RAJALAKSHMI ENGINEERING COLLEGE

Approved by AICTE | Affiliated to Anna University | Accredited by NAAC

Department of Computer Science and Engineering

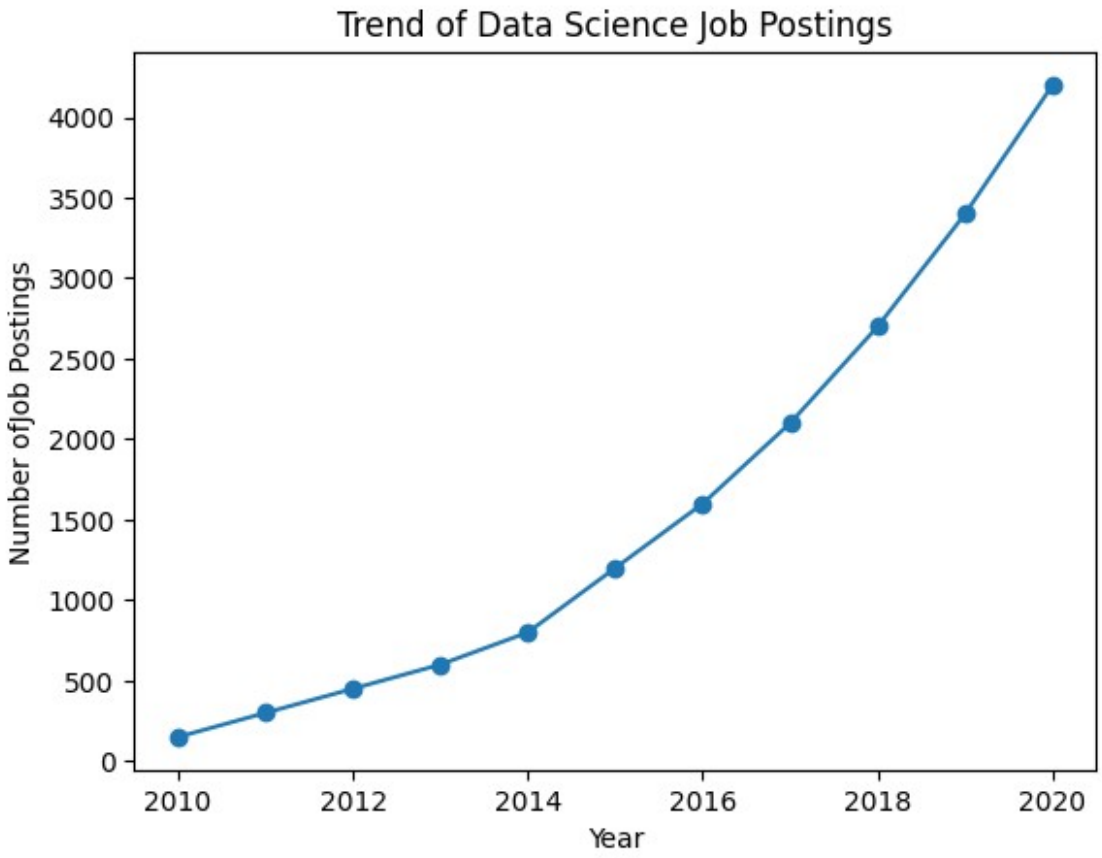
CS23334 Fundamentals of Data Science Lab

III semester II Year (2023R)

Name of the Student DEVISHREE J

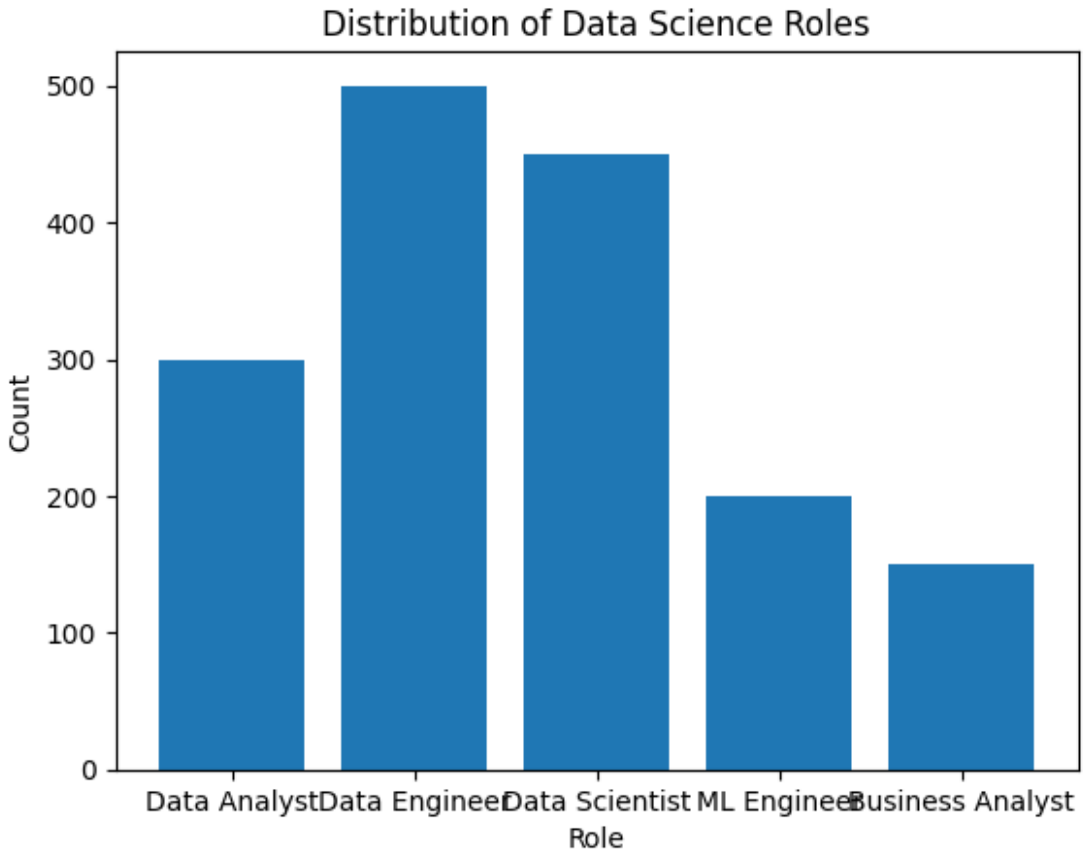
Register Number : 2116240701702

```
import pandas as pd
import matplotlib.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'], marker='o')
plt.title('Trend of Data Science Job Postings')
plt.xlabel('Year')
plt.ylabel('Number ofJob Postings')
plt.show()
```




```
roles = ['Data Analyst', 'Data Engineer', 'Data Scientist', 'ML
Engineer',
'Business Analyst']
counts = [300, 500, 450, 200, 150]
plt.bar(roles, counts)
plt.title('Distribution of Data Science Roles')
plt.xlabel('Role')
```

```
plt.ylabel('Count')
plt.show()
```




```
# Structured data example
structured_data = pd.DataFrame({
'ID': [1, 2, 3],
'Name': ['Alice', 'Bob', 'Charlie'],
'Age': [25, 30, 35]
})
print("Structured Data:\n", structured_data)

# Unstructured data example
unstructured_data = "This is an example of unstructured data. It can
be a piece of text, an image,or a video file."
print("\nUnstructured Data:\n", unstructured_data)

# Semi-structured data example (JSON)
semi_structured_data = {'ID': 1, 'Name': 'Alice', 'Attributes':
{'Height': 165, 'Weight': 68}}
print("\nSemi-structured Data:\n", semi_structured_data)
```

```
Structured Data:
    ID     Name  Age
```

```
0   1    Alice   25
1   2      Bob   30
2   3  Charlie   35

Unstructured Data:
 This is an example of unstructured data. It can be a piece of text,
an image,or a video file.

Semi-structured Data:
 {'ID': 1, 'Name': 'Alice', 'Attributes': {'Height': 165, 'Weight':
68}}
```

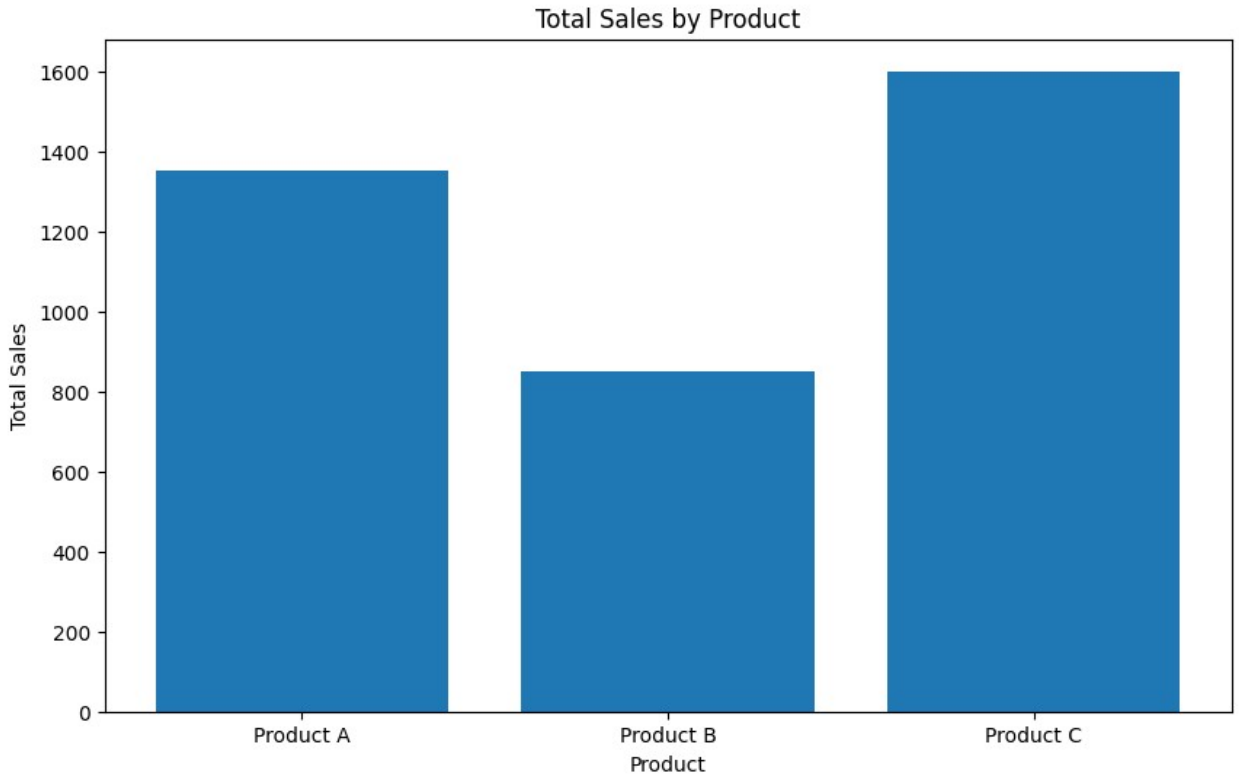
```python
# Generate key and encrypt data
from cryptography.fernet import Fernet
key = Fernet.generate_key()
f = Fernet(key)
token = f.encrypt(b"Rajalakshmi Engineering College")
token
b'...'
f.decrypt(token)
b'Rajalakshmi Engineering College'
key = Fernet.generate_key()
cipher_suite = Fernet(key)
plain_text = b"Rajalakshmi Engineering College."
cipher_text = cipher_suite.encrypt(plain_text)
# Decrypt data
decrypted_text = cipher_suite.decrypt(cipher_text)
print("Original Data:", plain_text)
print("Encrypted Data:", cipher_text)
print("Decrypted Data:", decrypted_text)
```

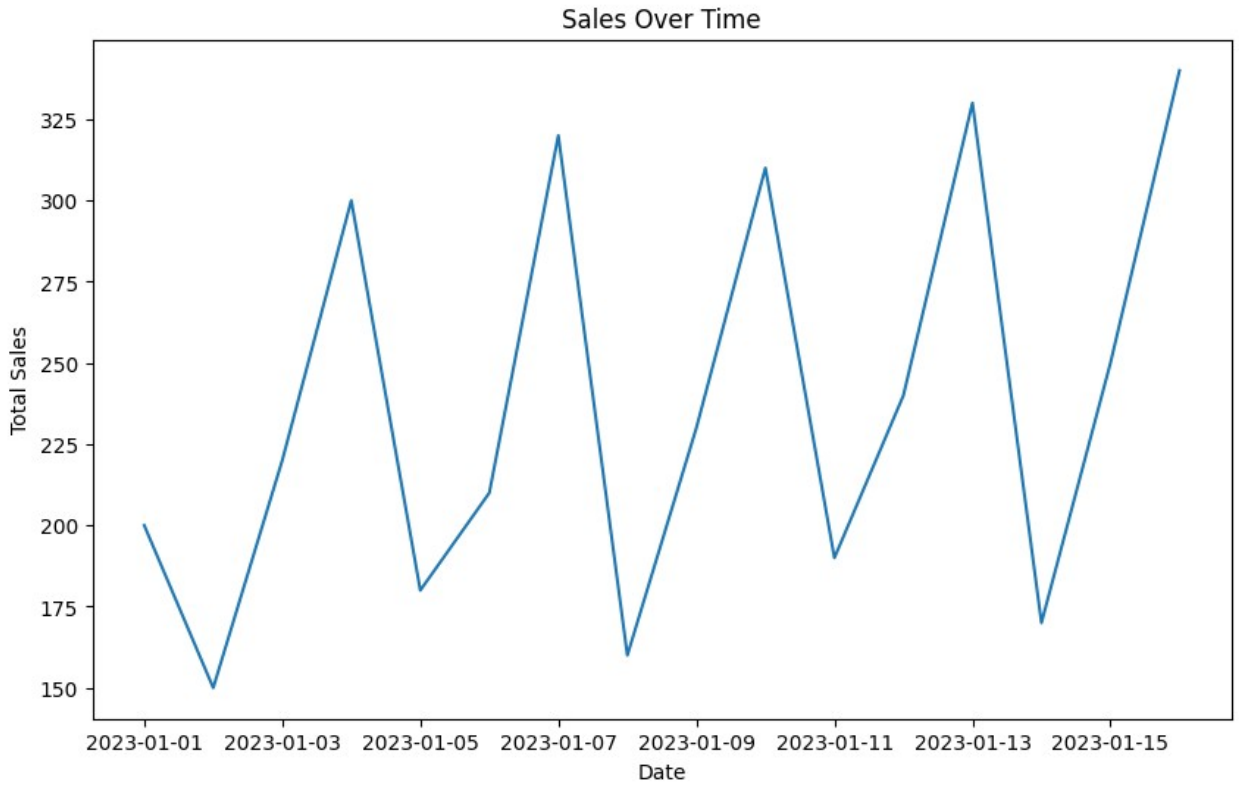
```
Original Data: b'Rajalakshmi Engineering College.'
Encrypted Data: b'gAAAAABpAtiTHMCdPYNjh7zfHPW6HnQ9BY7e6duvXzZ-
pyhvry4B2cvegfQ44zYsV7btCFRuSpuvtyHXa03t7rJoy9D7AXwYR-
DXISwIbnRLxZMpwRP7H922y5lftNQ7gOL0QJXO872K'
Decrypted Data: b'Rajalakshmi Engineering College.'
```

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

df = pd.read_csv(r"C:\Users\praka_32k187u\Downloads\sales_data.xlsx - Sheet1.csv")
print(df.head())
print(df.isnull().sum())
df['Sales'].fillna(df['Sales'].mean(), inplace=True)
df.dropna(subset=['Product', 'Quantity', 'Region'], inplace=True)
print(df.describe())
product_summary = df.groupby('Product').agg({'Sales': 'sum','Quantity': 'sum'}).reset_index()
print(product_summary)
plt.figure(figsize=(10, 6))
plt.bar(product_summary['Product'], product_summary['Sales'])
plt.xlabel('Product')
plt.ylabel('Total Sales')
plt.title('Total Sales by Product')
plt.show()
df['Date'] = pd.to_datetime(df['Date'], dayfirst=True, errors='coerce')
df.dropna(subset=['Date'], inplace=True)
sales_over_time = df.groupby('Date').agg({'Sales': 'sum'}).reset_index()
plt.figure(figsize=(10, 6))
plt.plot(sales_over_time['Date'], sales_over_time['Sales'])
plt.xlabel('Date')
plt.ylabel('Total Sales')
plt.title('Sales Over Time')
plt.show()
pivot_table = df.pivot_table(values='Sales', index='Region', columns='Product', aggfunc=np.sum, fill_value=0)
print(pivot_table)
correlation_matrix = df.corr(numeric_only=True)
print(correlation_matrix)
plt.figure(figsize=(8, 6))
sns.heatmap(correlation_matrix, annot=True, cmap='coolwarm')
plt.title('Correlation Matrix')
plt.show()
```

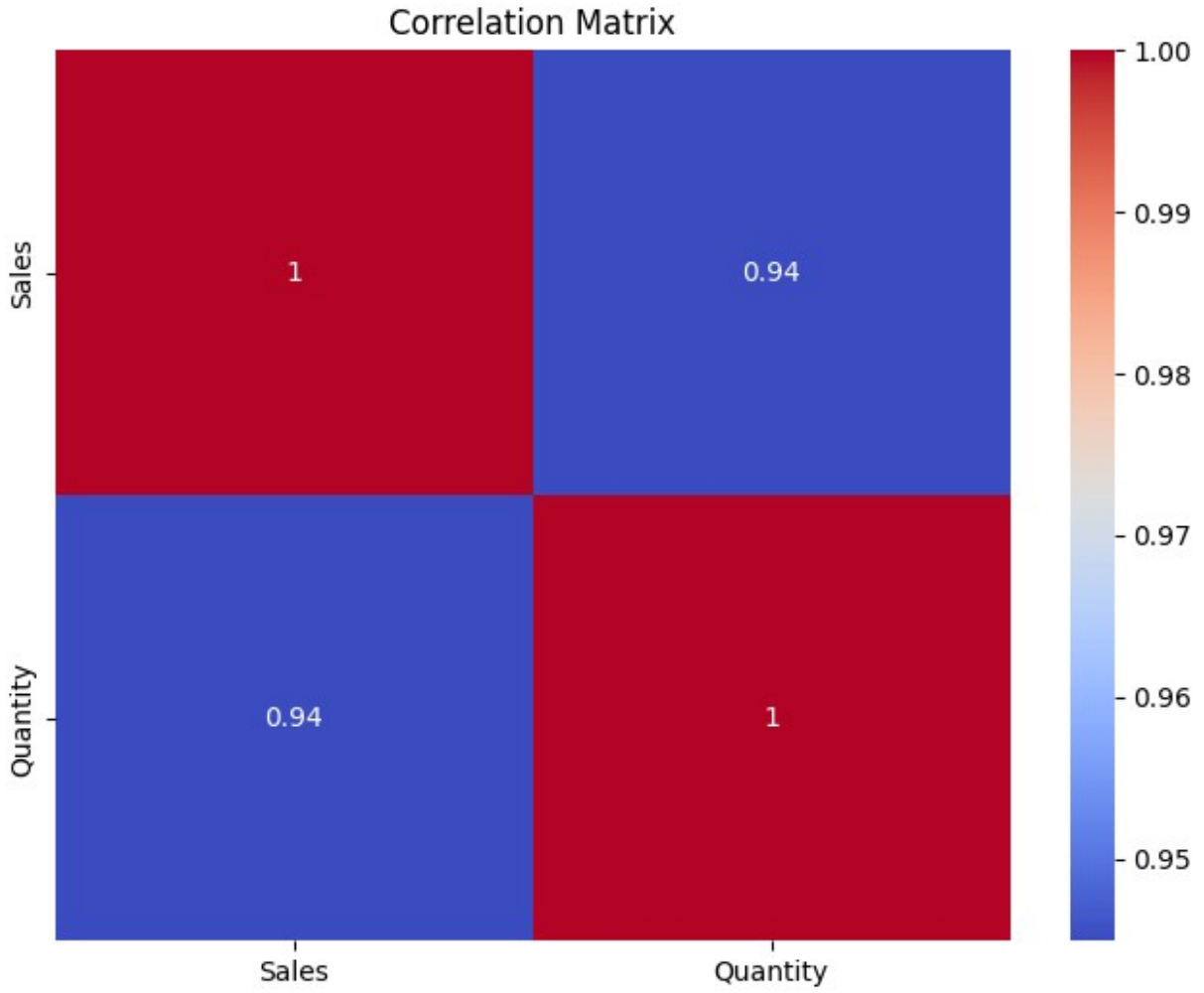
```
         Date    Product  Sales  Quantity Region
0  01-01-2023  Product A    200         4  North
1  02-01-2023  Product B    150         3  South
2  03-01-2023  Product A    220         5  North
3  04-01-2023  Product C    300         6   East
4  05-01-2023  Product B    180         4   West
Date        0
Product     0
```

```
Sales       0
Quantity    0
Region      0
dtype: int64
            Sales   Quantity
count   16.000000  16.000000
mean   237.500000   5.375000
std     64.031242   1.746425
min    150.000000   3.000000
25%    187.500000   4.000000
50%    225.000000   5.500000
75%    302.500000   7.000000
max    340.000000   8.000000
     Product  Sales  Quantity
0  Product A   1350        33
1  Product B    850        17
2  Product C   1600        36

C:\Users\praka_32k187u\AppData\Local\Temp\
ipykernel_14268\406383238.py:9: FutureWarning: A value is trying to be
set on a copy of a DataFrame or Series through chained assignment
using an inplace method.
The behavior will change in pandas 3.0. This inplace method will never
work because the intermediate object on which we are setting values
always behaves as a copy.

For example, when doing 'df[col].method(value, inplace=True)', try
using 'df.method({col: value}, inplace=True)' or df[col] =
df[col].method(value) instead, to perform the operation inplace on the
original object.


  df['Sales'].fillna(df['Sales'].mean(), inplace=True)
```

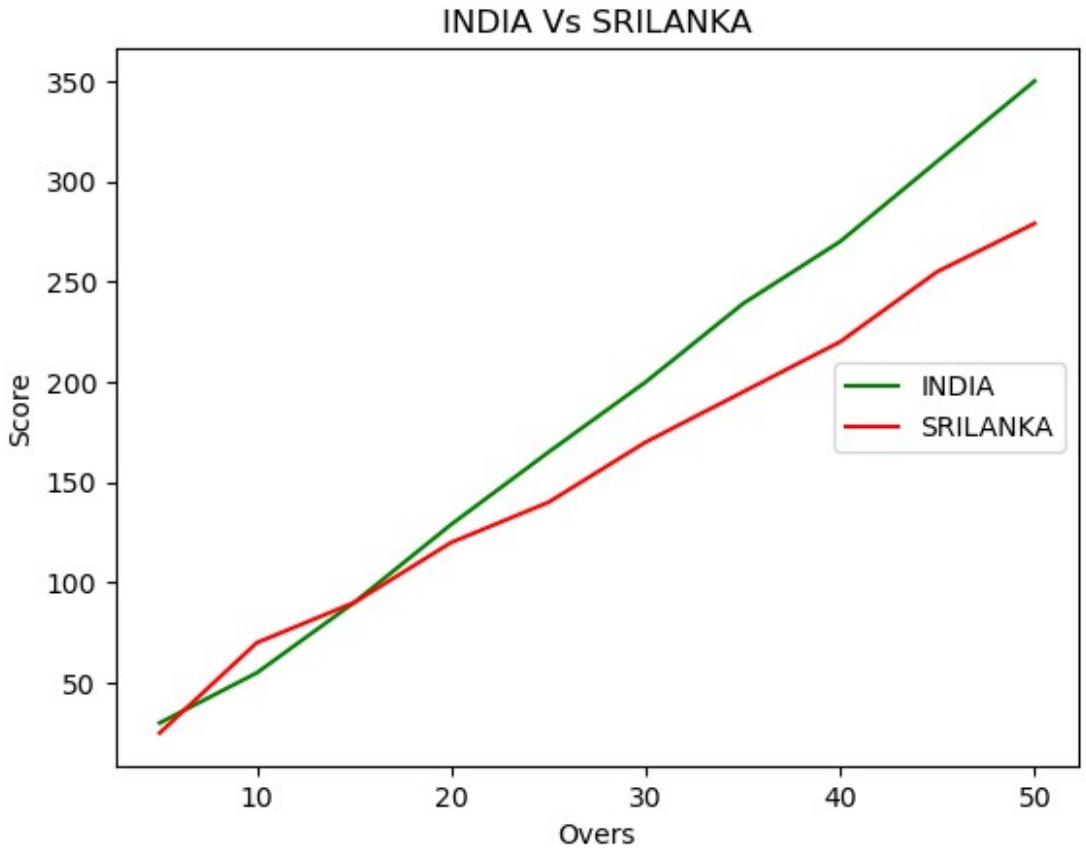

Total Sales by Product
Total Sales
1600
1400
1200
1000
800
600
400
200
0
Product A
Product B
Product C
Product


Sales Over Time
Total Sales
325
300
275
250
225
200
175
150
2023-01-01
2023-01-03
2023-01-05
2023-01-07
2023-01-09
2023-01-11
2023-01-13
2023-01-15
Date

```
Product  Product A  Product B  Product C
Region
East             0          0       1600
North         1350          0          0
South            0        480          0
West             0        370          0
             Sales  Quantity
Sales     1.000000  0.944922
Quantity  0.944922  1.000000

C:\Users\praka_32k187u\AppData\Local\Temp\
ipykernel_14268\406383238.py:29: FutureWarning: The provided callable
<function sum at 0x000002257A133B00> is currently using
DataFrameGroupBy.sum. In a future version of pandas, the provided
callable will be used directly. To keep current behavior pass the
string "sum" instead.
  pivot_table = df.pivot_table(values='Sales', index='Region',
columns='Product', aggfunc=np.sum, fill_value=0)
```

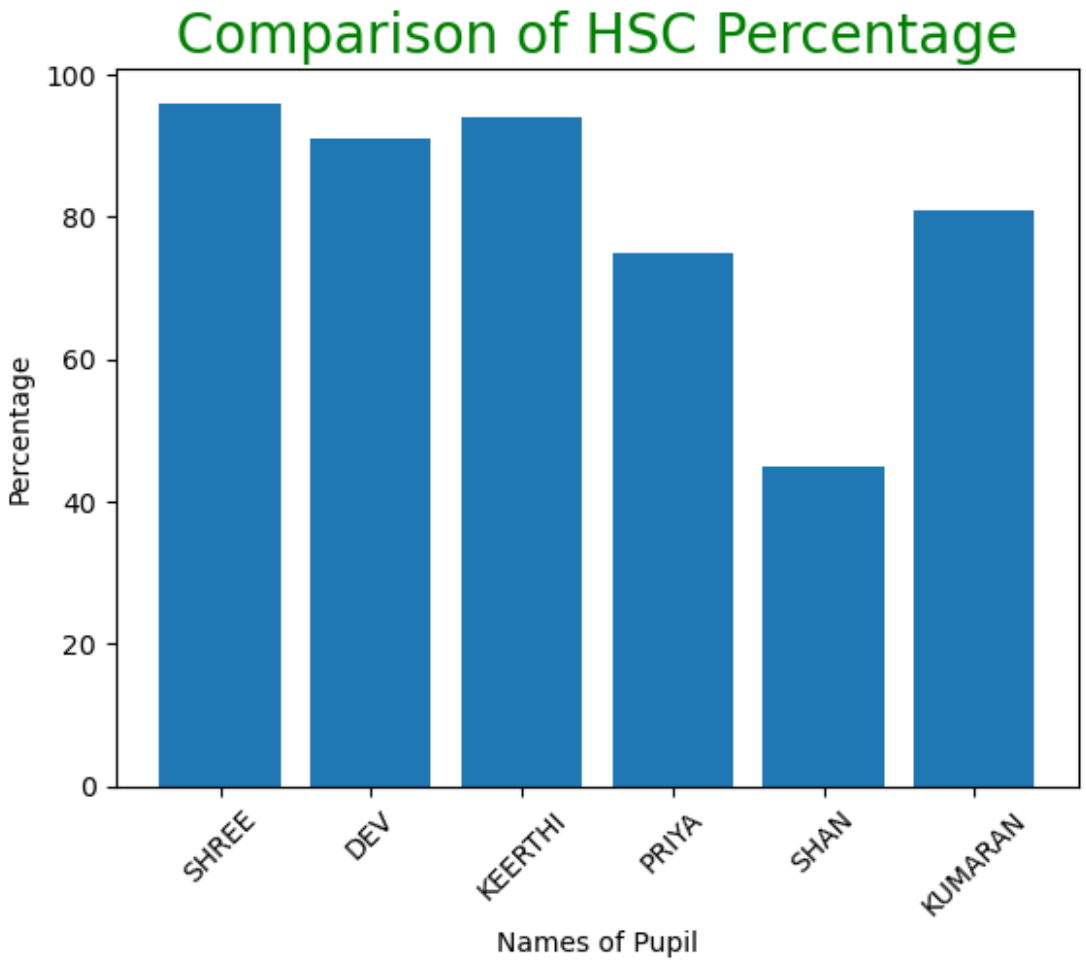


```
import matplotlib.pyplot as cricket

Overs = list(range(5, 51, 5))
Indian_Score = [30, 55, 90, 129, 165, 200, 239, 270, 310, 350]
Srilankan_Score = [25, 70, 90, 120, 140, 170, 195, 220, 255, 279]
cricket.plot(Overs, Indian_Score, color="green", label="INDIA")
cricket.plot(Overs, Srilankan_Score, color="red", label="SRILANKA")
cricket.title("INDIA Vs SRILANKA")
cricket.xlabel("Overs")
cricket.ylabel("Score")
cricket.legend(loc="center right")
cricket.show()
```

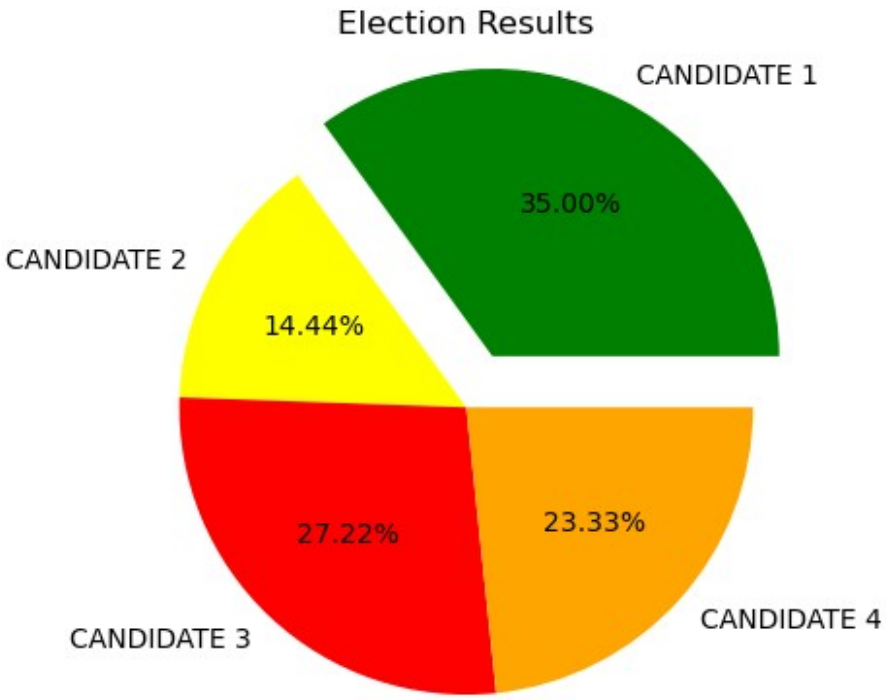



```
import matplotlib.pyplot as hscmark
import numpy as np
Names = ['SHREE', 'DEV', 'KEERTHI', 'PRIYA', 'SHAN', 'KUMARAN']
xaxis = np.arange(len(Names))
Percentage_hsc = [96, 91, 94, 75, 45, 81]
hscmark.bar(Names, Percentage_hsc)
hscmark.xticks(xaxis, Names, rotation=45)
hscmark.xlabel("Names of Pupil")
```

```
hscmark.ylabel("Percentage")
hscmark.title("Comparison of HSC Percentage", fontsize=20,
color="green")
hscmark.show()
```




```
import matplotlib.pyplot as election
labels = ['CANDIDATE 1', 'CANDIDATE 2', 'CANDIDATE 3', 'CANDIDATE 4']
Votes = [315, 130, 245, 210]
colors = ['green', 'yellow', 'red', 'orange']
explode = (0.2, 0, 0, 0)
election.pie(Votes, labels=labels, colors=colors, explode=explode,
autopct='%0.2f%%')
election.title('Election Results')
election.show()
```


Election Results
CANDIDATE 1
35.00%
CANDIDATE 2
14.44%
27.22%
23.33%
CANDIDATE 3
CANDIDATE 4

```
import nltk
from nltk.tokenize import word_tokenize
from nltk.corpus import gutenberg

nltk.download('gutenberg')
nltk.download('punkt')

sample = gutenberg.raw("austen-emma.txt")
token = word_tokenize(sample)

wlist = []
for i in range(50):
    wlist.append(token[i])

wordfreq = [wlist.count(w) for w in wlist]
print("Pairs\n" + str(list(zip(wlist, wordfreq))))
```

```
[nltk_data] Downloading package gutenberg to
[nltk_data]     C:\Users\REC\AppData\Roaming\nltk_data...
[nltk_data]   Package gutenberg is already up-to-date!
[nltk_data] Downloading package punkt to
[nltk_data]     C:\Users\REC\AppData\Roaming\nltk_data...
[nltk_data]   Package punkt is already up-to-date!

Pairs
[('[', 1), ('Emma', 2), ('by', 1), ('Jane', 1), ('Austen', 1),
('1816', 1), (']', 1), ('VOLUME', 1), ('I', 2), ('CHAPTER', 1), ('I',
2), ('Emma', 2), ('Woodhouse', 1), (',', 5), ('handsome', 1), (',',
5), ('clever', 1), (',', 5), ('and', 3), ('rich', 1), (',', 5),
('with', 2), ('a', 1), ('comfortable', 1), ('home', 1), ('and', 3),
('happy', 1), ('disposition', 1), (',', 5), ('seemed', 1), ('to', 1),
('unite', 1), ('some', 1), ('of', 2), ('the', 2), ('best', 1),
('blessings', 1), ('of', 2), ('existence', 1), (';', 1), ('and', 3),
('had', 1), ('lived', 1), ('nearly', 1), ('twenty-one', 1), ('years',
1), ('in', 1), ('the', 2), ('world', 1), ('with', 2)]
```

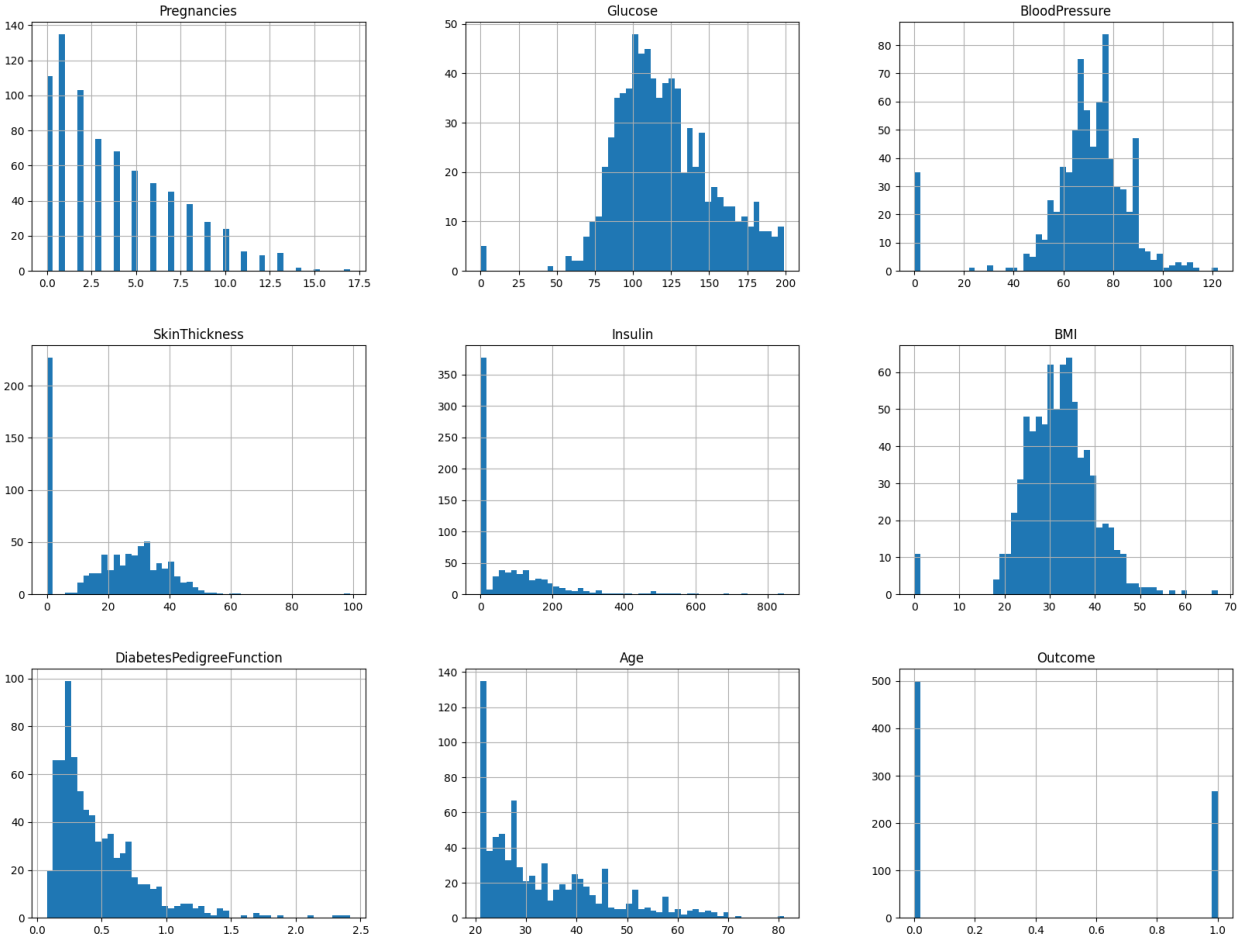
```
import pandas as pd
diabetes_df = pd.read_csv(r"C:\Users\praka_32k187u\Downloads\diabetes
- diabetes (1).csv")

print(diabetes_df.head())
```

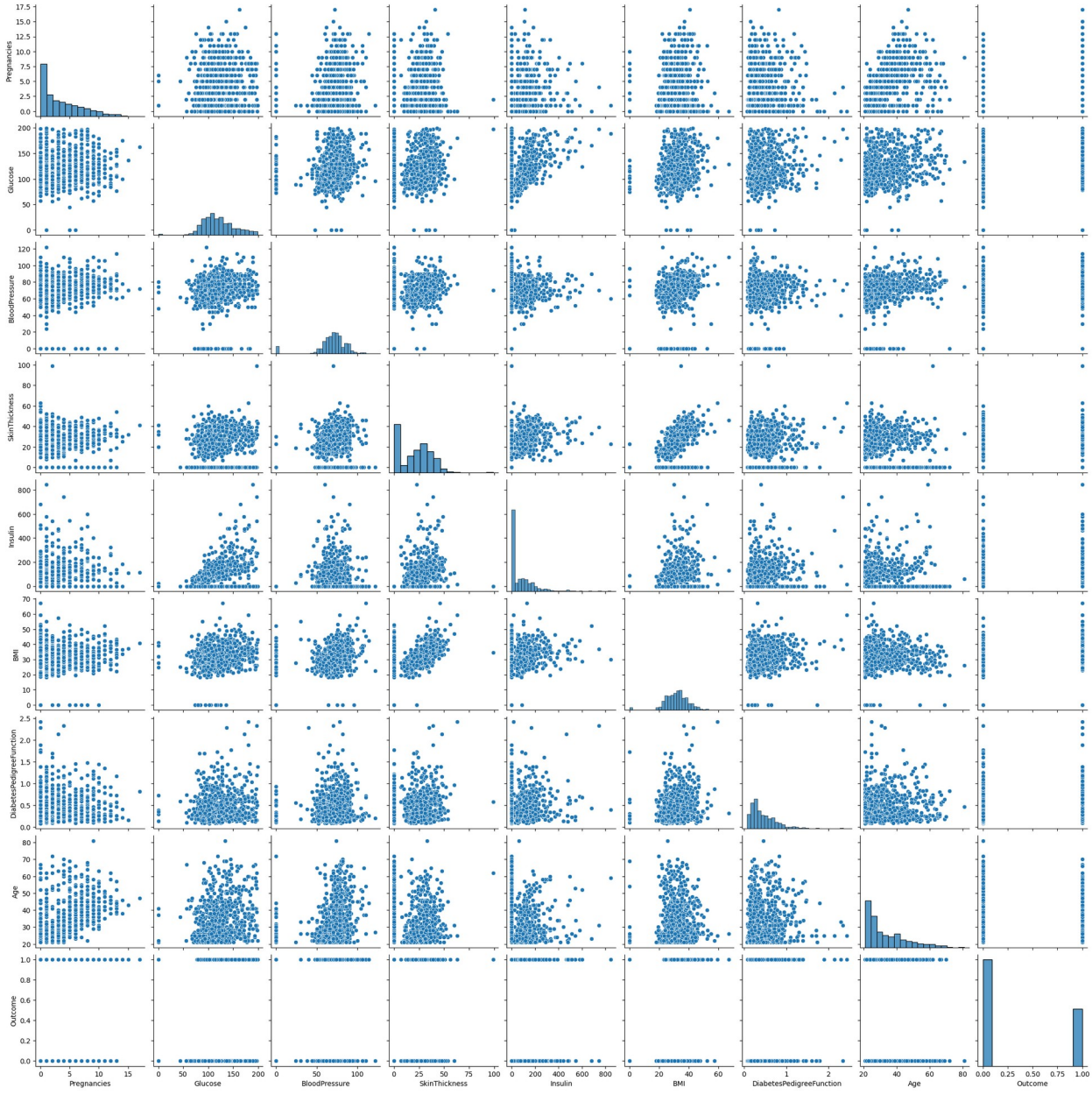
```
   Pregnancies  Glucose  BloodPressure  SkinThickness  Insulin
BMI  \
0            6      148             72             35        0  33.6

1            1       85             66             29        0  26.6

2            8      183             64              0        0  23.3

3            1       89             66             23       94  28.1

4            0      137             40             35      168  43.1


   DiabetesPedigreeFunction  Age  Outcome
0                     0.627   50        1
1                     0.351   31        0
2                     0.672   32        1
3                     0.167   21        0
4                     2.288   33        1
```

```
print(diabetes_df.info())
print(diabetes_df.describe())
import matplotlib.pyplot as plt
import seaborn as sns
diabetes_df.hist(bins=50,figsize=(20,15))
plt.show()
sns.pairplot(diabetes_df)
plt.show()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 768 entries, 0 to 767
Data columns (total 9 columns):
 #   Column                    Non-Null Count  Dtype
---  ------                    --------------  -----
 0   Pregnancies               768 non-null    int64
 1   Glucose                   768 non-null    int64
 2   BloodPressure             768 non-null    int64
 3   SkinThickness             768 non-null    int64
 4   Insulin                   768 non-null    int64
 5   BMI                       768 non-null    float64
 6   DiabetesPedigreeFunction  768 non-null    float64
 7   Age                       768 non-null    int64
 8   Outcome                   768 non-null    int64
dtypes: float64(2), int64(7)
memory usage: 54.1 KB
```

```
None
       Pregnancies     Glucose  BloodPressure  SkinThickness
Insulin  \
count   768.000000  768.000000     768.000000     768.000000
768.000000
mean      3.845052  120.894531      69.105469      20.536458
79.799479
std       3.369578   31.972618      19.355807      15.952218
115.244002
min       0.000000    0.000000       0.000000       0.000000
0.000000
25%       1.000000   99.000000      62.000000       0.000000
0.000000
50%       3.000000  117.000000      72.000000      23.000000
30.500000
75%       6.000000  140.250000      80.000000      32.000000
127.250000
max      17.000000  199.000000     122.000000      99.000000
846.000000

              BMI  DiabetesPedigreeFunction          Age     Outcome
count  768.000000                768.000000  768.000000  768.000000
mean    31.992578                  0.471876   33.240885    0.348958
std      7.884160                  0.331329   11.760232    0.476951
min      0.000000                  0.078000   21.000000    0.000000
25%     27.300000                  0.243750   24.000000    0.000000
50%     32.000000                  0.372500   29.000000    0.000000
75%     36.600000                  0.626250   41.000000    1.000000
max     67.100000                  2.420000   81.000000    1.000000
```


Pregnancies
Glucose
BloodPressure
SkinThickness
Insulin
BMI
DiabetesPedigreeFunction
Age
Outcome


Pregnancies
Glucose
BloodPressure
SkinThickness
Insulin
BMI
DiabetesPedigreeFunction
Age
Outcome

```
import numpy as np
import pandas as pd
df = pd.read_csv(r"C:\Users\praka_32k187u\Downloads\Hotel_Dataset - Hotel_Dataset.csv")
print("Original DataFrame:")
print(df)
print(df.duplicated())
print(df.info())
df.drop_duplicates(inplace=True)
print(df)
print(len(df))
index=np.array(list(range(0,len(df))))
df.set_index(index,inplace=True)
print(index)
print(df)
df.drop(['Age_Group.1'],axis=1,inplace=True)
print(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
print(df)
df['NoOfPax'].loc[(df['NoOfPax']<1) | (df['NoOfPax']>20)]=np.nan
print(df)
print(df.Age_Group.unique())
print(df.Hotel.unique())
df.Hotel.replace(['Ibys'],'Ibis',inplace=True)
print(df.FoodPreference.unique)
df.FoodPreference.replace(['Vegetarian','veg'],'Veg',inplace=True)
df.FoodPreference.replace(['non-Veg'],'Non-Veg',inplace=True)
df.EstimatedSalary.fillna(round(df.EstimatedSalary.mean()),inplace=True)
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)
print(df)
```

```
Original DataFrame:
    CustomerID Age_Group  Rating(1-5)      Hotel FoodPreference  Bill
\
0            1     20-25            4       Ibis            veg  1300

1            2     30-35            5  LemonTree        Non-Veg  2000

2            3     25-30            6     RedFox            Veg  1322

3            4     20-25           -1  LemonTree            Veg  1234

4            5       35+            3       Ibis     Vegetarian   989
```

```
5            6       35+             3       Ibys        Non-Veg  1909

6            7       35+             4     RedFox     Vegetarian  1000

7            8     20-25             7  LemonTree            Veg  2999

8            9     25-30             2       Ibis        Non-Veg  3456

9            9     25-30             2       Ibis        Non-Veg  3456

10          10     30-35             5     RedFox        non-Veg -6755


    NoOfPax  EstimatedSalary Age_Group.1
0         2             40000       20-25
1         3             59000       30-35
2         2             30000       25-30
3         2            120000       20-25
4         2             45000         35+
5         2            122220         35+
6        -1             21122         35+
7       -10            345673       20-25
8         3            -99999       25-30
9         3            -99999       25-30
10        4             87777       30-35
0     False
1     False
2     False
3     False
4     False
5     False
6     False
7     False
8     False
9      True
10    False
dtype: bool
<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
None
    CustomerID Age_Group  Rating(1-5)      Hotel FoodPreference  Bill
\
0            1     20-25            4       Ibis            veg  1300

1            2     30-35            5  LemonTree        Non-Veg  2000

2            3     25-30            6     RedFox            Veg  1322

3            4     20-25           -1  LemonTree            Veg  1234

4            5       35+            3       Ibis     Vegetarian   989

5            6       35+            3       Ibys        Non-Veg  1909

6            7       35+            4     RedFox     Vegetarian  1000

7            8     20-25            7  LemonTree            Veg  2999

8            9     25-30            2       Ibis        Non-Veg  3456

10          10     30-35            5     RedFox        non-Veg -6755


    NoOfPax  EstimatedSalary Age_Group.1
0         2            40000       20-25
1         3            59000       30-35
2         2            30000       25-30
3         2           120000       20-25
4         2            45000         35+
5         2           122220         35+
6        -1            21122         35+
7       -10           345673       20-25
8         3           -99999       25-30
10        4            87777       30-35
10
[0 1 2 3 4 5 6 7 8 9]
   CustomerID Age_Group  Rating(1-5)      Hotel FoodPreference  Bill
NoOfPax  \
0           1     20-25            4       Ibis            veg  1300
2
1           2     30-35            5  LemonTree        Non-Veg  2000
3
2           3     25-30            6     RedFox            Veg  1322
2
3           4     20-25           -1  LemonTree            Veg  1234
2
```

```
4            5       35+             3       Ibis     Vegetarian   989
2
5            6       35+             3       Ibys        Non-Veg  1909
2
6            7       35+             4     RedFox     Vegetarian  1000
-1
7            8     20-25             7  LemonTree            Veg  2999
-10
8            9     25-30             2       Ibis        Non-Veg  3456
3
9           10     30-35             5     RedFox        non-Veg -6755
4

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

   EstimatedSalary
0            40000
```

```
1            59000
2            30000
3           120000
4            45000
5           122220
6            21122
7           345673
8           -99999
9            87777
   CustomerID Age_Group  Rating(1-5)      Hotel FoodPreference    Bill
\
0         1.0     20-25            4       Ibis            veg  1300.0

1         2.0     30-35            5  LemonTree       Non-Veg  2000.0

2         3.0     25-30            6     RedFox            Veg  1322.0

3         4.0     20-25           -1  LemonTree            Veg  1234.0

4         5.0       35+            3       Ibis     Vegetarian   989.0

5         6.0       35+            3       Ibys        Non-Veg  1909.0

6         7.0       35+            4     RedFox     Vegetarian  1000.0

7         8.0     20-25            7  LemonTree            Veg  2999.0

8         9.0     25-30            2       Ibis        Non-Veg  3456.0

9        10.0     30-35            5     RedFox        non-Veg     NaN


   NoOfPax  EstimatedSalary
0        2          40000.0
1        3          59000.0
2        2          30000.0
3        2         120000.0
4        2          45000.0
5        2         122220.0
6       -1          21122.0
7      -10         345673.0
8        3              NaN
9        4          87777.0
   CustomerID Age_Group  Rating(1-5)      Hotel FoodPreference    Bill
\
0         1.0     20-25            4       Ibis            veg  1300.0

1         2.0     30-35            5  LemonTree       Non-Veg  2000.0

2         3.0     25-30            6     RedFox            Veg  1322.0
```

```
3         4.0     20-25           -1  LemonTree            Veg  1234.0

4         5.0       35+            3       Ibis     Vegetarian   989.0

5         6.0       35+            3       Ibys        Non-Veg  1909.0

6         7.0       35+            4     RedFox     Vegetarian  1000.0

7         8.0     20-25            7  LemonTree            Veg  2999.0

8         9.0     25-30            2       Ibis        Non-Veg  3456.0

9        10.0     30-35            5     RedFox        non-Veg     NaN


   NoOfPax  EstimatedSalary
0      2.0          40000.0
1      3.0          59000.0
2      2.0          30000.0
3      2.0         120000.0
4      2.0          45000.0
5      2.0         122220.0
6      NaN          21122.0
7      NaN         345673.0
8      3.0              NaN
9      4.0          87777.0
['20-25' '30-35' '25-30' '35+']
['Ibis' 'LemonTree' 'RedFox' 'Ibys']
<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>
   CustomerID Age_Group  Rating(1-5)      Hotel FoodPreference    Bill
\
0         1.0     20-25            4       Ibis            Veg  1300.0

1         2.0     30-35            5  LemonTree        Non-Veg  2000.0

2         3.0     25-30            6     RedFox            Veg  1322.0

3         4.0     20-25           -1  LemonTree            Veg  1234.0

4         5.0       35+            3       Ibis            Veg   989.0
```

```
5         6.0       35+             3       Ibis        Non-Veg  1909.0

6         7.0       35+             4     RedFox            Veg  1000.0

7         8.0     20-25             7  LemonTree            Veg  2999.0

8         9.0     25-30             2       Ibis        Non-Veg  3456.0

9        10.0     30-35             5     RedFox        Non-Veg  1801.0


   NoOfPax  EstimatedSalary
0      2.0          40000.0
1      3.0          59000.0
2      2.0          30000.0
3      2.0         120000.0
4      2.0          45000.0
5      2.0         122220.0
6      2.0          21122.0
7      2.0         345673.0
8      3.0          96755.0
9      4.0          87777.0

C:\Users\praka_32k187u\AppData\Local\Temp\
ipykernel_23604\2289843159.py:17: FutureWarning:
ChainedAssignmentError: behaviour will change in pandas 3.0!
You are setting values through chained assignment. Currently this
works in certain cases, but when using Copy-on-Write (which will
become the default behaviour in pandas 3.0) this will never work to
update the original DataFrame or Series, because the intermediate
object on which we are setting values will behave as a copy.
A typical example is when you are setting values in a column of a
DataFrame, like:

df["col"][row_indexer] = value

Use `df.loc[row_indexer, "col"] = values` instead, to perform the
assignment in a single step and ensure this keeps updating the
original `df`.

See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#
returning-a-view-versus-a-copy

  df.CustomerID.loc[df.CustomerID<0]=np.nan
C:\Users\praka_32k187u\AppData\Local\Temp\
ipykernel_23604\2289843159.py:17: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation:
```

```
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#
returning-a-view-versus-a-copy
  df.CustomerID.loc[df.CustomerID<0]=np.nan
C:\Users\praka_32k187u\AppData\Local\Temp\
ipykernel_23604\2289843159.py:18: FutureWarning:
ChainedAssignmentError: behaviour will change in pandas 3.0!
You are setting values through chained assignment. Currently this
works in certain cases, but when using Copy-on-Write (which will
become the default behaviour in pandas 3.0) this will never work to
update the original DataFrame or Series, because the intermediate
object on which we are setting values will behave as a copy.
A typical example is when you are setting values in a column of a
DataFrame, like:

df["col"][row_indexer] = value

Use `df.loc[row_indexer, "col"] = values` instead, to perform the
assignment in a single step and ensure this keeps updating the
original `df`.

See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#
returning-a-view-versus-a-copy

  df.Bill.loc[df.Bill<0]=np.nan
C:\Users\praka_32k187u\AppData\Local\Temp\
ipykernel_23604\2289843159.py:18: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#
returning-a-view-versus-a-copy
  df.Bill.loc[df.Bill<0]=np.nan
C:\Users\praka_32k187u\AppData\Local\Temp\
ipykernel_23604\2289843159.py:19: FutureWarning:
ChainedAssignmentError: behaviour will change in pandas 3.0!
You are setting values through chained assignment. Currently this
works in certain cases, but when using Copy-on-Write (which will
become the default behaviour in pandas 3.0) this will never work to
update the original DataFrame or Series, because the intermediate
object on which we are setting values will behave as a copy.
A typical example is when you are setting values in a column of a
DataFrame, like:

df["col"][row_indexer] = value

Use `df.loc[row_indexer, "col"] = values` instead, to perform the
assignment in a single step and ensure this keeps updating the
original `df`.
```

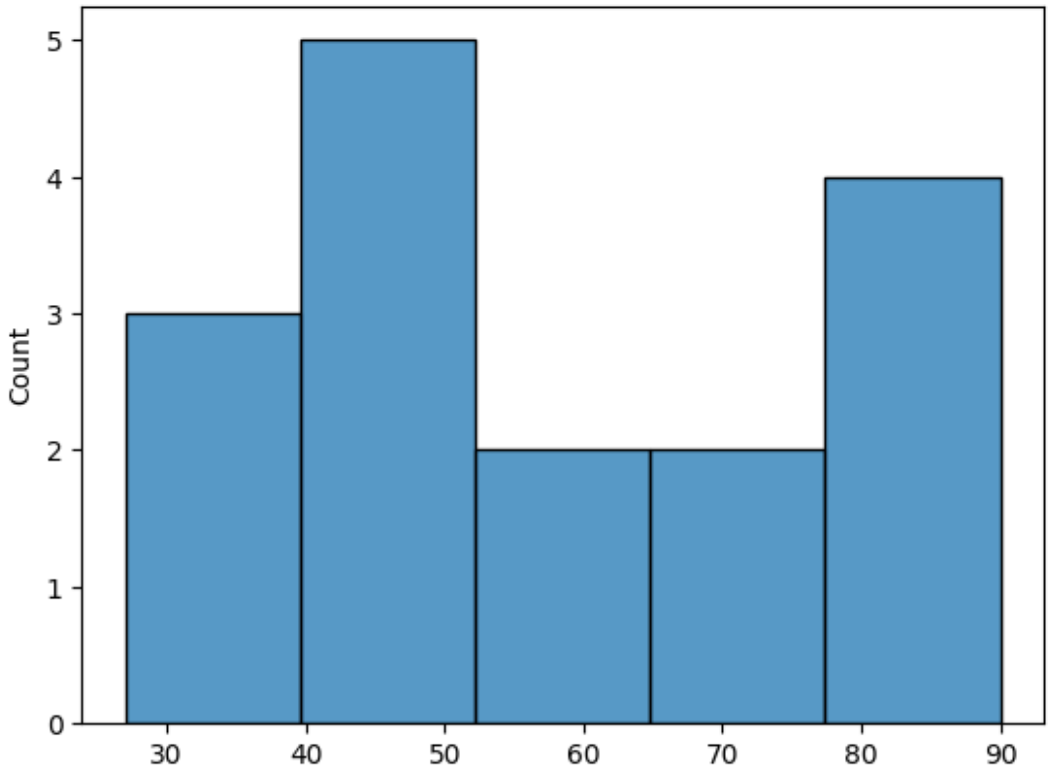
```
See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#
returning-a-view-versus-a-copy

  df.EstimatedSalary.loc[df.EstimatedSalary<0]=np.nan
C:\Users\praka_32k187u\AppData\Local\Temp\
ipykernel_23604\2289843159.py:19: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#
returning-a-view-versus-a-copy
  df.EstimatedSalary.loc[df.EstimatedSalary<0]=np.nan
C:\Users\praka_32k187u\AppData\Local\Temp\
ipykernel_23604\2289843159.py:21: FutureWarning:
ChainedAssignmentError: behaviour will change in pandas 3.0!
You are setting values through chained assignment. Currently this
works in certain cases, but when using Copy-on-Write (which will
become the default behaviour in pandas 3.0) this will never work to
update the original DataFrame or Series, because the intermediate
object on which we are setting values will behave as a copy.
A typical example is when you are setting values in a column of a
DataFrame, like:

df["col"][row_indexer] = value

Use `df.loc[row_indexer, "col"] = values` instead, to perform the
assignment in a single step and ensure this keeps updating the
original `df`.

See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#
returning-a-view-versus-a-copy

  df['NoOfPax'].loc[(df['NoOfPax']<1) | (df['NoOfPax']>20)]=np.nan
C:\Users\praka_32k187u\AppData\Local\Temp\
ipykernel_23604\2289843159.py:21: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#
returning-a-view-versus-a-copy
  df['NoOfPax'].loc[(df['NoOfPax']<1) | (df['NoOfPax']>20)]=np.nan
C:\Users\praka_32k187u\AppData\Local\Temp\
ipykernel_23604\2289843159.py:25: FutureWarning: A value is trying to
be set on a copy of a DataFrame or Series through chained assignment
using an inplace method.
The behavior will change in pandas 3.0. This inplace method will never
work because the intermediate object on which we are setting values
always behaves as a copy.
```

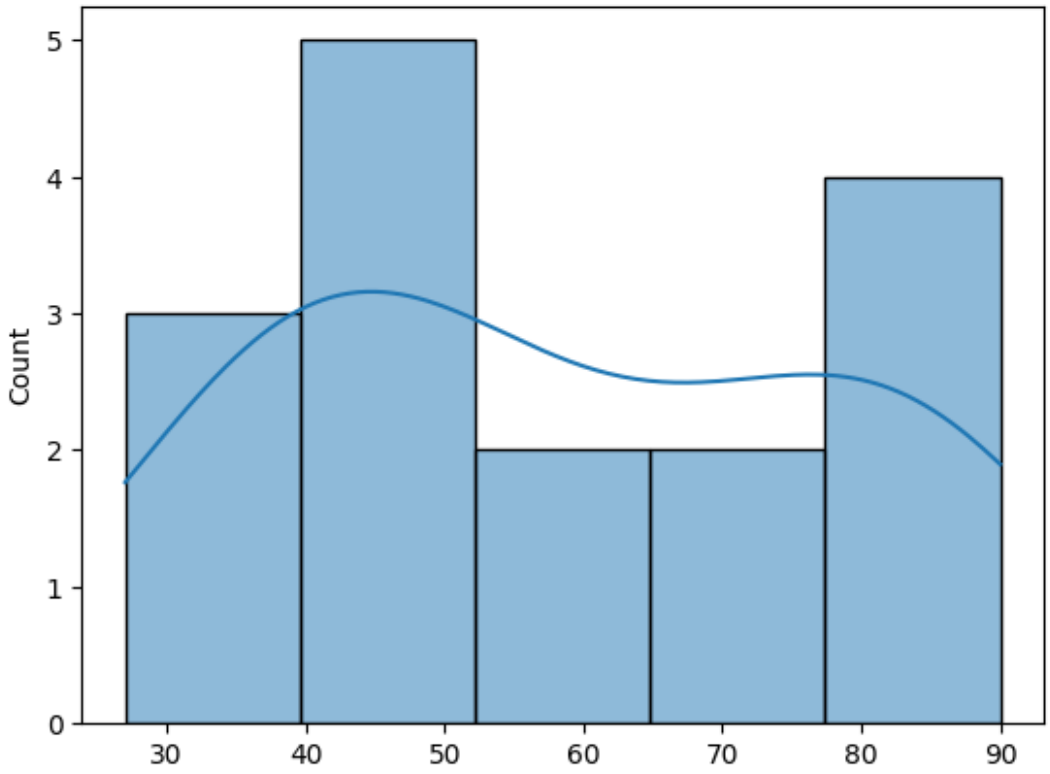
```
For example, when doing 'df[col].method(value, inplace=True)', try
using 'df.method({col: value}, inplace=True)' or df[col] =
df[col].method(value) instead, to perform the operation inplace on the
original object.


  df.Hotel.replace(['Ibys'],'Ibis',inplace=True)
C:\Users\praka_32k187u\AppData\Local\Temp\
ipykernel_23604\2289843159.py:27: FutureWarning: A value is trying to
be set on a copy of a DataFrame or Series through chained assignment
using an inplace method.
The behavior will change in pandas 3.0. This inplace method will never
work because the intermediate object on which we are setting values
always behaves as a copy.

For example, when doing 'df[col].method(value, inplace=True)', try
using 'df.method({col: value}, inplace=True)' or df[col] =
df[col].method(value) instead, to perform the operation inplace on the
original object.


  df.FoodPreference.replace(['Vegetarian','veg'],'Veg',inplace=True)
C:\Users\praka_32k187u\AppData\Local\Temp\
ipykernel_23604\2289843159.py:31: FutureWarning: A value is trying to
be set on a copy of a DataFrame or Series through chained assignment
using an inplace method.
The behavior will change in pandas 3.0. This inplace method will never
work because the intermediate object on which we are setting values
always behaves as a copy.

For example, when doing 'df[col].method(value, inplace=True)', try
using 'df.method({col: value}, inplace=True)' or df[col] =
df[col].method(value) instead, to perform the operation inplace on the
original object.


  df['Rating(1-5)'].fillna(round(df['Rating(1-5)'].median()),
inplace=True)
```

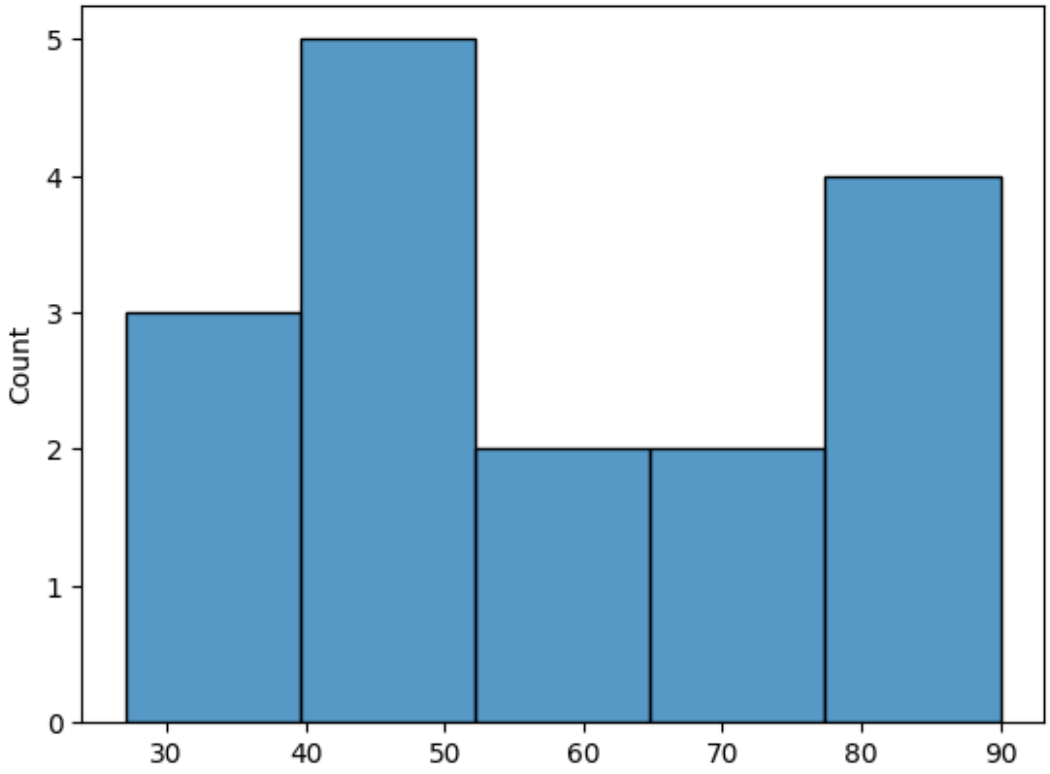
```
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt

array=np.random.randint(1,100,16)
print(array)
print(array.mean())
print(np.percentile(array,25))
print(np.percentile(array,50))
print(np.percentile(array,75))
print(np.percentile(array,100))

def outDetection(array):
    array=np.sort(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)
print(lr,ur)

# 1st graph – bar graph
sns.histplot(array, kde=False)
plt.show()

# 2nd graph – bar graph + line
sns.histplot(array, kde=True)
plt.show()

new_array=array[(array>lr) & (array<ur)]
new_array

lr1,ur1=outDetection(new_array)
lr1,ur1

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

# 3rd graph – bar graph
sns.histplot(final_array, kde=False)
plt.show()

# 4th graph – bar graph + line
sns.histplot(final_array, kde=True)
plt.show()
```

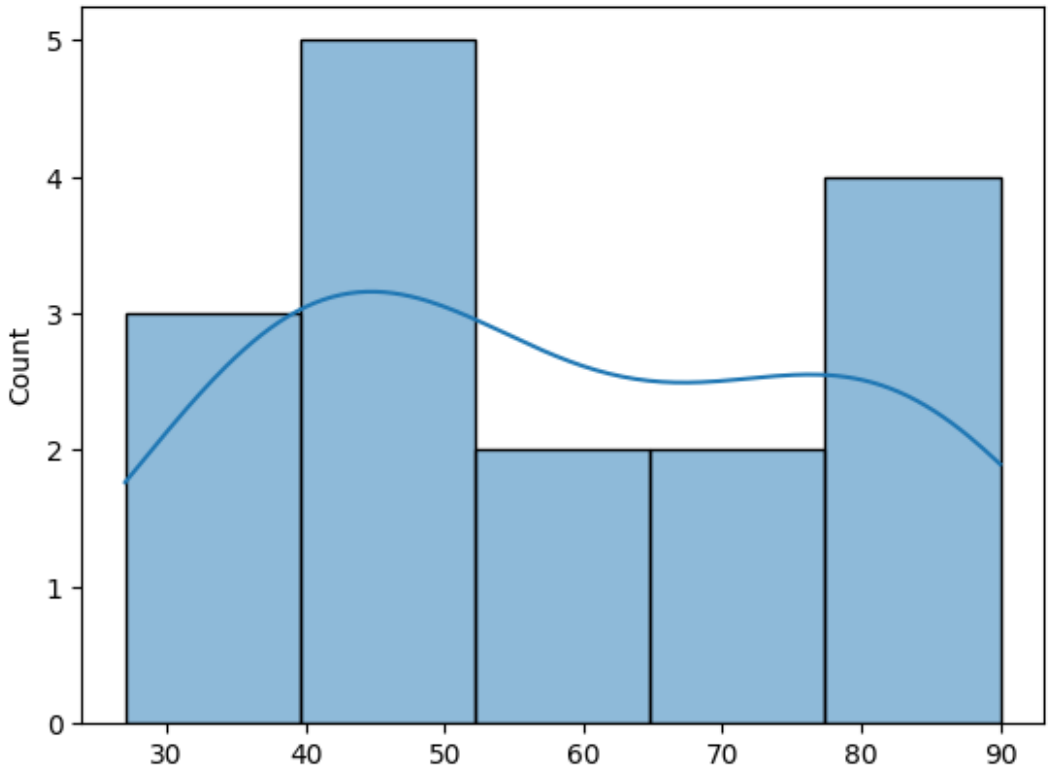
```
[80 59 71 35 45 77 63 36 48 90 86 27 84 42 52 41]
58.5
```

```
41.75
55.5
77.75
90.0
-12.25 131.75
```




Count
0
1
2
3
4
5
30
40
50
60
70
80
90


Count
0
1
2
3
4
5
30
40
50
60
70
80
90


Count
0
1
2
3
4
5
30
40
50
60
70
80
90

```
import numpy as np
import pandas as pd
from sklearn.impute import SimpleImputer
from sklearn.preprocessing import OneHotEncoder, StandardScaler,
MinMaxScaler


df = pd.read_csv(r"C:\Users\praka_32k187u\Downloads\
pre_process_datasample - pre_process_datasample.csv")
df['Country'].fillna(df['Country'].mode()[0], inplace=True)


features = df.iloc[:, :-1].values
label = df.iloc[:, -1].values


age_imputer = SimpleImputer(strategy="mean", missing_values=np.nan)
salary_imputer = SimpleImputer(strategy="mean", missing_values=np.nan)

age_imputer.fit(features[:, [1]])
salary_imputer.fit(features[:, [2]])

features[:, [1]] = age_imputer.transform(features[:, [1]])
features[:, [2]] = salary_imputer.transform(features[:, [2]])


oh = OneHotEncoder(sparse_output=False)
country_encoded = oh.fit_transform(features[:, [0]])


final_set = np.concatenate((country_encoded, features[:, [1, 2]]),
axis=1)
print(final_set)


sc = StandardScaler()
sc.fit(final_set)
feat_standard_scaler = sc.transform(final_set)
print(feat_standard_scaler)


mms = MinMaxScaler(feature_range=(0, 1))
mms.fit(final_set)
feat_minmax_scaler = mms.transform(final_set)
print(feat_minmax_scaler)


[[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]
 [0.0 1.0 0.0 50.0 83000.0]
 [1.0 0.0 0.0 37.0 67000.0]]
[[ 1.22474487e+00 -6.54653671e-01 -6.54653671e-01  7.58874362e-01
   7.49473254e-01]
 [-8.16496581e-01 -6.54653671e-01  1.52752523e+00 -1.71150388e+00
  -1.43817841e+00]
 [-8.16496581e-01  1.52752523e+00 -6.54653671e-01 -1.27555478e+00
  -8.91265492e-01]
 [-8.16496581e-01 -6.54653671e-01  1.52752523e+00 -1.13023841e-01
  -2.53200424e-01]
 [-8.16496581e-01  1.52752523e+00 -6.54653671e-01  1.77608893e-01
   6.63219199e-16]
 [ 1.22474487e+00 -6.54653671e-01 -6.54653671e-01 -5.48972942e-01
  -5.26656882e-01]
 [-8.16496581e-01 -6.54653671e-01  1.52752523e+00  0.00000000e+00
  -1.07356980e+00]
 [ 1.22474487e+00 -6.54653671e-01 -6.54653671e-01  1.34013983e+00
   1.38753832e+00]
 [-8.16496581e-01  1.52752523e+00 -6.54653671e-01  1.63077256e+00
   1.75214693e+00]
 [ 1.22474487e+00 -6.54653671e-01 -6.54653671e-01 -2.58340208e-01
   2.93712492e-01]]
[[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]
 [0.         1.         0.         1.         1.        ]
 [1.         0.         0.         0.43478261 0.54285714]]

C:\Users\praka_32k187u\AppData\Local\Temp\
ipykernel_10068\138591308.py:8: FutureWarning: A value is trying to be
set on a copy of a DataFrame or Series through chained assignment
using an inplace method.
The behavior will change in pandas 3.0. This inplace method will never
work because the intermediate object on which we are setting values
always behaves as a copy.

For example, when doing 'df[col].method(value, inplace=True)', try
using 'df.method({col: value}, inplace=True)' or df[col] =
df[col].method(value) instead, to perform the operation inplace on the
original object.
```

```
  df['Country'].fillna(df['Country'].mode()[0], inplace=True)
```

```
import numpy as np
import pandas as pd

df = pd.read_csv(r"C:\Users\praka_32k187u\Downloads\
pre_process_datasample - pre_process_datasample.csv")
print(df)

print(df.info())
print(df.Country.mode())
print(df.Country.mode()[0])
print(type(df.Country.mode()))

df['Country'].fillna(df['Country'].mode()[0], inplace=True)
df['Age'].fillna(df['Age'].median(), inplace=True)
df['Salary'].fillna(round(df['Salary'].mean()), inplace=True)

print(pd.get_dummies(df['Country']))

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

print(df.info())

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

```
   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  Germany  50.0  83000.0        No
9   France  37.0  67000.0       Yes
<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        9 non-null      float64
 2   Salary     9 non-null      float64
```

```
 3   Purchased  10 non-null     object
dtypes: float64(2), object(2)
memory usage: 452.0+ bytes
None
0    France
Name: Country, dtype: object
France
<class 'pandas.core.series.Series'>
   France  Germany  Spain
0    True    False  False
1   False    False   True
2   False     True  False
3   False    False   True
4   False     True  False
5    True    False  False
6   False    False   True
7    True    False  False
8   False     True  False
9    True    False  False
   France  Germany  Spain   Age   Salary Purchased
0    True    False  False  44.0  72000.0        No
1   False    False   True  27.0  48000.0       Yes
2   False     True  False  30.0  54000.0        No
3   False    False   True  38.0  61000.0        No
4   False     True  False  40.0  63778.0       Yes
5    True    False  False  35.0  58000.0       Yes
6   False    False   True  38.0  52000.0        No
7    True    False  False  48.0  79000.0       Yes
8   False     True  False  50.0  83000.0        No
9    True    False  False  37.0  67000.0       Yes
<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: 452.0+ bytes
None
   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   False     True  False  50.0  83000.0          0
9    True    False  False  37.0  67000.0          1
```

```
C:\Users\praka_32k187u\AppData\Local\Temp\
ipykernel_10068\1971939639.py:12: FutureWarning: A value is trying to
be set on a copy of a DataFrame or Series through chained assignment
using an inplace method.
The behavior will change in pandas 3.0. This inplace method will never
work because the intermediate object on which we are setting values
always behaves as a copy.

For example, when doing 'df[col].method(value, inplace=True)', try
using 'df.method({col: value}, inplace=True)' or df[col] =
df[col].method(value) instead, to perform the operation inplace on the
original object.
```

```
  df['Country'].fillna(df['Country'].mode()[0], inplace=True)
```

```
C:\Users\praka_32k187u\AppData\Local\Temp\
ipykernel_10068\1971939639.py:13: FutureWarning: A value is trying to
be set on a copy of a DataFrame or Series through chained assignment
using an inplace method.
The behavior will change in pandas 3.0. This inplace method will never
work because the intermediate object on which we are setting values
always behaves as a copy.

For example, when doing 'df[col].method(value, inplace=True)', try
using 'df.method({col: value}, inplace=True)' or df[col] =
df[col].method(value) instead, to perform the operation inplace on the
original object.
```

```
  df['Age'].fillna(df['Age'].median(), inplace=True)
```

```
C:\Users\praka_32k187u\AppData\Local\Temp\
ipykernel_10068\1971939639.py:14: FutureWarning: A value is trying to
be set on a copy of a DataFrame or Series through chained assignment
using an inplace method.
The behavior will change in pandas 3.0. This inplace method will never
work because the intermediate object on which we are setting values
always behaves as a copy.

For example, when doing 'df[col].method(value, inplace=True)', try
using 'df.method({col: value}, inplace=True)' or df[col] =
df[col].method(value) instead, to perform the operation inplace on the
original object.
```

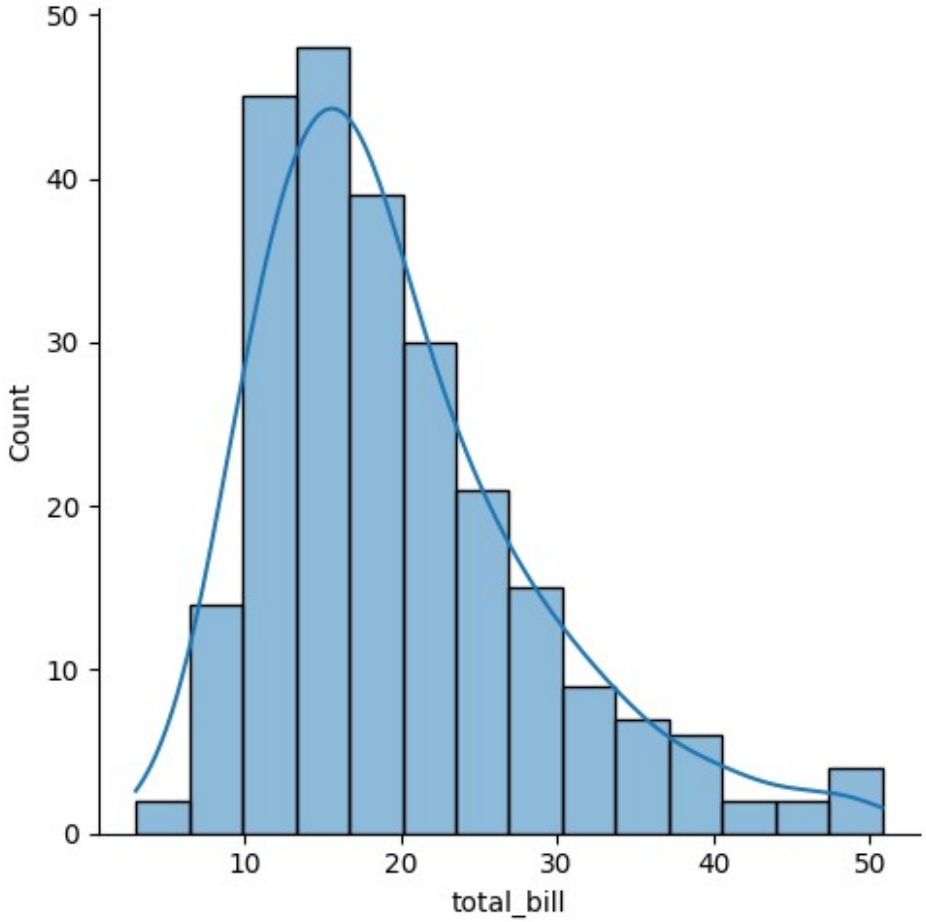
```
  df['Salary'].fillna(round(df['Salary'].mean()), inplace=True)
```

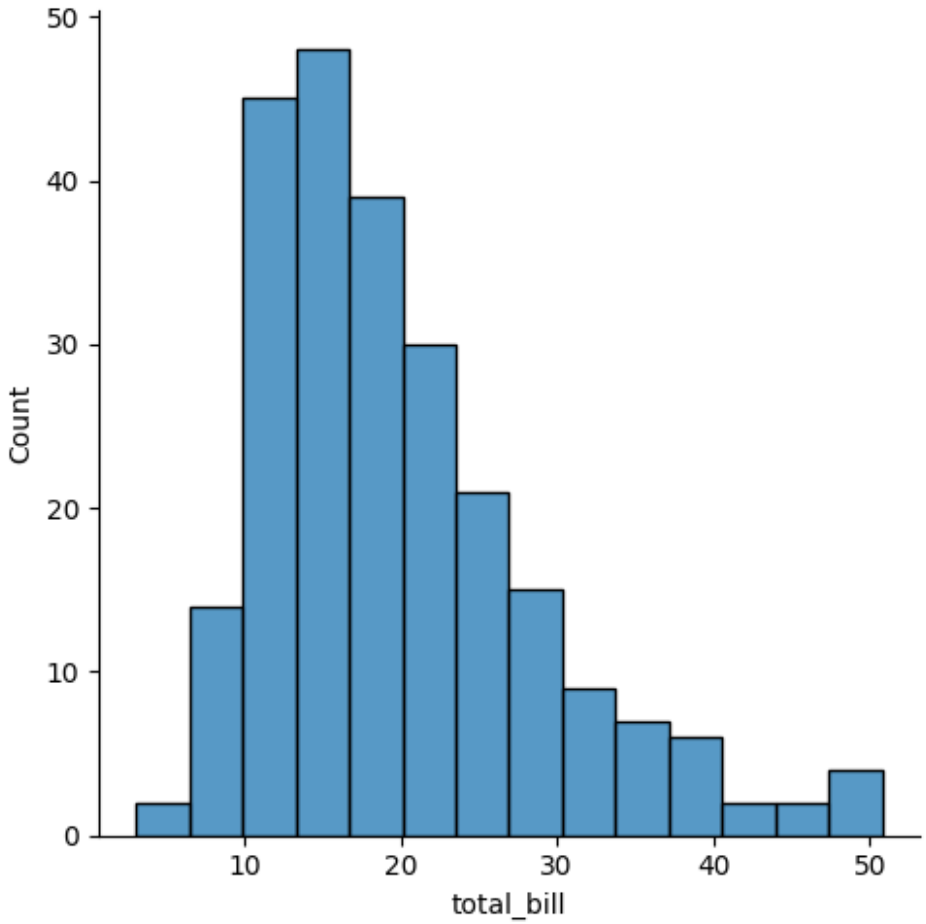
```
C:\Users\praka_32k187u\AppData\Local\Temp\
ipykernel_10068\1971939639.py:23: FutureWarning: A value is trying to
be set on a copy of a DataFrame or Series through chained assignment
using an inplace method.
The behavior will change in pandas 3.0. This inplace method will never
work because the intermediate object on which we are setting values
always behaves as a copy.

For example, when doing 'df[col].method(value, inplace=True)', try
using 'df.method({col: value}, inplace=True)' or df[col] =
df[col].method(value) instead, to perform the operation inplace on the
original object.


  updated_dataset['Purchased'].replace(['No', 'Yes'], [0, 1],
inplace=True)
C:\Users\praka_32k187u\AppData\Local\Temp\
ipykernel_10068\1971939639.py:23: FutureWarning: Downcasting behavior
in `replace` is deprecated and will be removed in a future version. To
retain the old behavior, explicitly call
`result.infer_objects(copy=False)`. To opt-in to the future behavior,
set `pd.set_option('future.no_silent_downcasting', True)`
  updated_dataset['Purchased'].replace(['No', 'Yes'], [0, 1],
inplace=True)
```

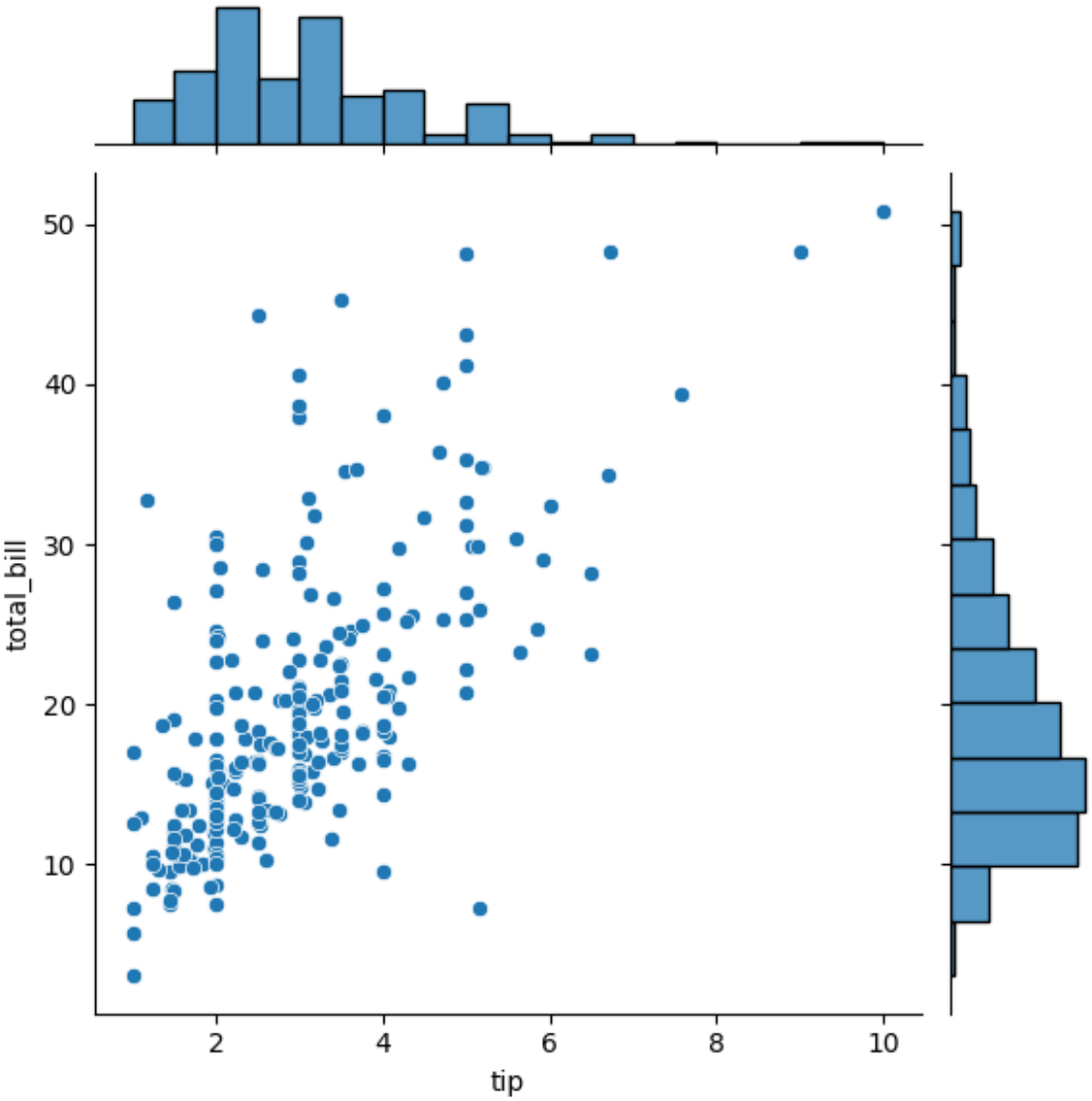
```
import seaborn as sns
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
tips=sns.load_dataset('tips')



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

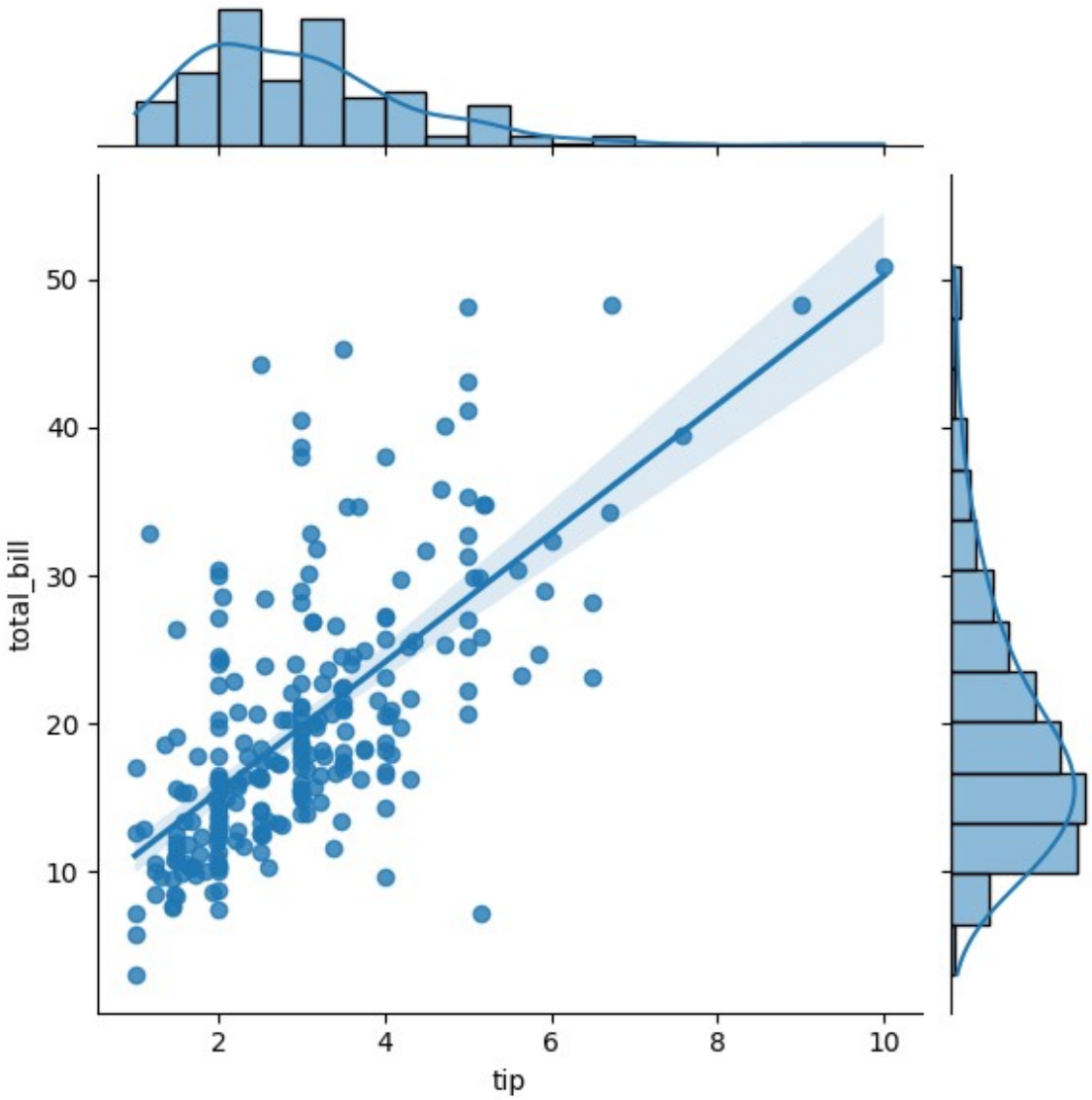
```
   total_bill   tip     sex smoker  day    time  size
0       16.99  1.01  Female     No  Sun  Dinner     2
1       10.34  1.66    Male     No  Sun  Dinner     3
2       21.01  3.50    Male     No  Sun  Dinner     3
3       23.68  3.31    Male     No  Sun  Dinner     2
4       24.59  3.61  Female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

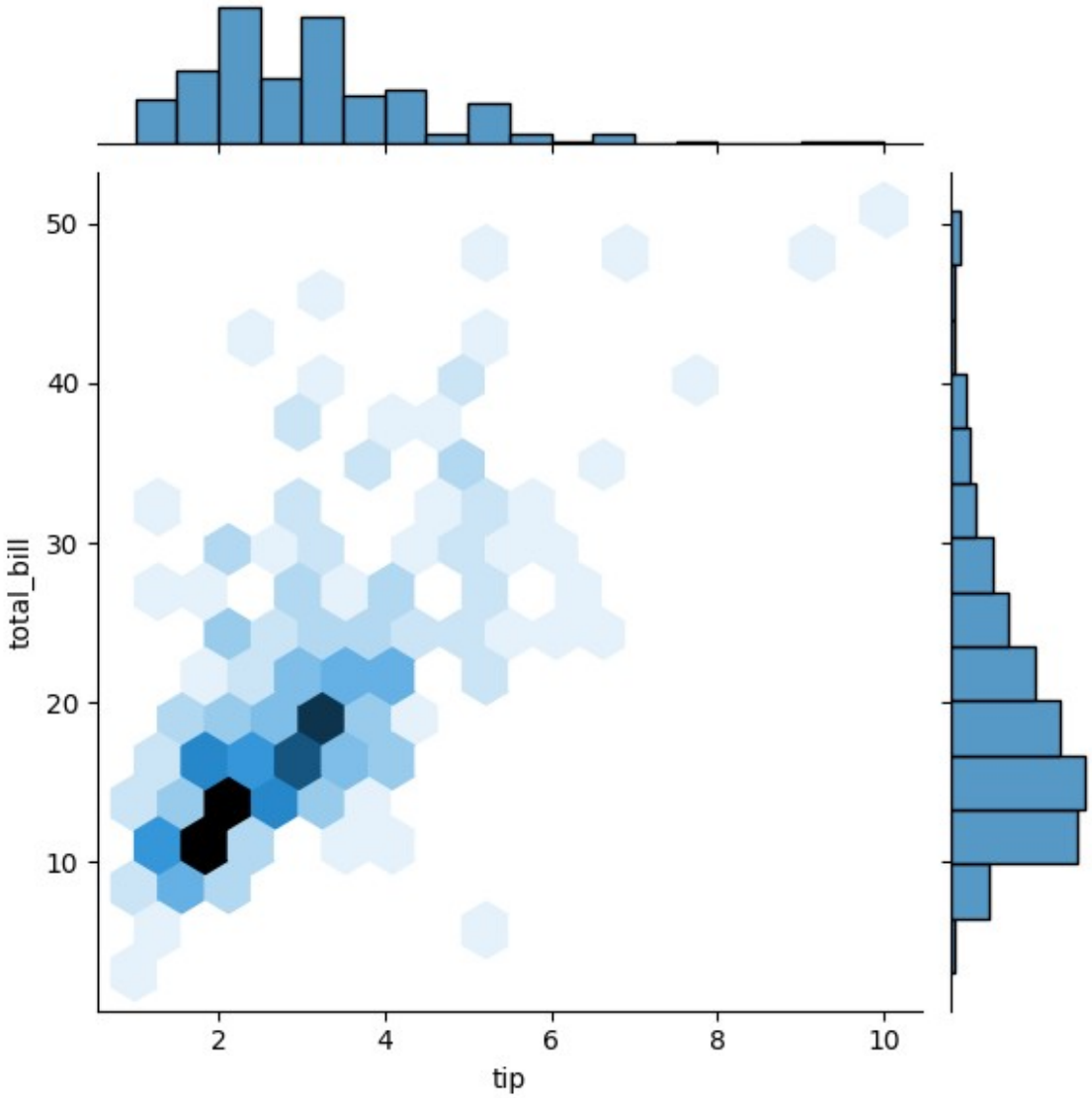
```
<seaborn.axisgrid.PairGrid at 0x2c4c6d6dba0>
```

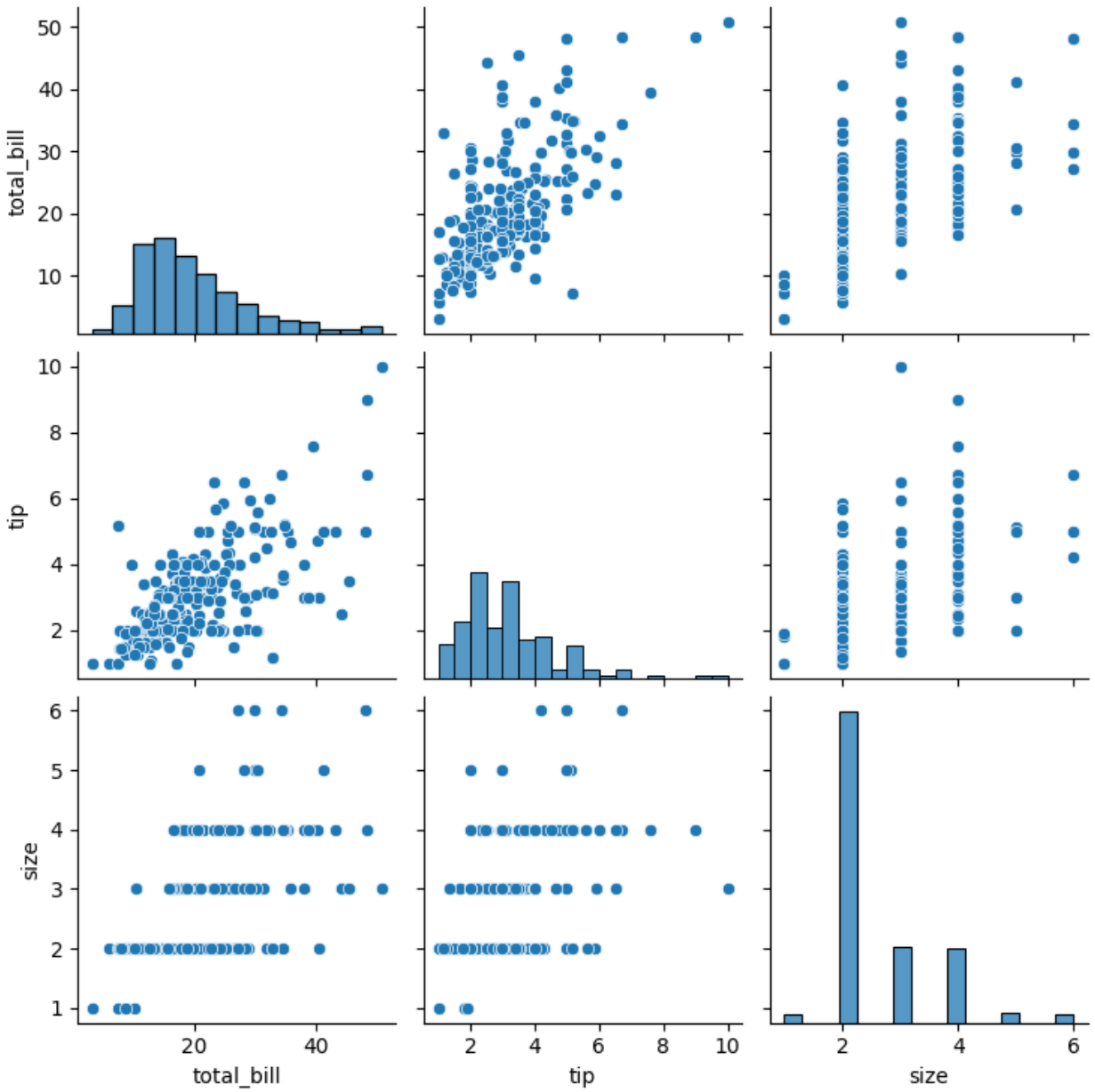

50
40
30
20
10
0
Count
10
20
30
40
50
total_bill


50
40
30
20
10
0
Count
10
20
30
40
50
total_bill


total_bill
tip
10
20
30
40
50
2
4
6
8
10


total_bill
tip
10
20
30
40
50
2
4
6
8
10

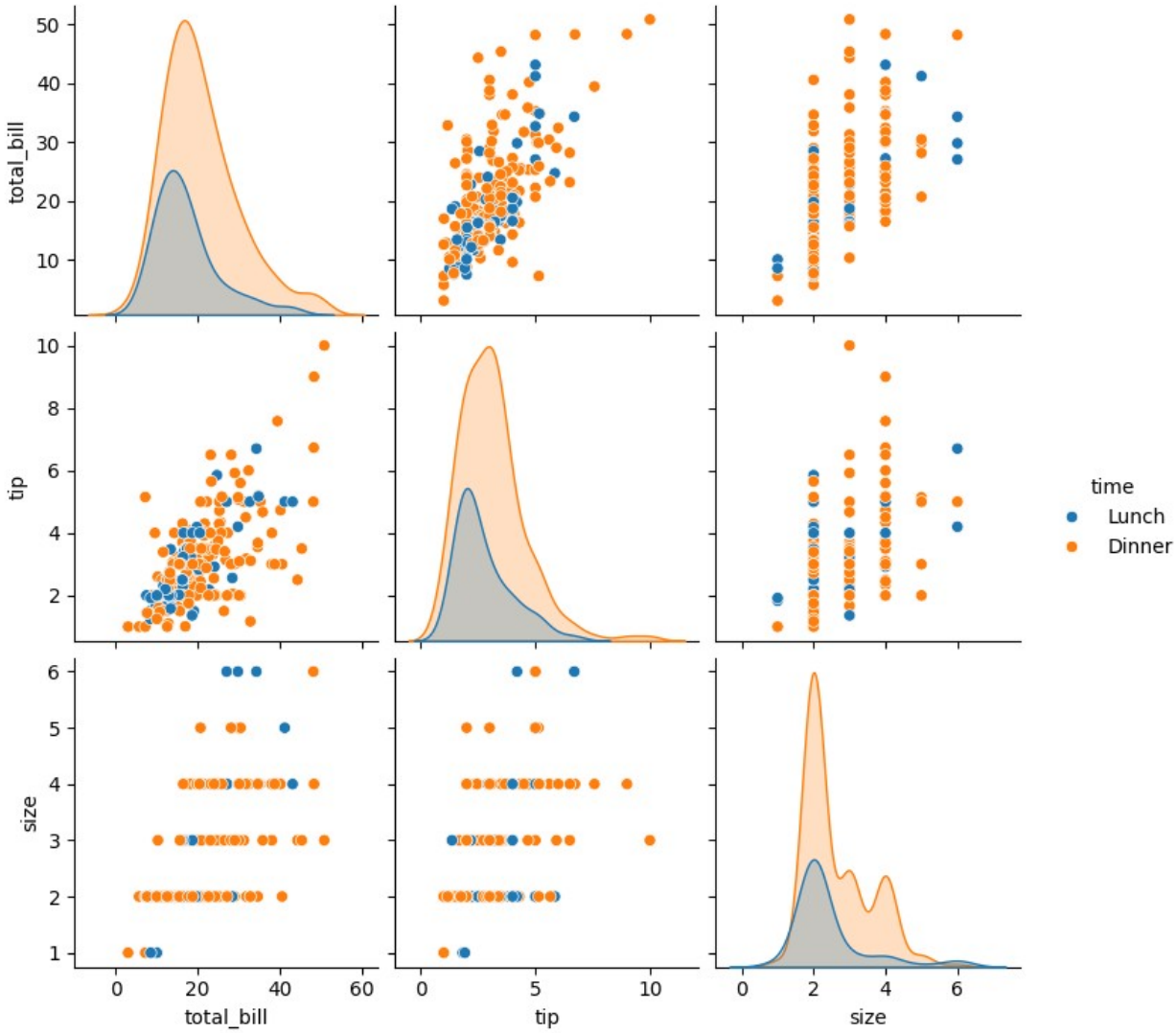

50
40
30
20
10
total_bill
2
4
6
8
10
tip

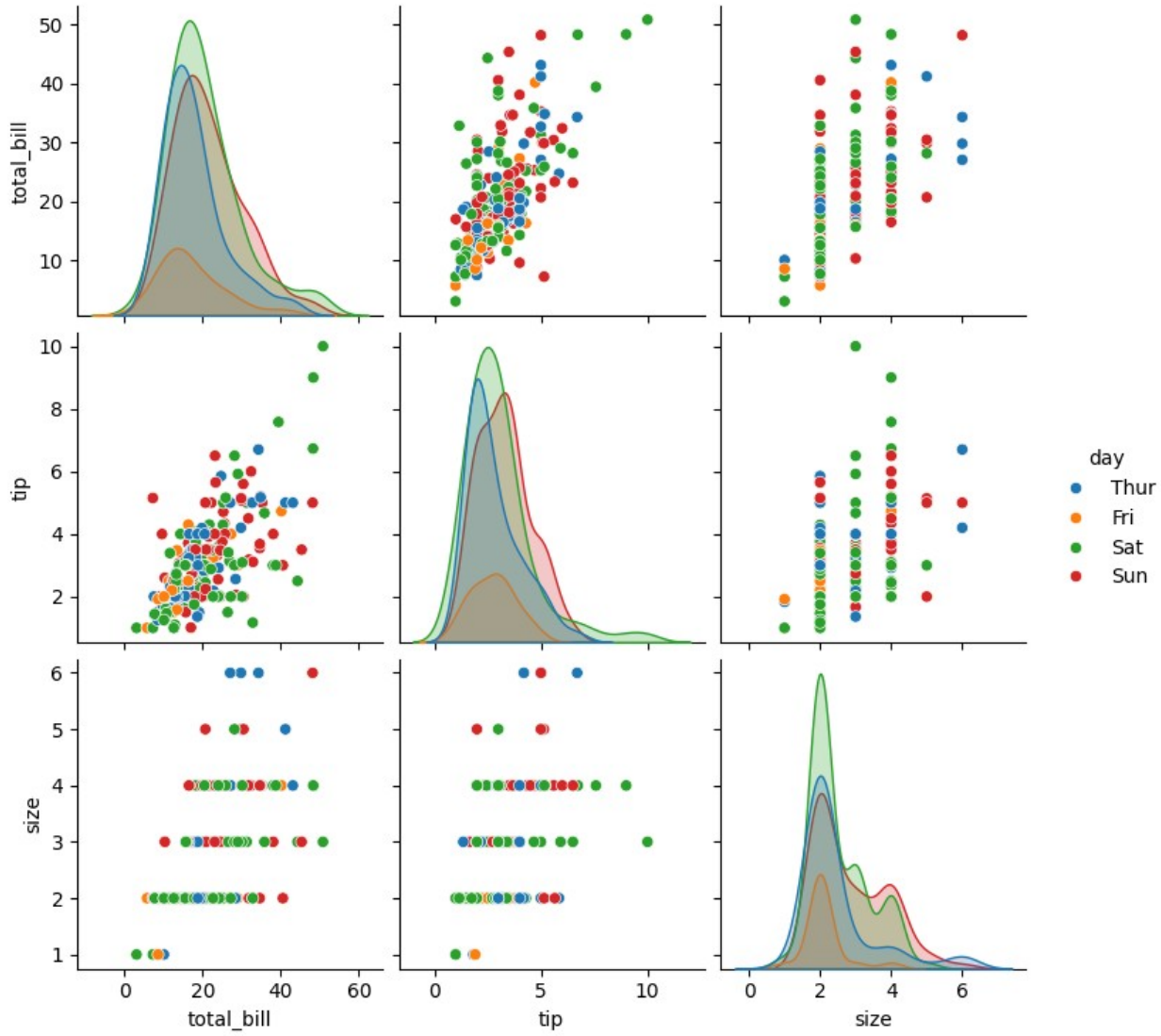



```
print(tips.time.value_counts())
sns.pairplot(tips,hue='time')
sns.pairplot(tips,hue='day')
```

```
time
Dinner    176
Lunch      68
Name: count, dtype: int64
```

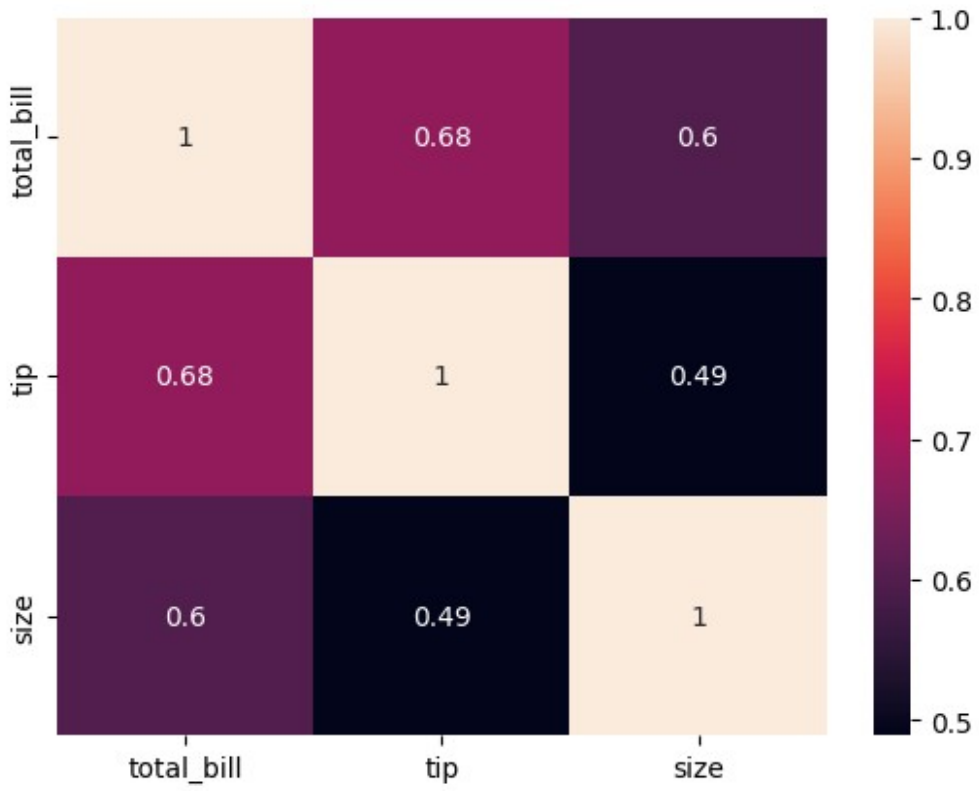
```
<seaborn.axisgrid.PairGrid at 0x2c4c6d6e9e0>
```


total_bill
tip
size
time
Lunch
Dinner



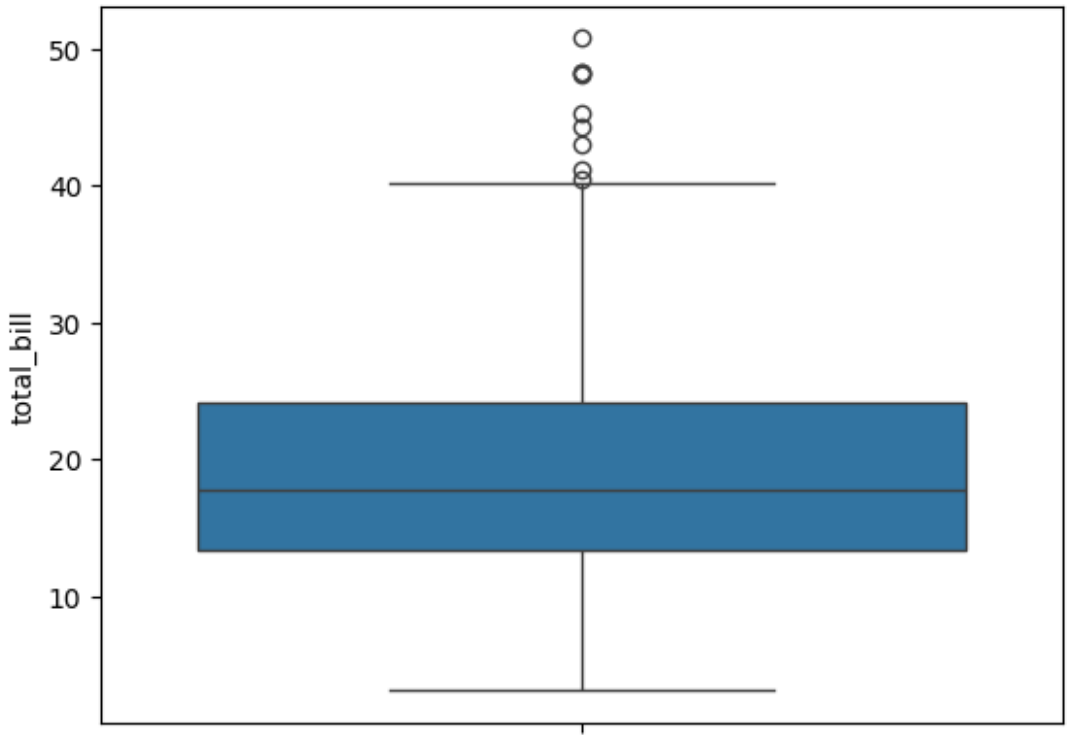

```
sns.heatmap(tips.corr(numeric_only=True),annot=True)
```

```
<Axes: >
```



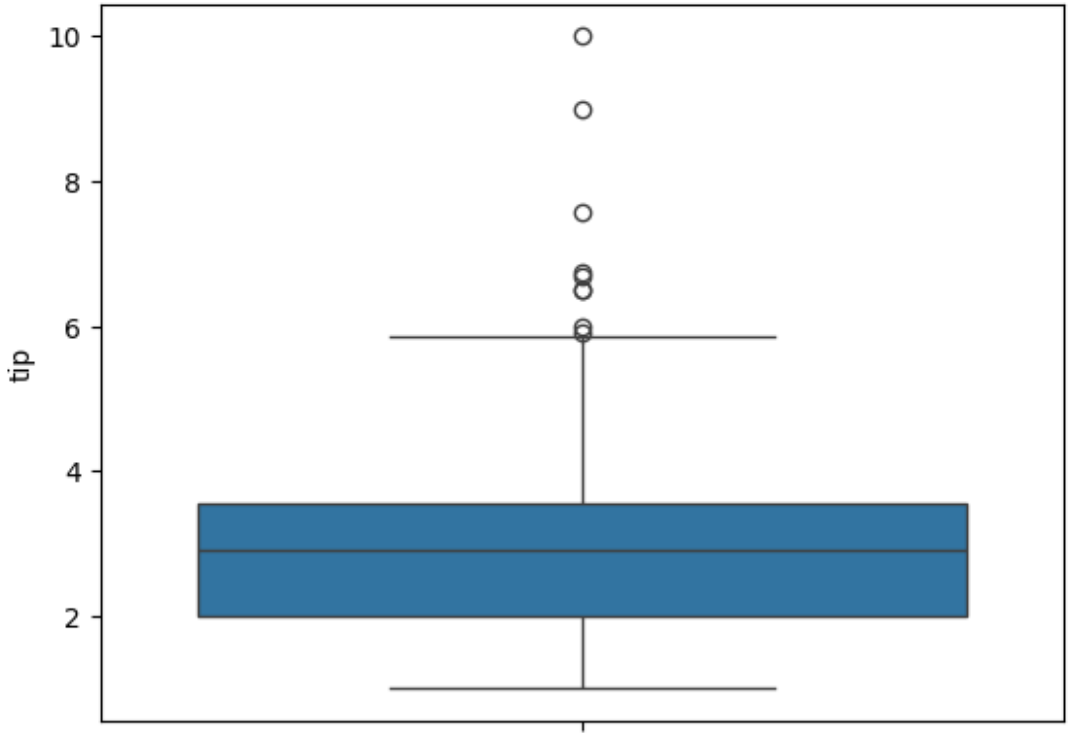

```
print(sns.boxplot(tips.total_bill))
```

```
Axes(0.125,0.11;0.775x0.77)
```



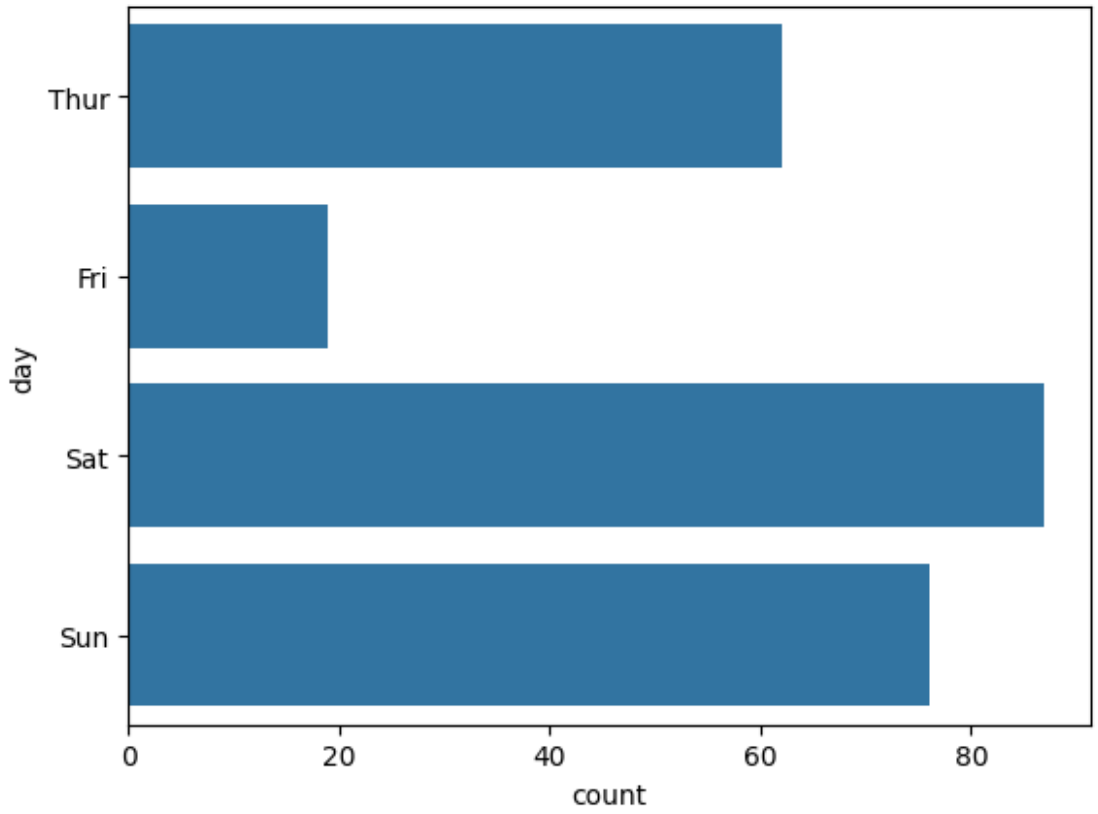

```
print(sns.boxplot(tips.tip))
```

```
Axes(0.125,0.11;0.775x0.77)
```



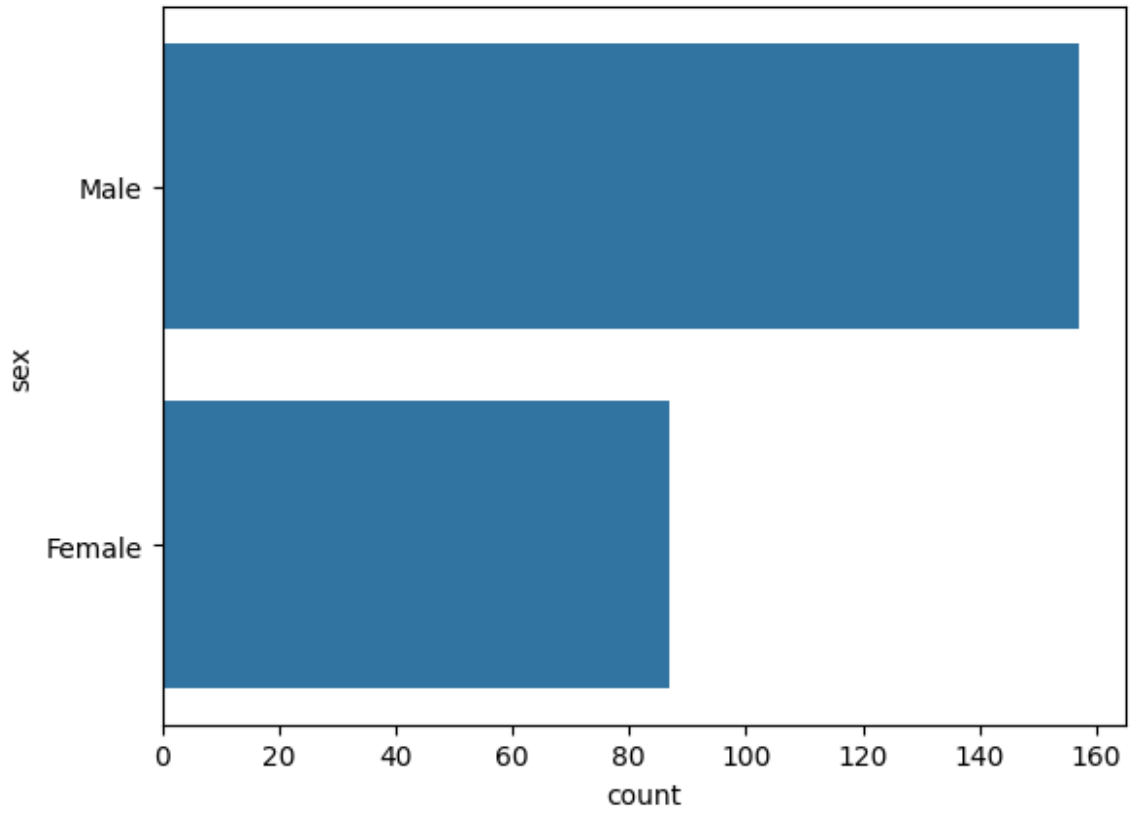
```
print(sns.countplot(tips.day))
```

```
Axes(0.125,0.11;0.775x0.77)
```



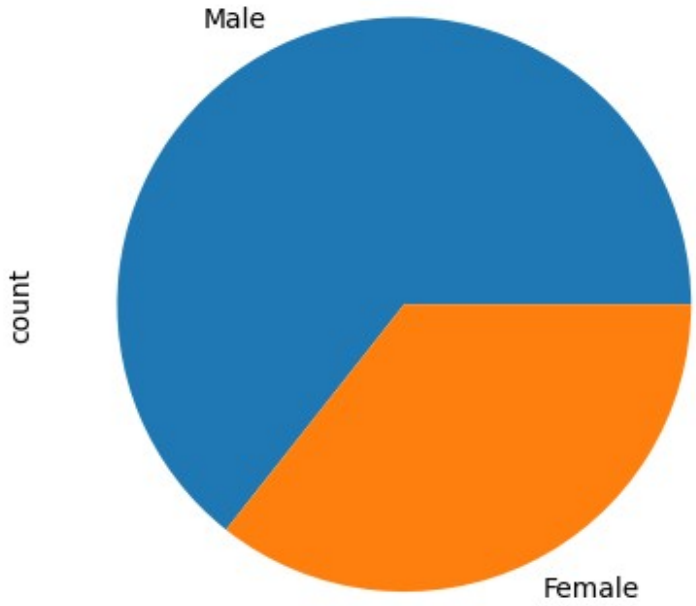

```
print(sns.countplot(tips.sex))
```

```
Axes(0.125,0.11;0.775x0.77)
```



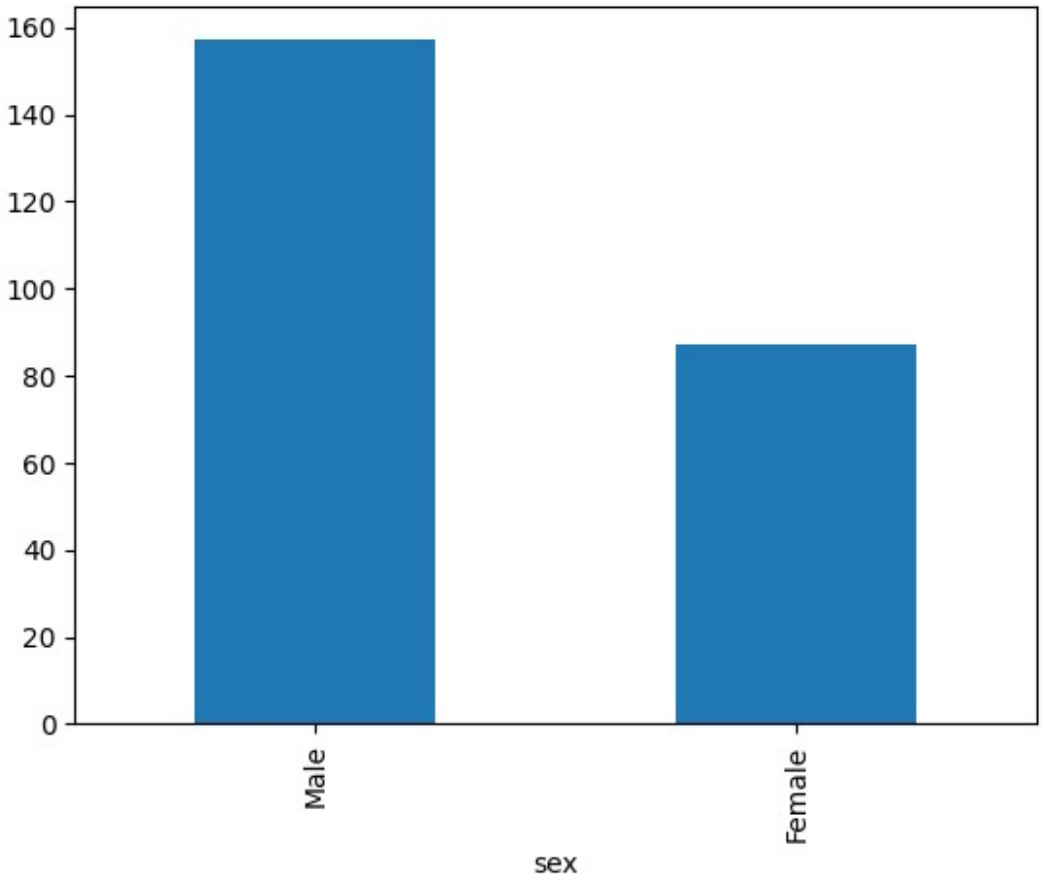

```
tips.sex.value_counts().plot(kind='pie')
```

```
<Axes: ylabel='count'>
```



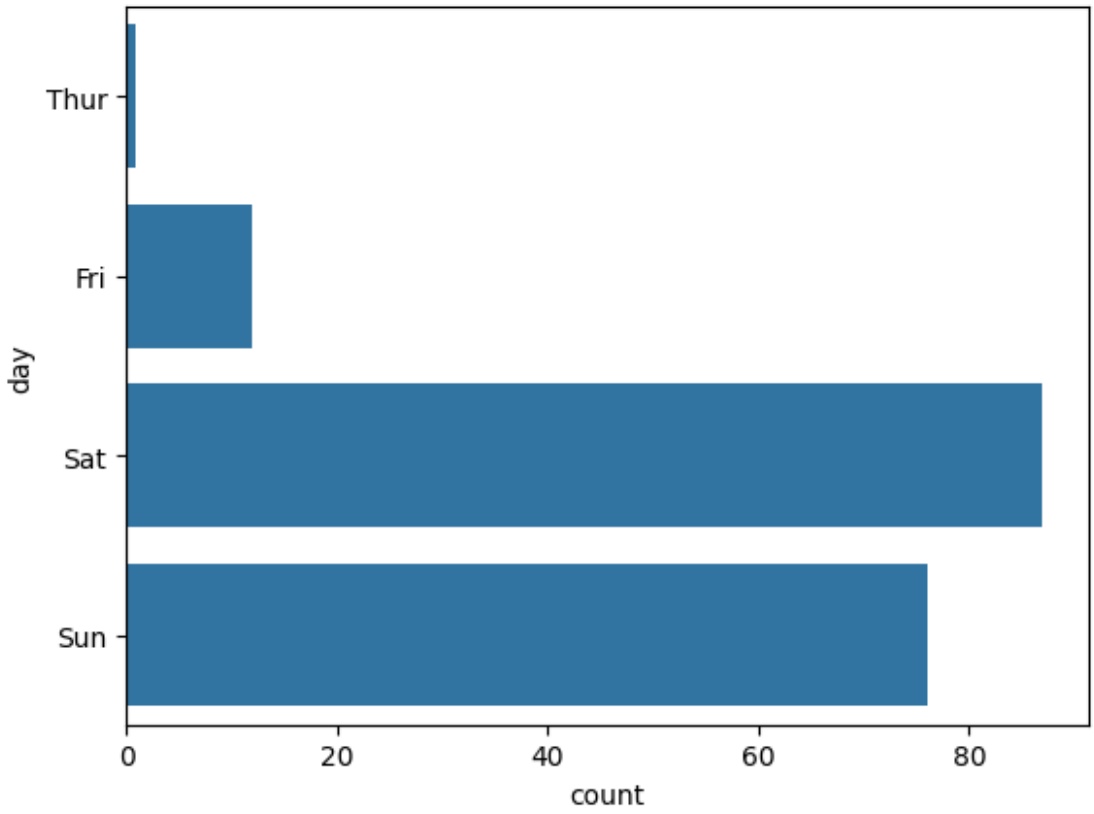

```
tips.sex.value_counts().plot(kind='bar')
```

```
<Axes: xlabel='sex'>
```




```
sns.countplot(tips[tips.time=='Dinner']['day'])
```

```
<Axes: xlabel='count', ylabel='day'>
```


Thur
Fri
Sat
Sun
day
0
20
40
60
80
count

```
import numpy as np
import pandas as pd
df=pd.read_csv(r"C:\Users\praka_32k187u\Downloads\Salary_data - Salary_data.csv")
df
df.info()
df.dropna(inplace=True)
df.info()
df.describe()
```

```
<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
<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
```

```
       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_selection import train_test_split

x_train, x_test, y_train, y_test = train_test_split(features, label, test_size=0.2, random_state=42)

from sklearn.linear_model import LinearRegression
model=LinearRegression()
model.fit(x_train,y_train)
```

```
LinearRegression()
```

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

```
0.9645401573418146
```

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

```
0.9024461774180497
```

```
model.coef_
```

```
array([[9423.81532303]])
```

```
model.intercept_
```

```
array([25321.58301178])
```

```
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)
```

```
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 [[439969.45722514]]:
```

```
import numpy as np
import pandas as pd
df=pd.read_csv(r"C:\Users\praka_32k187u\Downloads\Social_Network_Ads - 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 x 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].values
features
```

```
array([[    19,  19000],
       [    35,  20000],
       [    26,  43000],
       [    27,  57000],
       [    19,  76000],
       [    27,  58000],
       [    27,  84000],
       [    32, 150000],
       [    25,  33000],
       [    35,  65000],
       [    26,  80000],
       [    26,  52000],
       [    20,  86000],
       [    32,  18000],
       [    18,  82000],
       [    29,  80000],
```

```
       [    47,  25000],
       [    45,  26000],
       [    46,  28000],
       [    48,  29000],
       [    45,  22000],
       [    47,  49000],
       [    48,  41000],
       [    45,  22000],
       [    46,  23000],
       [    47,  20000],
       [    49,  28000],
       [    47,  30000],
       [    29,  43000],
       [    31,  18000],
       [    31,  74000],
       [    27, 137000],
       [    21,  16000],
       [    28,  44000],
       [    27,  90000],
       [    35,  27000],
       [    33,  28000],
       [    30,  49000],
       [    26,  72000],
       [    27,  31000],
       [    27,  17000],
       [    33,  51000],
       [    35, 108000],
       [    30,  15000],
       [    28,  84000],
       [    23,  20000],
       [    25,  79000],
       [    27,  54000],
       [    30, 135000],
       [    31,  89000],
       [    24,  32000],
       [    18,  44000],
       [    29,  83000],
       [    35,  23000],
       [    27,  58000],
       [    24,  55000],
       [    23,  48000],
       [    28,  79000],
       [    22,  18000],
       [    32, 117000],
       [    27,  20000],
       [    25,  87000],
       [    23,  66000],
       [    32, 120000],
       [    59,  83000],
```

```
       [    24,  58000],
       [    24,  19000],
       [    23,  82000],
       [    22,  63000],
       [    31,  68000],
       [    25,  80000],
       [    24,  27000],
       [    20,  23000],
       [    33, 113000],
       [    32,  18000],
       [    34, 112000],
       [    18,  52000],
       [    22,  27000],
       [    28,  87000],
       [    26,  17000],
       [    30,  80000],
       [    39,  42000],
       [    20,  49000],
       [    35,  88000],
       [    30,  62000],
       [    31, 118000],
       [    24,  55000],
       [    28,  85000],
       [    26,  81000],
       [    35,  50000],
       [    22,  81000],
       [    30, 116000],
       [    26,  15000],
       [    29,  28000],
       [    29,  83000],
       [    35,  44000],
       [    35,  25000],
       [    28, 123000],
       [    35,  73000],
       [    28,  37000],
       [    27,  88000],
       [    28,  59000],
       [    32,  86000],
       [    33, 149000],
       [    19,  21000],
       [    21,  72000],
       [    26,  35000],
       [    27,  89000],
       [    26,  86000],
       [    38,  80000],
       [    39,  71000],
       [    37,  71000],
       [    38,  61000],
       [    37,  55000],
```

```
       [    42,  80000],
       [    40,  57000],
       [    35,  75000],
       [    36,  52000],
       [    40,  59000],
       [    41,  59000],
       [    36,  75000],
       [    37,  72000],
       [    40,  75000],
       [    35,  53000],
       [    41,  51000],
       [    39,  61000],
       [    42,  65000],
       [    26,  32000],
       [    30,  17000],
       [    26,  84000],
       [    31,  58000],
       [    33,  31000],
       [    30,  87000],
       [    21,  68000],
       [    28,  55000],
       [    23,  63000],
       [    20,  82000],
       [    30, 107000],
       [    28,  59000],
       [    19,  25000],
       [    19,  85000],
       [    18,  68000],
       [    35,  59000],
       [    30,  89000],
       [    34,  25000],
       [    24,  89000],
       [    27,  96000],
       [    41,  30000],
       [    29,  61000],
       [    20,  74000],
       [    26,  15000],
       [    41,  45000],
       [    31,  76000],
       [    36,  50000],
       [    40,  47000],
       [    31,  15000],
       [    46,  59000],
       [    29,  75000],
       [    26,  30000],
       [    32, 135000],
       [    32, 100000],
       [    25,  90000],
       [    37,  33000],
```

```
       [    35,  38000],
       [    33,  69000],
       [    18,  86000],
       [    22,  55000],
       [    35,  71000],
       [    29, 148000],
       [    29,  47000],
       [    21,  88000],
       [    34, 115000],
       [    26, 118000],
       [    34,  43000],
       [    34,  72000],
       [    23,  28000],
       [    35,  47000],
       [    25,  22000],
       [    24,  23000],
       [    31,  34000],
       [    26,  16000],
       [    31,  71000],
       [    32, 117000],
       [    33,  43000],
       [    33,  60000],
       [    31,  66000],
       [    20,  82000],
       [    33,  41000],
       [    35,  72000],
       [    28,  32000],
       [    24,  84000],
       [    19,  26000],
       [    29,  43000],
       [    19,  70000],
       [    28,  89000],
       [    34,  43000],
       [    30,  79000],
       [    20,  36000],
       [    26,  80000],
       [    35,  22000],
       [    35,  39000],
       [    49,  74000],
       [    39, 134000],
       [    41,  71000],
       [    58, 101000],
       [    47,  47000],
       [    55, 130000],
       [    52, 114000],
       [    40, 142000],
       [    46,  22000],
       [    48,  96000],
       [    52, 150000],
```

```
       [    59,  42000],
       [    35,  58000],
       [    47,  43000],
       [    60, 108000],
       [    49,  65000],
       [    40,  78000],
       [    46,  96000],
       [    59, 143000],
       [    41,  80000],
       [    35,  91000],
       [    37, 144000],
       [    60, 102000],
       [    35,  60000],
       [    37,  53000],
       [    36, 126000],
       [    56, 133000],
       [    40,  72000],
       [    42,  80000],
       [    35, 147000],
       [    39,  42000],
       [    40, 107000],
       [    49,  86000],
       [    38, 112000],
       [    46,  79000],
       [    40,  57000],
       [    37,  80000],
       [    46,  82000],
       [    53, 143000],
       [    42, 149000],
       [    38,  59000],
       [    50,  88000],
       [    56, 104000],
       [    41,  72000],
       [    51, 146000],
       [    35,  50000],
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       [    41,  52000],
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```
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=10)
    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))
```

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Test 0.9 Train0.840625 Random State 395
Test 0.9 Train0.840625 Random State 396
Test 0.9 Train0.840625 Random State 397
```

```
Test 0.9 Train0.840625 Random State 398
Test 0.9 Train0.840625 Random State 399
Test 0.9 Train0.840625 Random State 400
```

```
x_train, x_test, y_train, y_test = train_test_split(features, label,
test_size=0.2, random_state=42)
finalModel=LogisticRegression()
finalModel.fit(x_train,y_train)
```

```
LogisticRegression()
```

```
print(finalModel.score(x_train,y_train))
print(finalModel.score(x_test,y_test))
```

```
0.8375
0.8875
```

```
from sklearn.metrics import classification_report
print(classification_report(label,finalModel.predict(features)))
```

```
              precision    recall  f1-score   support

           0       0.85      0.93      0.89       257
           1       0.85      0.70      0.77       143

    accuracy                           0.85       400
   macro avg       0.85      0.81      0.83       400
weighted avg       0.85      0.85      0.84       400
```

```
import numpy as np
import pandas as pd

df=pd.read_csv(r"C:\Users\praka_32k187u\Downloads\Iris - Iris.csv")
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 150 entries, 0 to 149
Data columns (total 5 columns):
 #   Column        Non-Null Count  Dtype  
---  ------        --------------  -----  
 0   sepal.length  150 non-null    float64
 1   sepal.width   150 non-null    float64
 2   petal.length  150 non-null    float64
 3   petal.width   150 non-null    float64
 4   variety       150 non-null    object 
dtypes: float64(4), object(1)
memory usage: 6.0+ KB
```

```
df.variety.value_counts()
```

```
variety
Setosa        50
Versicolor    50
Virginica     50
Name: count, dtype: int64
```

```
df.head()
```

	sepal.length	sepal.width	petal.length	petal.width	variety
0	5.1	3.5	1.4	0.2	Setosa
1	4.9	3.0	1.4	0.2	Setosa
2	4.7	3.2	1.3	0.2	Setosa
3	4.6	3.1	1.5	0.2	Setosa
4	5.0	3.6	1.4	0.2	Setosa

```
features=df.iloc[:,:-1].values
label=df.iloc[:,4].values

from sklearn.model_selection import train_test_split
from sklearn.neighbors import KNeighborsClassifier

xtrain, xtest, ytrain, ytest = train_test_split(features, label,
test_size=0.2, random_state=42)

model_KNN=KNeighborsClassifier(n_neighbors=5)
model_KNN.fit(xtrain,ytrain)
```

```
KNeighborsClassifier()
```

```
print(model_KNN.score(xtrain,ytrain))
print(model_KNN.score(xtest,ytest))
```

```
0.9666666666666667
1.0
```

```
from sklearn.metrics import confusion_matrix
confusion_matrix(label,model_KNN.predict(features))
```

```
array([[50,  0,  0],
       [ 0, 47,  3],
       [ 0,  1, 49]])
```

```
from sklearn.metrics import classification_report
print(classification_report(label,model_KNN.predict(features)))
```

```
              precision    recall  f1-score   support

      Setosa       1.00      1.00      1.00        50
  Versicolor       0.98      0.94      0.96        50
   Virginica       0.94      0.98      0.96        50

    accuracy                           0.97       150
   macro avg       0.97      0.97      0.97       150
weighted avg       0.97      0.97      0.97       150
```

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline

df=pd.read_csv(r"C:\Users\praka_32k187u\Downloads\Mall_Customers - Mall_Customers.csv")

df.info()
```

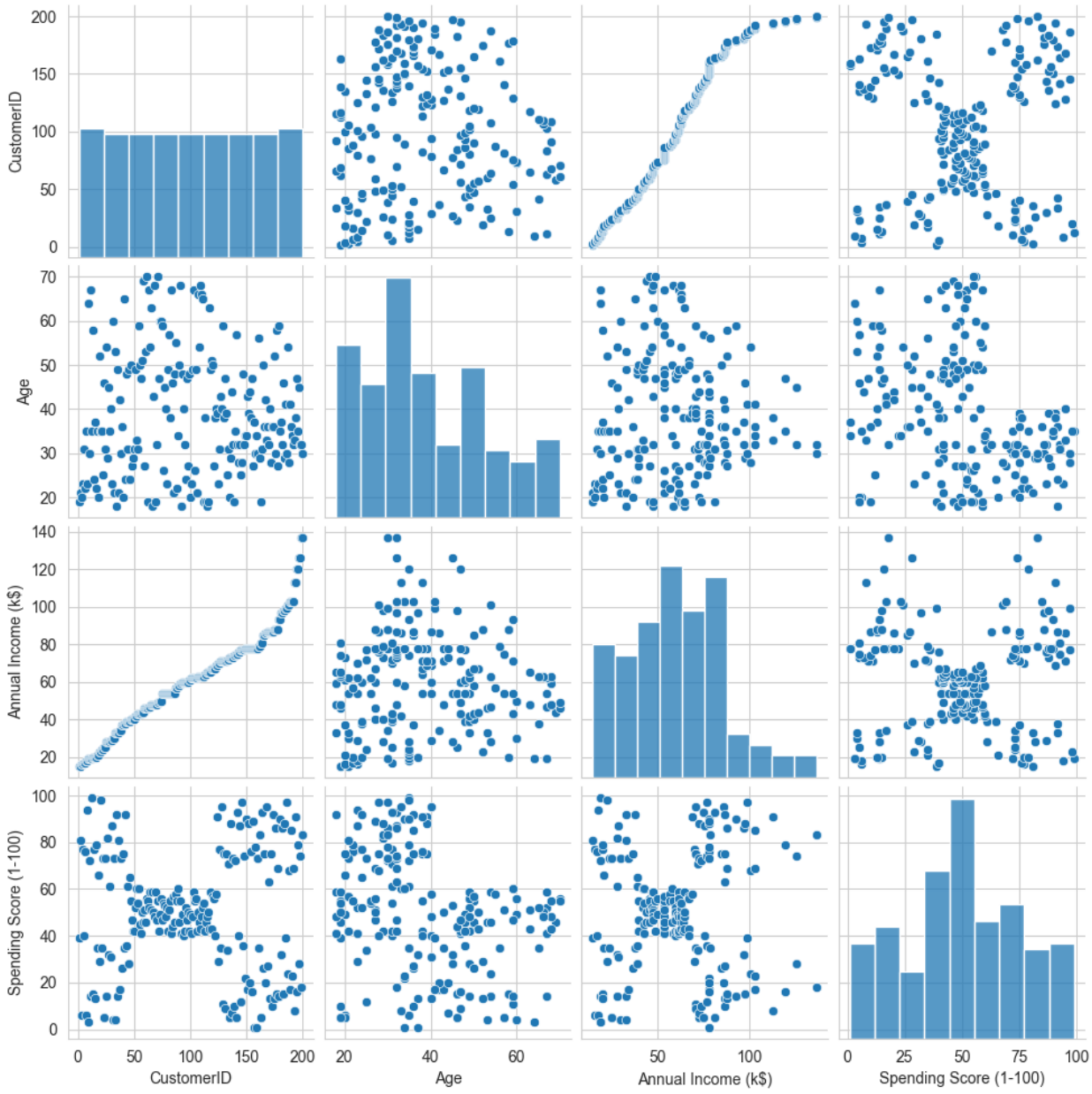
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 200 entries, 0 to 199
Data columns (total 5 columns):
 #   Column                  Non-Null Count  Dtype  
---  ------                  --------------  -----  
 0   CustomerID              200 non-null    int64  
 1   Gender                  200 non-null    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)
```

```
<seaborn.axisgrid.PairGrid at 0x223f3d20d70>
```

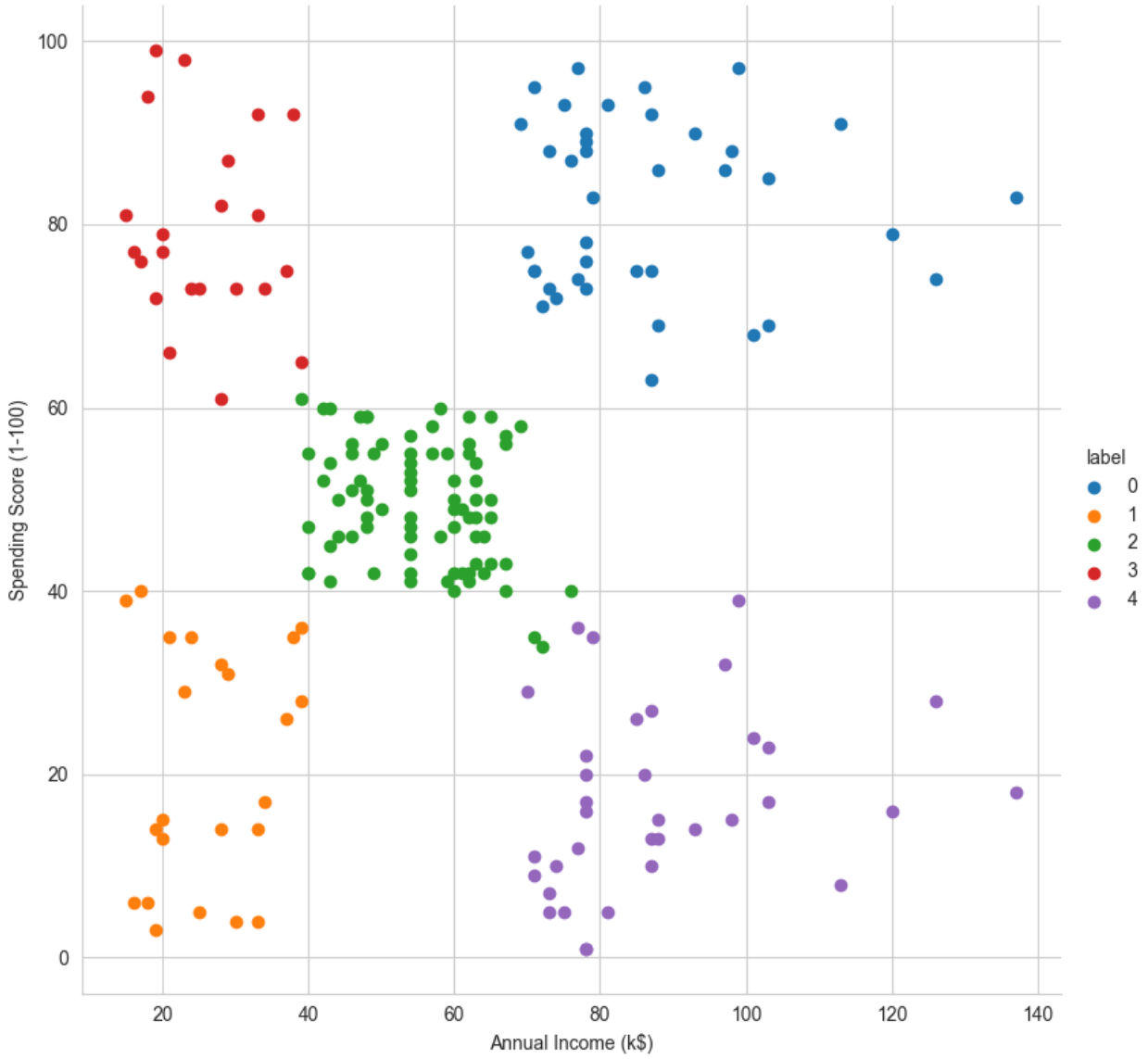



```
features=df.iloc[:,[3,4]].values

from sklearn.cluster import KMeans
model=KMeans(n_clusters=5)
model.fit(features)
KMeans(n_clusters=5)

KMeans(n_clusters=5)

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

```
C:\Users\praka_32k187u\AppData\Local\Temp\
ipykernel_15688\470183701.py:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#
returning-a-view-versus-a-copy
  Final['label']=model.predict(features)
```

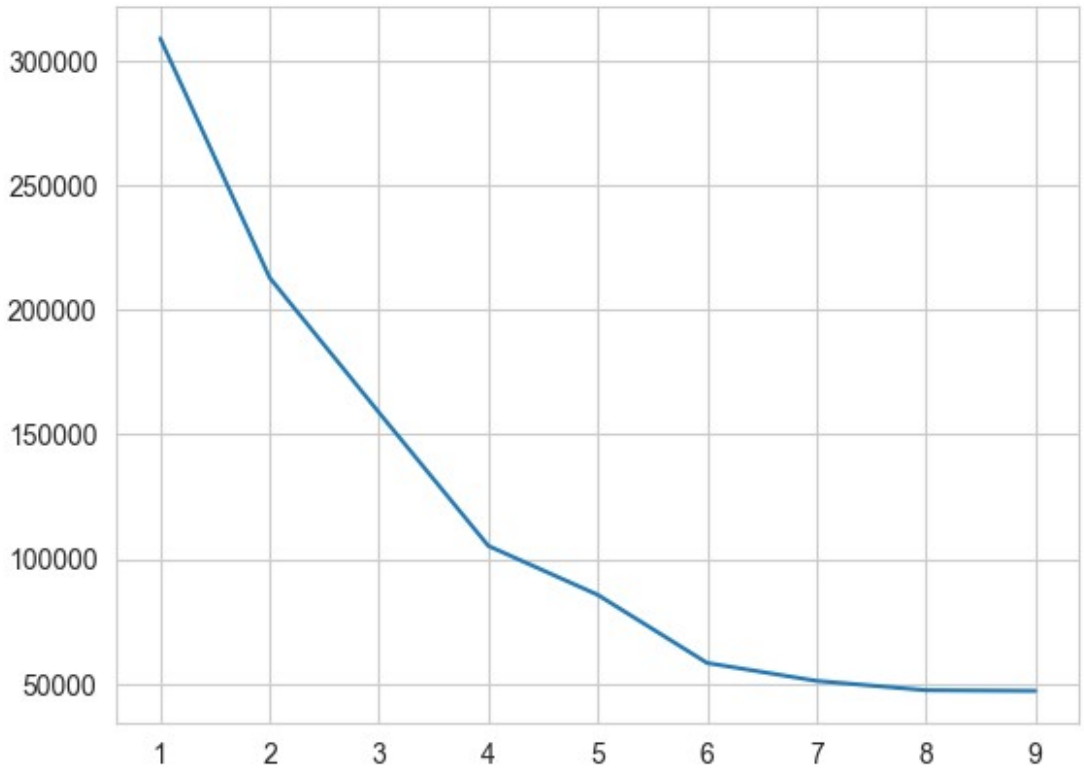
	Annual Income (k$)	Spending Score (1-100)	label
0	15	39	1
1	15	81	3
2	16	6	1
3	16	77	3
4	17	40	1

```
sns.set_style("whitegrid")
sns.FacetGrid(Final,hue="label",height=8) \
.map(plt.scatter,"Annual Income (k$)", "Spending Score (1-100)") \
.add_legend();
plt.show()
```




```
features_el=df.iloc[:,[2,3,4]].values
from sklearn.cluster import KMeans
wcss=[]
for i in range(1,10):
    model=KMeans(n_clusters=i)
    model.fit(features_el)
    wcss.append(model.inertia_)
plt.plot(range(1,10),wcss)
```

```
[<matplotlib.lines.Line2D at 0x223f6e2c910>]
```


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

```python
#T-test
import numpy as np
from scipy import stats
marks = np.array([72, 68, 75, 70, 74, 69, 71, 73, 70, 72])
mu_0 = 70
t_stat, p_value = stats.ttest_1samp(marks, mu_0)
print(f"T-statistic: {t_stat:.3f}")
print(f"quot;P-value: {p_value:.4f}")
alpha = 0.05
if p_value< alpha:
    print("Reject Null Hypothesis → Mean is significantly different
from 70.")
else:
    print("Fail to Reject Null Hypothesis → No significant
difference.")
```

```
T-statistic: 1.993
quot;P-value: 0.0774
Fail to Reject Null Hypothesis → No significant difference.
```

```python
#Z-test
import numpy as np
from math import sqrt
from scipy.stats import norm


x_bar = 51.2   # sample mean
mu_0 = 50      # population mean
sigma = 3      # population standard deviation
n = 36         # sample size


z_stat = (x_bar - mu_0) / (sigma / sqrt(n))

# Two-tailed p-value
p_value = 2 * (1 - norm.cdf(abs(z_stat)))


print(f"Z-statistic: {z_stat:.3f}")
print(f"P-value: {p_value:.4f}")


alpha = 0.05


if p_value < alpha:
    print("Reject Null Hypothesis → Mean is significantly different
from 50 g.")
else:
    print("Fail to Reject Null Hypothesis → No significant
difference.")
```

```
Z-statistic: 2.400
P-value: 0.0164
Reject Null Hypothesis → Mean is significantly different from 50 g.
```

```
#ANNOVA
import numpy as np
from scipy import stats

# Data
A = [20, 22, 23]
B = [19, 20, 18]
C = [25, 27, 26]


f_stat, p_value = stats.f_oneway(A, B, C)


print(f"F-statistic: {f_stat:.3f}")
print(f"P-value: {p_value:.4f}")


alpha = 0.05


if p_value < alpha:
    print("Reject Null Hypothesis → Means are significantly
different.")
else:
    print("Fail to Reject Null Hypothesis → No significant
difference.")
```

```
F-statistic: 25.923
P-value: 0.0011
Reject Null Hypothesis → Means are significantly different.
```