In [1]:

```
import numpy as np  #linear algebra
import pandas as pd  #data processing
```

In [3]:

```
df=pd.read_csv("Advertising.csv")
df.head()
```

Out[3]:

	Unnamed: 0	TV	Radio	Newspaper	Sales
0	1	230.1	37.8	69.2	22.1
1	2	44.5	39.3	45.1	10.4
2	3	17.2	45.9	69.3	9.3
3	4	151.5	41.3	58.5	18.5
4	5	180.8	10.8	58.4	12.9

In [4]:

```
df.tail()
```

Out[4]:

	Unnamed: 0	TV	Radio	Newspaper	Sales
195	196	38.2	3.7	13.8	7.6
196	197	94.2	4.9	8.1	9.7
197	198	177.0	9.3	6.4	12.8
198	199	283.6	42.0	66.2	25.5
199	200	232.1	8.6	8.7	13.4

In [5]:

```
df.shape
```

Out[5]:

```
(200, 5)
```

In [6]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 200 entries, 0 to 199
Data columns (total 5 columns):
 #   Column      Non-Null Count  Dtype  
---  ------      --------------  -----  
 0   Unnamed: 0  200 non-null    int64  
 1   TV          200 non-null    float64
 2   Radio       200 non-null    float64
 3   Newspaper   200 non-null    float64
 4   Sales       200 non-null    float64
dtypes: float64(4), int64(1)
memory usage: 7.9 KB
```

In [7]:
```
df.describe()
```

Out[7]:

	Unnamed: 0	TV	Radio	Newspaper	Sales
count	200.000000	200.000000	200.000000	200.000000	200.000000
mean	100.500000	147.042500	23.264000	30.554000	14.022500
std	57.879185	85.854236	14.846809	21.778621	5.217457
min	1.000000	0.700000	0.000000	0.300000	1.600000
25%	50.750000	74.375000	9.975000	12.750000	10.375000
50%	100.500000	149.750000	22.900000	25.750000	12.900000
75%	150.250000	218.825000	36.525000	45.100000	17.400000
max	200.000000	296.400000	49.600000	114.000000	27.000000

In [8]:
```
df=df.drop(columns=["Unnamed: 0"])
```

In [9]:
```
df
```

	TV	Radio	Newspaper	Sales
0	230.1	37.8	69.2	22.1
1	44.5	39.3	45.1	10.4
2	17.2	45.9	69.3	9.3
3	151.5	41.3	58.5	18.5
4	180.8	10.8	58.4	12.9
...	...	...	...	...
195	38.2	3.7	13.8	7.6
196	94.2	4.9	8.1	9.7
197	177.0	9.3	6.4	12.8
198	283.6	42.0	66.2	25.5
199	232.1	8.6	8.7	13.4

200 rows × 4 columns

In [10]:

```
x=df.iloc[:, 0:-1]
x
```

Out[10]:

	TV	Radio	Newspaper
0	230.1	37.8	69.2
1	44.5	39.3	45.1
2	17.2	45.9	69.3
3	151.5	41.3	58.5
4	180.8	10.8	58.4
...	...	...	...
195	38.2	3.7	13.8
196	94.2	4.9	8.1
197	177.0	9.3	6.4
198	283.6	42.0	66.2
199	232.1	8.6	8.7

200 rows × 3 columns

In [11]:

```
y=df.iloc[:,-1]
y
```

Out[11]:

```
0      22.1
1      10.4
2       9.3
3      18.5
4      12.9
       ...
195     7.6
196     9.7
197    12.8
198    25.5
199    13.4
Name: Sales, Length: 200, dtype: float64
```

In [12]:

```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2,random_sta
```

In [13]:

```
x_train
```

Out[13]:

	TV	Radio	Newspaper
116	139.2	14.3	25.6
138	43.0	25.9	20.5
155	4.1	11.6	5.7
82	75.3	20.3	32.5
160	172.5	18.1	30.7
...	...	...	...
58	210.8	49.6	37.7
21	237.4	5.1	23.5
49	66.9	11.7	36.8
64	131.1	42.8	28.9
68	237.4	27.5	11.0

160 rows × 3 columns

In [14]:

```
x_test
```

Out[14]:

	TV	Radio	Newspaper
56	7.3	28.1	41.4
37	74.7	49.4	45.7
67	139.3	14.5	10.2
79	116.0	7.7	23.1
80	76.4	26.7	22.3
188	286.0	13.9	3.7
183	287.6	43.0	71.8
10	66.1	5.8	24.2
128	220.3	49.0	3.2
62	239.3	15.5	27.3
65	69.0	9.3	0.9
17	281.4	39.6	55.8
133	219.8	33.5	45.1
195	38.2	3.7	13.8
146	240.1	7.3	8.7
38	43.1	26.7	35.1
173	168.4	7.1	12.8
149	44.7	25.8	20.6
93	250.9	36.5	72.3
29	70.6	16.0	40.8
0	230.1	37.8	69.2
2	17.2	45.9	69.3
122	224.0	2.4	15.6
180	156.6	2.6	8.3
95	163.3	31.6	52.9
121	18.8	21.7	50.4
185	205.0	45.1	19.6
39	228.0	37.7	32.0
66	31.5	24.6	2.2
19	147.3	23.9	19.1
11	214.7	24.0	4.0
45	175.1	22.5	31.5
41	177.0	33.4	38.7
92	217.7	33.5	59.0
168	215.4	23.6	57.6
1	44.5	39.3	45.1
57	136.2	19.2	16.6
189	18.7	12.1	23.4

	TV	Radio	Newspaper
151	121.0	8.4	48.7
167	206.8	5.2	19.4

In [15]:

```
x_train=x_train.astype(int)
y_train=y_train.astype(int)
x_test=x_test.astype(int)
y_test=y_test.astype(int)
```

In [16]:

```
from sklearn.preprocessing import StandardScaler
Sc=StandardScaler()
x_train_scaled=Sc.fit_transform(x_train)
x_test_scaled=Sc.fit_transform(x_test)
```

In [17]:

```
from sklearn.linear_model import LinearRegression
```

In [18]:

```
lr=LinearRegression()
```

In [19]:

```
lr.fit(x_train_scaled,y_train)
```

Out[19]:

```
▾ LinearRegression
LinearRegression()
```

In [20]:

```
y_pred=lr.predict(x_test_scaled)
```

In [21]:

```
from sklearn.metrics import r2_score
```

In [22]:

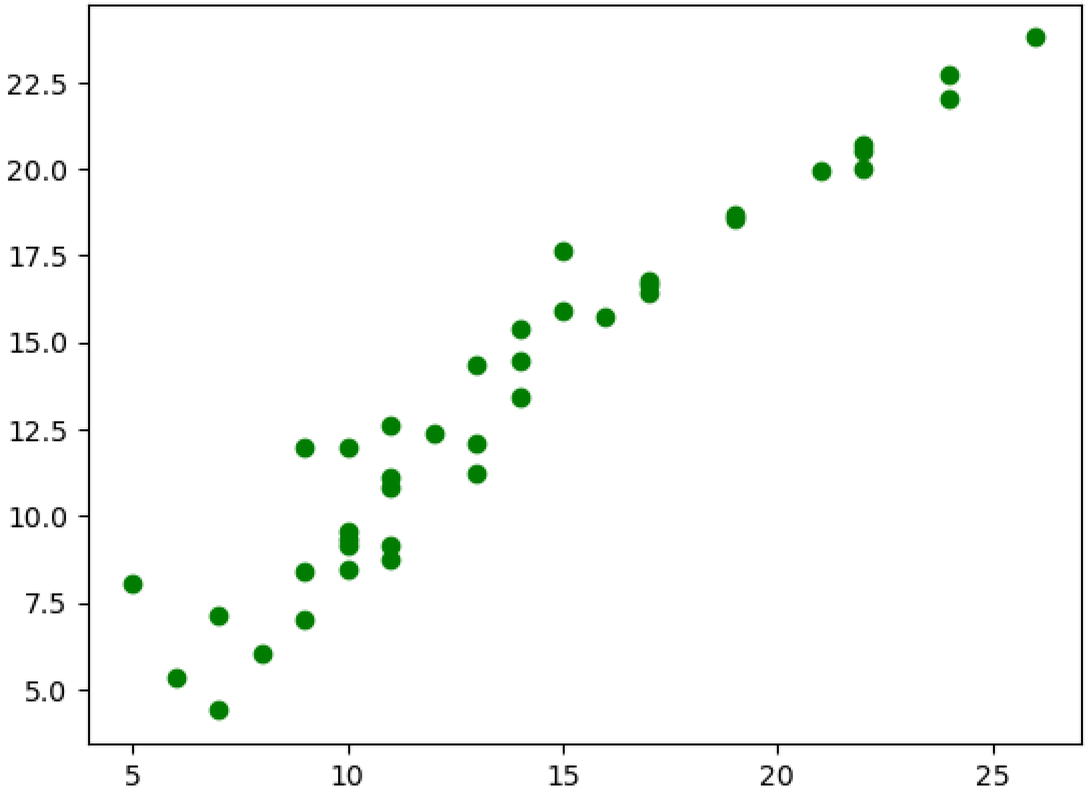
```
r2_score(y_test,y_pred)
```

Out[22]:

```
0.9222988021105913
```

```
In [23]: import matplotlib.pyplot as plt
         plt.scatter(y_test,y_pred,c='g')

Out[23]: <matplotlib.collections.PathCollection at 0x2999f1bb110>
```



```
In [24]: r=r2_score(y_test,y_pred)*100

In [25]: r

Out[25]: 92.22988021105914

In [ ]:
```