```
import numpy as np

arr=np.array([1,2,3,4,5])
arr
```

```
array([1, 2, 3, 4, 5])
```

```
sum=np.sum(arr)
sum
```

```
15
```

```
mean=np.mean(arr)
mean
```

```
3.0
```

```
sqrt=np.sqrt(arr)
sqrt
```

```
array([1.        , 1.41421356, 1.73205081, 2.        , 2.23606798])
```

```
exponent=np.exp(arr)
exponent
```

```
array([  2.71828183,   7.3890561 ,  20.08553692,  54.59815003,
       148.4131591 ])
```

```
first_element=arr[0]
first_element
```

```
1
```

```
sub_element=arr[2:4]
sub_element
```

```
array([3, 4])
```

```
combined_array=np.concatenate([arr,sub_element])
combined_array
```

```
array([1, 2, 3, 4, 5, 3, 4])
```

```
arr1=np.array([0,6,7,8,9])
arr1
```

```
array([0, 6, 7, 8, 9])
```

```
combined_arr1=np.concatenate([arr,arr1])
combined_arr1
```

```
array([1, 2, 3, 4, 5, 0, 6, 7, 8, 9])
```

```
import pandas as pd
```

```
data={'Name':['aneef','akilesh','kio','arron','ashwin'],'Age':
[17,18,9,17,18],'city':
['chennai','trichy','pudukkottai','madura','salem']}
data
```

```
{'Name': ['aneef', 'akilesh', 'kio', 'arron', 'ashwin'],
 'Age': [17, 18, 9, 17, 18],
 'city': ['chennai', 'trichy', 'pudukkottai', 'madura', 'salem']}
```

```
df=pd.DataFrame(data)
df
```

```
      Name  Age         city
0    aneef   17      chennai
1  akilesh   18       trichy
2      kio    9  pudukkottai
3    arron   17       madura
4   ashwin   18        salem
```

```
df['Name']
```

```
0      aneef
1    akilesh
2        kio
3      arron
4     ashwin
Name: Name, dtype: object
```

```
df['Age']
```

```
0    17
1    18
2     9
3    17
4    18
Name: Age, dtype: int64
```

```
df[['Name','city']]
```

```
      Name         city
0    aneef      chennai
1  akilesh       trichy
2      kio  pudukkottai
3    arron       madura
4   ashwin        salem
```

```
df['Fees']=[50000,60000,55000,72000,75000]
df['Fees']
```

```
0    50000
1    60000
2    55000
```

```
3    72000
4    75000
Name: Fees, dtype: int64
```

```
df
```

```
      Name  Age         city   Fees
0    aneef   17      chennai  50000
1  akilesh   18       trichy  60000
2      kio    9  pudukkottai  55000
3    arron   17       madura  72000
4   ashwin   18        salem  75000
```

```
print("student less than 18")
less=(df[df['Age']<18])
less
```

```
student less than 18
```

```
    Name  Age         city   Fees
0  aneef   17      chennai  50000
2    kio    9  pudukkottai  55000
3  arron   17       madura  72000
```

```
print("student has less fess")
std=(df[df['Fees']<60000])
std
```

```
student has less fess
```

```
    Name  Age         city   Fees
0  aneef   17      chennai  50000
2    kio    9  pudukkottai  55000
```

```
print("sorting by age in descending order")
sorted=(df.sort_values(by='Age',ascending=False))
sorted
```

```
sorting by age in descending order
```

```
      Name  Age         city   Fees
1  akilesh   18       trichy  60000
4   ashwin   18        salem  75000
0    aneef   17      chennai  50000
3    arron   17       madura  72000
2      kio    9  pudukkottai  55000
```

```
average_age=df['Age'].mean()
average_age
```

```
15.8
```

```
average_fees=df['Fees'].mean()
average_fees
```

```
62400.0
```

```
df.groupby('Name').groups
```

```
{'akilesh': [1], 'aneef': [0], 'arron': [3], 'ashwin': [4], 'kio':
[2]}
```

```
df.groupby(['city','Fees']).groups
```

```
{('chennai', 50000): [0], ('madura', 72000): [3], ('pudukkottai',
55000): [2], ('salem', 75000): [4], ('trichy', 60000): [1]}
```

```
grouped_data=df.groupby(['city'])['Name'].sum()
print(grouped_data)
```

```
city
chennai          aneef
madura           arron
pudukkottai        kio
salem           ashwin
trichy         akilesh
Name: Name, dtype: object
```

```
df['age_squared']=df['Age'].apply(lambda x:x**2)
df['age_squared']
```

```
0    289
1    324
2     81
3    289
4    324
Name: age_squared, dtype: int64
```

```
df
```

	Name	Age	city	Fees	age_squared
0	aneef	17	chennai	50000	289
1	akilesh	18	trichy	60000	324
2	kio	9	pudukkottai	55000	81
3	arron	17	madura	72000	289
4	ashwin	18	salem	75000	324

```
df=df.drop(columns=['age_squared'])
df
```

	Name	Age	city	Fees
0	aneef	17	chennai	50000
1	akilesh	18	trichy	60000
2	kio	9	pudukkottai	55000

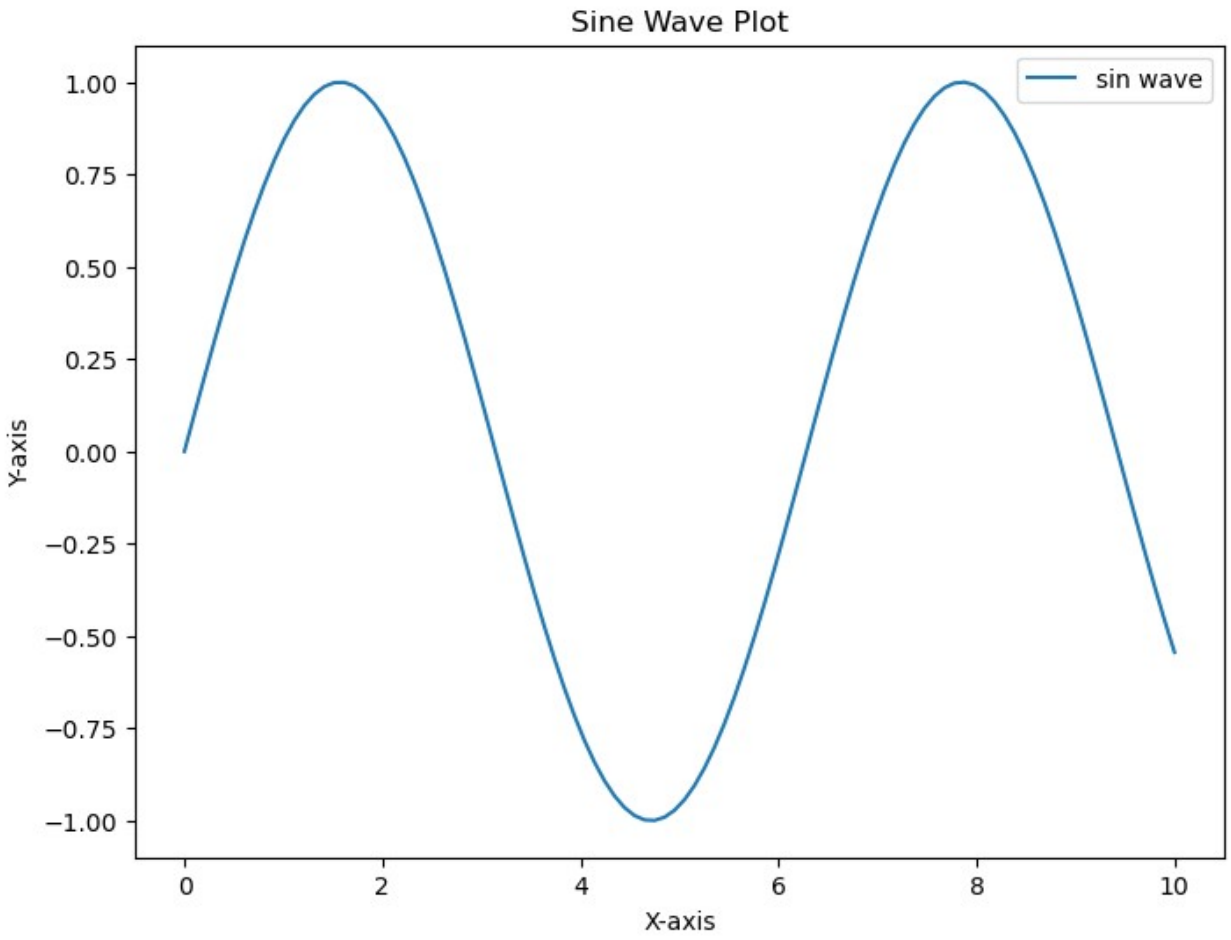
```
3    arron   17       madura  72000
4   ashwin   18        salem  75000
```

```
df.to_csv('output.csv',index=False)
```

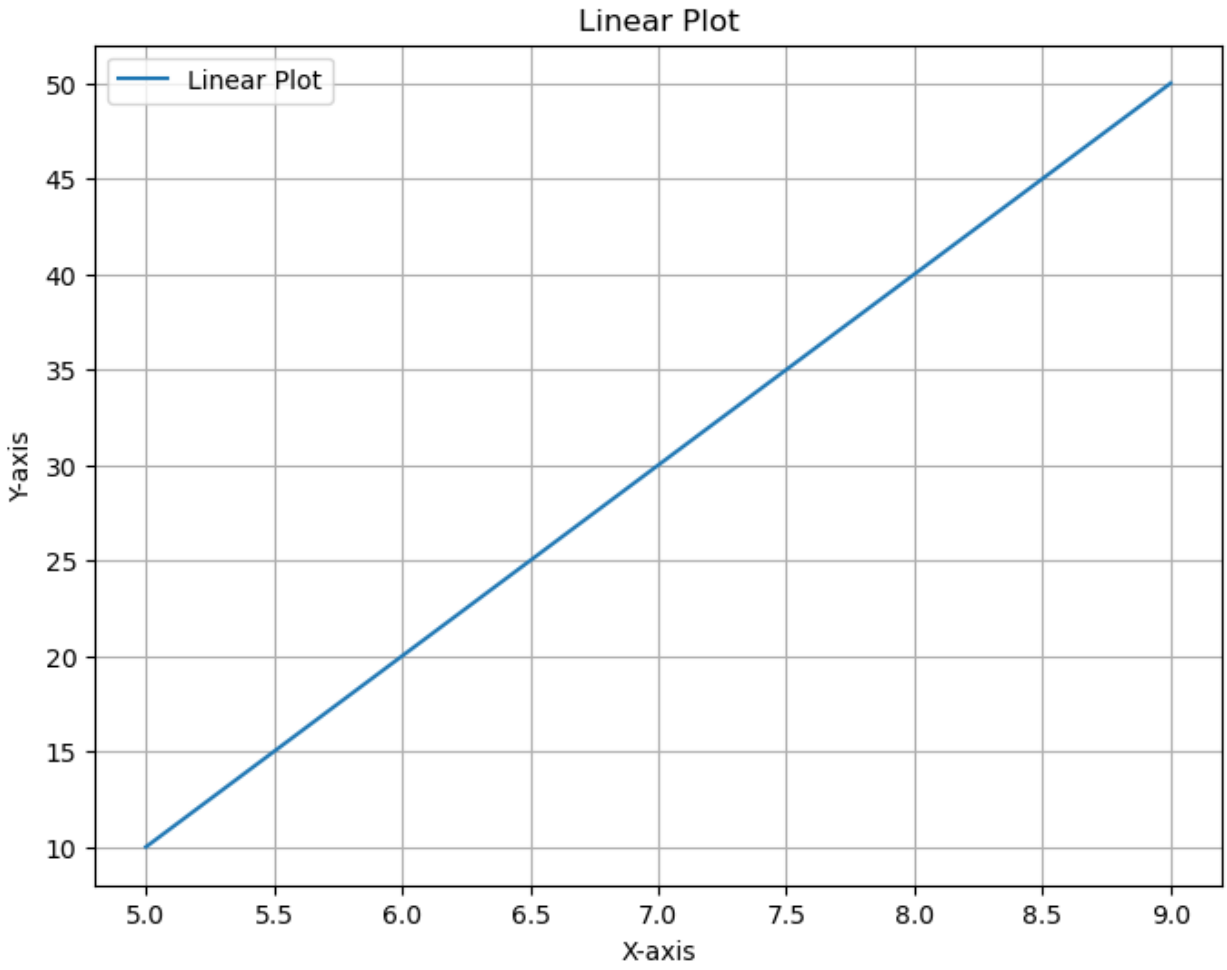
```
new_df=pd.read_csv('output.csv')
new_df
```

```
      Name  Age         city   Fees
0    aneef   17      chennai  50000
1  akilesh   18       trichy  60000
2      kio    9  pudukkottai  55000
3    arron   17       madura  72000
4   ashwin   18        salem  75000
```

```
import matplotlib.pyplot as plt

x=np.linspace(0,10,100)
y=np.sin(x)

plt.figure(figsize=(8, 6))
plt.plot(x, y, label='sin wave')
plt.title('Sine Wave Plot')
plt.xlabel('X-axis')
plt.ylabel('Y-axis')
plt.legend()
plt.grid(False)
plt.show()
```




```
x=np.array([5,6,7,8,9])
y=np.array([10,20,30,40,50])

plt.figure(figsize=(8, 6))
plt.plot(x, y, label='Linear Plot')
plt.title('Linear Plot')
plt.xlabel('X-axis')
plt.ylabel('Y-axis')
plt.legend()
plt.grid(True)
plt.show()
```


Linear Plot
Linear Plot
50
45
40
35
30
25
20
15
10
Y-axis
5.0
5.5
6.0
6.5
7.0
7.5
8.0
8.5
9.0
X-axis