosa

In [180]:
```python
def half(s):
    return s*0.5
d1 = iris[['sepal_length']].apply(half)
d1
```

Out[180]:

	sepal_length
0	2.55
1	2.45
2	2.35
3	2.30
4	2.50
...	...
145	3.35
146	3.15
147	3.25
148	3.10
149	2.95

150 rows × 1 columns

```
In [181]:   #Example-01.(ii):

In [182]:   def half(s):
                print(s*0.5)
            d1 = iris[['sepal_length']].apply(half)
            d1

            0       2.55
            1       2.45
            2       2.35
            3       2.30
            4       2.50
                    ...
            145     3.35
            146     3.15
            147     3.25
            148     3.10
            149     2.95
            Name: sepal_length, Length: 150, dtype: float64

Out[182]:   sepal_length    None
            dtype: object

In [183]:   #Example-02:

In [184]:   #Example-02.(ii):

In [185]:   def quarter(s):
                return s*0.25
            d2 = iris[['sepal_length','sepal_width','petal_width','petal_length']].
            apply(quarter)
            d2

Out[185]:
```

	sepal_length	sepal_width	petal_width	petal_length
0	1.275	0.875	0.050	0.350
1	1.225	0.750	0.050	0.350

	sepal_length	sepal_width	petal_width	petal_length
2	1.175	0.800	0.050	0.325
3	1.150	0.775	0.050	0.375
4	1.250	0.900	0.050	0.350
...	...	...	...	...
145	1.675	0.750	0.575	1.300
146	1.575	0.625	0.475	1.250
147	1.625	0.750	0.500	1.300
148	1.550	0.850	0.575	1.350
149	1.475	0.750	0.450	1.275

150 rows × 4 columns

```
In [186]: def quarter(s):
              print(s*0.25)
          d2 = iris[['sepal_length','sepal_width']].apply(quarter)
          d2
```

```
0      1.275
1      1.225
2      1.175
3      1.150
4      1.250
        ...
145    1.675
146    1.575
147    1.625
148    1.550
149    1.475
Name: sepal_length, Length: 150, dtype: float64
0      0.875
1      0.750
2      0.800
```

```
3      0.775
4      0.900
        ...
145    0.750
146    0.625
147    0.750
148    0.850
149    0.750
Name: sepal_width, Length: 150, dtype: float64
```

Out[186]:
```
sepal_length    None
sepal_width     None
dtype: object
```

In [187]: `#Example-03.(i):`

In [188]:
```
d3 = iris.head(25)
d3
```

Out[188]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa
5	5.4	3.9	1.7	0.4	setosa
6	4.6	3.4	1.4	0.3	setosa
7	5.0	3.4	1.5	0.2	setosa
8	4.4	2.9	1.4	0.2	setosa
9	4.9	3.1	1.5	0.1	setosa
10	5.4	3.7	1.5	0.2	setosa
11	4.8	3.4	1.6	0.2	setosa

	sepal_length	sepal_width	petal_length	petal_width	species
12	4.8	3.0	1.4	0.1	setosa
13	4.3	3.0	1.1	0.1	setosa
14	5.8	4.0	1.2	0.2	setosa
15	5.7	4.4	1.5	0.4	setosa
16	5.4	3.9	1.3	0.4	setosa
17	5.1	3.5	1.4	0.3	setosa
18	5.7	3.8	1.7	0.3	setosa
19	5.1	3.8	1.5	0.3	setosa
20	5.4	3.4	1.7	0.2	setosa
21	5.1	3.7	1.5	0.4	setosa
22	4.6	3.6	1.0	0.2	setosa
23	5.1	3.3	1.7	0.5	setosa
24	4.8	3.4	1.9	0.2	setosa

In [189]:
```python
def double(s):
    return s*2
d3 = iris[['sepal_length','sepal_width','petal_length','petal_width']].apply(double)
d3
```

Out[189]:

	sepal_length	sepal_width	petal_length	petal_width
0	10.2	7.0	2.8	0.4
1	9.8	6.0	2.8	0.4
2	9.4	6.4	2.6	0.4
3	9.2	6.2	3.0	0.4
4	10.0	7.2	2.8	0.4
...	...	...	...	...

	sepal_length	sepal_width	petal_length	petal_width
145	13.4	6.0	10.4	4.6
146	12.6	5.0	10.0	3.8
147	13.0	6.0	10.4	4.0
148	12.4	6.8	10.8	4.6
149	11.8	6.0	10.2	3.6

150 rows × 4 columns

In [190]: *#Exampl-03(ii):*

In [191]:
```python
d3 = iris.head(45)
d3
```

Out[191]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa
5	5.4	3.9	1.7	0.4	setosa
6	4.6	3.4	1.4	0.3	setosa
7	5.0	3.4	1.5	0.2	setosa
8	4.4	2.9	1.4	0.2	setosa
9	4.9	3.1	1.5	0.1	setosa
10	5.4	3.7	1.5	0.2	setosa
11	4.8	3.4	1.6	0.2	setosa

	sepal_length	sepal_width	petal_length	petal_width	species
12	4.8	3.0	1.4	0.1	setosa
13	4.3	3.0	1.1	0.1	setosa
14	5.8	4.0	1.2	0.2	setosa
15	5.7	4.4	1.5	0.4	setosa
16	5.4	3.9	1.3	0.4	setosa
17	5.1	3.5	1.4	0.3	setosa
18	5.7	3.8	1.7	0.3	setosa
19	5.1	3.8	1.5	0.3	setosa
20	5.4	3.4	1.7	0.2	setosa
21	5.1	3.7	1.5	0.4	setosa
22	4.6	3.6	1.0	0.2	setosa
23	5.1	3.3	1.7	0.5	setosa
24	4.8	3.4	1.9	0.2	setosa
25	5.0	3.0	1.6	0.2	setosa
26	5.0	3.4	1.6	0.4	setosa
27	5.2	3.5	1.5	0.2	setosa
28	5.2	3.4	1.4	0.2	setosa
29	4.7	3.2	1.6	0.2	setosa
30	4.8	3.1	1.6	0.2	setosa
31	5.4	3.4	1.5	0.4	setosa
32	5.2	4.1	1.5	0.1	setosa
33	5.5	4.2	1.4	0.2	setosa
34	4.9	3.1	1.5	0.2	setosa
35	5.0	3.2	1.2	0.2	setosa
36	5.5	3.5	1.3	0.2	setosa

	sepal_length	sepal_width	petal_length	petal_width	species
37	4.9	3.6	1.4	0.1	setosa
38	4.4	3.0	1.3	0.2	setosa
39	5.1	3.4	1.5	0.2	setosa
40	5.0	3.5	1.3	0.3	setosa
41	4.5	2.3	1.3	0.3	setosa
42	4.4	3.2	1.3	0.2	setosa
43	5.0	3.5	1.6	0.6	setosa
44	5.1	3.8	1.9	0.4	setosa

In [192]:
```python
def double(s):
    print(s*2)
d3 = iris[['sepal_length','sepal_width','petal_length','petal_width']].apply(double)
d3
```

```
0      10.2
1       9.8
2       9.4
3       9.2
4      10.0
       ...
145    13.4
146    12.6
147    13.0
148    12.4
149    11.8
Name: sepal_length, Length: 150, dtype: float64
0       7.0
1       6.0
2       6.4
3       6.2
4       7.2
       ...
145     6.0
```

```
146    5.0
147    6.0
148    6.8
149    6.0
Name: sepal_width, Length: 150, dtype: float64
0        2.8
1        2.8
2        2.6
3        3.0
4        2.8
        ...
145     10.4
146     10.0
147     10.4
148     10.8
149     10.2
Name: petal_length, Length: 150, dtype: float64
0        0.4
1        0.4
2        0.4
3        0.4
4        0.4
        ...
145     4.6
146     3.8
147     4.0
148     4.6
149     3.6
Name: petal_width, Length: 150, dtype: float64
```

Out[192]:
```
sepal_length    None
sepal_width     None
petal_length    None
petal_width     None
dtype: object
```

In [193]:
```
#Example-04.(i):
```

In [194]:
```
d4 = iris.head(35)
```

```
d4
```

Out[194]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa
5	5.4	3.9	1.7	0.4	setosa
6	4.6	3.4	1.4	0.3	setosa
7	5.0	3.4	1.5	0.2	setosa
8	4.4	2.9	1.4	0.2	setosa
9	4.9	3.1	1.5	0.1	setosa
10	5.4	3.7	1.5	0.2	setosa
11	4.8	3.4	1.6	0.2	setosa
12	4.8	3.0	1.4	0.1	setosa
13	4.3	3.0	1.1	0.1	setosa
14	5.8	4.0	1.2	0.2	setosa
15	5.7	4.4	1.5	0.4	setosa
16	5.4	3.9	1.3	0.4	setosa
17	5.1	3.5	1.4	0.3	setosa
18	5.7	3.8	1.7	0.3	setosa
19	5.1	3.8	1.5	0.3	setosa
20	5.4	3.4	1.7	0.2	setosa
21	5.1	3.7	1.5	0.4	setosa
22	4.6	3.6	1.0	0.2	setosa

	sepal_length	sepal_width	petal_length	petal_width	species
23	5.1	3.3	1.7	0.5	setosa
24	4.8	3.4	1.9	0.2	setosa
25	5.0	3.0	1.6	0.2	setosa
26	5.0	3.4	1.6	0.4	setosa
27	5.2	3.5	1.5	0.2	setosa
28	5.2	3.4	1.4	0.2	setosa
29	4.7	3.2	1.6	0.2	setosa
30	4.8	3.1	1.6	0.2	setosa
31	5.4	3.4	1.5	0.4	setosa
32	5.2	4.1	1.5	0.1	setosa
33	5.5	4.2	1.4	0.2	setosa
34	4.9	3.1	1.5	0.2	setosa

In [195]:
```python
def sum(s):
    return s+10
d4 = iris[['sepal_length','petal_width']].apply(sum)
d4
```

Out[195]:

	sepal_length	petal_width
0	15.1	10.2
1	14.9	10.2
2	14.7	10.2
3	14.6	10.2
4	15.0	10.2
...	...	...

145	sepal_length	petal_width
146	16.3	11.9
147	16.5	12.0
148	16.2	12.3
149	15.9	11.8

150 rows × 2 columns

In [196]: `#Example-04.(ii):`

In [197]:
```
d4 = iris.head(23)
d4
```

Out[197]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa
5	5.4	3.9	1.7	0.4	setosa
6	4.6	3.4	1.4	0.3	setosa
7	5.0	3.4	1.5	0.2	setosa
8	4.4	2.9	1.4	0.2	setosa
9	4.9	3.1	1.5	0.1	setosa
10	5.4	3.7	1.5	0.2	setosa
11	4.8	3.4	1.6	0.2	setosa
12	4.8	3.0	1.4	0.1	setosa
13	4.3	3.0	1.1	0.1	setosa

	sepal_length	sepal_width	petal_length	petal_width	species
14	5.8	4.0	1.2	0.2	setosa
15	5.7	4.4	1.5	0.4	setosa
16	5.4	3.9	1.3	0.4	setosa
17	5.1	3.5	1.4	0.3	setosa
18	5.7	3.8	1.7	0.3	setosa
19	5.1	3.8	1.5	0.3	setosa
20	5.4	3.4	1.7	0.2	setosa
21	5.1	3.7	1.5	0.4	setosa
22	4.6	3.6	1.0	0.2	setosa

In [198]:
```python
def sub(s):
    return s-100
d4 = iris[['sepal_length','petal_width']].apply(sub)
d4
```

Out[198]:

	sepal_length	petal_width
0	-94.9	-99.8
1	-95.1	-99.8
2	-95.3	-99.8
3	-95.4	-99.8
4	-95.0	-99.8
...	...	...
145	-93.3	-97.7
146	-93.7	-98.1
147	-93.5	-98.0
148	-93.8	-97.7

	sepal_length	petal_width
149	-94.1	-98.2

150 rows × 2 columns

In [199]: `#Example-04.(iii):`

In [200]:
```
d4 = iris.head(19)
d4
```

Out[200]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa
5	5.4	3.9	1.7	0.4	setosa
6	4.6	3.4	1.4	0.3	setosa
7	5.0	3.4	1.5	0.2	setosa
8	4.4	2.9	1.4	0.2	setosa
9	4.9	3.1	1.5	0.1	setosa
10	5.4	3.7	1.5	0.2	setosa
11	4.8	3.4	1.6	0.2	setosa
12	4.8	3.0	1.4	0.1	setosa
13	4.3	3.0	1.1	0.1	setosa
14	5.8	4.0	1.2	0.2	setosa
15	5.7	4.4	1.5	0.4	setosa

	sepal_length	sepal_width	petal_length	petal_width	species
16	5.4	3.9	1.3	0.4	setosa
17	5.1	3.5	1.4	0.3	setosa
18	5.7	3.8	1.7	0.3	setosa

In [201]:
```python
def mult(s):
    return s*10
d4 = iris[['sepal_length','petal_width']].apply(sum)
d4
```

Out[201]:

	sepal_length	petal_width
0	15.1	10.2
1	14.9	10.2
2	14.7	10.2
3	14.6	10.2
4	15.0	10.2
...	...	...
145	16.7	12.3
146	16.3	11.9
147	16.5	12.0
148	16.2	12.3
149	15.9	11.8

150 rows × 2 columns

In [202]:
```python
#Example-04.(iv):
```

In [203]:
```python
d4 = iris.head(45)
d4
```

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa
5	5.4	3.9	1.7	0.4	setosa
6	4.6	3.4	1.4	0.3	setosa
7	5.0	3.4	1.5	0.2	setosa
8	4.4	2.9	1.4	0.2	setosa
9	4.9	3.1	1.5	0.1	setosa
10	5.4	3.7	1.5	0.2	setosa
11	4.8	3.4	1.6	0.2	setosa
12	4.8	3.0	1.4	0.1	setosa
13	4.3	3.0	1.1	0.1	setosa
14	5.8	4.0	1.2	0.2	setosa
15	5.7	4.4	1.5	0.4	setosa
16	5.4	3.9	1.3	0.4	setosa
17	5.1	3.5	1.4	0.3	setosa
18	5.7	3.8	1.7	0.3	setosa
19	5.1	3.8	1.5	0.3	setosa
20	5.4	3.4	1.7	0.2	setosa
21	5.1	3.7	1.5	0.4	setosa
22	4.6	3.6	1.0	0.2	setosa
23	5.1	3.3	1.7	0.5	setosa
24	4.8	3.4	1.9	0.2	setosa

	sepal_length	sepal_width	petal_length	petal_width	species
25	5.0	3.0	1.6	0.2	setosa
26	5.0	3.4	1.6	0.4	setosa
27	5.2	3.5	1.5	0.2	setosa
28	5.2	3.4	1.4	0.2	setosa
29	4.7	3.2	1.6	0.2	setosa
30	4.8	3.1	1.6	0.2	setosa
31	5.4	3.4	1.5	0.4	setosa
32	5.2	4.1	1.5	0.1	setosa
33	5.5	4.2	1.4	0.2	setosa
34	4.9	3.1	1.5	0.2	setosa
35	5.0	3.2	1.2	0.2	setosa
36	5.5	3.5	1.3	0.2	setosa
37	4.9	3.6	1.4	0.1	setosa
38	4.4	3.0	1.3	0.2	setosa
39	5.1	3.4	1.5	0.2	setosa
40	5.0	3.5	1.3	0.3	setosa
41	4.5	2.3	1.3	0.3	setosa
42	4.4	3.2	1.3	0.2	setosa
43	5.0	3.5	1.6	0.6	setosa
44	5.1	3.8	1.9	0.4	setosa

```python
In [204]: def div(s):
              return s/100
          d4 = iris[['sepal_length','petal_width']].apply(div)
          d4
```

Out[204]:

	sepal_length	petal_width
0	0.051	0.002
1	0.049	0.002
2	0.047	0.002
3	0.046	0.002
4	0.050	0.002
...	...	...
145	0.067	0.023
146	0.063	0.019
147	0.065	0.020
148	0.062	0.023
149	0.059	0.018

150 rows × 2 columns

In [205]: `#k.value_counts():`

In [206]: `#Example:`

In [207]:
```python
d = iris.head()
d
```

Out[207]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa

```
In [208]: d = iris['species'].value_counts()
          d
```

Out[208]:
```
setosa        50
versicolor    50
virginica     50
Name: species, dtype: int64
```

```
In [209]: #l.Sort_values():-
```

```
In [210]: #Example-01:
```

```
In [211]: d1 = iris.head()
          d1
```

Out[211]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa

```
In [212]: d1 = iris.sort_values(by = 'sepal_length')
          d1
```

Out[212]:

	sepal_length	sepal_width	petal_length	petal_width	species
13	4.3	3.0	1.1	0.1	setosa
42	4.4	3.2	1.3	0.2	setosa
38	4.4	3.0	1.3	0.2	setosa
8	4.4	2.9	1.4	0.2	setosa

	sepal_length	sepal_width	petal_length	petal_width	species
41	4.5	2.3	1.3	0.3	setosa
...	...	...	...	...	...
122	7.7	2.8	6.7	2.0	virginica
118	7.7	2.6	6.9	2.3	virginica
117	7.7	3.8	6.7	2.2	virginica
135	7.7	3.0	6.1	2.3	virginica
131	7.9	3.8	6.4	2.0	virginica

150 rows × 5 columns

In [213]:
```
#Example-02:
```

In [214]:
```
d2 = iris.head()
d2
```

Out[214]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa

In [215]:
```
d2 = iris.sort_values(by='sepal_width')
d2
```

Out[215]:

	sepal_length	sepal_width	petal_length	petal_width	species
60	5.0	2.0	3.5	1.0	versicolor

	sepal_length	sepal_width	petal_length	petal_width	species
62	6.0	2.2	4.0	1.0	versicolor
119	6.0	2.2	5.0	1.5	virginica
68	6.2	2.2	4.5	1.5	versicolor
41	4.5	2.3	1.3	0.3	setosa
...	...	...	...	...	...
16	5.4	3.9	1.3	0.4	setosa
14	5.8	4.0	1.2	0.2	setosa
32	5.2	4.1	1.5	0.1	setosa
33	5.5	4.2	1.4	0.2	setosa
15	5.7	4.4	1.5	0.4	setosa

150 rows × 5 columns

In [216]: `#Example-03:`

In [217]:
```python
d3 = iris.head()
d3
```

Out[217]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa

In [218]:
```python
d3 = iris.sort_values(by='petal_length')
d3
```

	sepal_length	sepal_width	petal_length	petal_width	species
22	4.6	3.6	1.0	0.2	setosa
13	4.3	3.0	1.1	0.1	setosa
14	5.8	4.0	1.2	0.2	setosa
35	5.0	3.2	1.2	0.2	setosa
36	5.5	3.5	1.3	0.2	setosa
...	...	...	...	...	...
131	7.9	3.8	6.4	2.0	virginica
105	7.6	3.0	6.6	2.1	virginica
117	7.7	3.8	6.7	2.2	virginica
122	7.7	2.8	6.7	2.0	virginica
118	7.7	2.6	6.9	2.3	virginica

150 rows × 5 columns

In [219]: `#Example-04:`

In [220]:
```python
d4 = iris.head()
d4
```

Out[220]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa

In [221]:
```python
d4 = iris.sort_values(by='petal_width')
```

```
d4
```

	sepal_length	sepal_width	petal_length	petal_width	species
32	5.2	4.1	1.5	0.1	setosa
13	4.3	3.0	1.1	0.1	setosa
37	4.9	3.6	1.4	0.1	setosa
9	4.9	3.1	1.5	0.1	setosa
12	4.8	3.0	1.4	0.1	setosa
...	...	...	...	...	...
140	6.7	3.1	5.6	2.4	virginica
114	5.8	2.8	5.1	2.4	virginica
100	6.3	3.3	6.0	2.5	virginica
144	6.7	3.3	5.7	2.5	virginica
109	7.2	3.6	6.1	2.5	virginica

150 rows × 5 columns

In [222]: `#Example-05:`

In [223]:
```
d5 = iris.head(120)
d5
```

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa

	sepal_length	sepal_width	petal_length	petal_width	species
...	...	...	...	...	...
115	6.4	3.2	5.3	2.3	virginica
116	6.5	3.0	5.5	1.8	virginica
117	7.7	3.8	6.7	2.2	virginica
118	7.7	2.6	6.9	2.3	virginica
119	6.0	2.2	5.0	1.5	virginica

120 rows × 5 columns

In [224]:
```python
d5 = iris.sort_values(by='species')
d5
```

Out[224]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
27	5.2	3.5	1.5	0.2	setosa
28	5.2	3.4	1.4	0.2	setosa
29	4.7	3.2	1.6	0.2	setosa
30	4.8	3.1	1.6	0.2	setosa
...	...	...	...	...	...
119	6.0	2.2	5.0	1.5	virginica
120	6.9	3.2	5.7	2.3	virginica
121	5.6	2.8	4.9	2.0	virginica
111	6.4	2.7	5.3	1.9	virginica
149	5.9	3.0	5.1	1.8	virginica

150 rows × 5 columns