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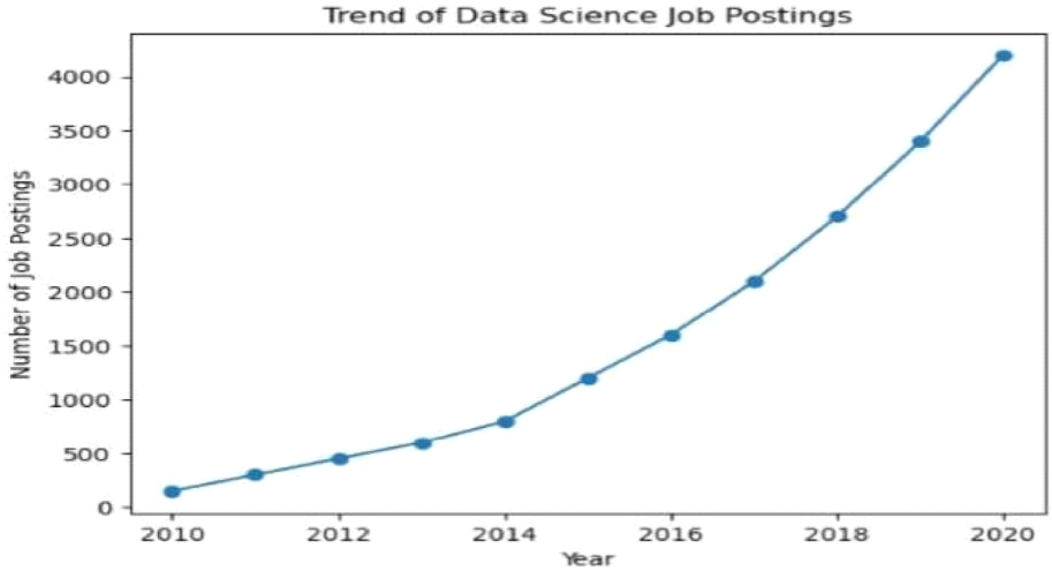
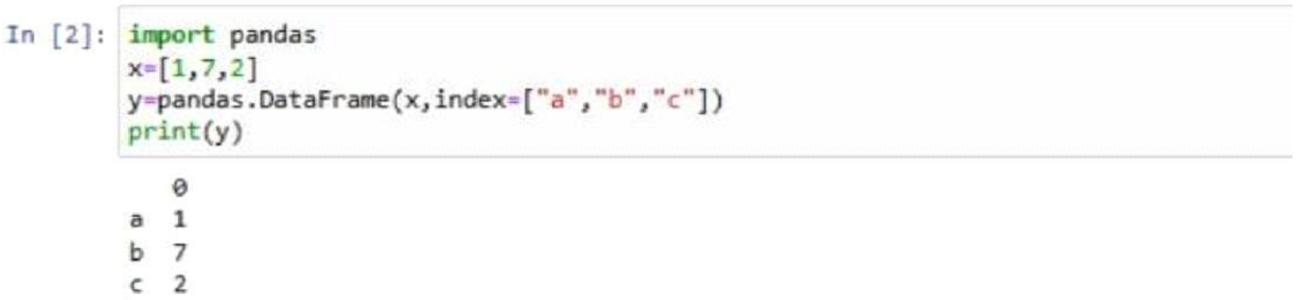
REG NO	230701188
CLASS/SEC	CSE C
SUBJECT	FUNDAMENTALS OF DATA SCIENCE
SUBJECT CODE	CS23334
TITLE	FDS LAB EXPERIMENTS

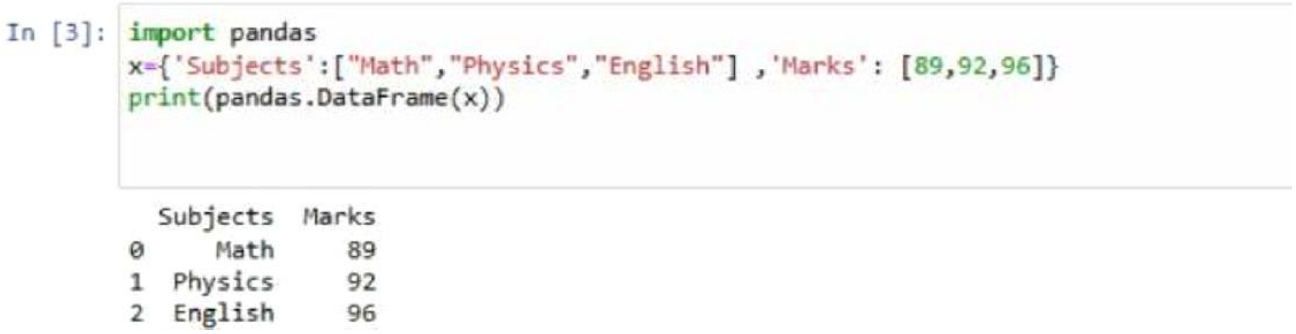
```
#Experime

nt_01_A

#MANIKA

NDAN.S

#23070117

5

#30/07/24


import pandas as pd importmatplotlib.pyplot as plt data =
{‘Year’: list(range(2010, 2021)),

‘Job Postings’: [150, 300, 450, 600, 800, 1200, 1600, 2100, 2700, 3400, 4200]}


df = pd.DataFrame(data) plt.plot(df[‘Year’], df[‘job Postings rob
Postings’], marker=‘o’) plt.title(‘Trend of Data Science Job
Postings’) plt.xlabel(‘Year’) plt.ylabel(‘Number of Job Postings’)
plt.show()
```

Output:

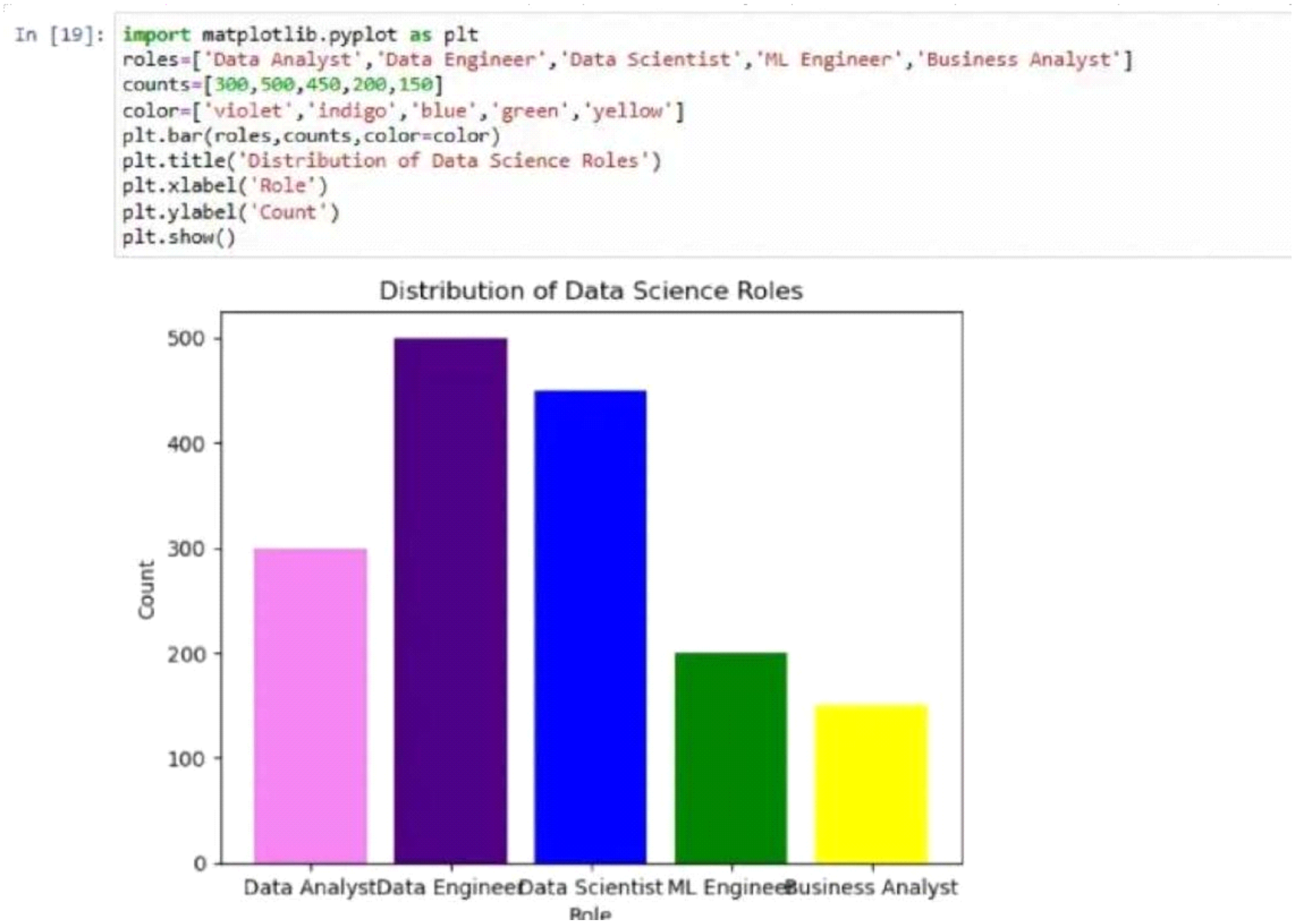




```
In [2]: import pandas
        x=[1,7,2]
        y=pandas.DataFrame(x,index=["a","b","c"])
        print(y)

   0
a  1
b  7
c  2
```



```
In [3]: import pandas
        x={'Subjects':["Math","Physics","English"] ,'Marks': [89,92,96]}
        print(pandas.DataFrame(x))

  Subjects  Marks
0     Math     89
1  Physics     92
2  English     96
```



```
In [19]: import matplotlib.pyplot as plt
         roles=['Data Analyst','Data Engineer','Data Scientist','ML Engineer','Business Analyst']
         counts=[300,500,450,200,150]
         color=['violet','indigo','blue','green','yellow']
         plt.bar(roles,counts,color=color)
         plt.title('Distribution of Data Science Roles')
         plt.xlabel('Role')
         plt.ylabel('Count')
         plt.show()
```

#Experime

nt_01_B

#MANIKA

NDAN.S

#230701175 #06/08/24

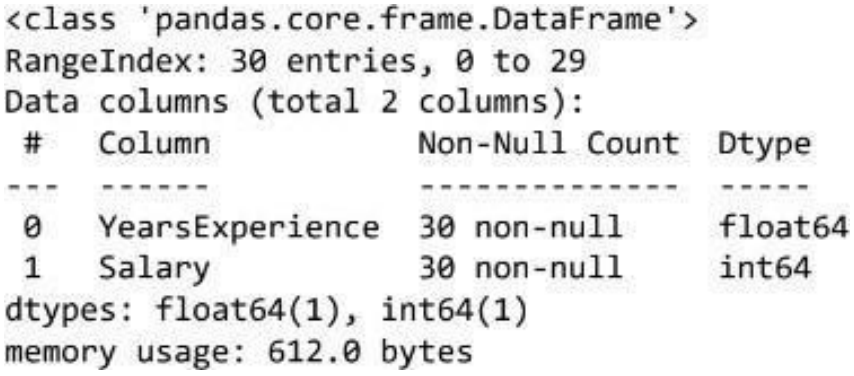
import numpy as np

import pandas as pd

df=pd.read_csv('Salary

_data.csv'

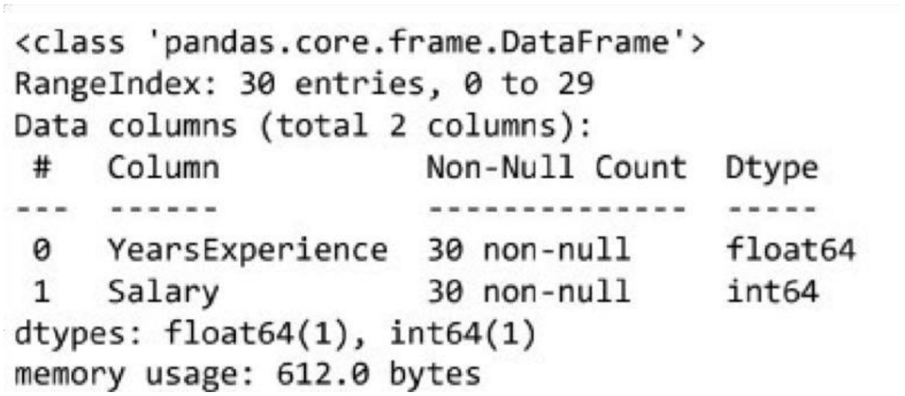
) df df.info()



```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 30 entries, 0 to 29
Data columns (total 2 columns):
 #   Column           Non-Null Count  Dtype  
---  ------           --------------  -----  
 0   YearsExperience  30 non-null     float64
 1   Salary           30 non-null     int64  
dtypes: float64(1), int64(1)
memory usage: 612.0 bytes
```

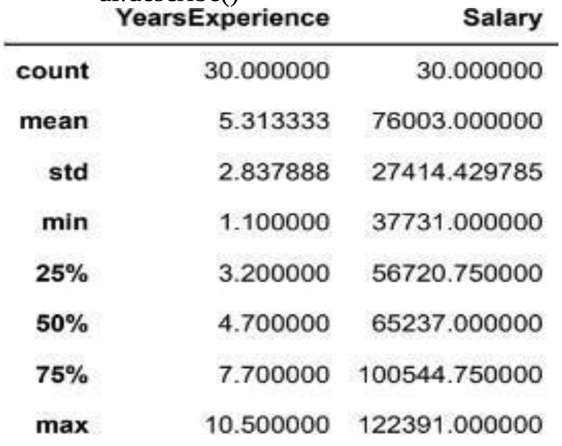
df.dropna(inplace=Tru

e)df.info()



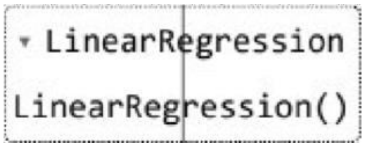
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 30 entries, 0 to 29
Data columns (total 2 columns):
 #   Column           Non-Null Count  Dtype  
---  ------           --------------  -----  
 0   YearsExperience  30 non-null     float64
 1   Salary           30 non-null     int64  
dtypes: float64(1), int64(1)
memory usage: 612.0 bytes
```

df.describe()



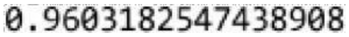
	YearsExperience	Salary
count	30.000000	30.000000
mean	5.313333	76003.000000
std	2.837888	27414.429785
min	1.100000	37731.000000
25%	3.200000	56720.750000
50%	4.700000	65237.000000
75%	7.700000	100544.750000
max	10.500000	122391.000000

features=df.iloc[:,[0]].values label=df.iloc[:,[1]].values fromsklearn.model_selection



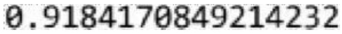
```
▾ LinearRegression
LinearRegression()
```

```
model.score(x_train,y_train)
```



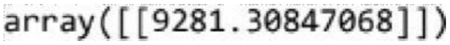
```
0.9603182547438908
```

```
model.score(x_test,y_test)
```



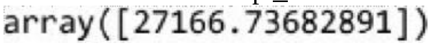
```
0.9184170849214232
```

```
model.coef_
```



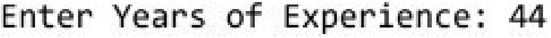
```
array([[9281.30847068]])
```

```
model.intercept_
```



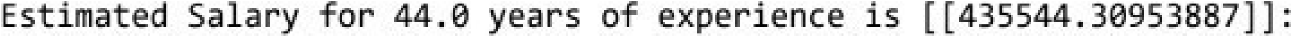
```
array([27166.73682891])
```

```
import                                    pickle
pickle.dump(model,open('SalaryPred.mode
l','wb'))
model=pickle.load(open('SalaryPred.model
','rb')) yr_of_exp=float(input("Enter  Years
of  Experience:
")) yr_of_exp_NP=np.array([[yr_of_exp]])

Salary=model.predict(yr_of_exp_NP)
```



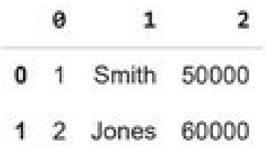
```
Enter Years of Experience: 44
```

```
print("Estimated Salary for {} years of experience is {}: " .format(yr_of_exp,Salary)
```



```
Estimated Salary for 44.0 years of experience is [[435544.30953887]]:
```

```
#PANDAS FUNCTIONS import
numpy as np import pandas as
pd
list=[[1,'Smith',50000],[2,'Jon
es',60000
```



	0	1	2
0	1	Smith	50000
1	2	Jones	60000

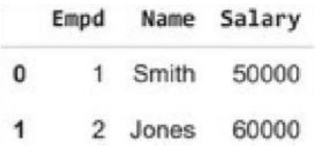
]]

df=pd.DataFra

me(list)df

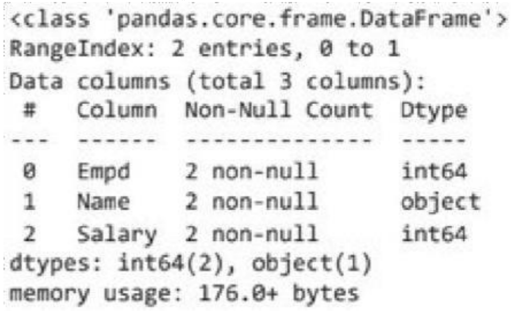
df.columns=['Empd','Name'

,'Salary']df



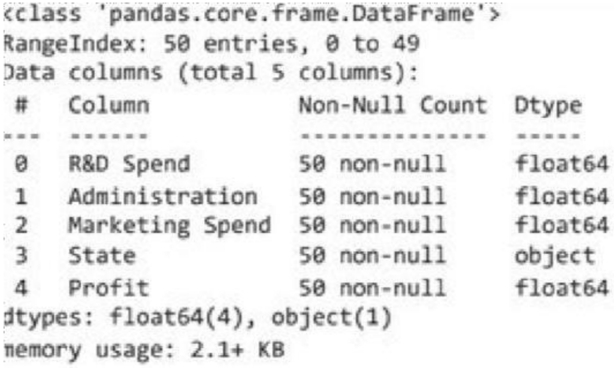
	Empd	Name	Salary
0	1	Smith	50000
1	2	Jones	60000

df.info()



```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2 entries, 0 to 1
Data columns (total 3 columns):
 #   Column  Non-Null Count  Dtype
---  ------  --------------  -----
 0   Empd    2 non-null      int64
 1   Name    2 non-null      object
 2   Salary  2 non-null      int64
dtypes: int64(2), object(1)
memory usage: 176.0+ bytes
```

df=pd.read_csv("/content/50_Start
ups.csv")df.info()



```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 50 entries, 0 to 49
Data columns (total 5 columns):
 #   Column           Non-Null Count  Dtype
---  ------           --------------  -----
 0   R&D Spend        50 non-null     float64
 1   Administration   50 non-null     float64
 2   Marketing Spend  50 non-null     float64
 3   State            50 non-null     object
 4   Profit           50 non-null     float64
dtypes: float64(4), object(1)
memory usage: 2.1+ KB
```

df.head()

df.tail()

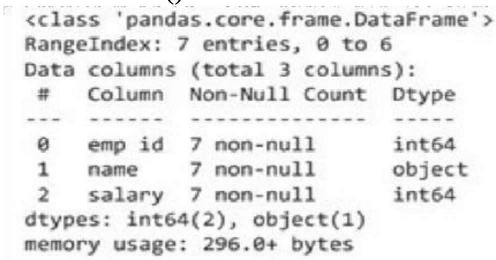
import numpy as np import

pandas as pd df =

pd.read_csv(“/content/employee.

csv”)df.head()

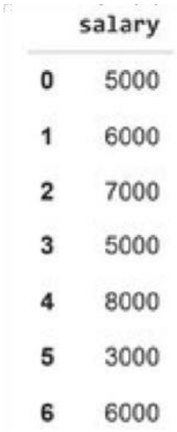
df.tail()



```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 7 entries, 0 to 6
Data columns (total 3 columns):
 #   Column  Non-Null Count  Dtype
---  ------  --------------  -----
 0   emp id  7 non-null      int64
 1   name    7 non-null      object
 2   salary  7 non-null      int64
dtypes: int64(2), object(1)
memory usage: 296.0+ bytes
```

df.info()

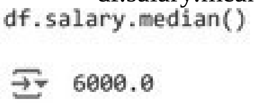
df.salary()



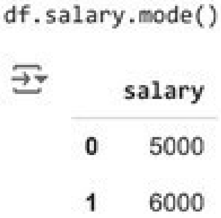
	salary
0	5000
1	6000
2	7000
3	5000
4	8000
5	3000
6	6000

```
type(df.salary)
```

```
df.salary.mean()
```

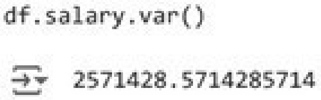


```
df.salary.median()

6000.0
```

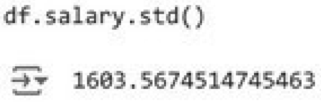


```
df.salary.mode()
```

	salary
0	5000
1	6000

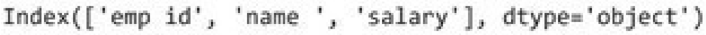


```
df.salary.var()

2571428.5714285714
```



```
df.salary.std()

1603.5674514745463
```

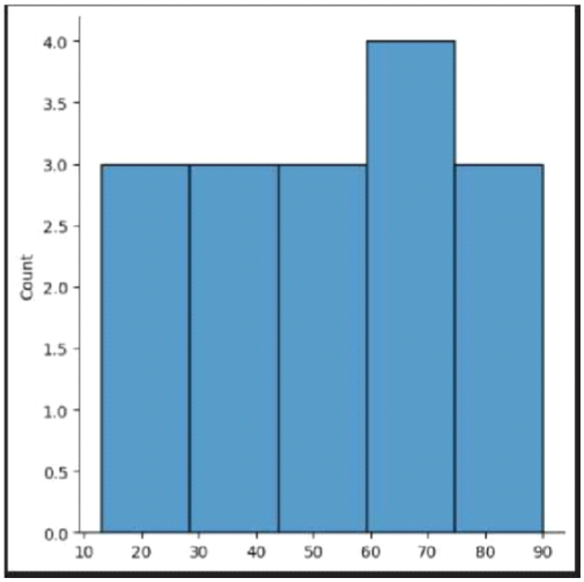
```
empCol=df
.columns
empCol
```



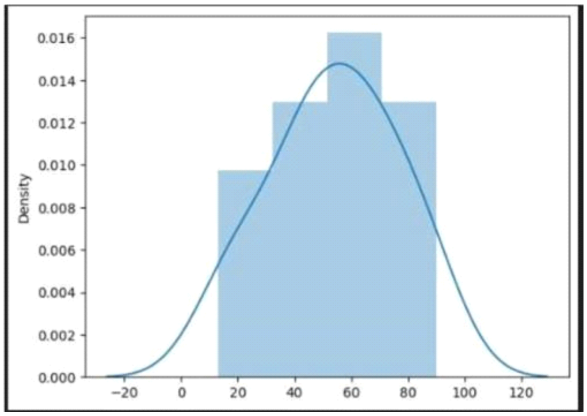
```
Index(['emp id', 'name ', 'salary'], dtype='object')
```

```
emparray=df.values
employee_DF=pd.DataFrame(emparray,columns=empCol)
#OUTLIERDETECTION

#MANIKANDAN.S
```

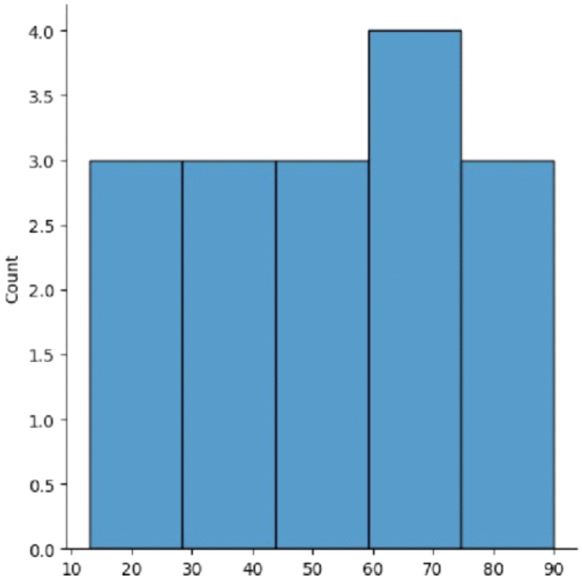
```
#230701175 #13/08/24 import numpy as np
array=np.random.randint(1,100,16) # randomly generate 16 numbers between
1 to 100 array

#array([21, 72, 69, 45, 61, 43, 43, 59, 62, 42, 90, 25, 54, 86, 80, 13], dtype=int32)
array.mean()            np.percentile(array,25)
                        np.percentile(array,50)  np.percentile(array,75)
np.percentile(array,100) #outliers detection def outDetection(array):

  sorted(array)
  Q1,Q3=np.percentile(array,
  [25,75]
  ) IQR=Q3-Q1 lr=Q1-(1.5*IQR)
  ur=Q3+(1.5*IQR)

  return lr,ur lr,ur=outDetection(array)



lr,ur
import seaborn as sns
%matplotlib    inlinesns.displot(array)
```



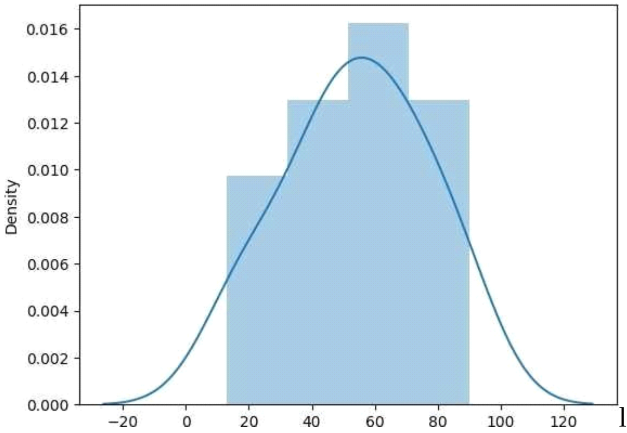
```
sns.distplot(array)
```



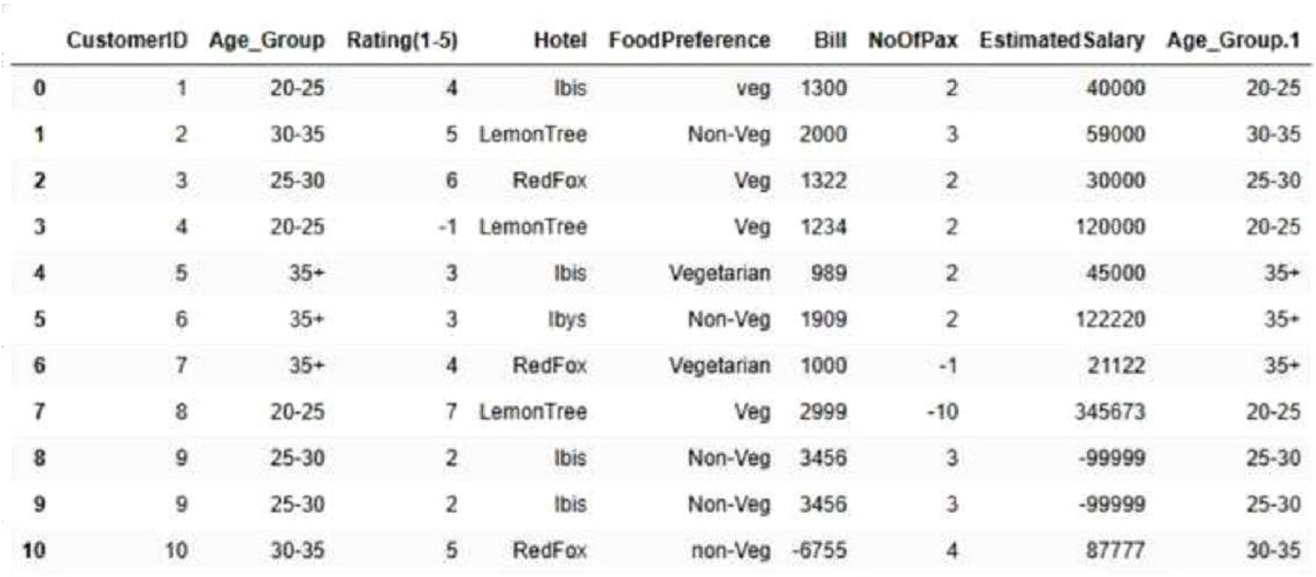
```
new_array=array[(array>lr)      &
                                (array<u
r)]new_array

sns.displot(new_array)
```



```
lr1,ur1=outDetection(new_array)
```

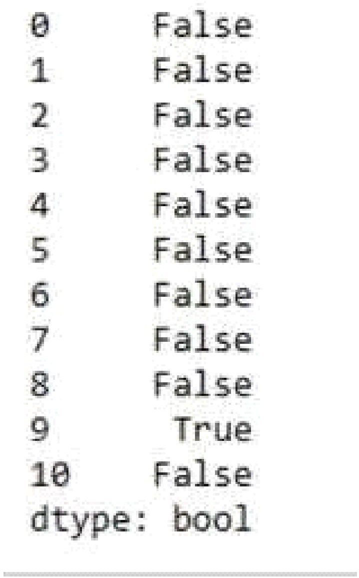


```
lr1,ur1

final_array=new_array[(new_array>lr1) & (new_array<ur1)]

final_arraysns.distplot(final_array)




#Experime

nt_03

#MANIKA

NDAN.S

#230701175 #20/08/24

import numpy as np import

pandas as pd

df=pd.read_csv("Hotel_Dat

aset.csv"

)

df
```



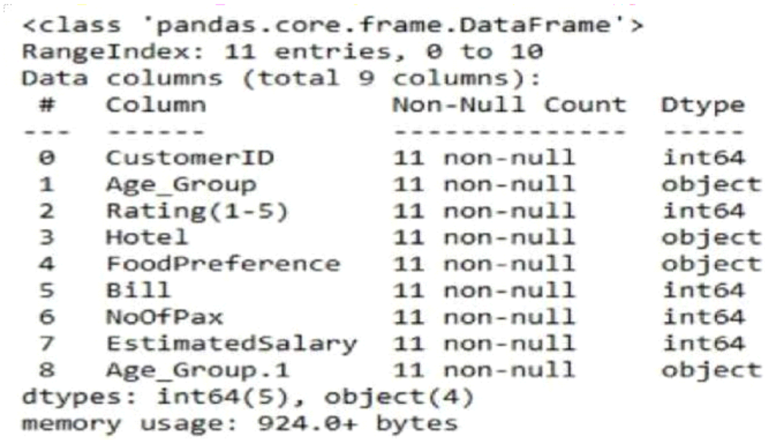
	CustomerID	Age_Group	Rating(1-5)	Hotel	FoodPreference	Bill	NoOfPax	EstimatedSalary	Age_Group.1
0	1	20-25	4	Ibis	veg	1300	2	40000	20-25
1	2	30-35	5	LemonTree	Non-Veg	2000	3	59000	30-35
2	3	25-30	6	RedFox	Veg	1322	2	30000	25-30
3	4	20-25	-1	LemonTree	Veg	1234	2	120000	20-25
4	5	35+	3	Ibis	Vegetarian	989	2	45000	35+
5	6	35+	3	Ibys	Non-Veg	1909	2	122220	35+
6	7	35+	4	RedFox	Vegetarian	1000	-1	21122	35+
7	8	20-25	7	LemonTree	Veg	2999	-10	345673	20-25
8	9	25-30	2	Ibis	Non-Veg	3456	3	-99999	25-30
9	9	25-30	2	Ibis	Non-Veg	3456	3	-99999	25-30
10	10	30-35	5	RedFox	non-Veg	-6755	4	87777	30-35

df.duplicated()



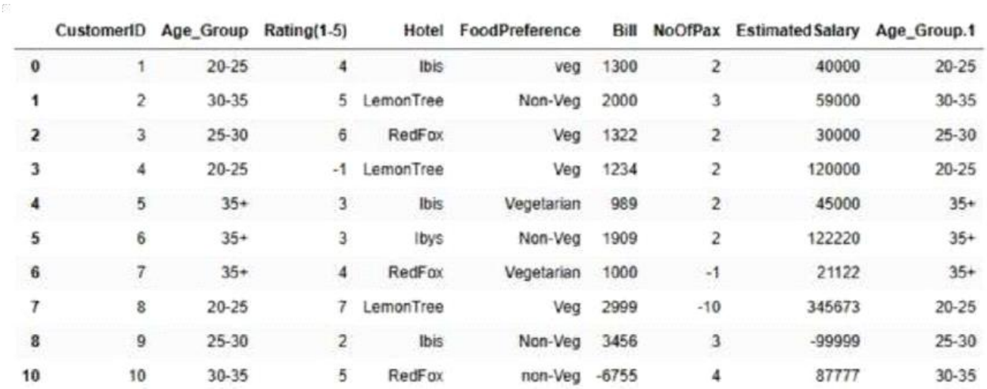
```
0      False
1      False
2      False
3      False
4      False
5      False
6      False
7      False
8      False
9       True
10     False
dtype: bool
```

df.info()



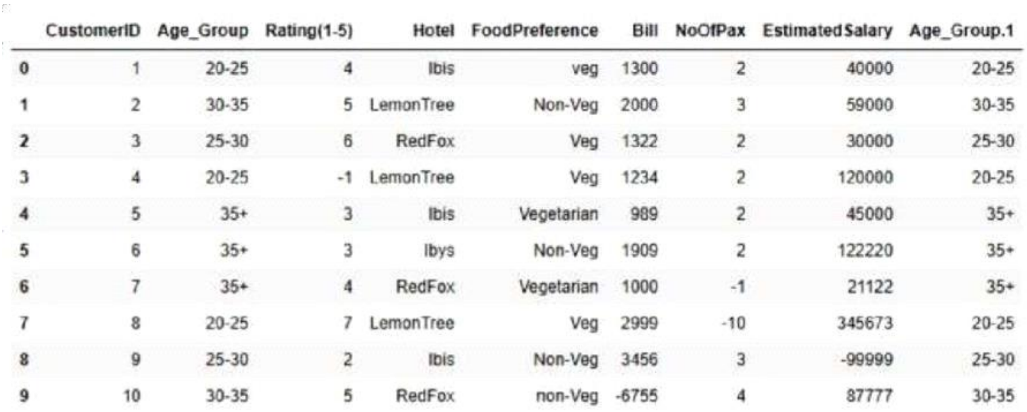
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 11 entries, 0 to 10
Data columns (total 9 columns):
 #   Column           Non-Null Count   Dtype
---  ------           --------------   -----
 0   CustomerID       11 non-null      int64
 1   Age_Group        11 non-null      object
 2   Rating(1-5)      11 non-null      int64
 3   Hotel            11 non-null      object
 4   FoodPreference   11 non-null      object
 5   Bill             11 non-null      int64
 6   NoOfPax          11 non-null      int64
 7   EstimatedSalary  11 non-null      int64
 8   Age_Group.1      11 non-null      object
dtypes: int64(5), object(4)
memory usage: 924.0+ bytes
```

```
df.drop_duplicates(inplac
e=True)df
```



	CustomerID	Age_Group	Rating(1-5)	Hotel	FoodPreference	Bill	NoOfPax	EstimatedSalary	Age_Group.1
0	1	20-25	4	Ibis	veg	1300	2	40000	20-25
1	2	30-35	5	LemonTree	Non-Veg	2000	3	59000	30-35
2	3	25-30	6	RedFox	Veg	1322	2	30000	25-30
3	4	20-25	-1	LemonTree	Veg	1234	2	120000	20-25
4	5	35+	3	Ibis	Vegetarian	989	2	45000	35+
5	6	35+	3	Ibys	Non-Veg	1909	2	122220	35+
6	7	35+	4	RedFox	Vegetarian	1000	-1	21122	35+
7	8	20-25	7	LemonTree	Veg	2999	-10	345673	20-25
8	9	25-30	2	Ibis	Non-Veg	3456	3	-99999	25-30
10	10	30-35	5	RedFox	non-Veg	-6755	4	87777	30-35

```
len(df)
index=np.array(list(range(
0,len(df))
))
df.set_index(index,inplace
=True)index array([0, 1,
2, 3, 4, 5, 6, 7, 8,
9]) df
```



	CustomerID	Age_Group	Rating(1-5)	Hotel	FoodPreference	Bill	NoOfPax	EstimatedSalary	Age_Group.1
0	1	20-25	4	Ibis	veg	1300	2	40000	20-25
1	2	30-35	5	LemonTree	Non-Veg	2000	3	59000	30-35
2	3	25-30	6	RedFox	Veg	1322	2	30000	25-30
3	4	20-25	-1	LemonTree	Veg	1234	2	120000	20-25
4	5	35+	3	Ibis	Vegetarian	989	2	45000	35+
5	6	35+	3	Ibys	Non-Veg	1909	2	122220	35+
6	7	35+	4	RedFox	Vegetarian	1000	-1	21122	35+
7	8	20-25	7	LemonTree	Veg	2999	-10	345673	20-25
8	9	25-30	2	Ibis	Non-Veg	3456	3	-99999	25-30
9	10	30-35	5	RedFox	non-Veg	-6755	4	87777	30-35

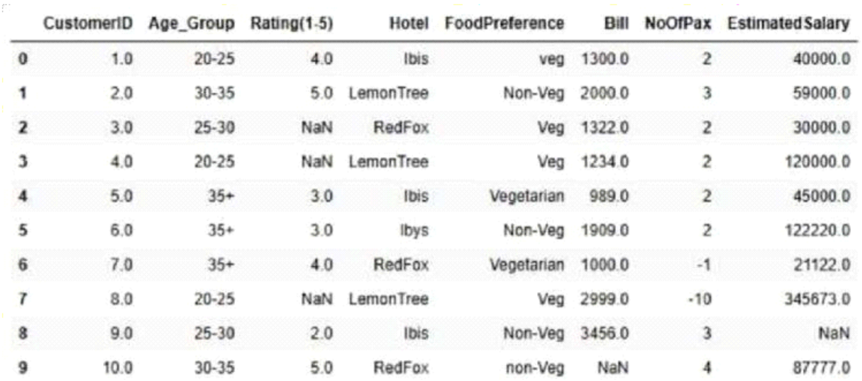
df.drop(['Age_Group.1'],axis=1,inpla

ce=True)df

df.CustomerID.loc[df.CustomerID<0
]=np.nan
df.Bill.loc[df.Bill<0]=np.nan

df.EstimatedSalary.loc[df.EstimatedSalary<0]=np.nan

df

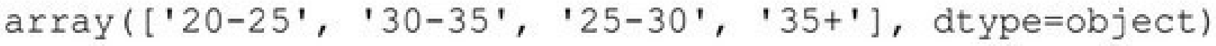


	CustomerID	Age_Group	Rating(1-5)	Hotel	FoodPreference	Bill	NoOfPax	EstimatedSalary
0	1.0	20-25	4.0	Ibis	veg	1300.0	2	40000.0
1	2.0	30-35	5.0	LemonTree	Non-Veg	2000.0	3	59000.0
2	3.0	25-30	NaN	RedFox	Veg	1322.0	2	30000.0
3	4.0	20-25	NaN	LemonTree	Veg	1234.0	2	120000.0
4	5.0	35+	3.0	Ibis	Vegetarian	989.0	2	45000.0
5	6.0	35+	3.0	Ibys	Non-Veg	1909.0	2	122220.0
6	7.0	35+	4.0	RedFox	Vegetarian	1000.0	-1	21122.0
7	8.0	20-25	NaN	LemonTree	Veg	2999.0	-10	345673.0
8	9.0	25-30	2.0	Ibis	Non-Veg	3456.0	3	NaN
9	10.0	30-35	5.0	RedFox	non-Veg	NaN	4	87777.0

df['NoOfPax'].loc[(df['NoOfPax']<1) |

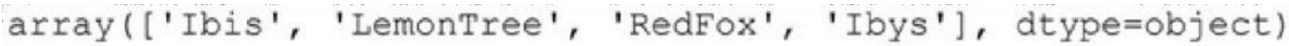
(df['NoOfPax']>20)]=np.nandf

df.Age_Group.unique()



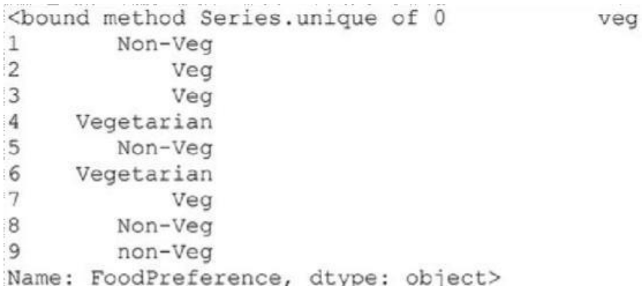
```
array(['20-25', '30-35', '25-30', '35+'], dtype=object)
```

df.Hotel.unique()



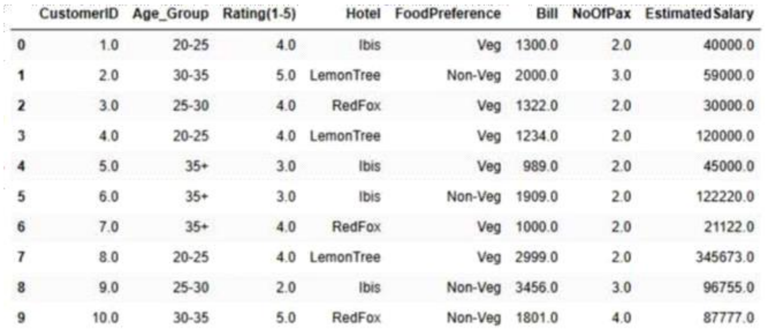
```
array(['Ibis', 'LemonTree', 'RedFox', 'Ibys'], dtype=object)
```

```
df.Hotel.replace(['Ibys'],'Ibis',inplace=True)
df.FoodPreference.unique
```



```
<bound method Series.unique of 0          veg
1       Non-Veg
2           Veg
3           Veg
4    Vegetarian
5       Non-Veg
6    Vegetarian
7           Veg
8       Non-Veg
9       non-Veg
Name: FoodPreference, dtype: object>
```

```
df.FoodPreference.replace(['Vegetarian','veg'],'Veg',inplace=T
rue) df.FoodPreference.replace(['non-Veg'],'Non-
Veg',inplace=True)
df.EstimatedSalary.fillna(round(df.EstimatedSalary.mean()),in
place=Tr ue)
df.NoOfPax.fillna(round(df.NoOfPax.median()),inplace=True
) df['Rating(1-5)'].fillna(round(df['Rating(1-5)'].median()),
inplace=True)
df.Bill.fillna(round(df.Bill.mean()),inplace=True) df
```

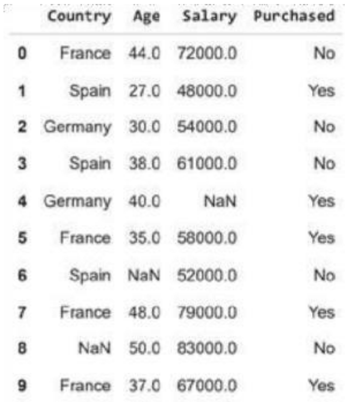


	CustomerID	Age_Group	Rating(1-5)	Hotel	FoodPreference	Bill	NoOfPax	EstimatedSalary
0	1.0	20-25	4.0	Ibis	Veg	1300.0	2.0	40000.0
1	2.0	30-35	5.0	LemonTree	Non-Veg	2000.0	3.0	59000.0
2	3.0	25-30	4.0	RedFox	Veg	1322.0	2.0	30000.0
3	4.0	20-25	4.0	LemonTree	Veg	1234.0	2.0	120000.0
4	5.0	35+	3.0	Ibis	Veg	989.0	2.0	45000.0
5	6.0	35+	3.0	Ibis	Non-Veg	1909.0	2.0	122220.0
6	7.0	35+	4.0	RedFox	Veg	1000.0	2.0	21122.0
7	8.0	20-25	4.0	LemonTree	Veg	2999.0	2.0	345673.0
8	9.0	25-30	2.0	Ibis	Non-Veg	3456.0	3.0	96755.0
9	10.0	30-35	5.0	RedFox	Non-Veg	1801.0	4.0	87777.0

#Experime

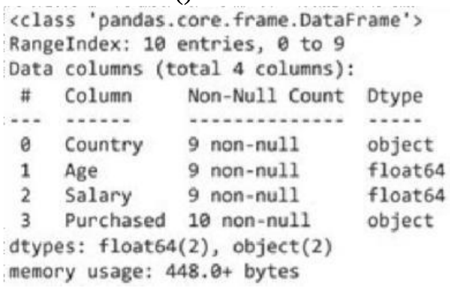
nt_04

```
#MANIKA
NDAN.S
#230701175 #27/08/24 import numpy as
np importpandas as pd
df=pd.read_csv("/content/pre-
process_datasample.csv")

df
```



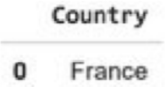
	Country	Age	Salary	Purchased
0	France	44.0	72000.0	No
1	Spain	27.0	48000.0	Yes
2	Germany	30.0	54000.0	No
3	Spain	38.0	61000.0	No
4	Germany	40.0	NaN	Yes
5	France	35.0	58000.0	Yes
6	Spain	NaN	52000.0	No
7	France	48.0	79000.0	Yes
8	NaN	50.0	83000.0	No
9	France	37.0	67000.0	Yes

```
df.info()
```



```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10 entries, 0 to 9
Data columns (total 4 columns):
 #   Column     Non-Null Count  Dtype
---  ------     --------------  -----
 0   Country    9 non-null      object
 1   Age        9 non-null      float64
 2   Salary     9 non-null      float64
 3   Purchased  10 non-null     object
dtypes: float64(2), object(2)
memory usage: 448.0+ bytes
```

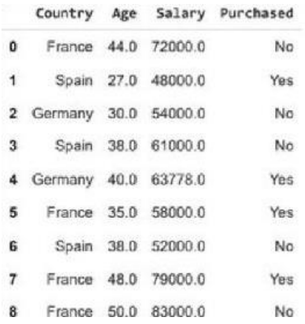
```
df.Country.mode()
```



	Country
0	France

```
df.Country.mode()[0]
type(df.Country.mode())
df.Country.fillna(df.Country.mode()[0],inpl
ace=Tru
e)
df.Age.fillna(df.Age.median(),inplace=Tru
e)
```

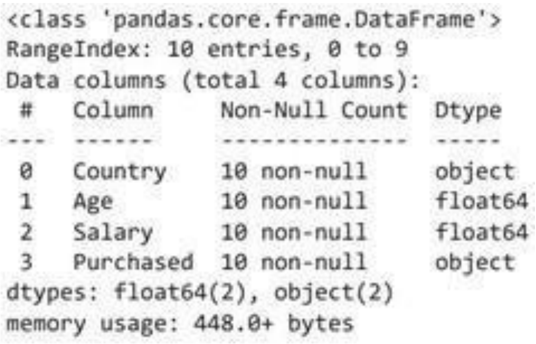
```
df.Salary.fillna(round(df.Salary.mean()),inp
lace=True)

df
```



	Country	Age	Salary	Purchased
0	France	44.0	72000.0	No
1	Spain	27.0	48000.0	Yes
2	Germany	30.0	54000.0	No
3	Spain	38.0	61000.0	No
4	Germany	40.0	63778.0	Yes
5	France	35.0	58000.0	Yes
6	Spain	38.0	52000.0	No
7	France	48.0	79000.0	Yes
8	France	50.0	83000.0	No

```
pd.get_dummies(df.Country)
updated_dataset=pd.concat([pd.get_dummies(df.Country),df.iloc[:,[1,2,3]]],axis=1)
```

```
France Germany Spain Age

Salary Purchased0 True False

False 44.0 72000.0 No

• False False True 27.0 48000.0 Yes

• False True False 30.0 54000.0 No

• False False True 38.0 61000.0 No

• False True False 40.0 63778.0 Yes

• True False False 35.0 58000.0 Yes

• False False True 38.0 52000.0 No

• True False False 48.0 79000.0 Yes

• True False False 50.0 83000.0 No

• True False False 37 0 67000 0 Yes df.info()
```



```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10 entries, 0 to 9
Data columns (total 4 columns):
 #   Column     Non-Null Count  Dtype
---  ------     --------------  -----
 0   Country    10 non-null     object
 1   Age        10 non-null     float64
 2   Salary     10 non-null     float64
 3   Purchased  10 non-null     object
dtypes: float64(2), object(2)
memory usage: 448.0+ bytes
```

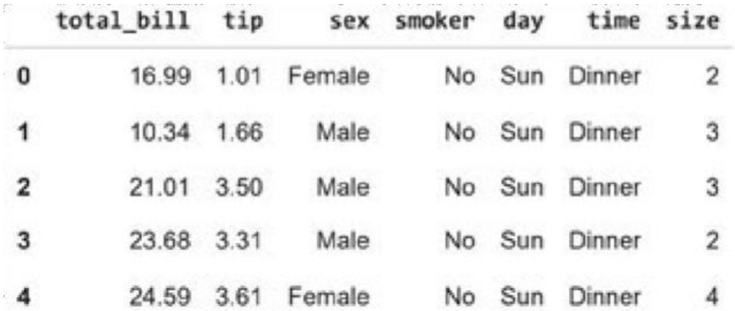
```
updated_dataset.Purchased.replace(['No','Yes'],[0,1],inplace=True) updated_dataset
```

	France	Germany	Spain	Age	Salary	Purchased
0	True	False	False	44.0	72000.0	0
1	False	False	True	27.0	48000.0	1
2	False	True	False	30.0	54000.0	0
3	False	False	True	38.0	61000.0	0
4	False	True	False	40.0	63778.0	1
5	True	False	False	35.0	58000.0	1
6	False	False	True	38.0	52000.0	0
7	True	False	False	48.0	79000.0	1
8	True	False	False	50.0	83000.0	0
9	True	False	False	37.0	67000.0	1

```
# EDA
#Experime
nt_01
#MANIKA
NDAN.S
#23070117
5
#03/09/24
```

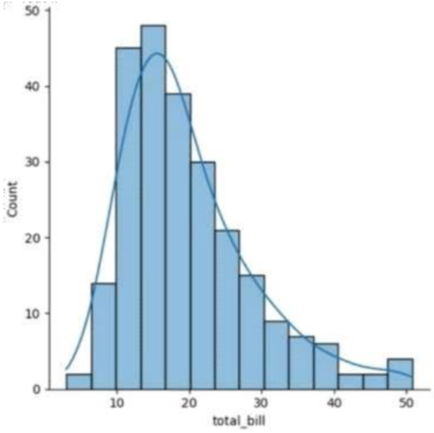
```
import seaborn as
sns importpandas as
pd import numpy as
```

```
np import

matplotlib.pyplot as

plt      %matplotlib      inlinetips=sns.load_dataset('tips') tips.head()
```

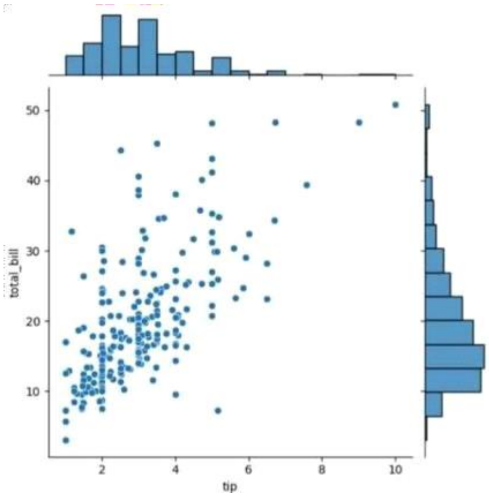


	total_bill	tip	sex	smoker	day	time	size
0	16.99	1.01	Female	No	Sun	Dinner	2
1	10.34	1.66	Male	No	Sun	Dinner	3
2	21.01	3.50	Male	No	Sun	Dinner	3
3	23.68	3.31	Male	No	Sun	Dinner	2
4	24.59	3.61	Female	No	Sun	Dinner	4

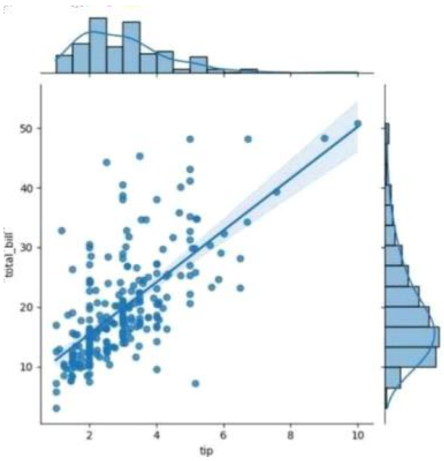
```
sns.displot(tips.total_bill,kde=True)
```



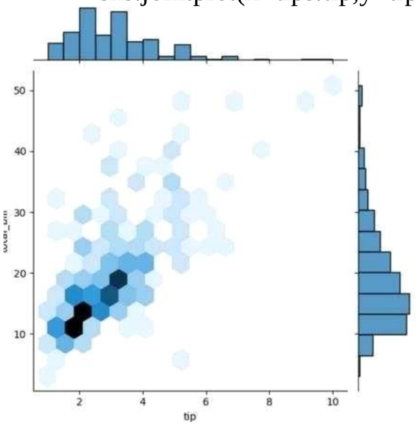
```
sns.jointplot(x=tips.tip,y=tips.total_bill)
```



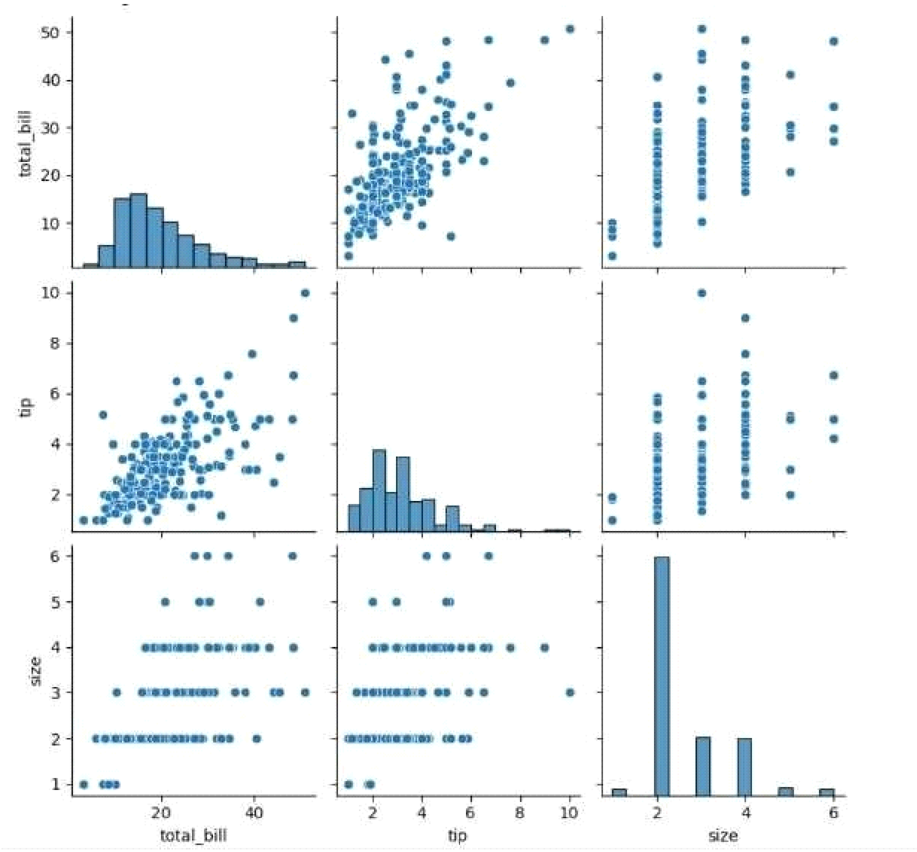
```
sns.jointplot(x=tips.tip,y=tips.total_bill,kind="reg")
```



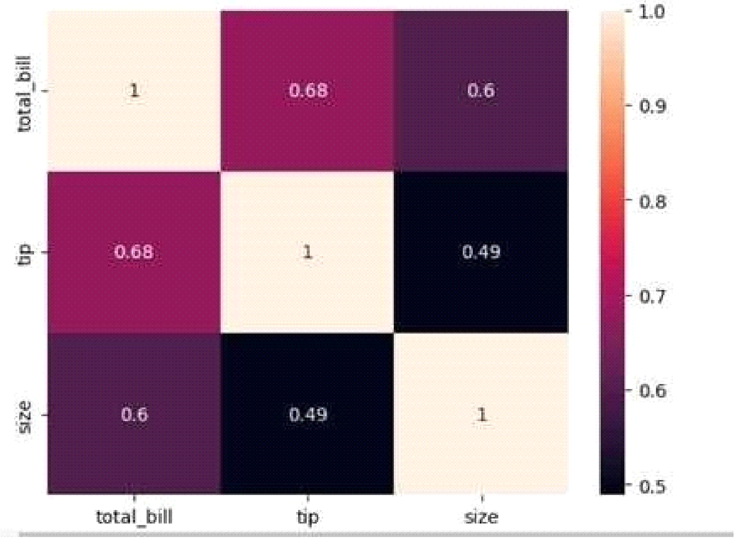
sns.jointplot(x=tips.tip,y=tips.total_bill,kind="hex")



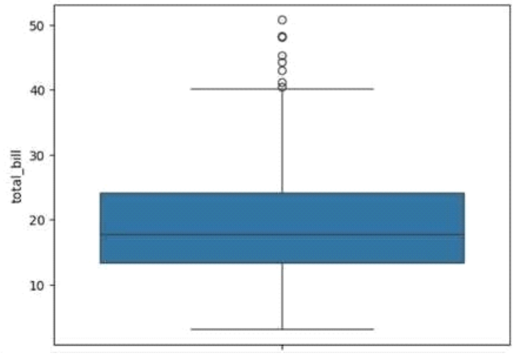
sns.pairplot(tips)



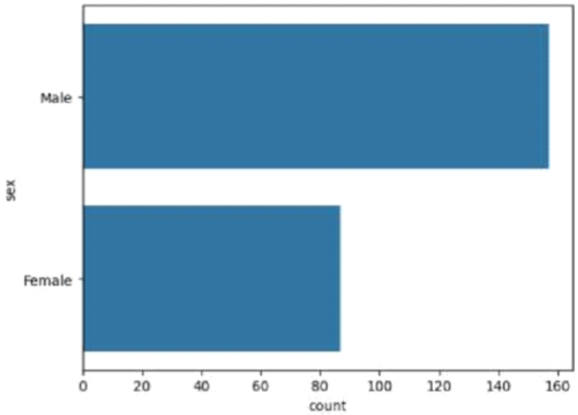
```
sns.heatmap(tips.corr(numeric_only=True),annot=True)
```

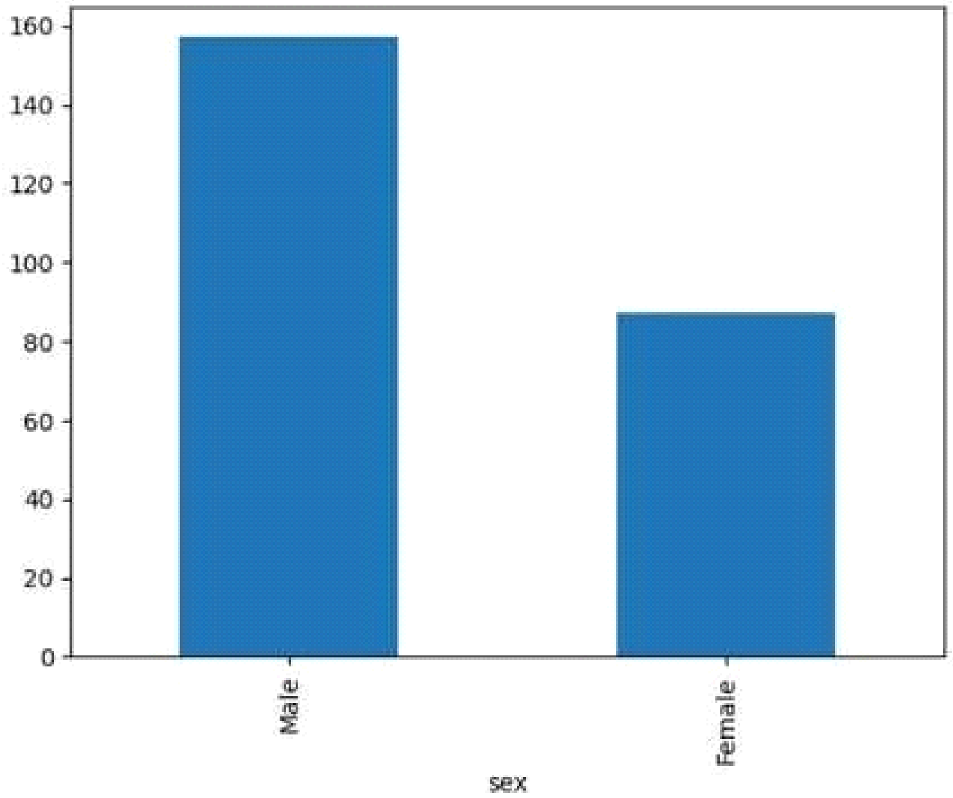


```
sns.boxplot(tips.total_bill)
```

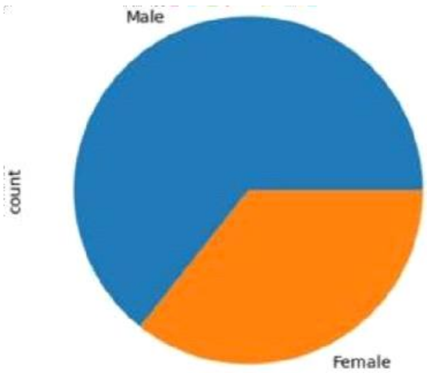


sns.countplot(tips.sex)



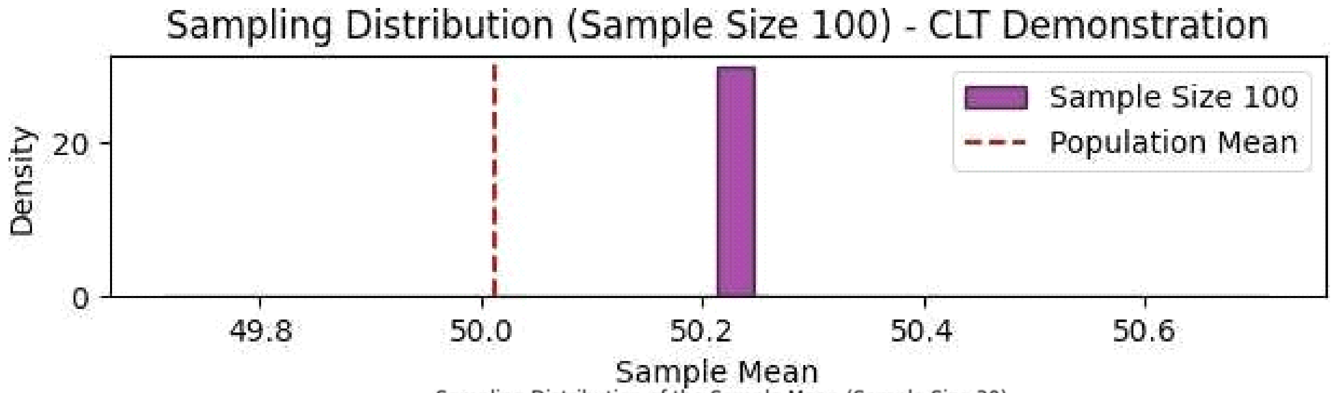


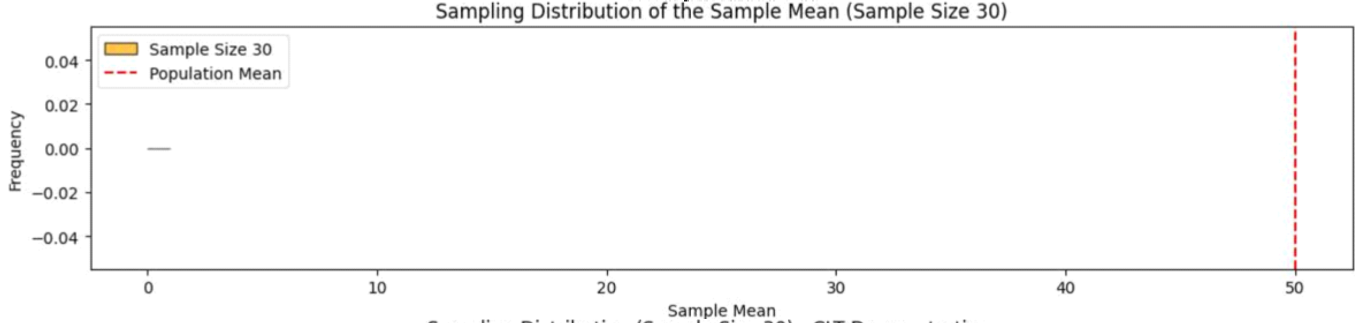
```
tips.sex.value_counts().plot(kind='pie')

tips.sex.value_counts().plot(kind='bar')
```

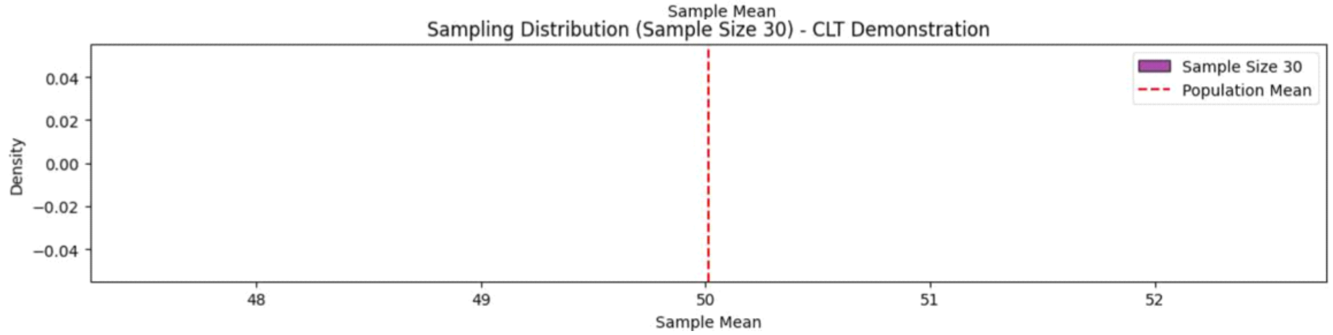


```
#Random Sampling and Sampling

Distribution#MANIKANDAN.S

#2
30
70
11
75
#1
0/0
9/2
4
```

```
import numpy as np
import
matplotlib.pyplot as
plt

population_mean = 50 population_std = 10 population_size = 100000 population =
np.random.normal(population_mean, population_std, population_size)

plt.figure(figsize=(8, 5)) plt.hist(population, bins=50, color='skyblue', edgecolor='black',
alpha=0.7) plt.title('Population                    Distribution')
                              plt.xlabel('Value')      plt.ylabel('Frequency')
plt.axvline(population_mean,      color='red',      linestyle='dashed',      linewidth=1.5,
label='Population Mean') plt.legend() plt.show() sample_sizes = [30, 50, 100] num_samples
= 1000 sample_means = {} for size in sample_sizes: sample_means[size] = [] for _ in
range(num_samples):

sample = np.random.choice(population, size=size,
        replace=False)sample_means[size].append(np.mean(sample))

plt.figure(figsize=(12, 8)) for i, size in enumerate(sample_sizes):
plt.subplot(len(sample_sizes), 1, i + 1) plt.hist(sample_means[size],
bins=30, alpha=0.7, color='orange', edgecolor='black', label=f'Sample
Size {size}')
plt.axvline(np.mean(population), color='red', linestyle='dashed', linewidth=1.5,
label='Population Mean') plt.title(f'Sampling Distribution of the Sample Mean (Sample
Size {size})') plt.xlabel('Sample Mean') plt.ylabel('Frequency') plt.legend()
plt.tight_layout() plt.show() plt.figure(figsize=(12, 8)) for i, size in
enumerate(sample_sizes): plt.subplot(len(sample_sizes), 1, i + 1)
plt.hist(sample_means[size], bins=30, alpha=0.7, color='purple', edgecolor='black',
label=f'Sample Size {size}', density=True)

plt.axvline(np.mean(population), color='red', linestyle='dashed', linewidth=1.5,
label='Population Mean') plt.title(f'Sampling Distribution (Sample Size {size}) - CLT
Demonstration') plt.xlabel('Sample Mean') plt.ylabel('Density') plt.legend()
plt.tight_layout() plt.show()
```







#MANIKA

NDAN.S

#23070117

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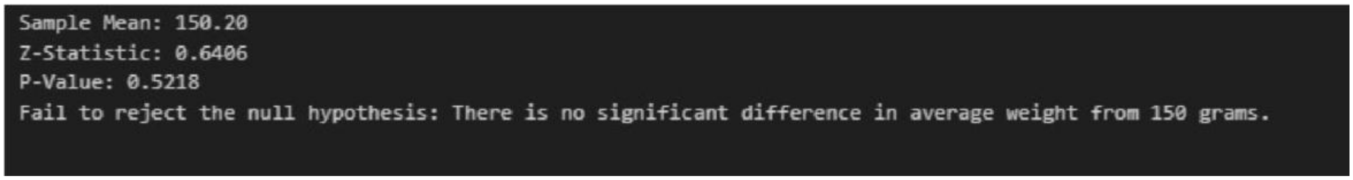
#10/09/24

#Z_TEST

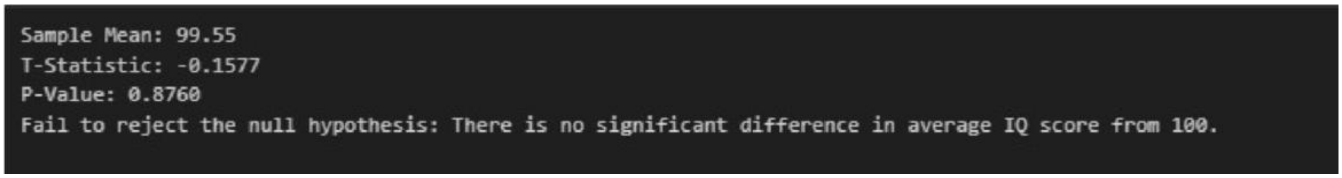
```
import numpy as
np import
scipy.stats as
stats
sample_data =
np.array([
152, 148, 151, 149, 147, 153, 150, 148, 152, 149,
151, 150, 149, 152, 151, 148, 150, 152, 149, 150,
148, 153, 151, 150, 149, 152, 148, 151, 150, 153
])
population_mean = 150
sample_mean =
np.mean(sample_data)
sample_std = np.std(sample_data,
ddof=1) n = len(sample_data)
z_statistic = (sample_mean - population_mean) / (sample_std /
np.sqrt(n))p_value = 2 * (1 - stats.norm.cdf(np.abs(z_statistic)))
print(f"Sample Mean: {sample_mean:.2f}")
print(f"Z-Statistic: {z_statistic:.4f}")
print(f"P- Value: {p_value:.4f}") alpha =
0.05 if p_value <alpha:
print("Reject the null hypothesis: The average weight is significantly different from 150
grams.") else: print("Fail to reject the null hypothesis: There is no significant difference in
average weight from 150 grams.")
```



```
Sample Mean: 150.20
Z-Statistic: 0.6406
P-Value: 0.5218
Fail to reject the null hypothesis: There is no significant difference in average weight from 150 grams.
```

```
# T-Test

# 230701175

#

 MANIKA

 NDAN.S#

 08.10.2024


import numpy as np import scipy.stats as stats

np.random.seed(42) sample_size = 25 sample_data =

np.random.normal(loc=102, scale=15, size=sample_size)
```

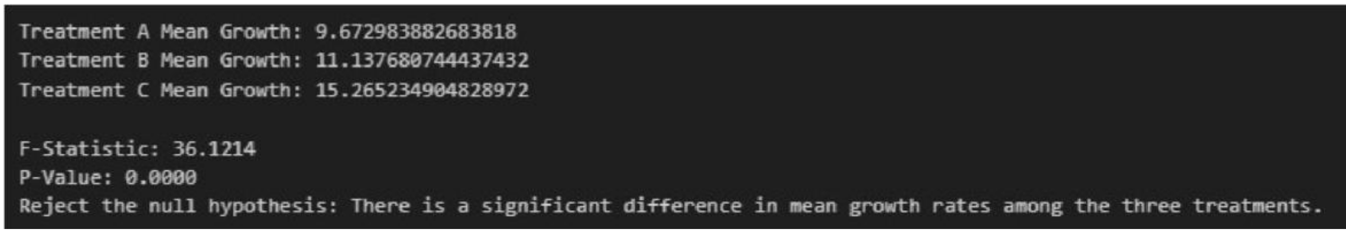
```
population_mean = 100 sample_mean =
np.mean(sample_data) sample_std = np.std(sample_data,
ddof=1) n =



len(sample_data) t_statistic, p_value =
stats.ttest_1samp(sample_data,population_mean)
print(f"Sample Mean: {sample_mean:.2f}")

print(f"T-Statistic:
{t_statistic:.4f}") print(f"P-Value:
{p_value:.4f}") alpha =
0.05 ifp_value < alpha:

print("Reject the null hypothesis: The average IQ score is significantly different from
100.")else:

print("Fail to reject the null hypothesis: There is no significant difference in average IQ score
from100."
```



```
Sample Mean: 99.55
T-Statistic: -0.1577
P-Value: 0.8760
Fail to reject the null hypothesis: There is no significant difference in average IQ score from 100.
```

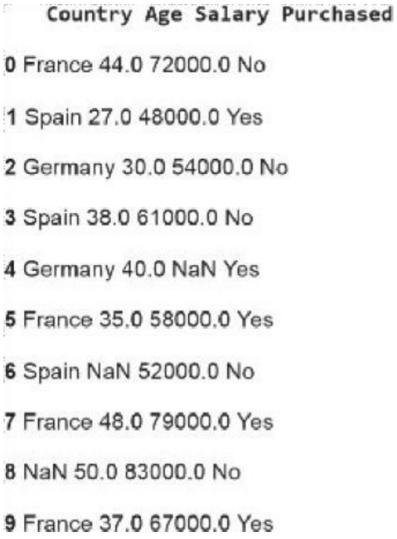
```
#
ANOV
ATES
T#
23070
1175
#
MANIKAN
DAN.S#
08.10.2024

import numpy as npimport scipy.stats as statsnp.random.seed(42) n_plants = 25
```

```
growth_A = np.random.normal(loc=10, scale=2,
size=n_plants) growth_B = np.random.normal(loc=12,
scale=3, size=n_plants) growth_C =
np.random.normal(loc=15, scale=2.5, size=n_plants)
f_statistic, p_value = stats.f_oneway(growth_A, growth_B,
growth_C) print("Treatment A Mean Growth:",
np.mean(growth_A)) print("Treatment B Mean Growth:",
np.mean(growth_B))
print("Treatment C Mean Growth:",
np.mean(growth_C))print() print(f"F-Statistic:
{f_statistic:.4f}") print(f"P- Value:
{p_value:.4f}") alpha = 0.05 if p_value < alpha:
print("Reject the null hypothesis: There is a significant difference in mean growth rates
amongthe three treatments.") else:
print("Fail to reject the null hypothesis: There is no significant difference in mean
growth ratesamong the three treatments.") if p_value < alpha:
all_data = np.concatenate([growth_A, growth_B, growth_C])
treatment_labels = ['A'] * n_plants + ['B'] * n_plants + ['C'] *
n_plants tukey_results = pairwise_tukeyhsd(all_data,
treatment_labels, alpha=0.05) print("\nTukey's HSD Post-hoc
Test:") print(tukey_results)
```



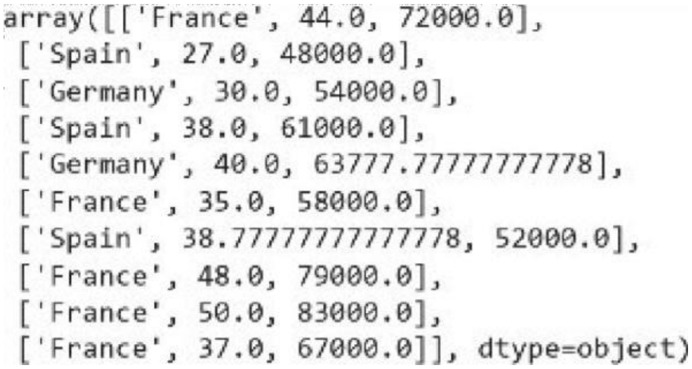
```
Treatment A Mean Growth: 9.672983882683818
Treatment B Mean Growth: 11.137680744437432
Treatment C Mean Growth: 15.265234904828972

F-Statistic: 36.1214
P-Value: 0.0000
Reject the null hypothesis: There is a significant difference in mean growth rates among the three treatments.
```

```
# Feature

Scaling

#MANIKA

NDAN.S

#23070117

5

#20/10/24 import numpy as np import pandas

as pd df =pd.read_csv('/content/pre-

process_datasample.csv')

df
```



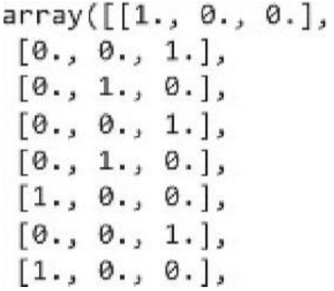
```
   Country Age Salary Purchased
0 France 44.0 72000.0 No
1 Spain 27.0 48000.0 Yes
2 Germany 30.0 54000.0 No
3 Spain 38.0 61000.0 No
4 Germany 40.0 NaN Yes
5 France 35.0 58000.0 Yes
6 Spain NaN 52000.0 No
7 France 48.0 79000.0 Yes
8 NaN 50.0 83000.0 No
9 France 37.0 67000.0 Yes
```

```
df['Country'].fillna(df['Country'].mode()[0],
inplace=True)  features  =  df.iloc[:,  :-
1].values  label  =df.iloc[:, -1].values

from sklearn.impute import SimpleImputer
age_imputer =SimpleImputer(strategy="mean")        salary_imputer             =SimpleImputer(strategy="mean") age_im
salary_imputer.fit(features[:,    [2]])    features[:,    [1]]    =
age_imputer.transform(features[:,  [1]])  features[:,  [2]]  =
salary_imputer.transform(features[:, [2]])
print("Featuresafter handling missing values:")
features
```



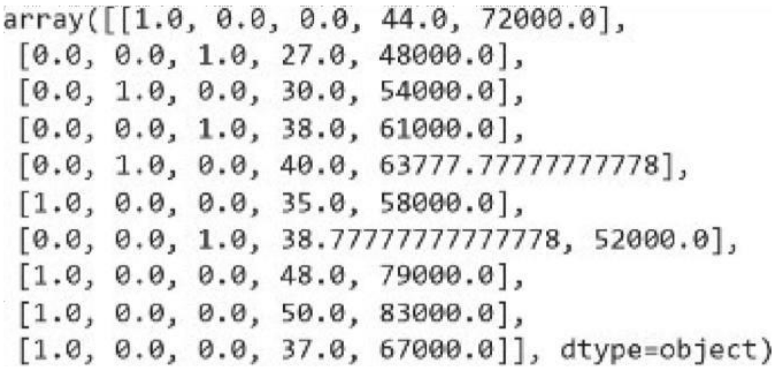
```
array([['France', 44.0, 72000.0],
 ['Spain', 27.0, 48000.0],
 ['Germany', 30.0, 54000.0],
 ['Spain', 38.0, 61000.0],
 ['Germany', 40.0, 63777.77777777778],
 ['France', 35.0, 58000.0],
 ['Spain', 38.77777777777778, 52000.0],
 ['France', 48.0, 79000.0],
 ['France', 50.0, 83000.0],
 ['France', 37.0, 67000.0]], dtype=object)
```

```
from sklearn.preprocessing import
OneHotEncoder oh =
OneHotEncoder(sparse_output=False)
Country = oh.fit_transform(features[:,
[0]]) print("OneHotEncoded 'Country'
column:")

Country
```



```
array([[1., 0., 0.],
 [0., 0., 1.],
 [0., 1., 0.],
 [0., 0., 1.],
 [0., 1., 0.],
 [1., 0., 0.],
 [0., 0., 1.],
 [1., 0., 0.],
```

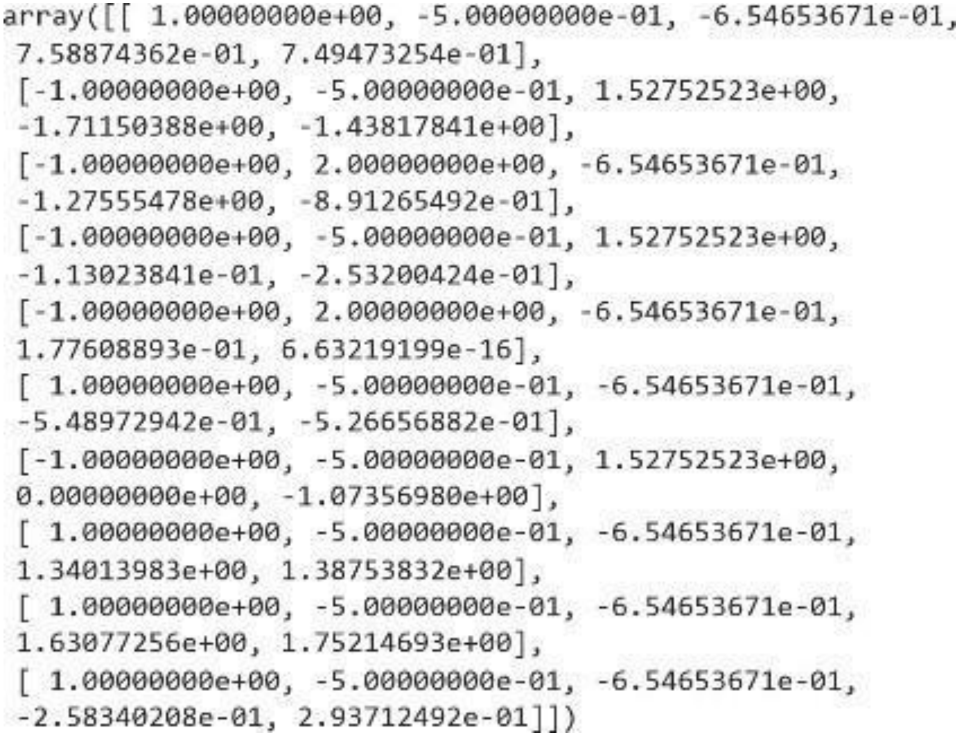
```
final_set = np.concatenate((Country, features[:, [1, 2]]),
axis=1) print("Final dataset with OneHotEncoded 'Country'
and other features:")final_set
```



```
array([[1.0, 0.0, 0.0, 44.0, 72000.0],
 [0.0, 0.0, 1.0, 27.0, 48000.0],
 [0.0, 1.0, 0.0, 30.0, 54000.0],
 [0.0, 0.0, 1.0, 38.0, 61000.0],
 [0.0, 1.0, 0.0, 40.0, 63777.77777777778],
 [1.0, 0.0, 0.0, 35.0, 58000.0],
 [0.0, 0.0, 1.0, 38.77777777777778, 52000.0],
 [1.0, 0.0, 0.0, 48.0, 79000.0],
 [1.0, 0.0, 0.0, 50.0, 83000.0],
 [1.0, 0.0, 0.0, 37.0, 67000.0]], dtype=object)
```

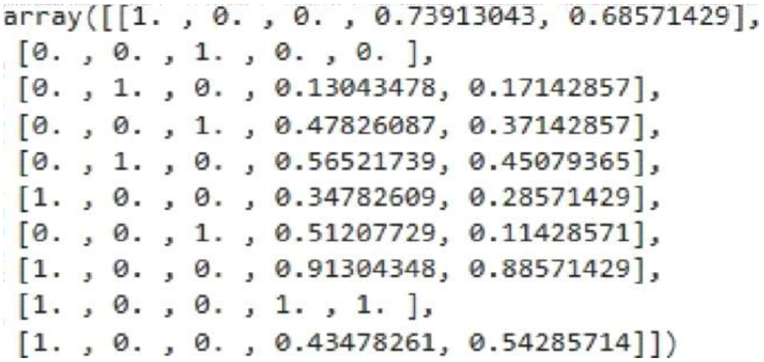
```
from sklearn.preprocessing import StandardScaler sc
= StandardScaler()
```

```
sc.fit(final_set)

feat_standard_scaler =

sc.transform(final_set)

print("Standardizedfeatures:")

feat_standard_scaler
```



```
array([[ 1.00000000e+00, -5.00000000e-01, -6.54653671e-01,
 7.58874362e-01, 7.49473254e-01],
 [-1.00000000e+00, -5.00000000e-01, 1.52752523e+00,
 -1.71150388e+00, -1.43817841e+00],
 [-1.00000000e+00, 2.00000000e+00, -6.54653671e-01,
 -1.27555478e+00, -8.91265492e-01],
 [-1.00000000e+00, -5.00000000e-01, 1.52752523e+00,
 -1.13023841e-01, -2.53200424e-01],
 [-1.00000000e+00, 2.00000000e+00, -6.54653671e-01,
 1.77608893e-01, 6.63219199e-16],
 [ 1.00000000e+00, -5.00000000e-01, -6.54653671e-01,
 -5.48972942e-01, -5.26656882e-01],
 [-1.00000000e+00, -5.00000000e-01, 1.52752523e+00,
 0.00000000e+00, -1.07356980e+00],
 [ 1.00000000e+00, -5.00000000e-01, -6.54653671e-01,
 1.34013983e+00, 1.38753832e+00],
 [ 1.00000000e+00, -5.00000000e-01, -6.54653671e-01,
 1.63077256e+00, 1.75214693e+00],
 [ 1.00000000e+00, -5.00000000e-01, -6.54653671e-01,
 -2.58340208e-01, 2.93712492e-01]])
```

```
from sklearn.preprocessing import

MinMaxScaler mms =

MinMaxScaler(feature_range=(0, 1))

mms.fit(final_set) feat_minmax_scaler

= mms.transform(final_set)

print("Normalized features:")

print(feat_minmax_scaler)
```



```
array([[1. , 0. , 0. , 0.73913043, 0.68571429],
 [0. , 0. , 1. , 0. , 0. ],
 [0. , 1. , 0. , 0.13043478, 0.17142857],
 [0. , 0. , 1. , 0.47826087, 0.37142857],
 [0. , 1. , 0. , 0.56521739, 0.45079365],
 [1. , 0. , 0. , 0.34782609, 0.28571429],
 [0. , 0. , 1. , 0.51207729, 0.11428571],
 [1. , 0. , 0. , 0.91304348, 0.88571429],
 [1. , 0. , 0. , 1. , 1. ],
 [1. , 0. , 0. , 0.43478261, 0.54285714]])
```

# Linear

Regression

#MANIKA

NDAN.S

#23070117

5

#29/10/24 import

numpy as np import

pandas as pd

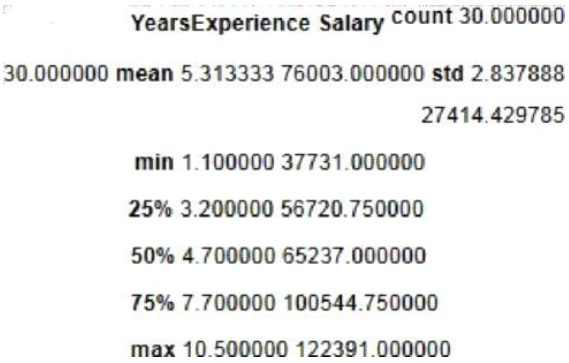
df=pd.read_csv('Salary_data.csv'

) df df.info()

df.dropna(inplace=Tru

e)df.info()

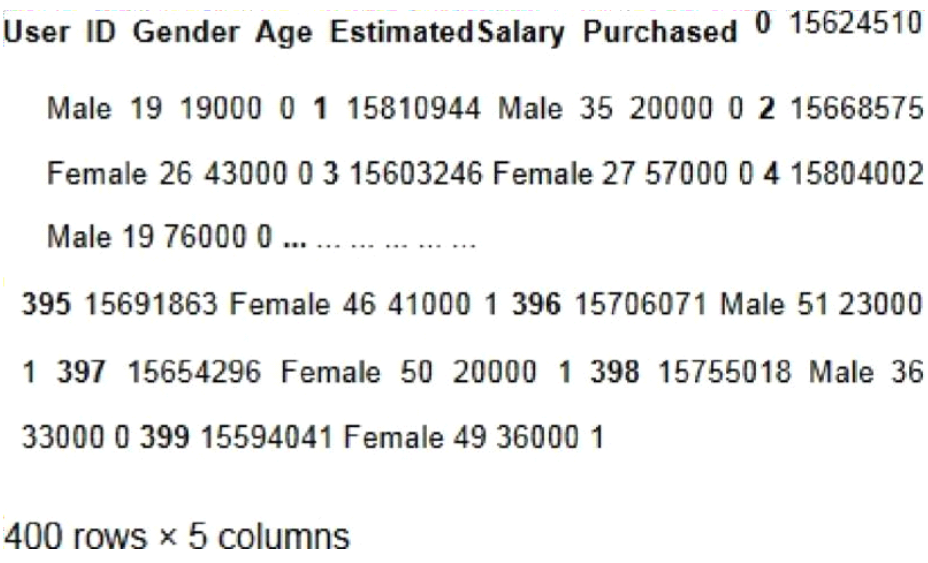
df.describe()



```
          YearsExperience Salary count 30.000000
30.000000 mean 5.313333 76003.000000 std 2.837888
                                    27414.429785
          min 1.100000 37731.000000
          25% 3.200000 56720.750000
          50% 4.700000 65237.000000
          75% 7.700000 100544.750000
          max 10.500000 122391.000000
```

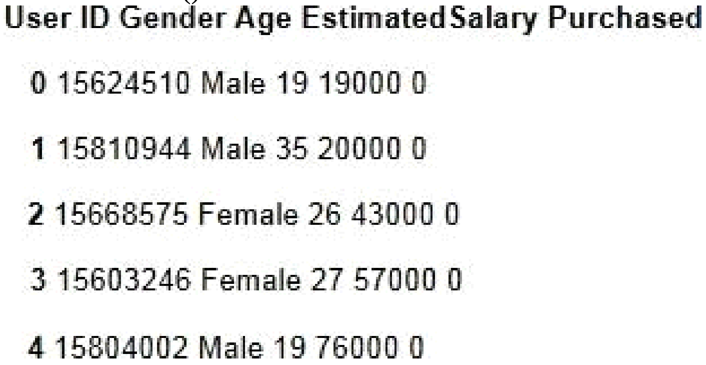
```
features=df.iloc[:,[0]].values    label=df.iloc[:,[1]].values    from
                                  sklearn.model_selectionimport
                                  train_test_split
x_train,x_test,y_train,y_test=train_test_split(features,label,test_size=0.2,random_state=23
) from sklearn.linear_model import LinearRegression model=LinearRegression()
model.fit(x_train,y_train)                              model.score(x_train,y_train)
model.score(x_test,y_test) model.coef_ model.intercept_
import          pickle
                pickle.dump(model,open('SalaryPred.model','wb'))
model=pickle.load(open('SalaryPred.model','rb'))
yr_of_exp=float(input("Enter      Years      of      Experience:      "))
yr_of_exp_NP=np.array([[yr_of_exp]])
Salary=model.predict(yr_of_exp_NP)  print("Estimated  Salary  for  {}
years of experience is {}: " .format(yr_of_exp,Salary)
```

```
# Logistic
Regression
#MANIKA
NDAN.S
#230701175
#29/10/24 import numpy as np
import pandas as pd
df=pd.read_csv('Social_Network
_Ads.csv')

df
```



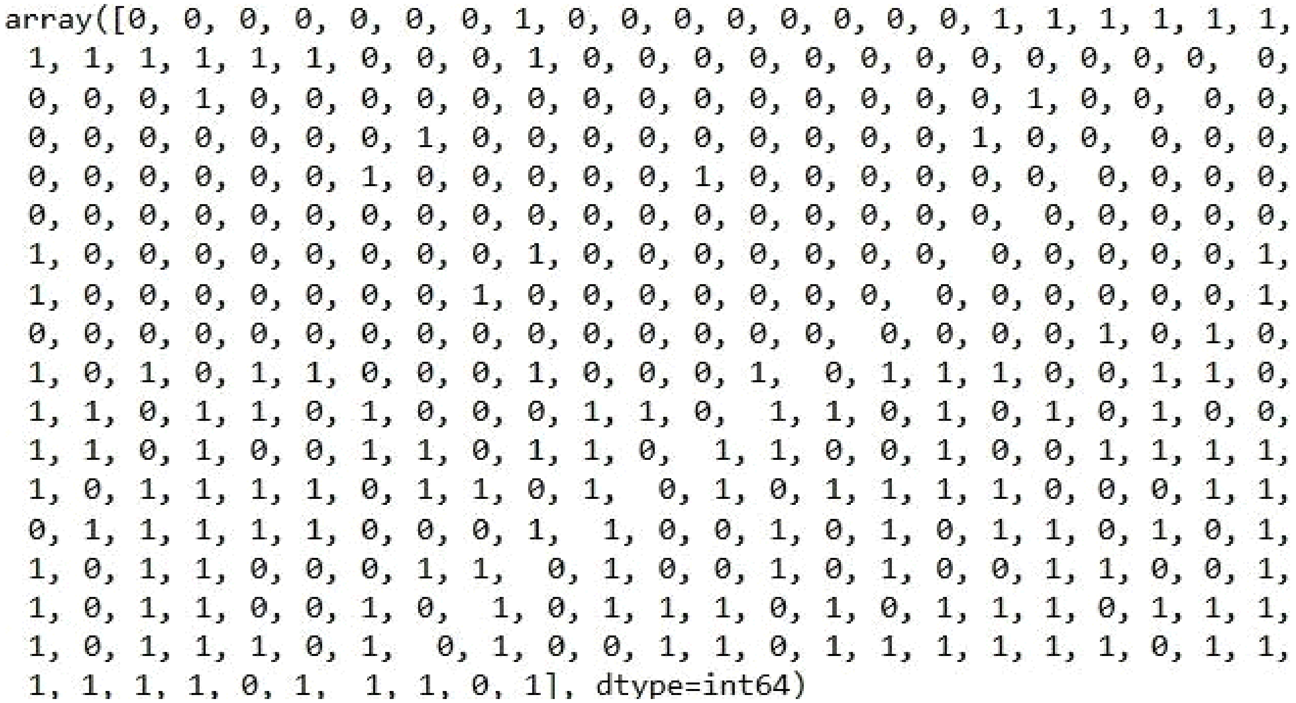
```
User ID Gender Age EstimatedSalary Purchased 0 15624510

  Male 19 19000 0 1 15810944 Male 35 20000 0 2 15668575

  Female 26 43000 0 3 15603246 Female 27 57000 0 4 15804002

  Male 19 76000 0 ... ... ... ... ... ...

 395 15691863 Female 46 41000 1 396 15706071 Male 51 23000

 1 397 15654296 Female 50 20000 1 398 15755018 Male 36

 33000 0 399 15594041 Female 49 36000 1

400 rows × 5 columns
```

```
df.head()
```



```
User ID Gender Age EstimatedSalary Purchased

 0 15624510 Male 19 19000 0

 1 15810944 Male 35 20000 0

 2 15668575 Female 26 43000 0

 3 15603246 Female 27 57000 0

 4 15804002 Male 19 76000 0
```

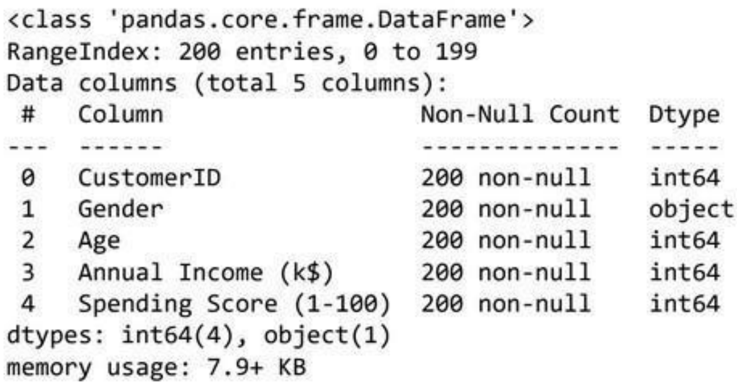
```
features=df.iloc[:,[2,
3]].values
label=df.iloc[:,4].val
ues features label
```



```
array([0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 1, 1,
 1, 1, 1, 1, 1, 1, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,  0,
 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0,  0, 0,
 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0,  0, 0, 0,
 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0,  0, 0, 0, 0,
 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,  0, 0, 0, 0, 0,
 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0,  0, 0, 0, 0, 0, 1,
 1, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0,  0, 0, 0, 0, 0, 0, 1,
 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,  0, 0, 0, 0, 1, 0, 1, 0,
 1, 0, 1, 0, 1, 1, 0, 0, 0, 1, 0, 0, 0, 1,  0, 1, 1, 1, 0, 0, 1, 1, 0,
 1, 1, 0, 1, 1, 0, 1, 0, 0, 0, 1, 1, 0,  1, 1, 0, 1, 0, 1, 0, 1, 0, 0,
 1, 1, 0, 1, 0, 0, 1, 1, 0, 1, 1, 0,  1, 1, 0, 0, 1, 0, 0, 1, 1, 1, 1,
 1, 0, 1, 1, 1, 1, 0, 1, 1, 0, 1,  0, 1, 0, 1, 1, 1, 1, 0, 0, 0, 1, 1,
 0, 1, 1, 1, 1, 1, 0, 0, 0, 1,  1, 0, 0, 1, 0, 1, 0, 1, 1, 0, 1, 0, 1,
 1, 0, 1, 1, 0, 0, 0, 1, 1,  0, 1, 0, 0, 1, 0, 1, 0, 0, 1, 1, 0, 0, 1,
 1, 0, 1, 1, 0, 0, 1, 0,  1, 0, 1, 1, 1, 0, 1, 0, 1, 1, 1, 0, 1, 1, 1,
 1, 0, 1, 1, 1, 0, 1,  0, 1, 0, 0, 1, 1, 0, 1, 1, 1, 1, 1, 1, 0, 1, 1,
 1, 1, 1, 1, 0, 1,  1, 1, 0, 1], dtype=int64)
```

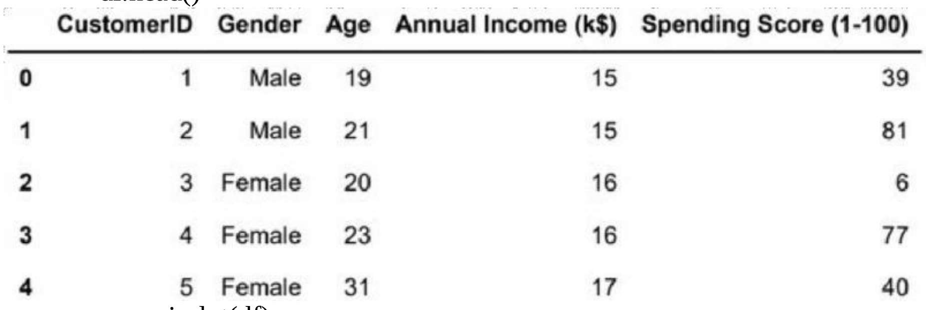
```
from sklearn.model_selection import
train_test_split from sklearn.linear_model
import LogisticRegression for i in
range(1,401):

x_train,x_test,y_train,y_test=train_test_split(features,label,test_size=0.2,random_state=i)
model=LogisticRegression()


model.fit(x_train,y_train)
train_score=model.score(x_train,y_train
)
test_score=model.score(x_test
,y_test)if
test_score>train_score:

print("Test {} Train{} Random State {}".format(test_score,train_score,i)
x_train,x_test,y_train,y_test=train_test_split(features,label,test_size=0.2,random_state=314
) finalModel=LogisticRegression() finalModel.fit(x_train,y_train)
print(finalModel.score(x_train,y_train))
print(finalModel.score(x_test,y_test)) fromsklearn.metrics import
classification_report
print(classification_report(label,finalModel.predict(features)))
# K-MEANS
CLUSTERING
#MANIKANDAN.
S
```

```
#230701175       #05/11/24
import numpy as np import
pandas as pd import
matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
df=pd.read_csv('Mall_Custo
mers.csv'
)

df.info()
```



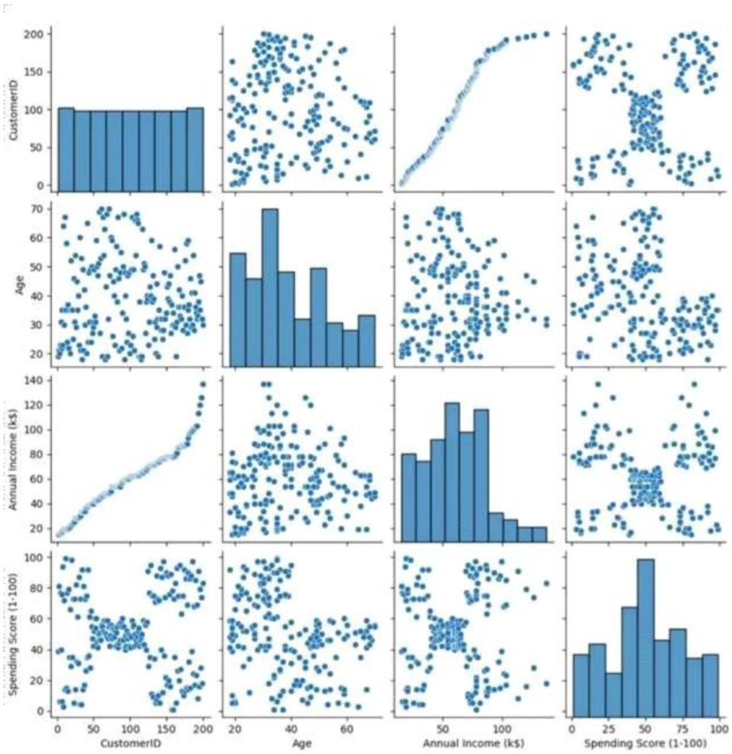
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 200 entries, 0 to 199
Data columns (total 5 columns):
 #   Column                  Non-Null Count  Dtype 
---  ------                  --------------  ----- 
 0   CustomerID              200 non-null    int64 
 1   Gender                  200 non-null    object
 2   Age                     200 non-null    int64 
 3   Annual Income (k$)      200 non-null    int64 
 4   Spending Score (1-100)  200 non-null    int64 
dtypes: int64(4), object(1)
memory usage: 7.9+ KB
```

```
df.head()
```

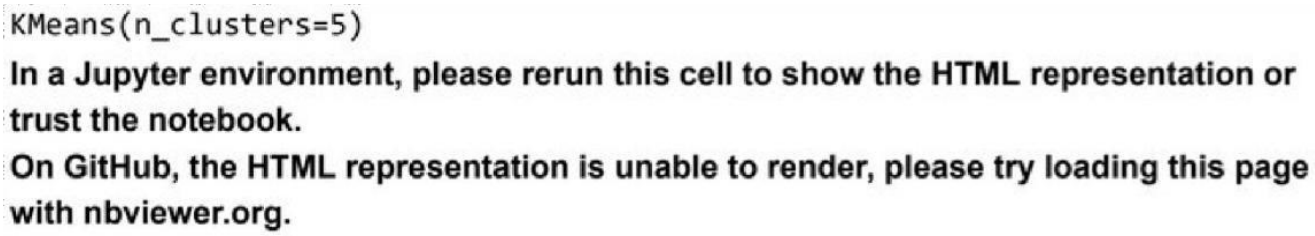


	CustomerID	Gender	Age	Annual Income (k$)	Spending Score (1-100)
0	1	Male	19	15	39
1	2	Male	21	15	81
2	3	Female	20	16	6
3	4	Female	23	16	77
4	5	Female	31	17	40

```
sns.pairplot(df)
```



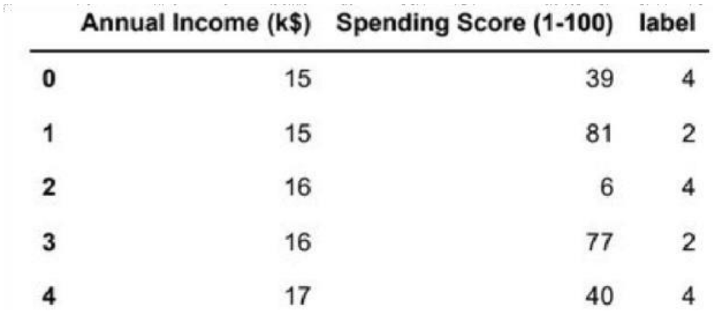
```
features=df.iloc[:,[3,4]].val
ues fromsklearn.cluster
import KMeans
model=KMeans(n_clusters
=5) model.fit(features)

KMeans(n_clusters=5)
```



```
KMeans(n_clusters=5)
```

In a Jupyter environment, please rerun this cell to show the HTML representation or trust the notebook.
On GitHub, the HTML representation is unable to render, please try loading this page with nbviewer.org.

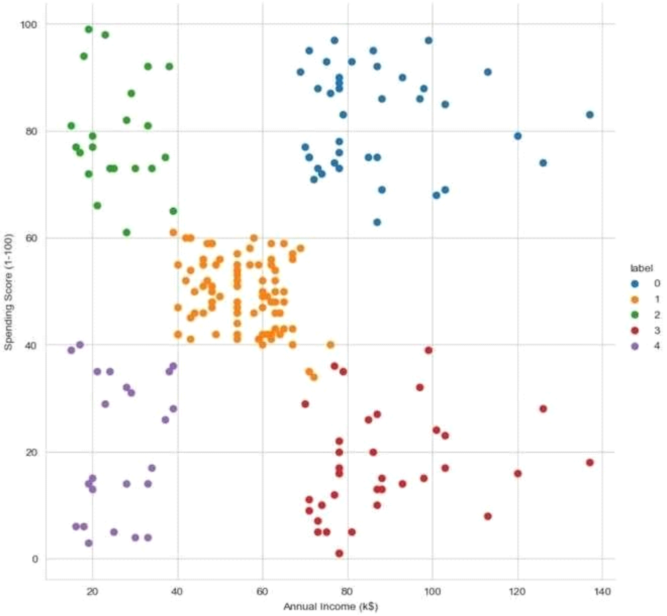
```
Final=df.iloc[:,[3,4]]
Final['label']=model.predict(fe
atures)Final.head()
```



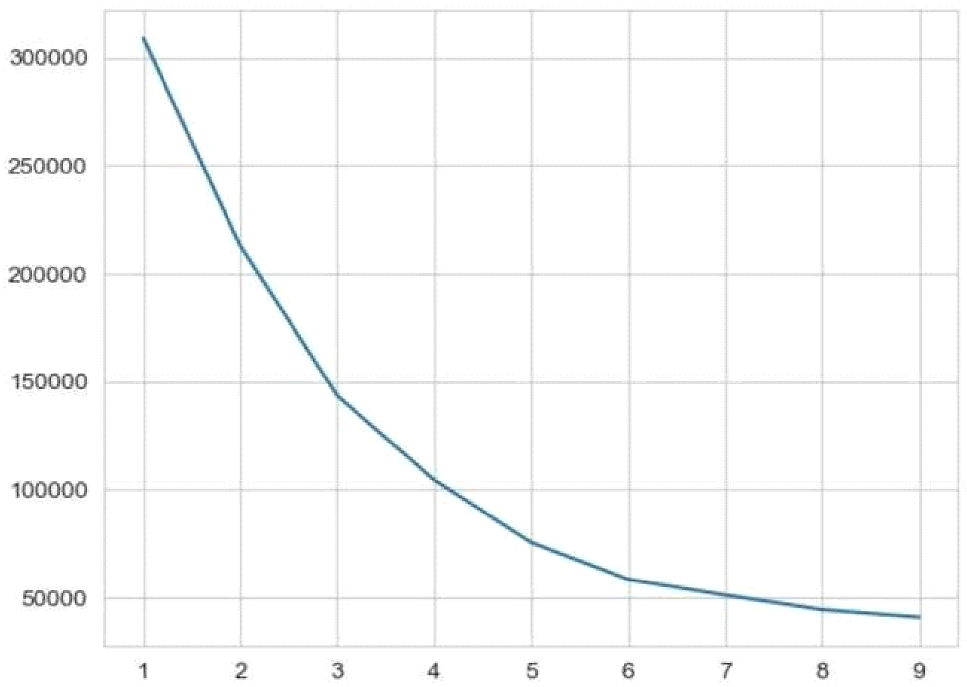
	Annual Income (k$)	Spending Score (1-100)	label
0	15	39	4
1	15	81	2
2	16	6	4
3	16	77	2
4	17	40	4

```
sns.set_style("whitegrid")
sns.FacetGrid(Final,hue="label",h
eight=8) \
```

```
.map(plt.scatter,"Annual Income (k$)", "Spending Score (1-100)") \
.add_
legen
d();
plt.sh
ow()
```



```
features_el=df.iloc[:,[2,3,4
]].values from
sklearn.cluster import
KMeanswcss=[] for i in
range(1,10):

model=KMeans(n_clu
sters=i)
model.fit(features_el)
wcss.append(model.in
ertia_)
plt.plot(range(1,10),w
css)
```


300000
250000
200000
150000
100000
50000
1
2
3
4
5
6
7
8
9