Course	: B. Sc. (h) Computer Science
Year	: III
Semester	: V
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Data Analysis and Visualisation Practical File

INDEX

SNO	PRACTICALS
1	**Ques1.** Given below is a dictionary having two keys 'Boys' and 'Girls' and having two lists of heights of five Boys and Five Girls respectively as values associated with these keys Original dictionary of lists: {'Boys': [72, 68, 70, 69, 74], 'Girls': [63, 65, 69, 62, 61]} From the given dictionary of lists create the following list of dictionaries: [{'Boys': 72, 'Girls': 63}, {'Boys': 68, 'Girls': 65}, {'Boys': 70, 'Girls': 69}, {'Boys': 69, 'Girls': 62}, {'Boys':74, 'Girls':61]
2	**Ques2.** Write programs in Python using NumPy library to do the following: a) Compute the mean, standard deviation, and variance of a two dimensional random integer array along the second axis. b) Get the indices of the sorted elements of a given array. a. B = [56, 48, 22, 41, 78, 91, 24, 46, 8, 33] c) Create a 2-dimensional array of size m x n integer elements, also print the shape, type and data type of the array and then reshape it into nx m array, n and m are user inputs given at the run time. d) Test whether the elements of a given array are zero, non-zero and NaN. Record the indices of these elements in three separate arrays.
3	**Ques3.** Create a dataframe having at least 3 columns and 50 rows to store numeric data generated using a random function. Replace 10% of the values by null values whose index positions are generated using random function. Do the following: a. Identify and count missing values in a dataframe. b. Drop the column having more than 5 null values. c. Identify the row label having maximum of the sum of all values in a row and drop that row. d. Sort the dataframe on the basis of the first column. e. Remove all duplicates from the first column. f. Find the correlation between first and second column and covariance between second and third column. g. Detect the outliers and remove the rows having outliers. h. Discretize second column and create 5 bins
4	**Ques4.** Consider two excel files having attendance of a workshop's participants for two days. Each file has three fields 'Name', 'Time of joining', duration (in minutes) where names are unique within a file. Note that duration may take one of three values (30, 40, 50) only. Import the data into two dataframes and do the following: a. Perform merging of the two dataframes to find the names of students who had attended the workshop on both days. b. Find names of all students who have attended workshop on either of the days. c. Merge two data frames row-wise and find the total number of records in the data frame d. Merge two data frames and use two columns names and duration as multi-row indexes. Generate descriptive statistics for this multi-index.
5	**Ques5.** Taking Iris data, plot the following with proper legend and axis labels: (Download IRIS data from: https://archive.ics.uci.edu/ml/datasets/iris or import it from sklearn.datasets

a. Plot bar chart to show the frequency of each class label in the data.
b. Draw a scatter plot for Petal width vs sepal width.
c. Plot density distribution for feature petal length.
d. Use a pair plot to show pairwise bivariate distribution in the Iris Dataset.

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Ques6. Consider any sales training/ weather forecasting dataset
a. Compute mean of a series grouped by another series
b. Fill an intermittent time series to replace all missing dates with values of previous non-missing date.
c. Perform appropriate year-month string to dates conversion.
d. Split a dataset to group by two columns and then sort the aggregated results within the groups.
e. Split a given dataframe into groups with bin counts

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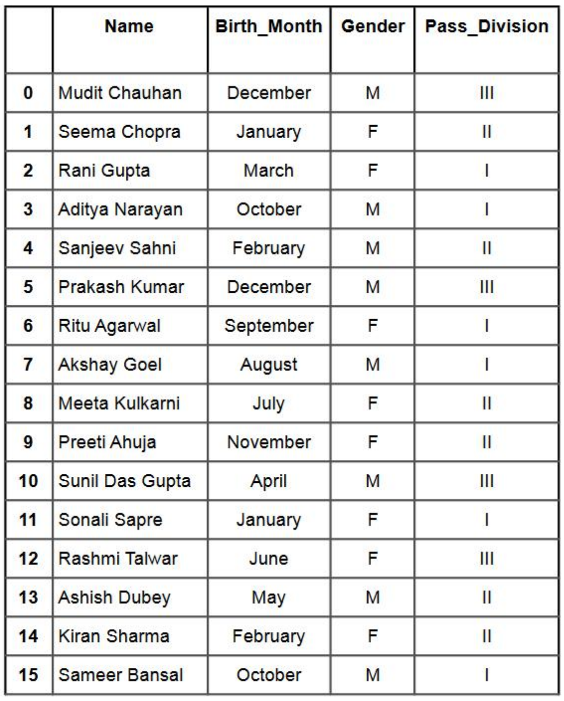
Ques7. Consider a data frame containing data about students i.e. name, gender and passing division:

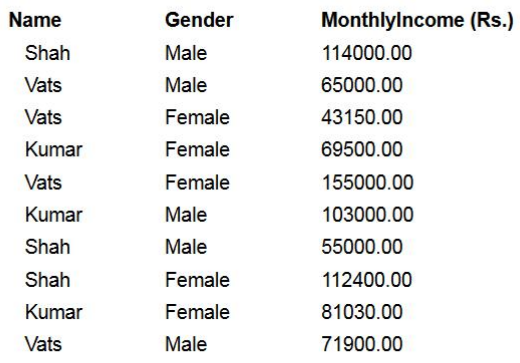


	Name	Birth_Month	Gender	Pass_Division
0	Mudit Chauhan	December	M	III
1	Seema Chopra	January	F	II
2	Rani Gupta	March	F	I
3	Aditya Narayan	October	M	I
4	Sanjeev Sahni	February	M	II
5	Prakash Kumar	December	M	III
6	Ritu Agarwal	September	F	I
7	Akshay Goel	August	M	I
8	Meeta Kulkarni	July	F	II
9	Preeti Ahuja	November	F	II
10	Sunil Das Gupta	April	M	III
11	Sonali Sapre	January	F	I
12	Rashmi Talwar	June	F	III
13	Ashish Dubey	May	M	II
14	Kiran Sharma	February	F	II
15	Sameer Bansal	October	M	I

a. Perform one hot encoding of the last two columns of categorical data using the get_dummies() function.
b. Sort this data frame on the "Birth Month" column (i.e. January to December). Hint: Convert Month to Categorical.

8

Ques8. Consider the following data frame containing a family name, gender of the family member and her/his monthly income in each record.



Name	Gender	MonthlyIncome (Rs.)
Shah	Male	114000.00
Vats	Male	65000.00
Vats	Female	43150.00
Kumar	Female	69500.00
Vats	Female	155000.00
Kumar	Male	103000.00
Shah	Male	55000.00
Shah	Female	112400.00
Kumar	Female	81030.00
Vats	Male	71900.00

	Write a program in Python using Pandas to perform the following: a. Calculate and display familywise gross monthly income. b.Calculate and display the member with the highest monthly income in a family. c. Calculate and display monthly income of all members with income greater than Rs. 60000.00. d. Calculate and display the average monthly income of the female members in the Shah family.

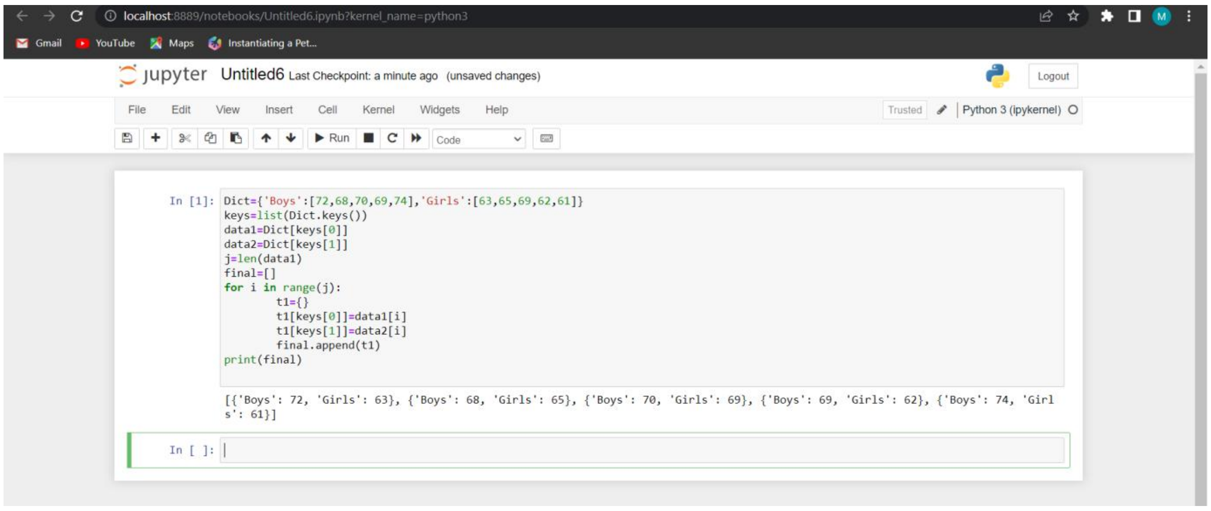
QUESTION1: Given below is a dictionary having two keys 'Boys' and 'Girls' and having two lists of heights of five Boys and Five Girls respectively as values associated with these keys
Original dictionary of lists: {'Boys': [72, 68, 70, 69, 74], 'Girls': [63, 65, 69, 62, 61]}
From the given dictionary of lists create the following list of dictionaries: [{'Boys': 72, 'Girls': 63}, {'Boys': 68, 'Girls': 65}, {'Boys': 70, 'Girls': 69}, {'Boys': 69, 'Girls': 62}, {'Boys':74,
'Girls':61].

Solution:

Code

```
Dict={'Boys':[72,68,70,69,74],'Girls':[63,65,69,62,61]}

keys=list(Dict.keys())

data1=Dict[keys[0]]

data2=Dict[keys[1]]

j=len(data1)

final=[]

for i in range(j):

    t1={}

    t1[keys[0]]=data1[i]

    t1[keys[1]]=data2[i]

    final.append(t1)

print(final)
```

OUTPUT



```
In [1]: Dict={'Boys':[72,68,70,69,74],'Girls':[63,65,69,62,61]}
        keys=list(Dict.keys())
        data1=Dict[keys[0]]
        data2=Dict[keys[1]]
        j=len(data1)
        final=[]
        for i in range(j):
                t1={}
                t1[keys[0]]=data1[i]
                t1[keys[1]]=data2[i]
                final.append(t1)
        print(final)

        [{'Boys': 72, 'Girls': 63}, {'Boys': 68, 'Girls': 65}, {'Boys': 70, 'Girls': 69}, {'Boys': 69, 'Girls': 62}, {'Boys': 74, 'Girl
        s': 61}]

In [ ]:
```

QUESTION2: Write programs in Python using NumPy library to do the following:

a) Compute the mean, standard deviation, and variance of a two dimensional random integer array along the second axis.

b) Get the indices of the sorted elements of a given array.

a. B = [56, 48, 22, 41, 78, 91, 24, 46, 8, 33]

c) Create a 2-dimensional array of size m x n integer elements, also print the shape, type and data type of the array and then reshape it into nx m array, n and m are user inputs given at the run time.

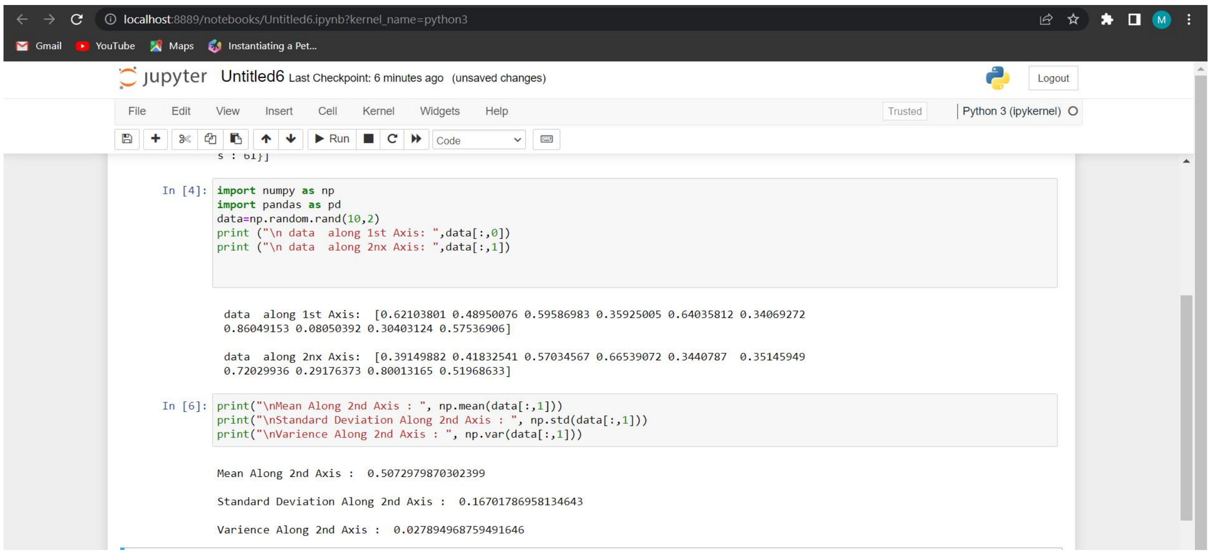
d) Test whether the elements of a given array are zero, non-zero and NaN. Record the indices of these elements in three separate arrays.

SOLUTION

CODE: (a)

```
 import numpy as np

import pandas as pd

data=np.random.rand(10,2)

print ("\n data  along 1st Axis: ",data[:,0])

print ("\n data  along 2nx Axis: ",data[:,1])

print("\nMean Along 2nd Axis : ", np.mean(data[:,1]))

print("\nStandard Deviation Along 2nd Axis : ", np.std(data[:,1]))

print("\nVarience Along 2nd Axis : ", np.var(data[:,1]))
```

OUTPUT



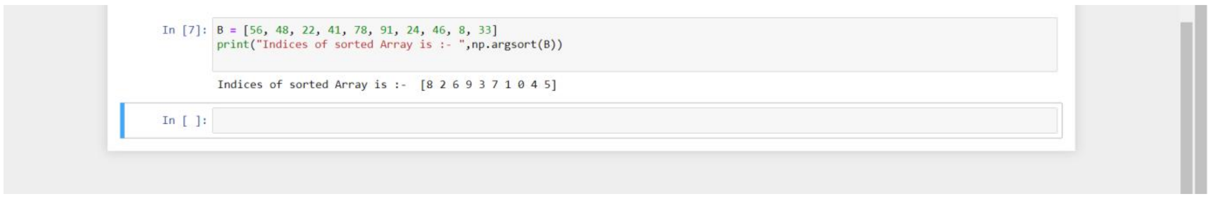
```
In [4]: import numpy as np
        import pandas as pd
        data=np.random.rand(10,2)
        print ("\n data  along 1st Axis: ",data[:,0])
        print ("\n data  along 2nx Axis: ",data[:,1])

         data  along 1st Axis:  [0.62103801 0.48950076 0.59586983 0.35925005 0.64035812 0.34069272
         0.86049153 0.08050392 0.30403124 0.57536906]

         data  along 2nx Axis:  [0.39149882 0.41832541 0.57034567 0.66539072 0.3440787  0.35145949
         0.72029936 0.29176373 0.80013165 0.51968633]

In [6]: print("\nMean Along 2nd Axis : ", np.mean(data[:,1]))
        print("\nStandard Deviation Along 2nd Axis : ", np.std(data[:,1]))
        print("\nVarience Along 2nd Axis : ", np.var(data[:,1]))

        Mean Along 2nd Axis :  0.5072979870302399

        Standard Deviation Along 2nd Axis :  0.16701786958134643

        Varience Along 2nd Axis :  0.027894968759491646
```

(b)

B = [56, 48, 22, 41, 78, 91, 24, 46, 8, 33]

print("Indices of sorted Array is :- ",np.argsort(B))

OUTPUT



```
In [7]: B = [56, 48, 22, 41, 78, 91, 24, 46, 8, 33]
        print("Indices of sorted Array is :- ",np.argsort(B))

        Indices of sorted Array is :-  [8 2 6 9 3 7 1 0 4 5]

In [ ]:
```

(c)

m,n=input("Enter Size of 2D Array :- ").split()

m=int(m)

n=int(n)

data=np.random.rand(m,n)

print(data)

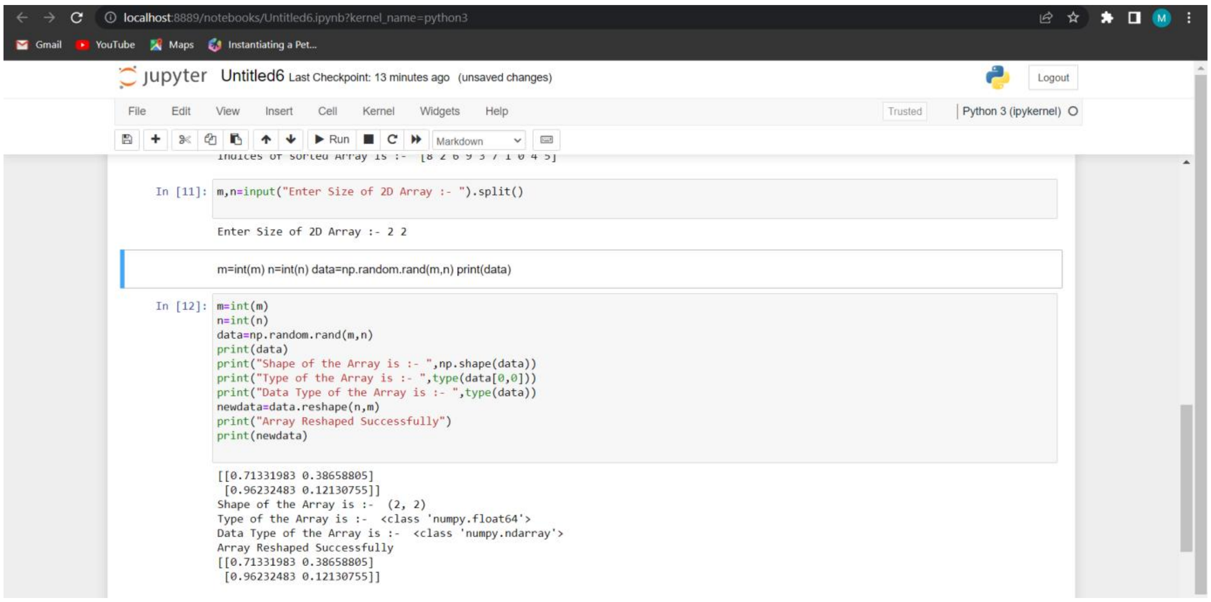
print("Shape of the Array is :- ",np.shape(data))

print("Type of the Array is :- ",type(data[0,0]))

print("Data Type of the Array is :- ",type(data))

```
newdata=data.reshape(n,m)

print("Array Reshaped Successfully")

print(newdata)
```

OUTPUT



```
In [11]: m,n=input("Enter Size of 2D Array :- ").split()

Enter Size of 2D Array :- 2 2
```

m=int(m) n=int(n) data=np.random.rand(m,n) print(data)

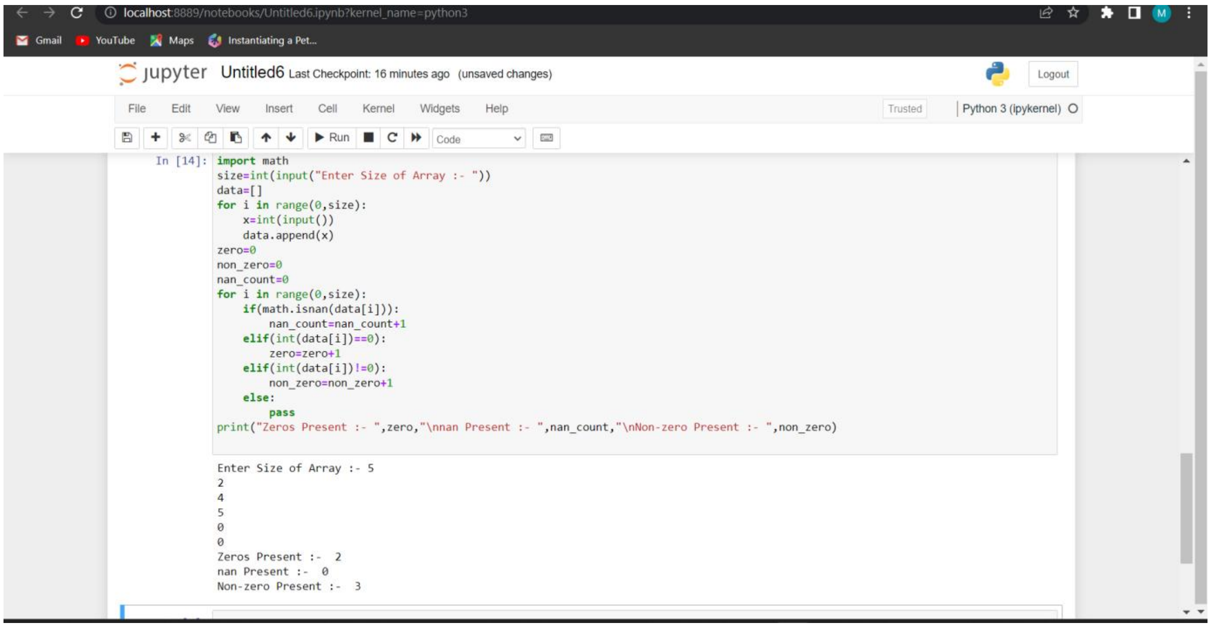
```
In [12]: m=int(m)
         n=int(n)
         data=np.random.rand(m,n)
         print(data)
         print("Shape of the Array is :- ",np.shape(data))
         print("Type of the Array is :- ",type(data[0,0]))
         print("Data Type of the Array is :- ",type(data))
         newdata=data.reshape(n,m)
         print("Array Reshaped Successfully")
         print(newdata)

[[0.71331983 0.38658805]
 [0.96232483 0.12130755]]
Shape of the Array is :-  (2, 2)
Type of the Array is :-  <class 'numpy.float64'>
Data Type of the Array is :-  <class 'numpy.ndarray'>
Array Reshaped Successfully
[[0.71331983 0.38658805]
 [0.96232483 0.12130755]]
```

(d)

```
import math

size=int(input("Enter Size of Array :- "))

data=[]
```

```
for i in range(0,size):
    x=int(input())
    data.append(x)
zero=0
non_zero=0
nan_count=0
for i in range(0,size):
    if(math.isnan(data[i])):
        nan_count=nan_count+1
    elif(int(data[i])==0):
        zero=zero+1
    elif(int(data[i])!=0):
        non_zero=non_zero+1
    else:
        pass
print("Zeros Present :- ",zero,"\nnan Present :- ",nan_count,"\nNon-zero Present :-
",non_zero)
```

OUTPUT



```
In [14]: import math
         size=int(input("Enter Size of Array :- "))
         data=[]
         for i in range(0,size):
             x=int(input())
             data.append(x)
         zero=0
         non_zero=0
         nan_count=0
         for i in range(0,size):
             if(math.isnan(data[i])):
                 nan_count=nan_count+1
             elif(int(data[i])==0):
                 zero=zero+1
             elif(int(data[i])!=0):
                 non_zero=non_zero+1
             else:
                 pass
         print("Zeros Present :- ",zero,"\nnan Present :- ",nan_count,"\nNon-zero Present :- ",non_zero)
```

```
Enter Size of Array :- 5
2
4
5
0
0
Zeros Present :-  2
nan Present :-  0
Non-zero Present :-  3
```

<u>Ques 3.</u>

Create a dataframe having at least 3 columns and 50 rows to store numeric data generated using a random function. Replace 10% of the values by null values whose index positions are generated using random function.Do the following:
a. Identify and count missing values in a dataframe.
b. Drop the column having more than 5 null values.
c. Identify the row label having maximum of the sum of all values in a row and drop that row.
d. Sort the dataframe on the basis of the first column.
e. Remove all duplicates from the first column.
f. Find the correlation between first and second column and covariance between 2nd & 3rd column.
g. Detect the outliers and remove the rows having outliers.
h. Discretize second column and create 5 bins

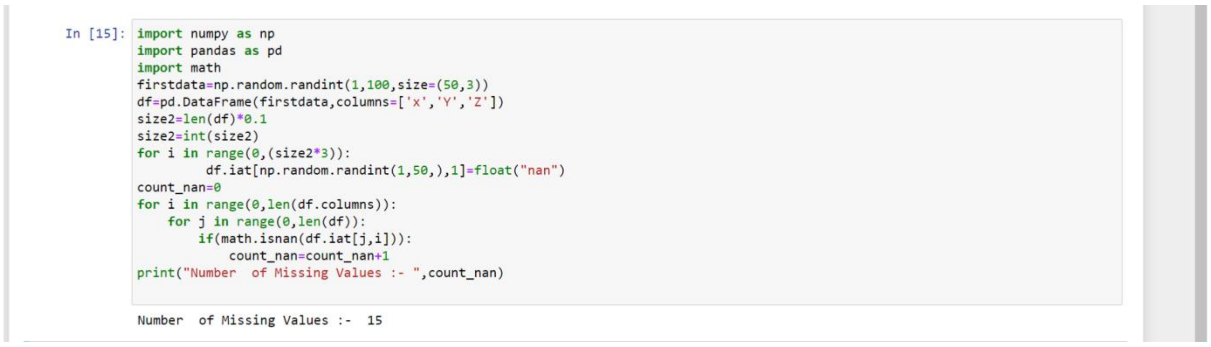
Solution:

Code:

(a)

```
import numpy as np

import pandas as pd

import math

firstdata=np.random.randint(1,100,size=(50,3))

df=pd.DataFrame(firstdata,columns=['x','Y','Z'])

size2=len(df)*0.1

size2=int(size2)

for i in range(0,(size2*3)):

        df.iat[np.random.randint(1,50,),1]=float("nan")

count_nan=0

for i in range(0,len(df.columns)):
    for j in range(0,len(df)):
        if(math.isnan(df.iat[j,i])):
            count_nan=count_nan+1
print("Number  of Missing Values :- ",count_nan)
```

OUTPUT

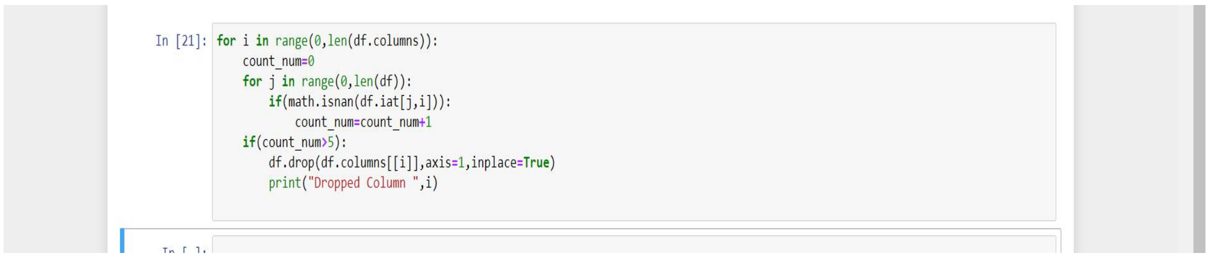


```
In [15]: import numpy as np
         import pandas as pd
         import math
         firstdata=np.random.randint(1,100,size=(50,3))
         df=pd.DataFrame(firstdata,columns=['x','Y','Z'])
         size2=len(df)*0.1
         size2=int(size2)
         for i in range(0,(size2*3)):
                 df.iat[np.random.randint(1,50,),1]=float("nan")
         count_nan=0
         for i in range(0,len(df.columns)):
             for j in range(0,len(df)):
                 if(math.isnan(df.iat[j,i])):
                     count_nan=count_nan+1
         print("Number  of Missing Values :- ",count_nan)

         Number  of Missing Values :-  15
```

(b)

```
for i in range(0,len(df.columns)):
    count_num=0
    for j in range(0,len(df)):
        if(math.isnan(df.iat[j,i])):
            count_num=count_num+1
    if(count_num>5):
        df.drop(df.columns[[i]],axis=1,inplace=True)
        print("Dropped Column ",i)
```

OUTPUT

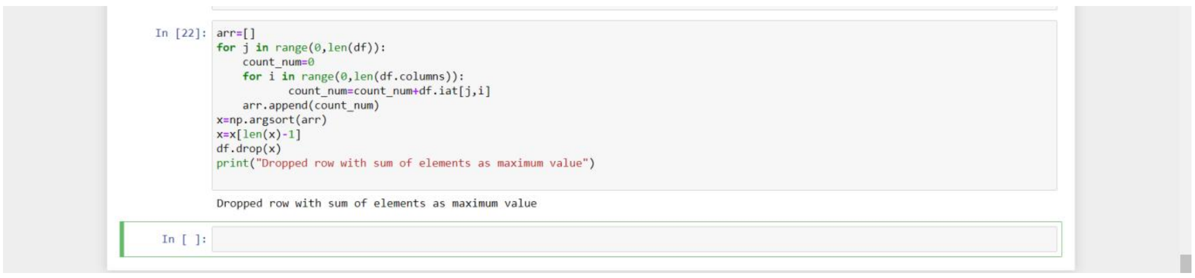


```
In [21]: for i in range(0,len(df.columns)):
             count_num=0
             for j in range(0,len(df)):
                 if(math.isnan(df.iat[j,i])):
                     count_num=count_num+1
             if(count_num>5):
                 df.drop(df.columns[[i]],axis=1,inplace=True)
                 print("Dropped Column ",i)
```

(c)

```
arr=[]
for j in range(0,len(df)):
    count_num=0
    for i in range(0,len(df.columns)):
        count_num=count_num+df.iat[j,i]
    arr.append(count_num)
x=np.argsort(arr)
x=x[len(x)-1]
df.drop(x)
print("Dropped row with sum of elements as maximum value")
```

OUTPUT

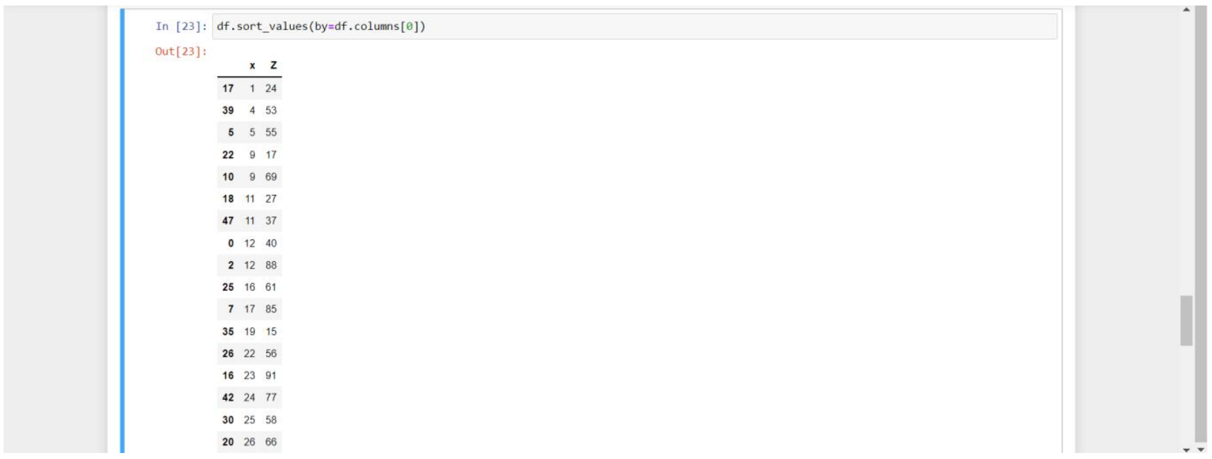


```
In [22]: arr=[]
         for j in range(0,len(df)):
             count_num=0
             for i in range(0,len(df.columns)):
                     count_num=count_num+df.iat[j,i]
             arr.append(count_num)
         x=np.argsort(arr)
         x=x[len(x)-1]
         df.drop(x)
         print("Dropped row with sum of elements as maximum value")

         Dropped row with sum of elements as maximum value

In [ ]:
```

(d)

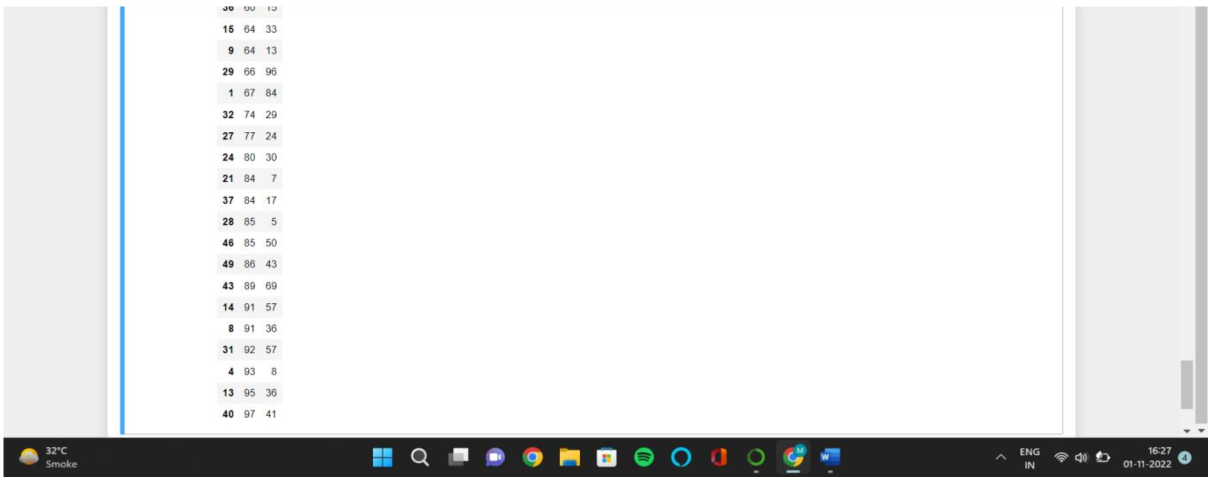
```
df.sort_values(by=df.columns[0])
```

OUTPUT



```
In [23]: df.sort_values(by=df.columns[0])
Out[23]:
```

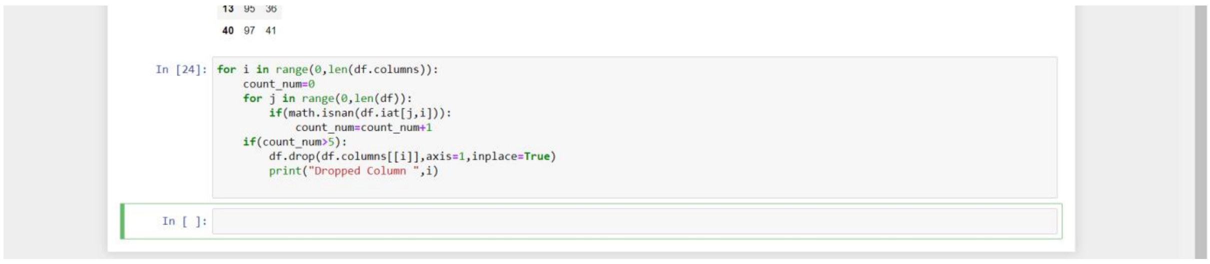
	x	Z
17	1	24
39	4	53
5	5	55
22	9	17
10	9	69
18	11	27
47	11	37
0	12	40
2	12	88
25	16	61
7	17	85
35	19	15
26	22	56
16	23	91
42	24	77
30	25	58
20	26	66



	x	Z
36	60	15
15	64	33
9	64	13
29	66	96
1	67	84
32	74	29
27	77	24
24	80	30
21	84	7
37	84	17
28	85	5
46	85	50
49	86	43
43	89	69
14	91	57
8	91	36
31	92	57
4	93	8
13	95	36
40	97	41

(e)

```
for i in range(0,len(df.columns)):
    count_num=0
    for j in range(0,len(df)):
        if(math.isnan(df.iat[j,i])):
            count_num=count_num+1
    if(count_num>5):
        df.drop(df.columns[[i]],axis=1,inplace=True)
        print("Dropped Column ",i)
```

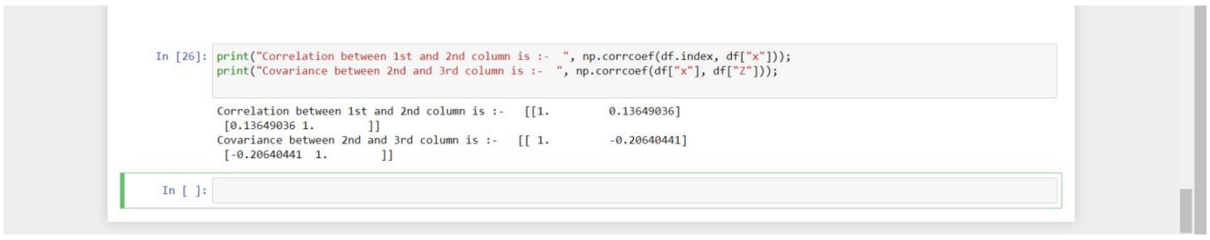


```
13  95  36
40  97  41

In [24]: for i in range(0,len(df.columns)):
             count_num=0
             for j in range(0,len(df)):
                 if(math.isnan(df.iat[j,i])):
                     count_num=count_num+1
             if(count_num>5):
                 df.drop(df.columns[[i]],axis=1,inplace=True)
                 print("Dropped Column ",i)

In [ ]:
```

(f)

```
print("Correlation between 1st and 2nd column is :-  ", np.corrcoef(df.index, df["x"]));
print("Covariance between 2nd and 3rd column is :-  ", np.corrcoef(df["x"], df["Z"]));
```

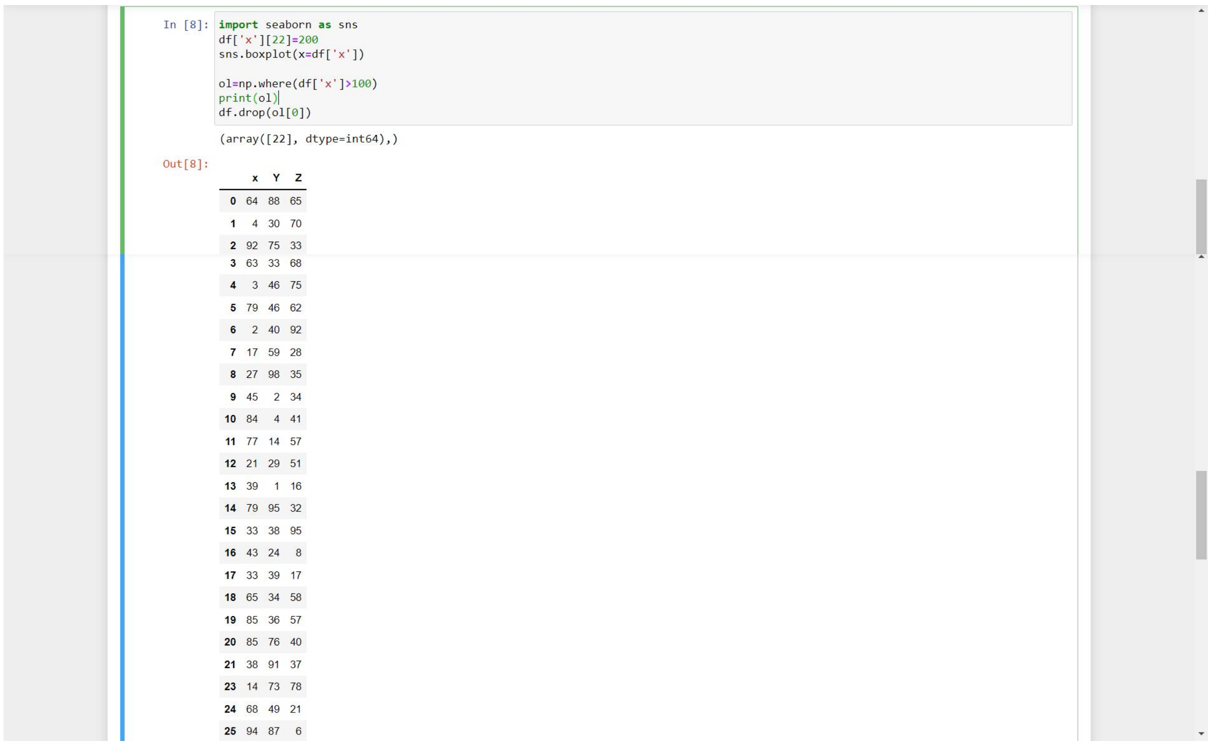
OUTPUT



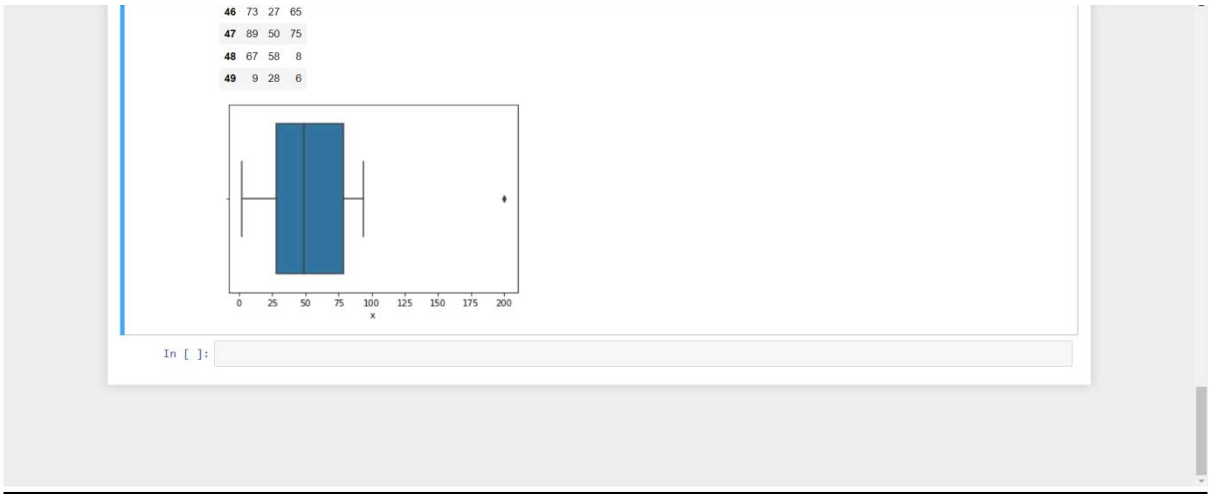
```
In [26]: print("Correlation between 1st and 2nd column is :-   ", np.corrcoef(df.index, df["x"]));
         print("Covariance between 2nd and 3rd column is :-   ", np.corrcoef(df["x"], df["Z"]));

         Correlation between 1st and 2nd column is :-    [[1.         0.13649036]
          [0.13649036 1.        ]]
         Covariance between 2nd and 3rd column is :-    [[ 1.         -0.20640441]
          [-0.20640441  1.        ]]

In [ ]:
```

(g)
```
import seaborn as sns
df['x'][22]=200
sns.boxplot(x=df['x'])
ol=np.where(df['x']>100)
print(ol)
df.drop(ol[0])
```

OUTPUT



```
In [8]: import seaborn as sns
        df['x'][22]=200
        sns.boxplot(x=df['x'])

        ol=np.where(df['x']>100)
        print(ol)
        df.drop(ol[0])

        (array([22], dtype=int64),)

Out[8]:
             x   Y   Z
         0  64  88  65
         1   4  30  70
         2  92  75  33
         3  63  33  68
         4   3  46  75
         5  79  46  62
         6   2  40  92
         7  17  59  28
         8  27  98  35
         9  45   2  34
        10  84   4  41
        11  77  14  57
        12  21  29  51
        13  39   1  16
        14  79  95  32
        15  33  38  95
        16  43  24   8
        17  33  39  17
        18  65  34  58
        19  85  36  57
        20  85  76  40
        21  38  91  37
        23  14  73  78
        24  68  49  21
        25  94  87   6
```



```
        46  73  27  65
        47  89  50  75
        48  67  58   8
        49   9  28   6
```

```
In [ ]:
```

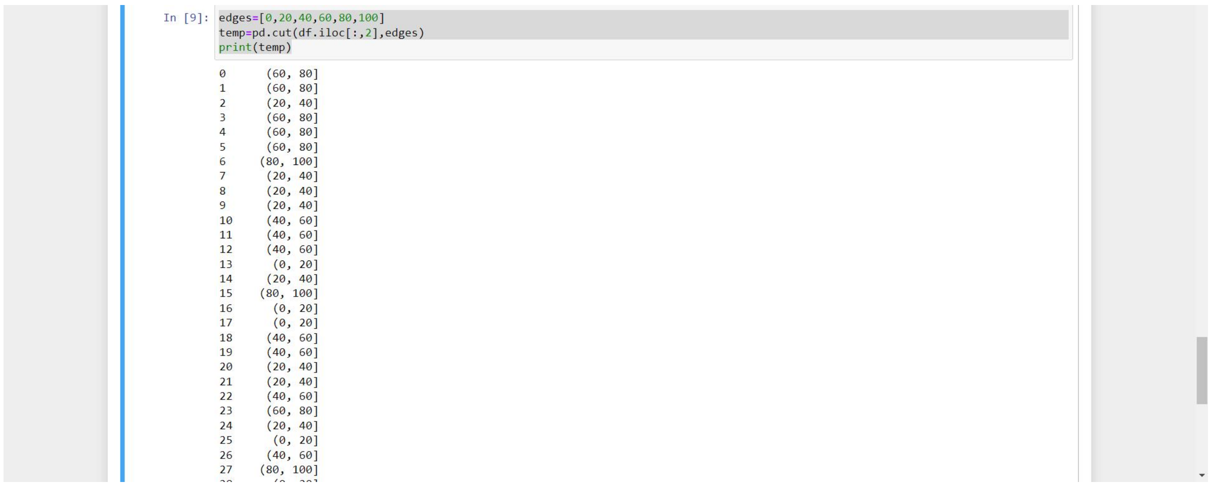
Code h) :

edges=[0,20,40,60,80,100]

temp=pd.cut(df.iloc[:,2],edges)

print(temp)

OUTPUT



```
In [9]: edges=[0,20,40,60,80,100]
        temp=pd.cut(df.iloc[:,2],edges)
        print(temp)
```

```
0      (60, 80]
1      (60, 80]
2      (20, 40]
3      (60, 80]
4      (60, 80]
5      (60, 80]
6     (80, 100]
7      (20, 40]
8      (20, 40]
9      (20, 40]
10     (40, 60]
11     (40, 60]
12     (40, 60]
13      (0, 20]
14     (20, 40]
15    (80, 100]
16      (0, 20]
17      (0, 20]
18     (40, 60]
19     (40, 60]
20     (20, 40]
21     (20, 40]
22     (40, 60]
23     (60, 80]
24     (20, 40]
25      (0, 20]
26     (40, 60]
27    (80, 100]
```

<u>Ques 4.</u>

Consider two excel files having attendance of a workshop's participants for two days. Each file has three fields 'Name', 'Time of joining', duration (in minutes) where names are unique within a file. Note that duration may take one of three values (30, 40, 50) only. Import the data into two dataframes and do the following:

a. Perform merging of the two dataframes to find the names of students who had attended the workshop on both days.

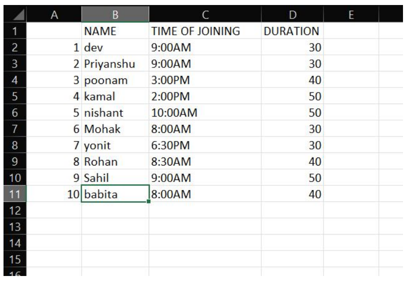
b. Find names of all students who have attended workshop on either of the days.

c. Merge two data frames row-wise and find the total number of records in the data frame.

d. Merge two data frames and use two columns names and duration as multi-row indexes. Generate descriptive statistics for this multi-index.

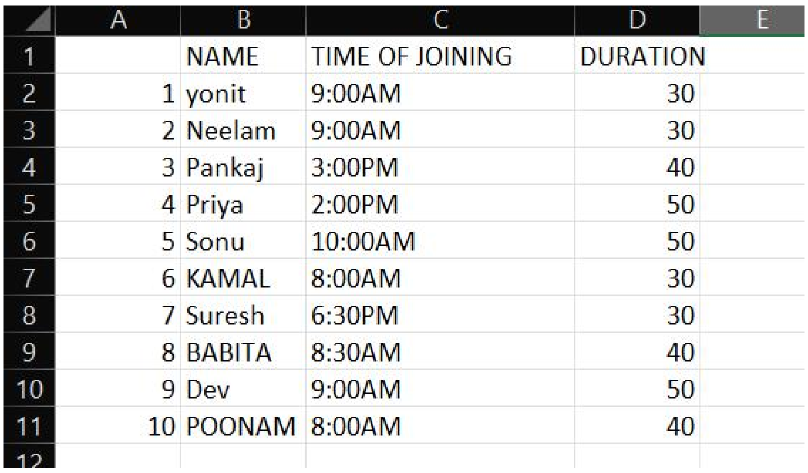
Solution

FILE1



	A	B	C	D	E
1		NAME	TIME OF JOINING	DURATION	
2	1	dev	9:00AM	30	
3	2	Priyanshu	9:00AM	30	
4	3	poonam	3:00PM	40	
5	4	kamal	2:00PM	50	
6	5	nishant	10:00AM	50	
7	6	Mohak	8:00AM	30	
8	7	yonit	6:30PM	30	
9	8	Rohan	8:30AM	40	
10	9	Sahil	9:00AM	50	
11	10	babita	8:00AM	40	
12					
13					
14					
15					

File2

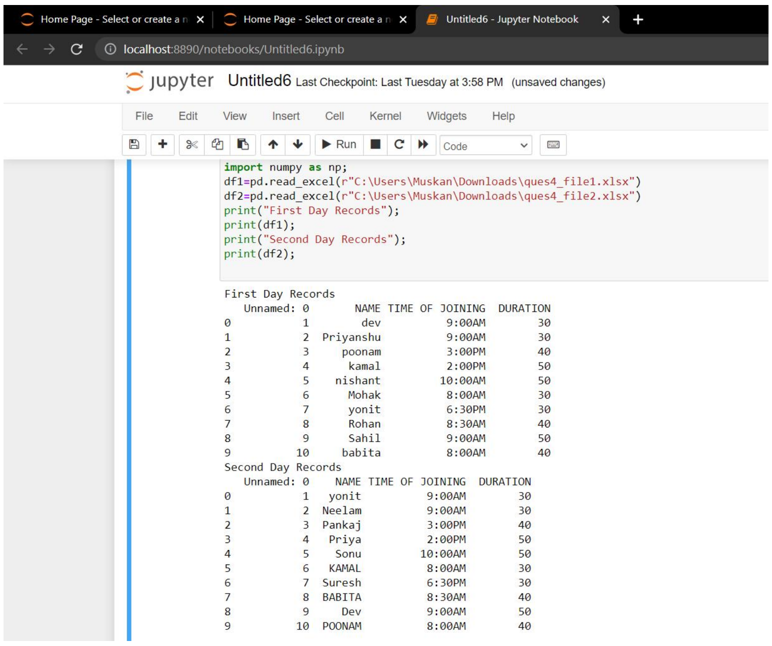


	A	B	C	D	E
1		NAME	TIME OF JOINING	DURATION	
2	1	yonit	9:00AM	30	
3	2	Neelam	9:00AM	30	
4	3	Pankaj	3:00PM	40	
5	4	Priya	2:00PM	50	
6	5	Sonu	10:00AM	50	
7	6	KAMAL	8:00AM	30	
8	7	Suresh	6:30PM	30	
9	8	BABITA	8:30AM	40	
10	9	Dev	9:00AM	50	
11	10	POONAM	8:00AM	40	

CODE

```
import pandas as pd;
import numpy as np;
df1=pd.read_excel(r"C:\Users\Muskan\Downloads\ques4_file1.xlsx")
df2=pd.read_excel(r"C:\Users\Muskan\Downloads\ques4_file2.xlsx")
print("First Day Records");
print(df1);
print("Second Day Records");
print(df2);
```

OUTPUT

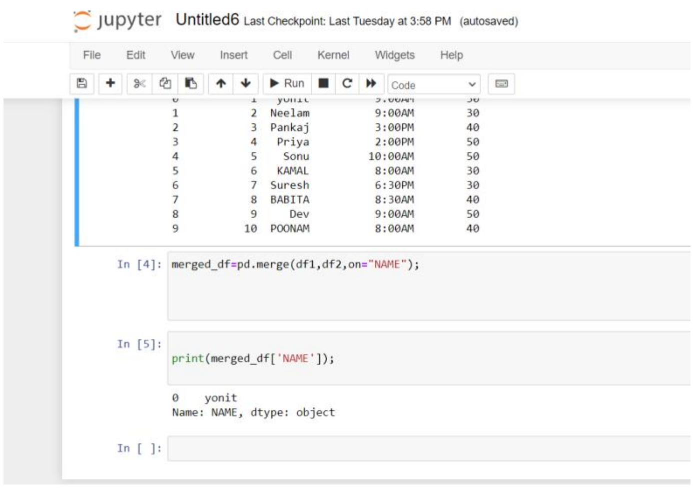

Home Page - Select or create a n
Home Page - Select or create a n
Untitled6 - Jupyter Notebook
localhost:8890/notebooks/Untitled6.ipynb
jupyter Untitled6 Last Checkpoint: Last Tuesday at 3:58 PM (unsaved changes)
File Edit View Insert Cell Kernel Widgets Help
Run
Code

```
import numpy as np;
df1=pd.read_excel(r"C:\Users\Muskan\Downloads\ques4_file1.xlsx")
df2=pd.read_excel(r"C:\Users\Muskan\Downloads\ques4_file2.xlsx")
print("First Day Records");
print(df1);
print("Second Day Records");
print(df2);
```

```
First Day Records
   Unnamed: 0       NAME TIME OF JOINING  DURATION
0           1        dev          9:00AM        30
1           2  Priyanshu          9:00AM        30
2           3     poonam          3:00PM        40
3           4      kamal          2:00PM        50
4           5    nishant         10:00AM        50
5           6      Mohak          8:00AM        30
6           7      yonit          6:30PM        30
7           8      Rohan          8:30AM        40
8           9      Sahil          9:00AM        50
9          10     babita          8:00AM        40
Second Day Records
   Unnamed: 0    NAME TIME OF JOINING  DURATION
0           1   yonit          9:00AM        30
1           2  Neelam          9:00AM        30
2           3  Pankaj          3:00PM        40
3           4   Priya          2:00PM        50
4           5    Sonu         10:00AM        50
5           6   KAMAL          8:00AM        30
6           7  Suresh          6:30PM        30
7           8  BABITA          8:30AM        40
8           9     Dev          9:00AM        50
9          10  POONAM          8:00AM        40
```

(a)

```
merged_df=pd.merge(df1,df2,on="Name");
print(merged_df['Name']);
```


jupyter Untitled6 Last Checkpoint: Last Tuesday at 3:58 PM (autosaved)
File Edit View Insert Cell Kernel Widgets Help
Run Code

```
0          1  yonit        9:00AM     30
1          2  Neelam       9:00AM     30
2          3  Pankaj       3:00PM     40
3          4   Priya       2:00PM     50
4          5    Sonu      10:00AM     50
5          6   KAMAL       8:00AM     30
6          7  Suresh       6:30PM     30
7          8  BABITA       8:30AM     40
8          9     Dev       9:00AM     50
9         10  POONAM       8:00AM     40
```

```
In [4]: merged_df=pd.merge(df1,df2,on="NAME");
```

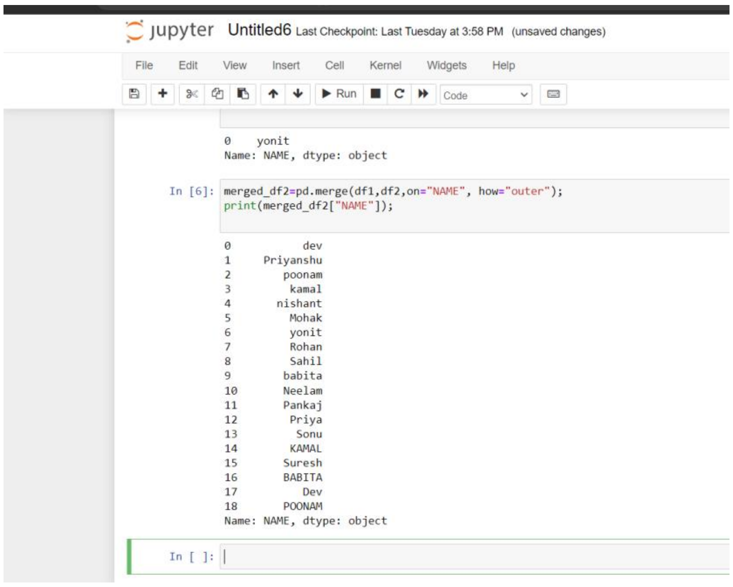
```
In [5]: print(merged_df['NAME']);
```

```
0    yonit
Name: NAME, dtype: object
```

```
In [ ]:
```

(b) merged_df2=pd.merge(df1,df2,on="NAME", how="outer");

print(merged_df2["NAME"]);


jupyter Untitled6 Last Checkpoint: Last Tuesday at 3:58 PM (unsaved changes)
File Edit View Insert Cell Kernel Widgets Help
Run Code

```
0    yonit
Name: NAME, dtype: object
```

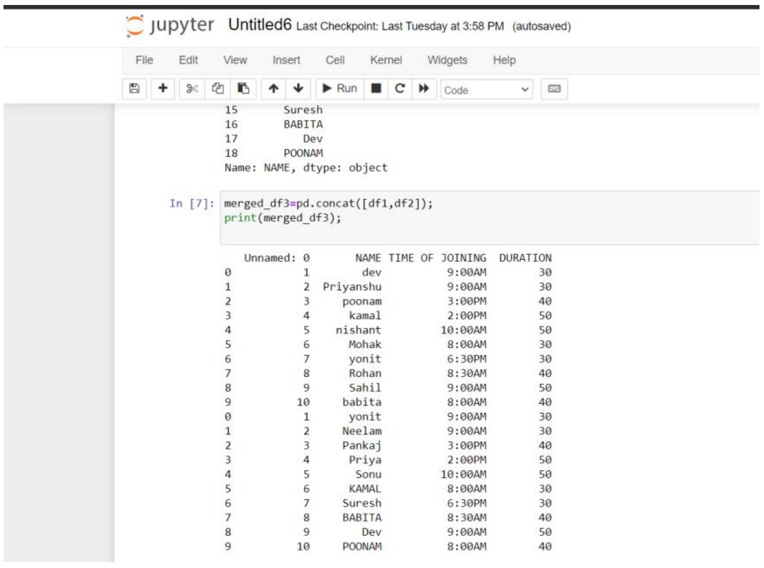
```
In [6]: merged_df2=pd.merge(df1,df2,on="NAME", how="outer");
        print(merged_df2["NAME"]);
```

```
0            dev
1      Priyanshu
2         poonam
3          kamal
4        nishant
5          Mohak
6          yonit
7          Rohan
8          Sahil
9         babita
10        Neelam
11        Pankaj
12         Priya
13          Sonu
14         KAMAL
15        Suresh
16        BABITA
17           Dev
18        POONAM
Name: NAME, dtype: object
```

```
In [ ]:
```

(c) merged_df3=pd.concat([df1,df2]);

print(merged_df3);


jupyter Untitled6 Last Checkpoint: Last Tuesday at 3:58 PM (autosaved)
File Edit View Insert Cell Kernel Widgets Help
Run
Code

```
15       Suresh
16       BABITA
17          Dev
18       POONAM
Name: NAME, dtype: object
```

```
In [7]: merged_df3=pd.concat([df1,df2]);
        print(merged_df3);
```

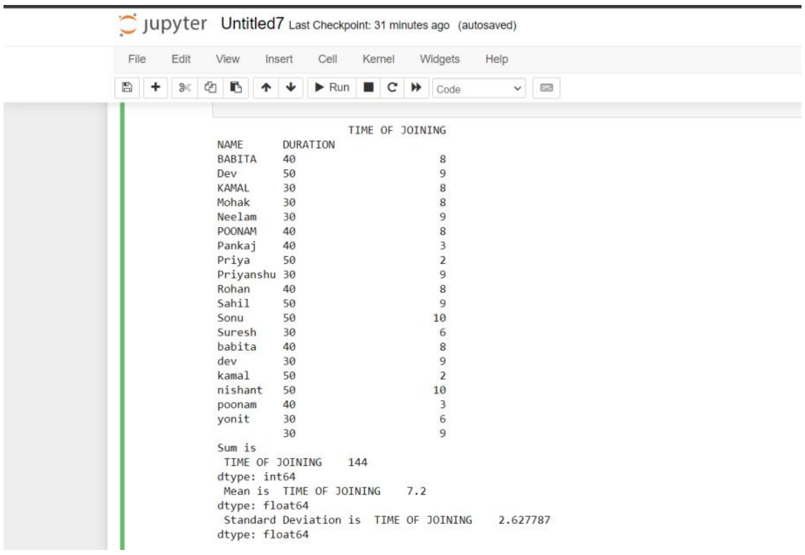
```
   Unnamed: 0       NAME TIME OF JOINING  DURATION
0           1        dev          9:00AM        30
1           2  Priyanshu          9:00AM        30
2           3     poonam          3:00PM        40
3           4      kamal          2:00PM        50
4           5    nishant         10:00AM        50
5           6      Mohak          8:00AM        30
6           7      yonit          6:30PM        30
7           8      Rohan          8:30AM        40
8           9      Sahil          9:00AM        50
9          10     babita          8:00AM        40
0           1      yonit          9:00AM        30
1           2     Neelam          9:00AM        30
2           3     Pankaj          3:00PM        40
3           4      Priya          2:00PM        50
4           5       Sonu         10:00AM        50
5           6      KAMAL          8:00AM        30
6           7     Suresh          6:30PM        30
7           8     BABITA          8:30AM        40
8           9        Dev          9:00AM        50
9          10     POONAM          8:00AM        40
```

(d)

```
merged_df4=pd.merge(df1,df2,how="outer");
merged_df4=merged_df4.set_index(['NAME','DURATION']);
merged_df4=merged_df4.sort_values(by=['NAME']);
# For Changing "Time of Joining " to integer from String
merged_df4['TIME OF JOINING']=merged_df4['TIME OF JOINING'].astype('string');



# print(merged_df4);
# for i in range(len(merged_df4)):
#     print(i);
for i in range(len(merged_df4)):
    merged_df4['TIME OF JOINING'][i]=merged_df4['TIME OF JOINING'][i].replace('AM','');
    merged_df4['TIME OF JOINING'][i]=merged_df4['TIME OF JOINING'][i].replace('PM','');

merged_df4['TIME OF JOINING']=merged_df4['TIME OF JOINING'].astype(int);
```

print(merged_df4);

print ("Sum is \n",merged_df4.sum(0),"\n Mean is ",merged_df4.mean(0),"\n Standard Deviation is ",merged_df4.std(0),);


jupyter Untitled7 Last Checkpoint: 31 minutes ago (autosaved)
File Edit View Insert Cell Kernel Widgets Help
Run
Code

```
                    TIME OF JOINING
NAME      DURATION
BABITA    40                      8
Dev       50                      9
KAMAL     30                      8
Mohak     30                      8
Neelam    30                      9
POONAM    40                      8
Pankaj    40                      3
Priya     50                      2
Priyanshu 30                      9
Rohan     40                      8
Sahil     50                      9
Sonu      50                     10
Suresh    30                      6
babita    40                      8
dev       30                      9
kamal     50                      2
nishant   50                     10
poonam    40                      3
yonit     30                      6
          30                      9
Sum is
 TIME OF JOINING    144
dtype: int64
 Mean is  TIME OF JOINING    7.2
dtype: float64
 Standard Deviation is  TIME OF JOINING    2.627787
dtype: float64
```

Ques 5.

Taking Iris data, plot the following with proper legend and axis labels: (Download IRIS data from:
https://archive.ics.uci.edu/ml/datasets/iris or import it from sklearn.datasets

a. Plot bar chart to show the frequency of each class label in the data.
b. Draw a scatter plot for Petal width vs sepal width.
c. Plot density distribution for feature petal length.
d. Use a pair plot to show pairwise bivariate distribution in the Iris Dataset.

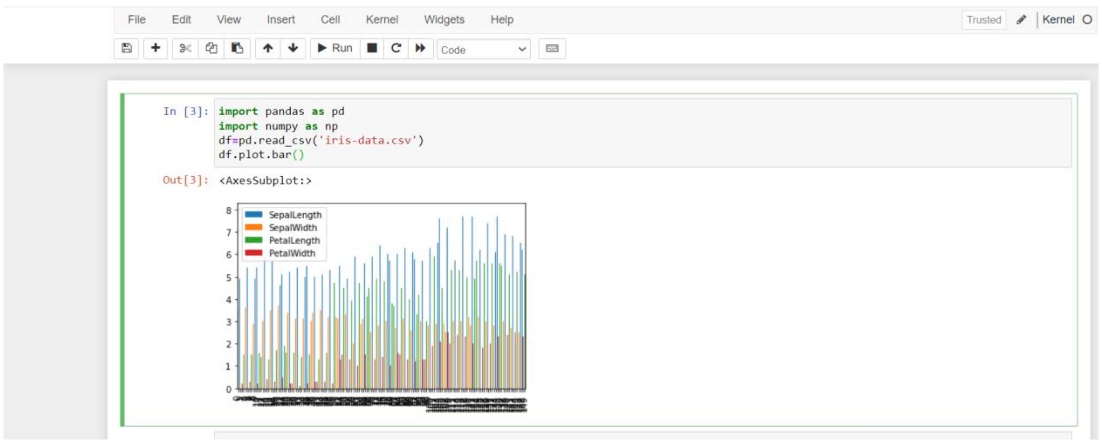
Code (a)

import pandas as pd

import numpy as np

df=pd.read_csv('iris-data.csv')

df.plot.bar()

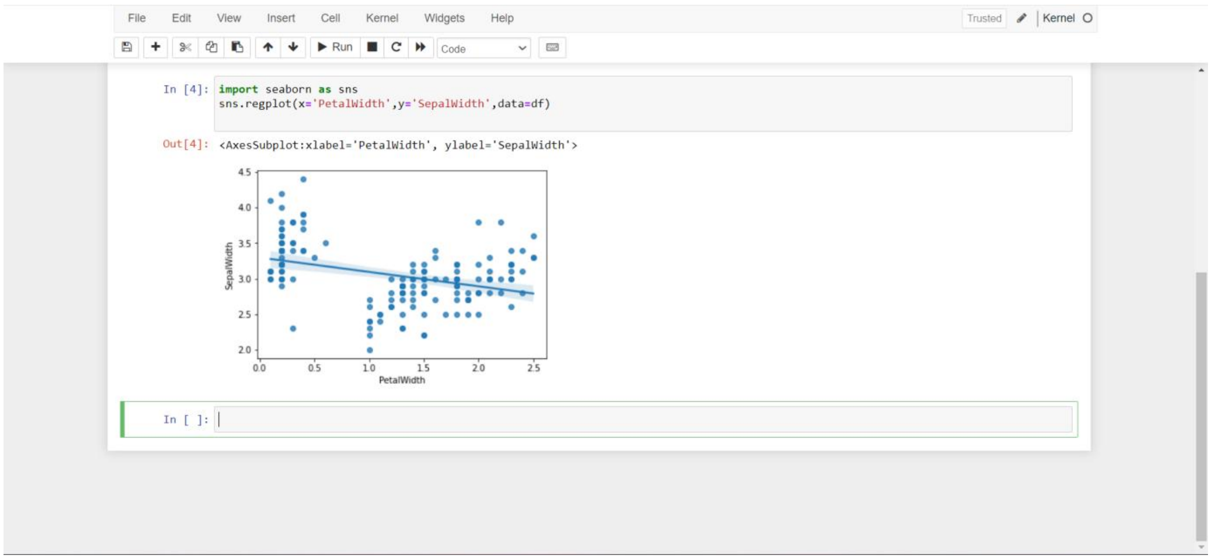


```
In [3]: import pandas as pd
        import numpy as np
        df=pd.read_csv('iris-data.csv')
        df.plot.bar()

Out[3]: <AxesSubplot:>
```

Code(b):

import seaborn as sns

sns.regplot(x='PetalWidth',y='SepalWidth',data=df)

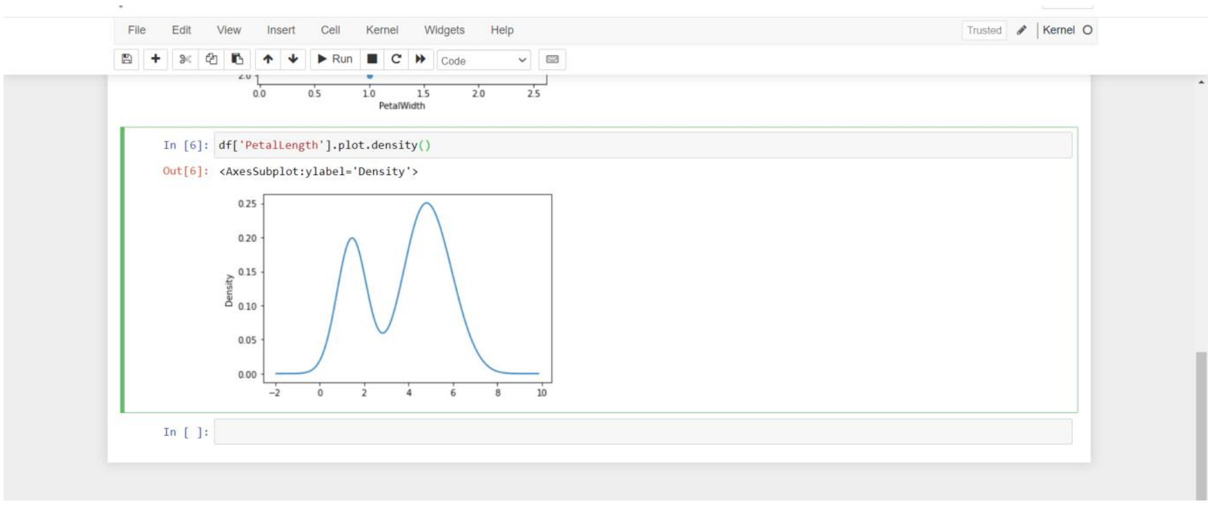


```
In [4]: import seaborn as sns
        sns.regplot(x='PetalWidth',y='SepalWidth',data=df)

Out[4]: <AxesSubplot:xlabel='PetalWidth', ylabel='SepalWidth'>
```

```
In [ ]:
```

Code (c):

df['PetalLength'].plot.density()

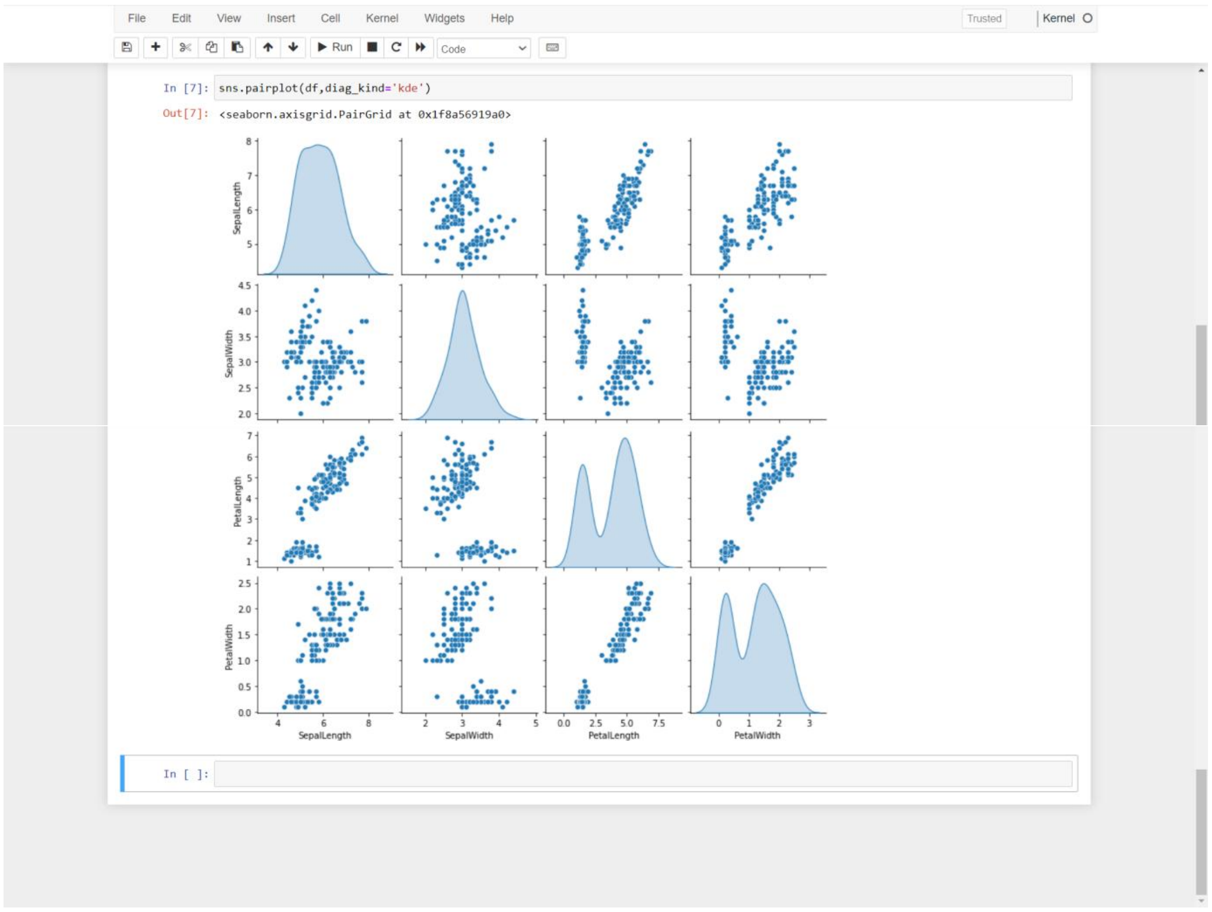


```
In [6]: df['PetalLength'].plot.density()
Out[6]: <AxesSubplot:ylabel='Density'>
```

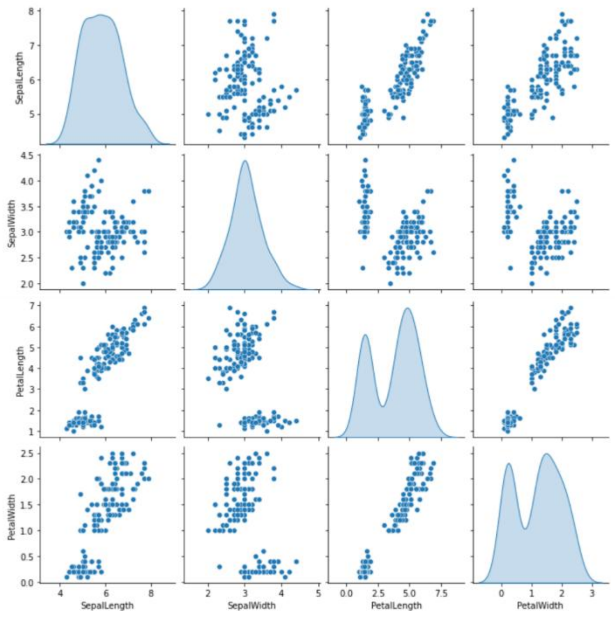
```
In [ ]:
```

Code d):

sns.pairplot(df,diag_kind='kde')



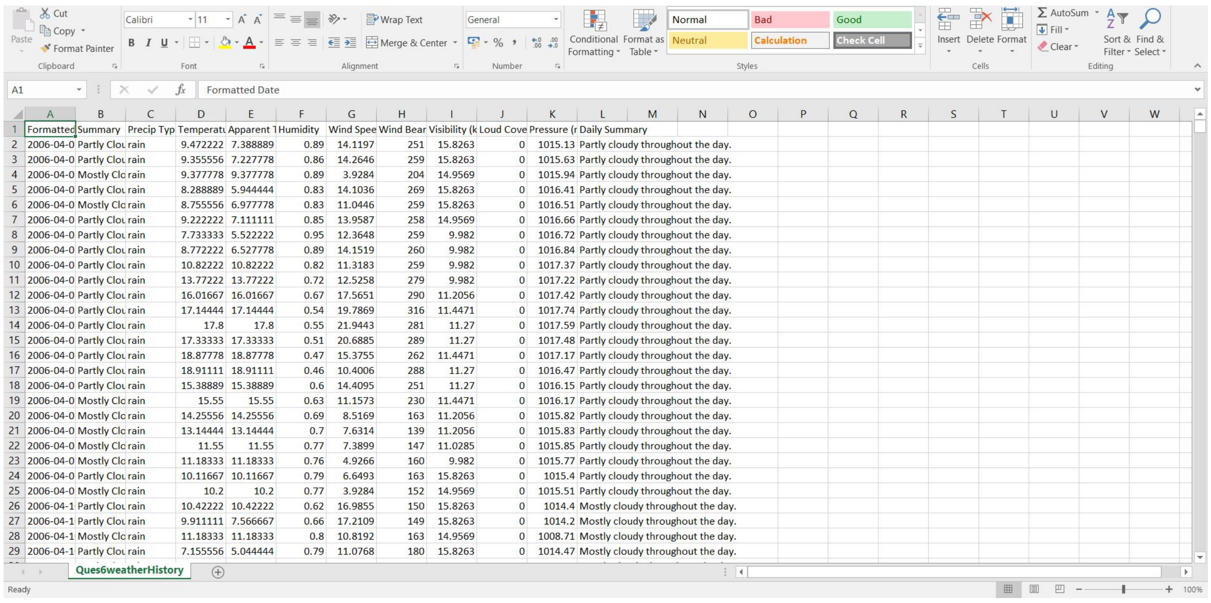
```
In [7]: sns.pairplot(df,diag_kind='kde')

Out[7]: <seaborn.axisgrid.PairGrid at 0x1f8a56919a0>
```



```
In [ ]:
```

Ques 6.

Consider any sales training/ weather forecasting dataset
a. Compute mean of a series grouped by another series
b. Fill an intermittent time series to replace all missing dates with values of previous non-missing date.
c. Perform appropriate year-month string to dates conversion.
d. Split a dataset to group by two columns and then sort the aggregated results within the groups.
e. Split a given dataframe into groups with bin counts



A1 Formatted Date

	A	B	C	D	E	F	G	H	I	J	K	L
1	Formatted	Summary	Precip Typ	Temperatu	Apparent T	Humidity	Wind Spee	Wind Bear	Visibility (k	Loud Cove	Pressure (r	Daily Summary
2	2006-04-0	Partly Clou	rain	9.472222	7.388889	0.89	14.1197	251	15.8263	0	1015.13	Partly cloudy throughout the day.
3	2006-04-0	Partly Clou	rain	9.355556	7.227778	0.86	14.2646	259	15.8263	0	1015.63	Partly cloudy throughout the day.
4	2006-04-0	Mostly Clo	rain	9.377778	9.377778	0.89	3.9284	204	14.9569	0	1015.94	Partly cloudy throughout the day.
5	2006-04-0	Partly Clou	rain	8.288889	5.944444	0.83	14.1036	269	15.8263	0	1016.41	Partly cloudy throughout the day.
6	2006-04-0	Mostly Clo	rain	8.755556	6.977778	0.83	11.0446	259	15.8263	0	1016.51	Partly cloudy throughout the day.
7	2006-04-0	Partly Clou	rain	9.222222	7.111111	0.85	13.9587	258	14.9569	0	1016.66	Partly cloudy throughout the day.
8	2006-04-0	Partly Clou	rain	7.733333	5.522222	0.95	12.3648	259	9.982	0	1016.72	Partly cloudy throughout the day.
9	2006-04-0	Partly Clou	rain	8.772222	6.527778	0.89	14.1519	260	9.982	0	1016.84	Partly cloudy throughout the day.
10	2006-04-0	Partly Clou	rain	10.82222	10.82222	0.82	11.3183	259	9.982	0	1017.37	Partly cloudy throughout the day.
11	2006-04-0	Partly Clou	rain	13.77222	13.77222	0.72	12.5258	279	9.982	0	1017.22	Partly cloudy throughout the day.
12	2006-04-0	Partly Clou	rain	16.01667	16.01667	0.67	17.5651	290	11.2056	0	1017.42	Partly cloudy throughout the day.
13	2006-04-0	Partly Clou	rain	17.14444	17.14444	0.54	19.7869	316	11.4471	0	1017.74	Partly cloudy throughout the day.
14	2006-04-0	Partly Clou	rain	17.8	17.8	0.55	21.9443	281	11.27	0	1017.59	Partly cloudy throughout the day.
15	2006-04-0	Partly Clou	rain	17.33333	17.33333	0.51	20.6885	289	11.27	0	1017.48	Partly cloudy throughout the day.
16	2006-04-0	Partly Clou	rain	18.87778	18.87778	0.47	15.3755	262	11.4471	0	1017.17	Partly cloudy throughout the day.
17	2006-04-0	Partly Clou	rain	18.91111	18.91111	0.46	10.4006	288	11.27	0	1016.47	Partly cloudy throughout the day.
18	2006-04-0	Partly Clou	rain	15.38889	15.38889	0.6	14.4095	251	11.27	0	1016.15	Partly cloudy throughout the day.
19	2006-04-0	Mostly Clo	rain	15.55	15.55	0.63	11.1573	230	11.4471	0	1016.17	Partly cloudy throughout the day.
20	2006-04-0	Mostly Clo	rain	14.25556	14.25556	0.69	8.5169	163	11.2056	0	1015.82	Partly cloudy throughout the day.
21	2006-04-0	Mostly Clo	rain	13.14444	13.14444	0.7	7.6314	139	11.2056	0	1015.83	Partly cloudy throughout the day.
22	2006-04-0	Mostly Clo	rain	11.55	11.55	0.77	7.3899	147	11.0285	0	1015.85	Partly cloudy throughout the day.
23	2006-04-0	Mostly Clo	rain	11.18333	11.18333	0.76	4.9266	160	9.982	0	1015.77	Partly cloudy throughout the day.
24	2006-04-0	Partly Clou	rain	10.11667	10.11667	0.79	6.6493	163	15.8263	0	1015.4	Partly cloudy throughout the day.
25	2006-04-0	Mostly Clo	rain	10.2	10.2	0.77	3.9284	152	14.9569	0	1015.51	Partly cloudy throughout the day.
26	2006-04-1	Partly Clou	rain	10.42222	10.42222	0.62	16.9855	150	15.8263	0	1014.4	Mostly cloudy throughout the day.
27	2006-04-1	Partly Clou	rain	9.911111	7.566667	0.66	17.2109	149	15.8263	0	1014.2	Mostly cloudy throughout the day.
28	2006-04-1	Mostly Clo	rain	11.18333	11.18333	0.8	10.8192	163	14.9569	0	1008.71	Mostly cloudy throughout the day.
29	2006-04-1	Partly Clou	rain	7.155556	5.044444	0.79	11.0768	180	15.8263	0	1014.47	Mostly cloudy throughout the day.

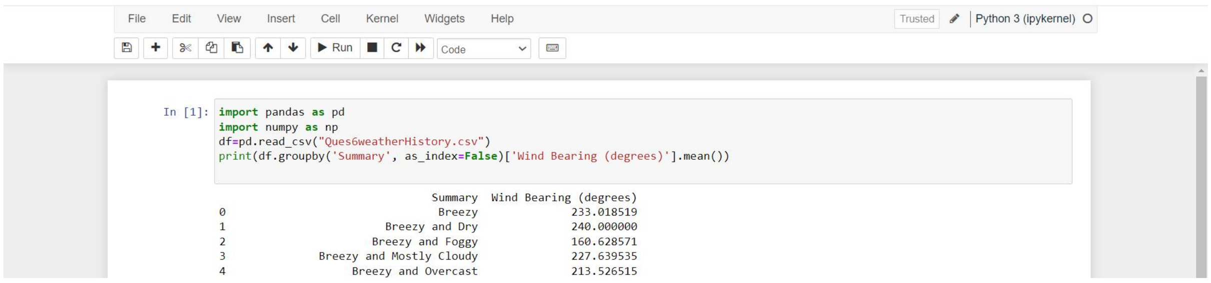
Ques6weatherHistory

Code a):

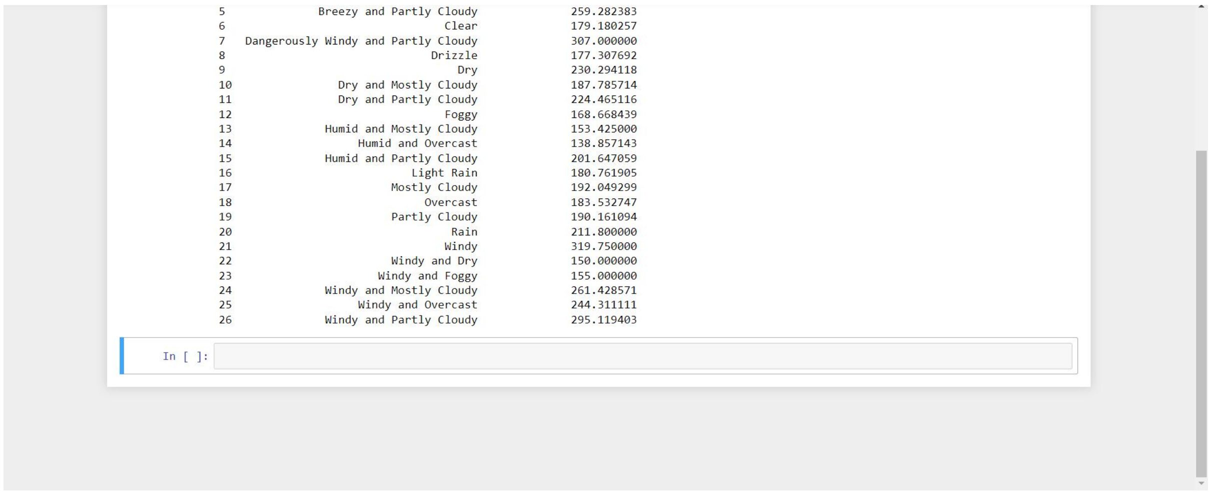
Note:- I have calculated Mean value of "Wind Bearing (degrees)" grouped by "Summary"

```
import pandas as pd

import numpy as np

df=pd.read_csv("Ques6weatherHistory.csv")

print(df.groupby('Summary', as_index=False)['Wind Bearing (degrees)'].mean())
```

OUTPUT



```
In [1]: import pandas as pd
        import numpy as np
        df=pd.read_csv("Ques6weatherHistory.csv")
        print(df.groupby('Summary', as_index=False)['Wind Bearing (degrees)'].mean())

                                Summary  Wind Bearing (degrees)
0                                Breezy              233.018519
1                        Breezy and Dry              240.000000
2                      Breezy and Foggy              160.628571
3              Breezy and Mostly Cloudy              227.639535
4                   Breezy and Overcast              213.526515
```

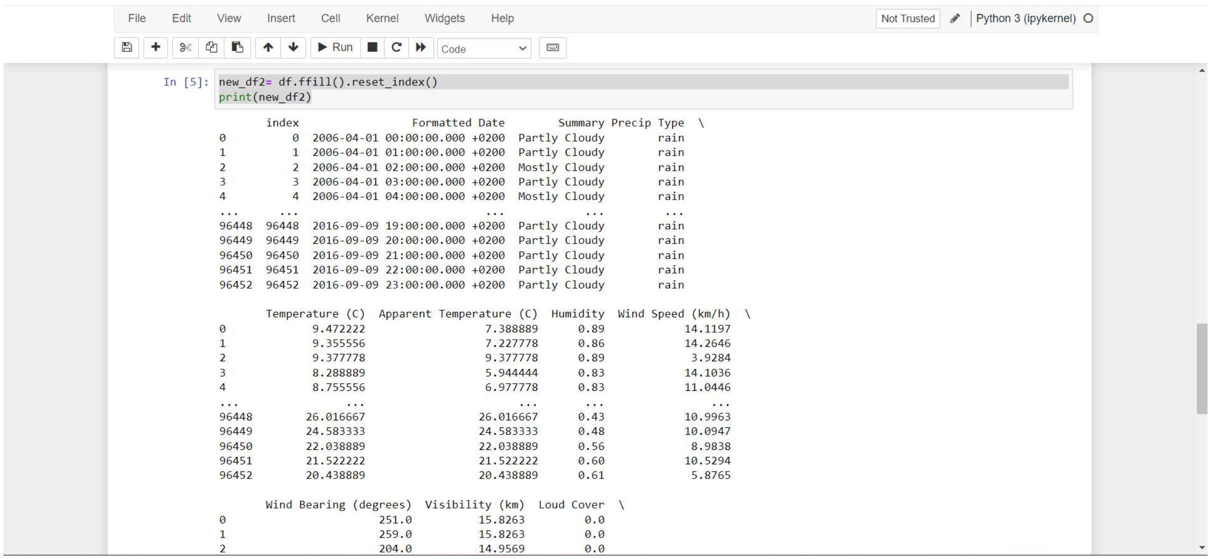


```
5              Breezy and Partly Cloudy              259.282383
6                                 Clear              179.180257
7   Dangerously Windy and Partly Cloudy              307.000000
8                               Drizzle              177.307692
9                                   Dry              230.294118
10                Dry and Mostly Cloudy              187.785714
11                Dry and Partly Cloudy              224.465116
12                                Foggy              168.668439
13              Humid and Mostly Cloudy              153.425000
14                   Humid and Overcast              138.857143
15              Humid and Partly Cloudy              201.647059
16                           Light Rain              180.761905
17                        Mostly Cloudy              192.049299
18                             Overcast              183.532747
19                        Partly Cloudy              190.161094
20                                 Rain              211.800000
21                                Windy              319.750000
22                        Windy and Dry              150.000000
23                      Windy and Foggy              155.000000
24              Windy and Mostly Cloudy              261.428571
25                   Windy and Overcast              244.311111
26              Windy and Partly Cloudy              295.119403

In [ ]:
```

Code b):

new_df2= df.ffill().reset_index()

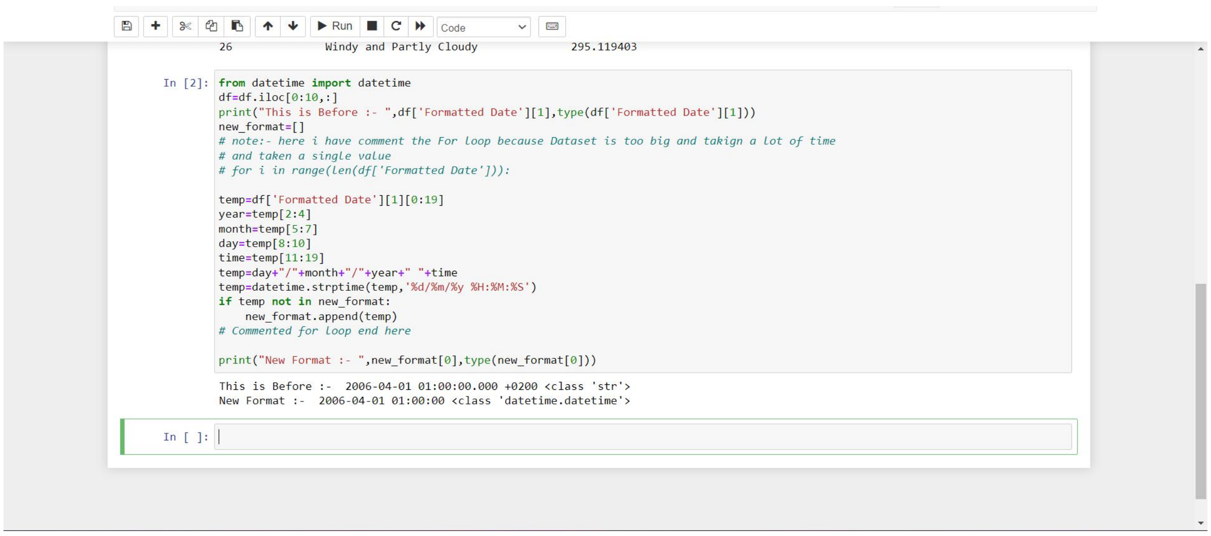
print(new_df2)



```
In [5]: new_df2= df.ffill().reset_index()
        print(new_df2)

       index                 Formatted Date        Summary Precip Type  \
0          0  2006-04-01 00:00:00.000 +0200  Partly Cloudy        rain
1          1  2006-04-01 01:00:00.000 +0200  Partly Cloudy        rain
2          2  2006-04-01 02:00:00.000 +0200  Mostly Cloudy        rain
3          3  2006-04-01 03:00:00.000 +0200  Partly Cloudy        rain
4          4  2006-04-01 04:00:00.000 +0200  Mostly Cloudy        rain
...      ...                            ...            ...         ...
96448  96448  2016-09-09 19:00:00.000 +0200  Partly Cloudy        rain
96449  96449  2016-09-09 20:00:00.000 +0200  Partly Cloudy        rain
96450  96450  2016-09-09 21:00:00.000 +0200  Partly Cloudy        rain
96451  96451  2016-09-09 22:00:00.000 +0200  Partly Cloudy        rain
96452  96452  2016-09-09 23:00:00.000 +0200  Partly Cloudy        rain

       Temperature (C)  Apparent Temperature (C)  Humidity  Wind Speed (km/h)  \
0             9.472222                  7.388889      0.89            14.1197
1             9.355556                  7.227778      0.86            14.2646
2             9.377778                  9.377778      0.89             3.9284
3             8.288889                  5.944444      0.83            14.1036
4             8.755556                  6.977778      0.83            11.0446
...                ...                       ...       ...                ...
96448        26.016667                 26.016667      0.43            10.9963
96449        24.583333                 24.583333      0.48            10.0947
96450        22.038889                 22.038889      0.56             8.9838
96451        21.522222                 21.522222      0.60            10.5294
96452        20.438889                 20.438889      0.61             5.8765

       Wind Bearing (degrees)  Visibility (km)  Loud Cover  \
0                       251.0          15.8263         0.0
1                       259.0          15.8263         0.0
2                       204.0          14.9569         0.0
```

Code c):

```
from datetime import datetime

df=df.iloc[0:10,:]

print("This is Before :- ",df['Formatted Date'][1],type(df['Formatted Date'][1]))

new_format=[]

# note:- here i have comment the For loop because Dataset is too big and takign a lot of
time

# and taken a single value

# for i in range(len(df['Formatted Date'])):


temp=df['Formatted Date'][1][0:19]

year=temp[2:4]

month=temp[5:7]

day=temp[8:10]

time=temp[11:19]

temp=day+"/"+month+"/"+year+" "+time

temp=datetime.strptime(temp,'%d/%m/%y %H:%M:%S')

if temp not in new_format:

    new_format.append(temp)

# Commented for loop end here


print("New Format :- ",new_format[0],type(new_format[0]))
```



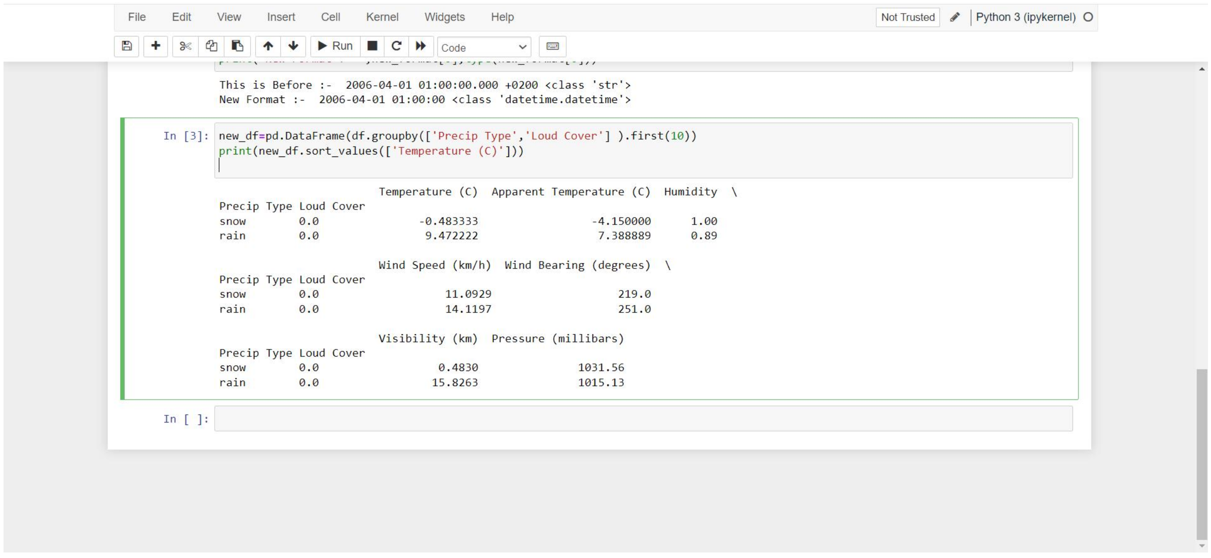
```
26              Windy and Partly Cloudy             295.119403
```

```
In [2]: from datetime import datetime
        df=df.iloc[0:10,:]
        print("This is Before :- ",df['Formatted Date'][1],type(df['Formatted Date'][1]))
        new_format=[]
        # note:- here i have comment the For loop because Dataset is too big and takign a lot of time
        # and taken a single value
        # for i in range(len(df['Formatted Date'])):

        temp=df['Formatted Date'][1][0:19]
        year=temp[2:4]
        month=temp[5:7]
        day=temp[8:10]
        time=temp[11:19]
        temp=day+"/"+month+"/"+year+" "+time
        temp=datetime.strptime(temp,'%d/%m/%y %H:%M:%S')
        if temp not in new_format:
            new_format.append(temp)
        # Commented for loop end here

        print("New Format :- ",new_format[0],type(new_format[0]))

        This is Before :-  2006-04-01 01:00:00.000 +0200 <class 'str'>
        New Format :-  2006-04-01 01:00:00 <class 'datetime.datetime'>

In [ ]:
```

Code d):

new_df=pd.DataFrame(df.groupby(['Precip Type','Loud Cover']).first(10))

print(new_df.sort_values(['Temperature (C)']))



```
This is Before :-  2006-04-01 01:00:00.000 +0200 <class 'str'>
New Format :-  2006-04-01 01:00:00 <class 'datetime.datetime'>

In [3]: new_df=pd.DataFrame(df.groupby(['Precip Type','Loud Cover'] ).first(10))
        print(new_df.sort_values(['Temperature (C)']))

                        Temperature (C)  Apparent Temperature (C)  Humidity  \
Precip Type Loud Cover
snow        0.0               -0.483333                 -4.150000      1.00
rain        0.0                9.472222                  7.388889      0.89

                        Wind Speed (km/h)  Wind Bearing (degrees)  \
Precip Type Loud Cover
snow        0.0                   11.0929                   219.0
rain        0.0                   14.1197                   251.0

                        Visibility (km)  Pressure (millibars)
Precip Type Loud Cover
snow        0.0                  0.4830               1031.56
rain        0.0                 15.8263               1015.13

In [ ]:
```

Code e):

edges=[0.0,0.3,0.6,1.0]

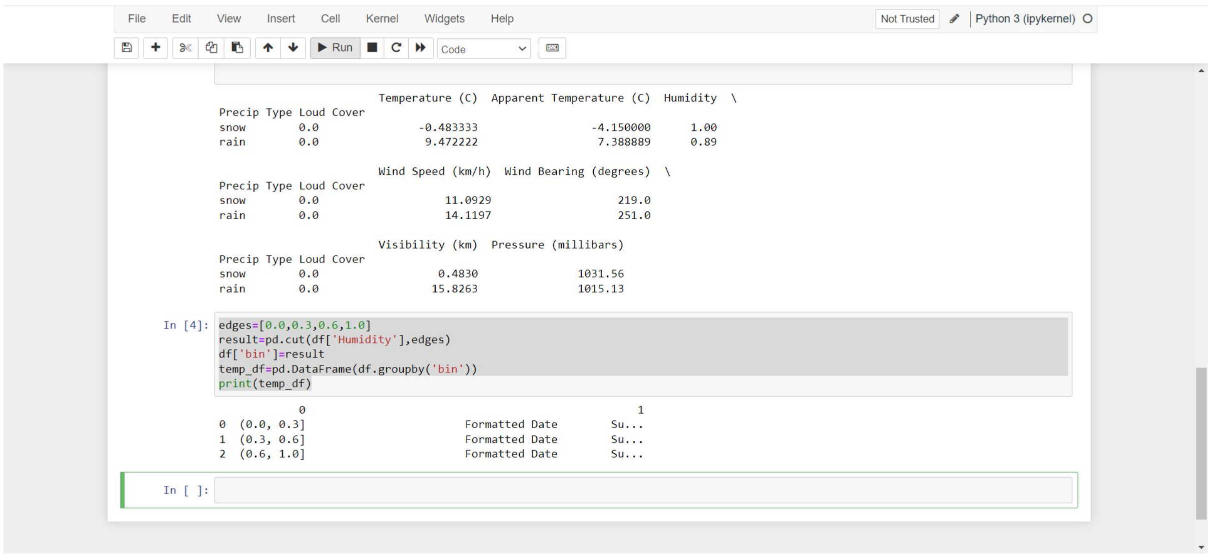
result=pd.cut(df['Humidity'],edges)

df['bin']=result

temp_df=pd.DataFrame(df.groupby('bin'))

print(temp_df)

OUTPUT



```
                             Temperature (C)  Apparent Temperature (C)  Humidity  \
Precip Type Loud Cover
snow        0.0                    -0.483333                 -4.150000      1.00
rain        0.0                     9.472222                  7.388889      0.89

                             Wind Speed (km/h)  Wind Bearing (degrees)  \
Precip Type Loud Cover
snow        0.0                        11.0929                   219.0
rain        0.0                        14.1197                   251.0

                             Visibility (km)  Pressure (millibars)
Precip Type Loud Cover
snow        0.0                       0.4830               1031.56
rain        0.0                      15.8263               1015.13
```

```
In [4]: edges=[0.0,0.3,0.6,1.0]
        result=pd.cut(df['Humidity'],edges)
        df['bin']=result
        temp_df=pd.DataFrame(df.groupby('bin'))
        print(temp_df)
```

```
            0                                          1
0  (0.0, 0.3]                      Formatted Date       Su...
1  (0.3, 0.6]                      Formatted Date       Su...
2  (0.6, 1.0]                      Formatted Date       Su...
```

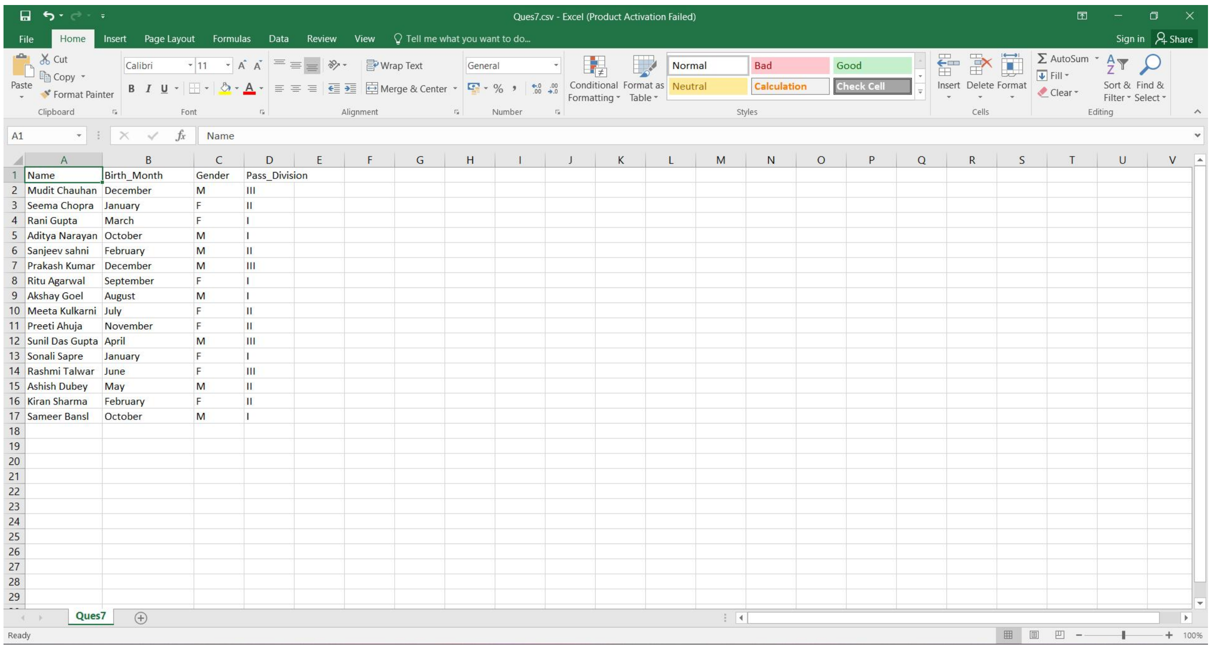
```
In [ ]:
```

Ques 7.

Consider a data frame containing data about students i.e. name, gender and passing division:

	Name	Birth_Month	Gender	Pass_Division
0	Mudit Chauhan	December	M	III
1	Seema Chopra	January	F	II
2	Rani Gupta	March	F	I
3	Aditya Narayan	October	M	I
4	Sanjeev Sahni	February	M	II
5	Prakash Kumar	December	M	III
6	Ritu Agarwal	September	F	I
7	Akshay Goel	August	M	I
8	Meeta Kulkarni	July	F	II
9	Preeti Ahuja	November	F	II
10	Sunil Das Gupta	April	M	III
11	Sonali Sapre	January	F	I
12	Rashmi Talwar	June	F	III
13	Ashish Dubey	May	M	II
14	Kiran Sharma	February	F	II
15	Sameer Bansal	October	M	I

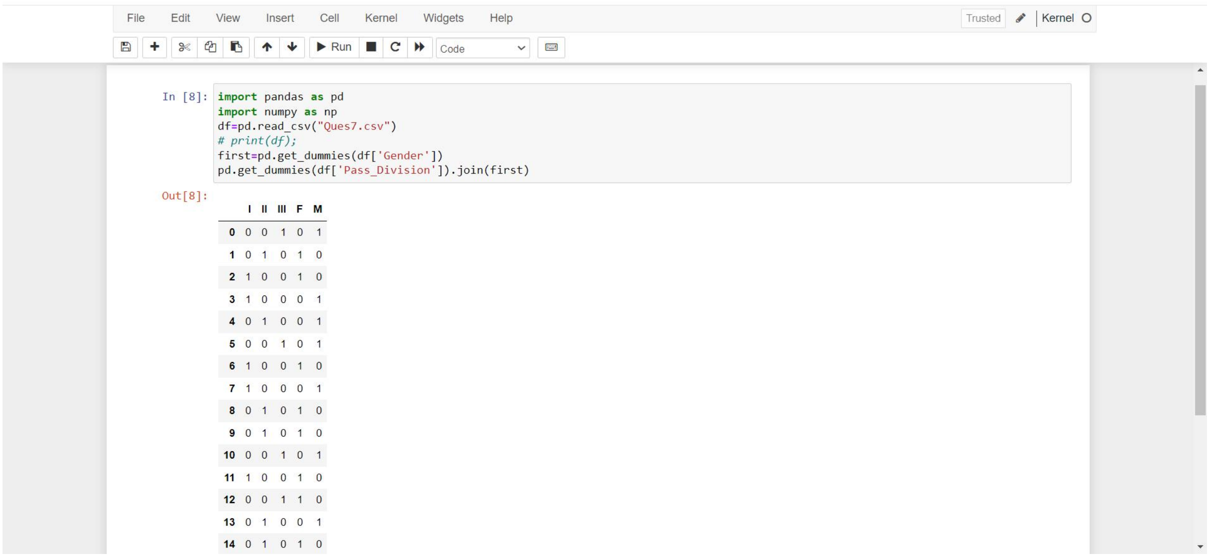
a. Perform one hot encoding of the last two columns of categorical data using the get_dummies() function.
b. Sort this data frame on the "Birth Month" column (i.e. January to December). Hint: Convert Month to Categorical.


Ques7.csv - Excel (Product Activation Failed)
File
Home
Insert
Page Layout
Formulas
Data
Review
View
Tell me what you want to do...
Sign in
Share
Ques7
Ready

	A	B	C	D
1	Name	Birth_Month	Gender	Pass_Division
2	Mudit Chauhan	December	M	III
3	Seema Chopra	January	F	II
4	Rani Gupta	March	F	I
5	Aditya Narayan	October	M	I
6	Sanjeev sahni	February	M	II
7	Prakash Kumar	December	M	III
8	Ritu Agarwal	September	F	I
9	Akshay Goel	August	M	I
10	Meeta Kulkarni	July	F	II
11	Preeti Ahuja	November	F	II
12	Sunil Das Gupta	April	M	III
13	Sonali Sapre	January	F	I
14	Rashmi Talwar	June	F	III
15	Ashish Dubey	May	M	II
16	Kiran Sharma	February	F	II
17	Sameer Bansl	October	M	I

Code a):

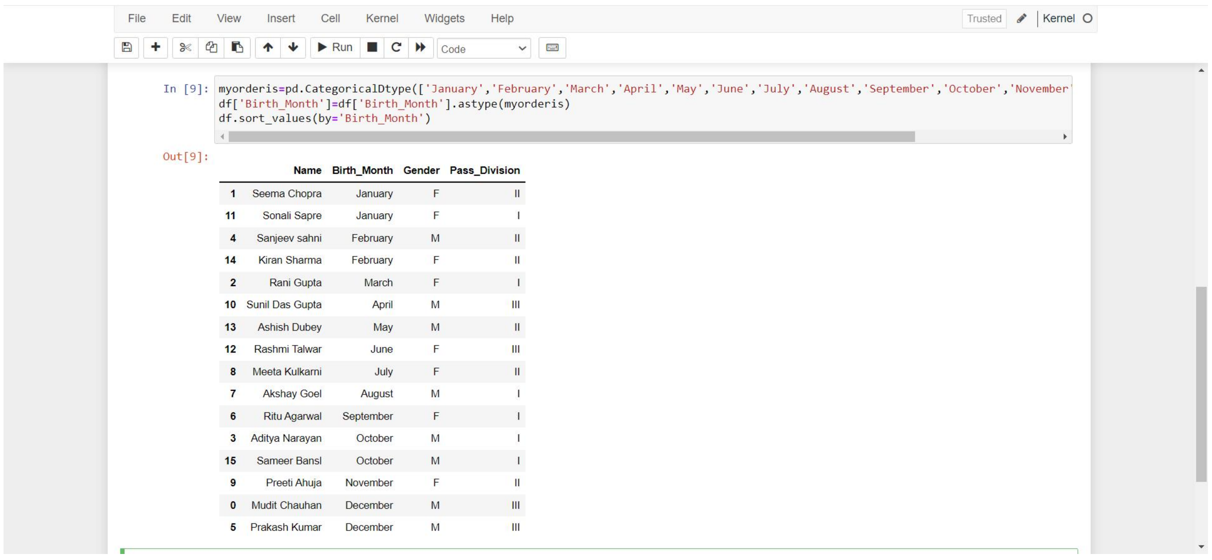
```
import pandas as pd

import numpy as np

df=pd.read_csv("Ques7.csv")

# print(df);

first=pd.get_dummies(df['Gender'])

pd.get_dummies(df['Pass_Division']).join(first)
```



```
In [8]: import pandas as pd
        import numpy as np
        df=pd.read_csv("Ques7.csv")
        # print(df);
        first=pd.get_dummies(df['Gender'])
        pd.get_dummies(df['Pass_Division']).join(first)

Out[8]:
         I  II  III  F  M
     0   0   0    1  0  1
     1   0   1    0  1  0
     2   1   0    0  1  0
     3   1   0    0  0  1
     4   0   1    0  0  1
     5   0   0    1  0  1
     6   1   0    0  1  0
     7   1   0    0  0  1
     8   0   1    0  1  0
     9   0   1    0  1  0
    10   0   0    1  0  1
    11   1   0    0  1  0
    12   0   0    1  1  0
    13   0   1    0  0  1
    14   0   1    0  1  0
```

Code b):

```
myorderis=pd.CategoricalDtype(['January','February','March','April','May','June','July','Au
gust','September','October','November','December'],ordered=True)

df['Birth_Month']=df['Birth_Month'].astype(myorderis)

df.sort_values(by='Birth_Month')
```

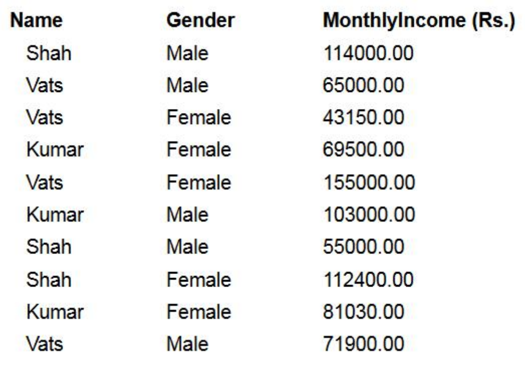


```
In [9]: myorderis=pd.CategoricalDtype(['January','February','March','April','May','June','July','August','September','October','November'
        df['Birth_Month']=df['Birth_Month'].astype(myorderis)
        df.sort_values(by='Birth_Month')
```

```
Out[9]:
              Name  Birth_Month  Gender  Pass_Division
     1  Seema Chopra    January       F             II
    11  Sonali Sapre    January       F              I
     4  Sanjeev sahni   February      M             II
    14  Kiran Sharma    February      F             II
     2  Rani Gupta      March         F              I
    10  Sunil Das Gupta April         M            III
    13  Ashish Dubey    May           M             II
    12  Rashmi Talwar   June          F            III
     8  Meeta Kulkarni  July          F             II
     7  Akshay Goel     August        M              I
     6  Ritu Agarwal    September     F              I
     3  Aditya Narayan  October       M              I
    15  Sameer Bansl    October       M              I
     9  Preeti Ahuja    November      F             II
     0  Mudit Chauhan   December      M            III
     5  Prakash Kumar   December      M            III
```

Ques 8.

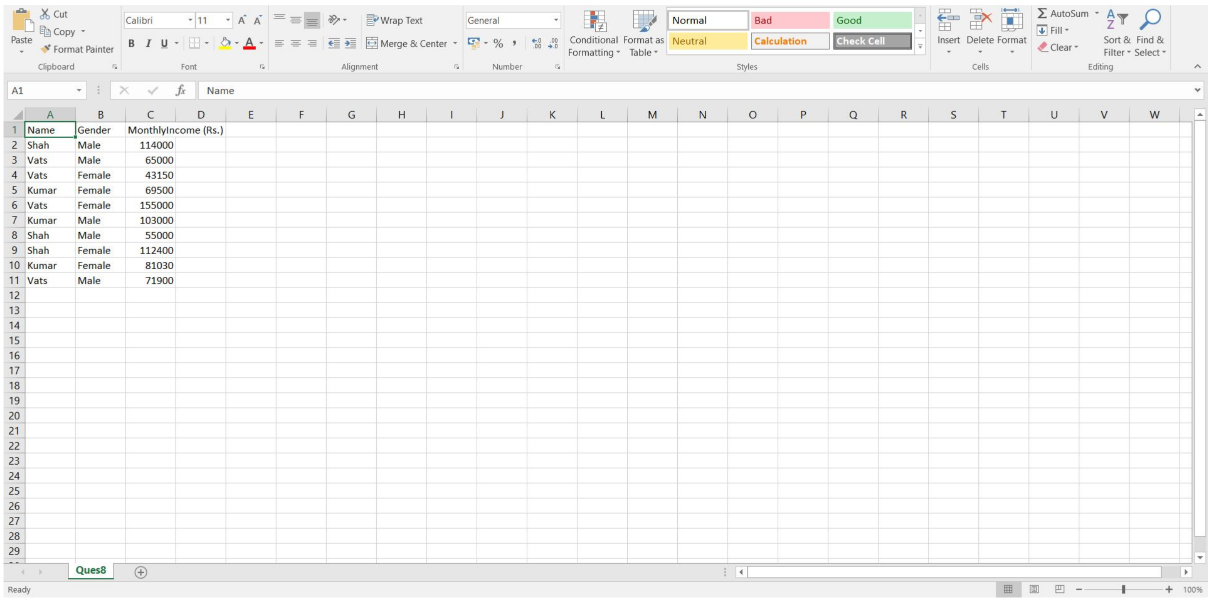
Consider the following data frame containing a family name, gender of the family member and her/his monthly income in each record.



Name	Gender	MonthlyIncome (Rs.)
Shah	Male	114000.00
Vats	Male	65000.00
Vats	Female	43150.00
Kumar	Female	69500.00
Vats	Female	155000.00
Kumar	Male	103000.00
Shah	Male	55000.00
Shah	Female	112400.00
Kumar	Female	81030.00
Vats	Male	71900.00

Write a program in Python using Pandas to perform the following:
a. Calculate and display familywise gross monthly income.
b. Calculate and display the member with the highest monthly income in a family.
c. Calculate and display monthly income of all members with income greater than Rs. 60000.00.
d. Calculate and display the average monthly income of the female members in the Shah family

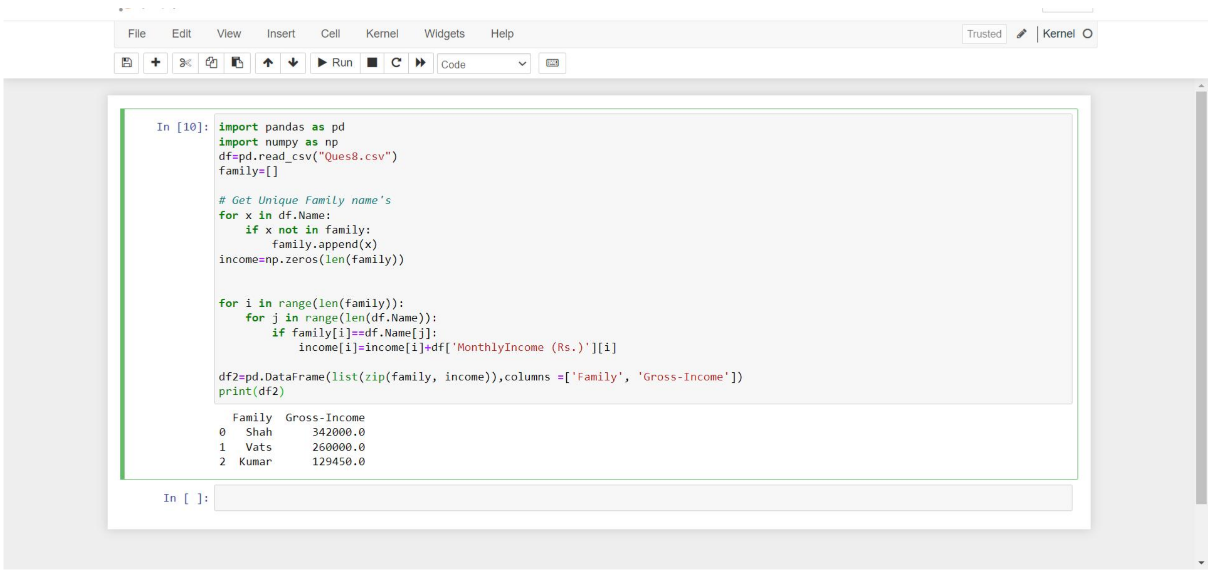
OUTPUT



Name	Gender	MonthlyIncome (Rs.)
Shah	Male	114000
Vats	Male	65000
Vats	Female	43150
Kumar	Female	69500
Vats	Female	155000
Kumar	Male	103000
Shah	Male	55000
Shah	Female	112400
Kumar	Female	81030
Vats	Male	71900

Code a):

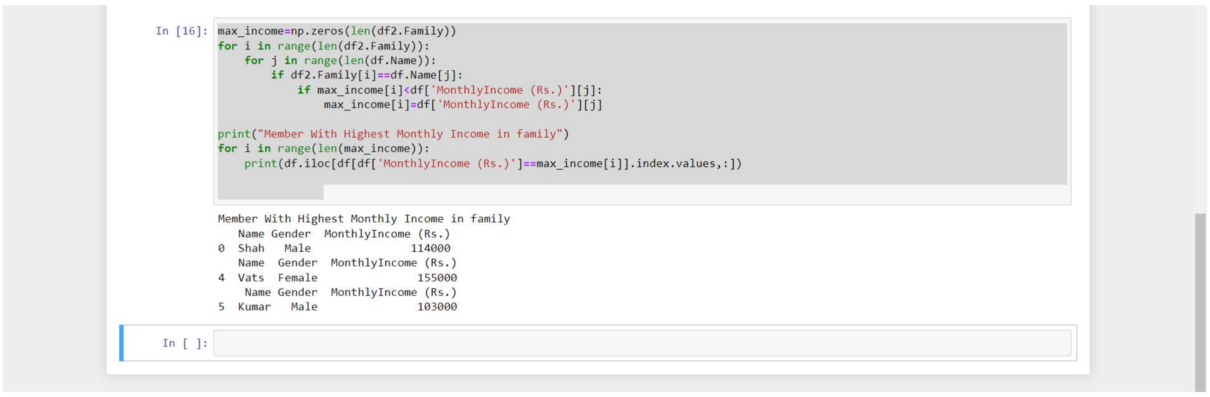
```
import pandas as pd

import numpy as np

df=pd.read_csv("Ques8.csv")

family=[]


# Get Unique Family name's

for x in df.Name:

    if x not in family:

        family.append(x)

income=np.zeros(len(family))




for i in range(len(family)):
    for j in range(len(df.Name)):
        if family[i]==df.Name[j]:
            income[i]=income[i]+df['MonthlyIncome (Rs.)'][i]


df2=pd.DataFrame(list(zip(family, income)),columns =['Family', 'Gross-Income'])
print(df2)
```



```
In [10]: import pandas as pd
         import numpy as np
         df=pd.read_csv("Ques8.csv")
         family=[]

         # Get Unique Family name's
         for x in df.Name:
             if x not in family:
                 family.append(x)
         income=np.zeros(len(family))


         for i in range(len(family)):
             for j in range(len(df.Name)):
                 if family[i]==df.Name[j]:
                     income[i]=income[i]+df['MonthlyIncome (Rs.)'][i]

         df2=pd.DataFrame(list(zip(family, income)),columns =['Family', 'Gross-Income'])
         print(df2)

           Family  Gross-Income
         0   Shah      342000.0
         1   Vats      260000.0
         2  Kumar      129450.0

In [ ]:
```

Code b):

```
max_income=np.zeros(len(df2.Family))
for i in range(len(df2.Family)):
    for j in range(len(df.Name)):
        if df2.Family[i]==df.Name[j]:
            if max_income[i]<df['MonthlyIncome (Rs.)'][j]:
                max_income[i]=df['MonthlyIncome (Rs.)'][j]

print("Member With Highest Monthly Income in family")
for i in range(len(max_income)):
    print(df.iloc[df[df['MonthlyIncome (Rs.)']==max_income[i]].index.values,:])
```



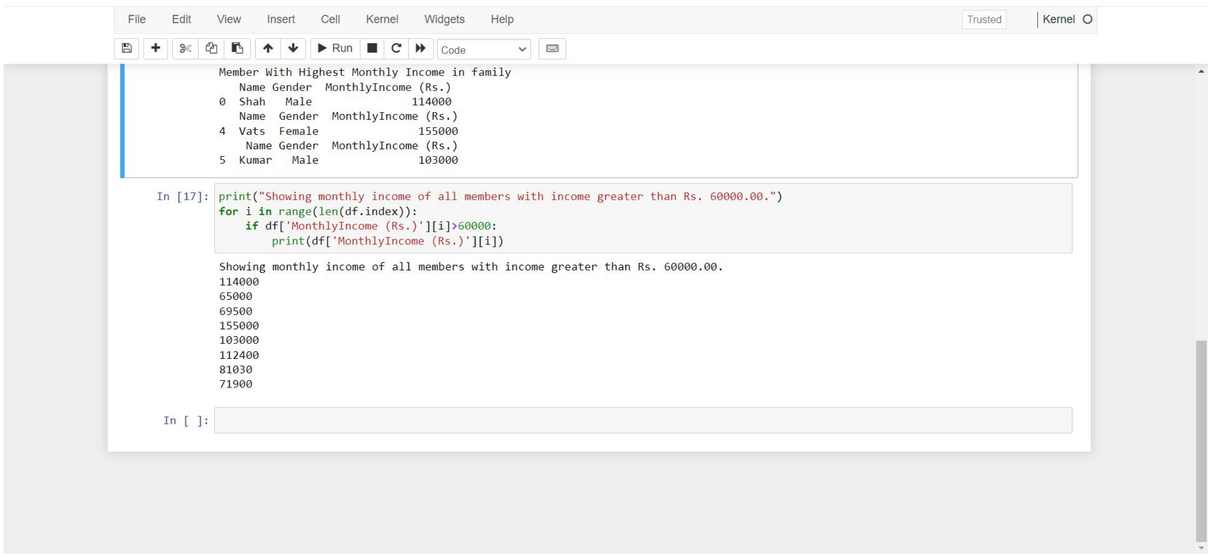
```
In [16]: max_income=np.zeros(len(df2.Family))
         for i in range(len(df2.Family)):
             for j in range(len(df.Name)):
                 if df2.Family[i]==df.Name[j]:
                     if max_income[i]<df['MonthlyIncome (Rs.)'][j]:
                         max_income[i]=df['MonthlyIncome (Rs.)'][j]

         print("Member With Highest Monthly Income in family")
         for i in range(len(max_income)):
             print(df.iloc[df[df['MonthlyIncome (Rs.)']==max_income[i]].index.values,:])
```

```
Member With Highest Monthly Income in family
   Name Gender  MonthlyIncome (Rs.)
0  Shah   Male               114000
   Name  Gender  MonthlyIncome (Rs.)
4  Vats  Female               155000
    Name Gender  MonthlyIncome (Rs.)
5  Kumar   Male               103000
```

```
In [ ]:
```

Code c):

```
print("Showing monthly income of all members with income greater than Rs. 60000.00.")
for i in range(len(df.index)):
    if df['MonthlyIncome (Rs.)'][i]>60000:
        print(df['MonthlyIncome (Rs.)'][i])
```



```
Member With Highest Monthly Income in family
   Name Gender  MonthlyIncome (Rs.)
0  Shah   Male               114000
   Name  Gender  MonthlyIncome (Rs.)
4  Vats  Female               155000
    Name Gender  MonthlyIncome (Rs.)
5  Kumar   Male               103000
```

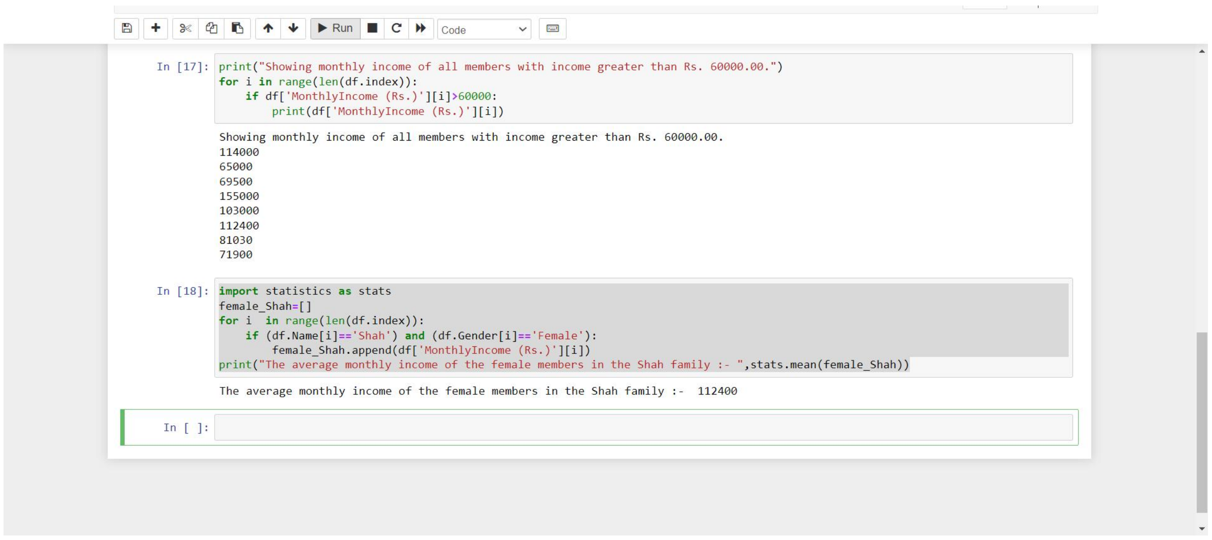
```
In [17]: print("Showing monthly income of all members with income greater than Rs. 60000.00.")
         for i in range(len(df.index)):
             if df['MonthlyIncome (Rs.)'][i]>60000:
                 print(df['MonthlyIncome (Rs.)'][i])
```

```
Showing monthly income of all members with income greater than Rs. 60000.00.
114000
65000
69500
155000
103000
112400
81030
71900
```

```
In [ ]:
```

Code d):

```
import statistics as stats
female_Shah=[]
for i  in range(len(df.index)):
    if (df.Name[i]=='Shah') and (df.Gender[i]=='Female'):
        female_Shah.append(df['MonthlyIncome (Rs.)'][i])
print("The average monthly income of the female members in the Shah family :- ",stats.mean(female_Shah))
```



```
In [17]: print("Showing monthly income of all members with income greater than Rs. 60000.00.")
         for i in range(len(df.index)):
             if df['MonthlyIncome (Rs.)'][i]>60000:
                 print(df['MonthlyIncome (Rs.)'][i])
```

```
Showing monthly income of all members with income greater than Rs. 60000.00.
114000
65000
69500
155000
103000
112400
81030
71900
```

```
In [18]: import statistics as stats
         female_Shah=[]
         for i  in range(len(df.index)):
             if (df.Name[i]=='Shah') and (df.Gender[i]=='Female'):
                 female_Shah.append(df['MonthlyIncome (Rs.)'][i])
         print("The average monthly income of the female members in the Shah family :- ",stats.mean(female_Shah))
```

```
The average monthly income of the female members in the Shah family :-  112400
```

```
In [ ]:
```