SALES PREDICTION

> Sales prediction involves forecasting the amount of a product that customers will purchase, taking into account various factors such as advertising expenditure, target audience segmentation, and advertising platform selection.

IMPORTING IMPORTANT LIBRARIES

In [ ]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

LOADING THE DATASET

In [ ]:
```
df = pd.read_csv("/content/advertising.csv")
df.head()
```

Out[ ]:

	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	12.0
3	151.5	41.3	58.5	16.5
4	180.8	10.8	58.4	17.9

In [ ]:
```
df.shape
```

Out[ ]:
```
(200, 4)
```

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

Out[ ]:

	TV	Radio	Newspaper	Sales
count	200.000000	200.000000	200.000000	200.000000
mean	147.042500	23.264000	30.554000	15.130500
std	85.854236	14.846809	21.778621	5.283892
min	0.700000	0.000000	0.300000	1.600000
25%	74.375000	9.975000	12.750000	11.000000
50%	149.750000	22.900000	25.750000	16.000000
75%	218.825000	36.525000	45.100000	19.050000
max	296.400000	49.600000	114.000000	27.000000

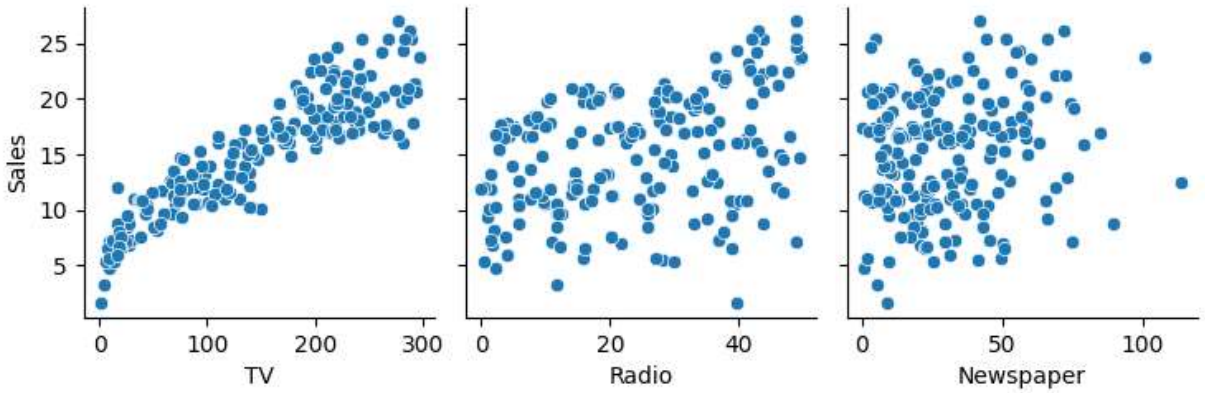
Basic Observation

Avg expense spend is highest on TV

Avg expense spend is lowest on Radio

Max sale is 27 and min is 1.6

In [ ]:
```
sns.pairplot(df, x_vars=['TV', 'Radio','Newspaper'], y_vars='Sales', kind='scatter'
plt.show()
```

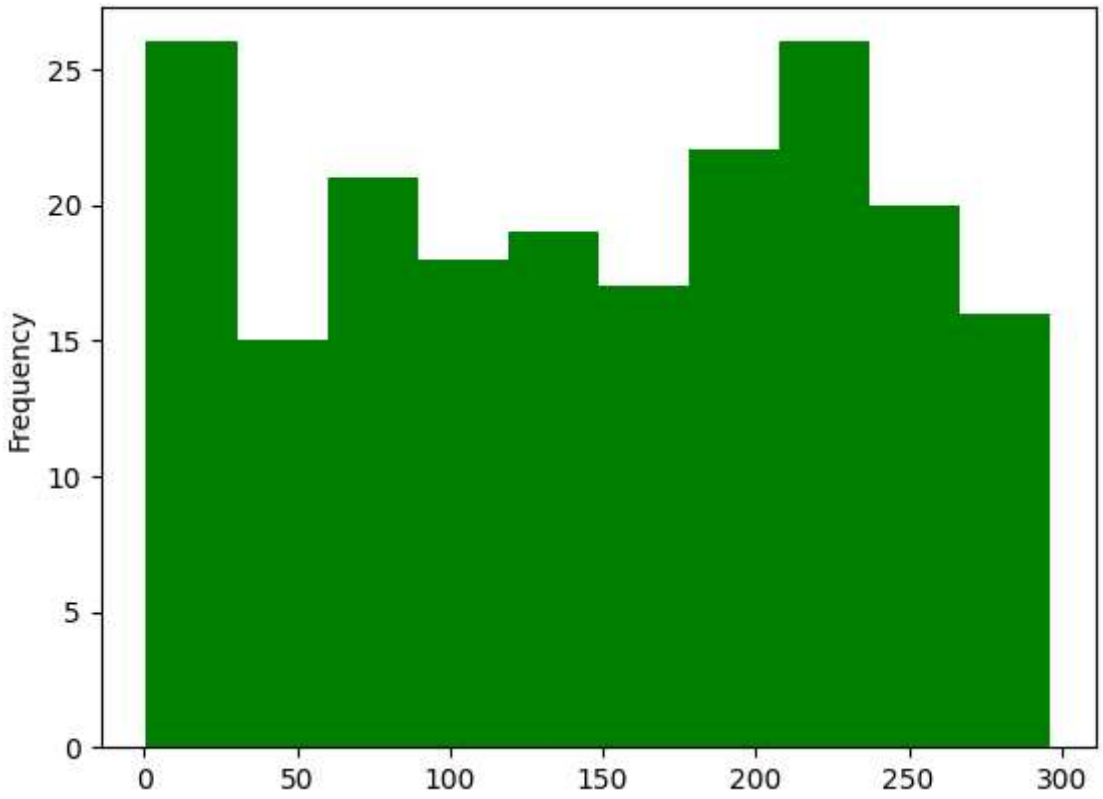


Pair Plot Observation

TV Ad costs rising reliably boost sales, but for newspapers and radio, the impact is less predictable.

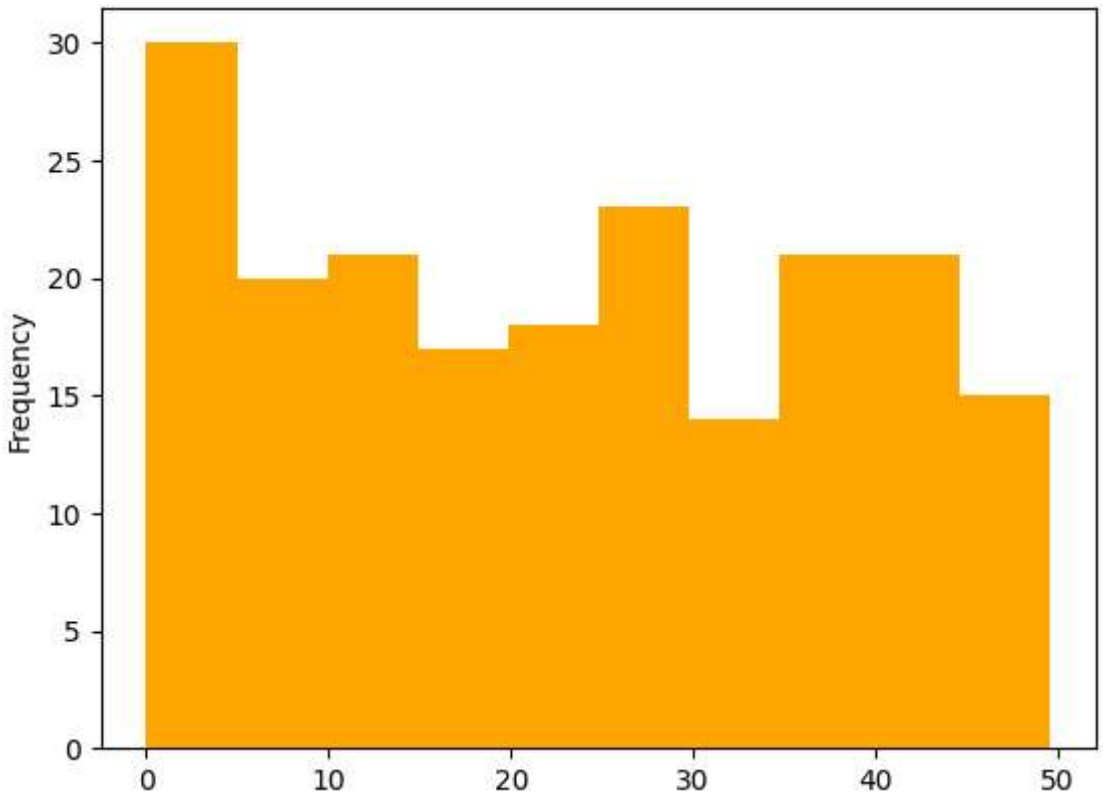
In [ ]:
```
df['TV'].plot.hist(bins=10, color="green", xlabel="TV")
```

Out[ ]:
```
<Axes: ylabel='Frequency'>
```



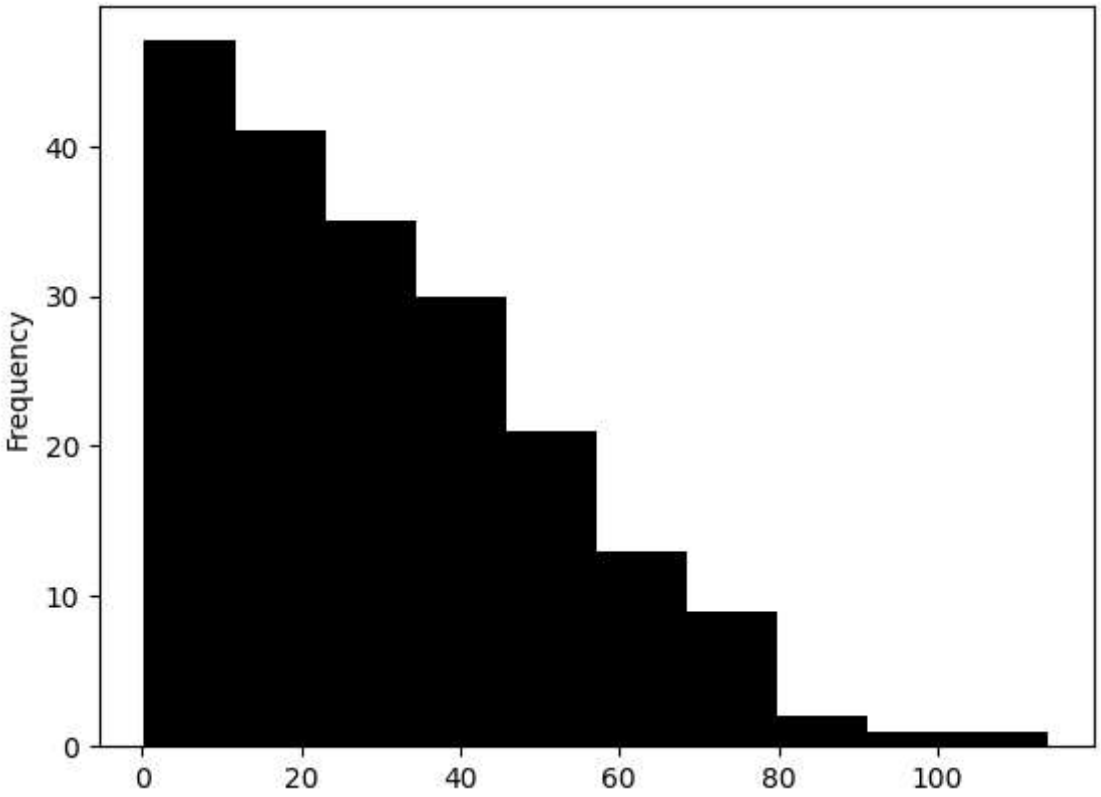
In [ ]:
```
df['Radio'].plot.hist(bins=10, color="orange", xlabel="Radio")
```

Out[ ]: <Axes: ylabel='Frequency'>



In [ ]:
```
df['Newspaper'].plot.hist(bins=10,color="black", xlabel="newspaper")
```

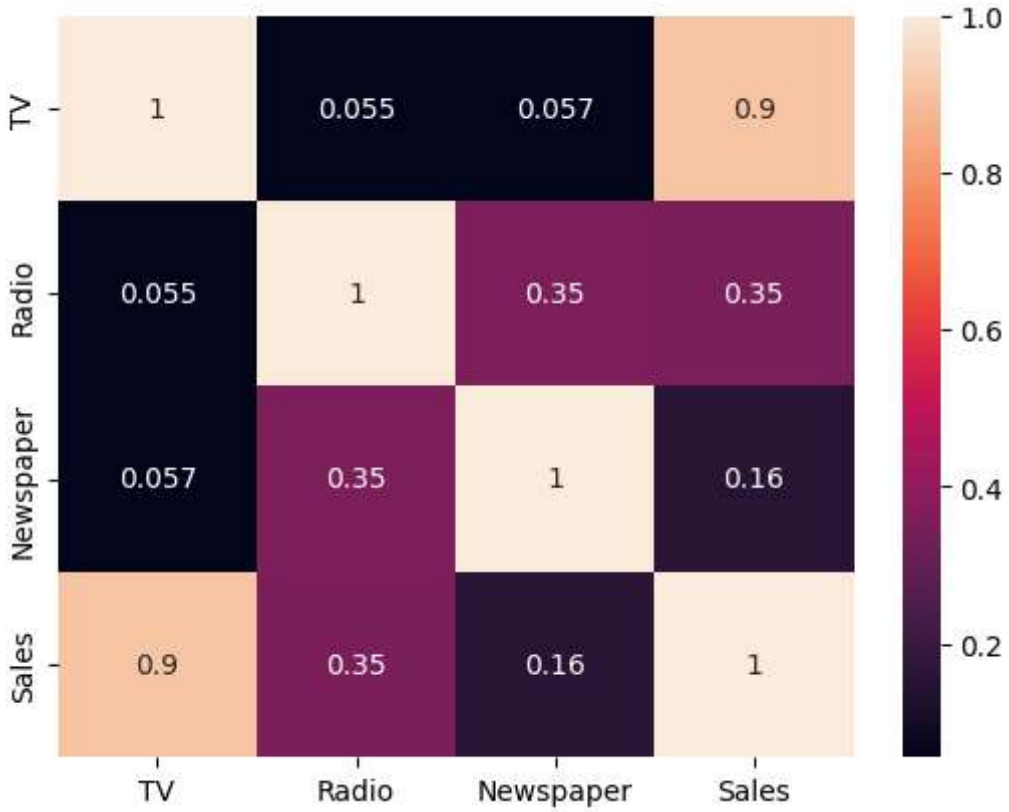
Out[ ]: <Axes: ylabel='Frequency'>



Histogram Observation

Most sales result from minimal advertising expenses in newspapers.

In [ ]:
```
sns.heatmap(df.corr(),annot = True)
plt.show()
```



TV has a strong correlation with high sales.

We should train our model using linear regression since it's correlated with just one variable: TV.

In [ ]:
```
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(df[['TV']], df[['Sales']], test
```

In [ ]:
```
print(X_train)
```

```
        TV
131  265.2
96   197.6
181  218.5
19   147.3
153  171.3
..     ...
67   139.3
192   17.2
117   76.4
47   239.9
172   19.6

[140 rows x 1 columns]
```

In [ ]:
```
print(y_train)
```

```
     Sales
131   17.7
96    16.7
181   17.2
19    14.6
153   16.0
..     ...
67    13.4
192    5.9
117    9.4
47    23.2
172    7.6

[140 rows x 1 columns]
```

In [ ]:
```
print(X_test)
```

	TV
18	69.2
170	50.0
107	90.4
98	289.7
177	170.2
182	56.2
5	8.7
146	240.1
12	23.8
152	197.6
61	261.3
125	87.2
180	156.6
154	187.8
80	76.4
7	120.2
33	265.6
130	0.7
37	74.7
74	213.4
183	287.6
145	140.3
45	175.1
159	131.7
60	53.5
123	123.1
179	165.6
185	205.0
122	224.0
44	25.1
16	67.8
55	198.9
150	280.7
111	241.7
22	13.2
189	18.7
129	59.6
4	180.8
83	68.4
106	25.0
134	36.9
66	31.5
26	142.9
113	209.6
168	215.4
63	102.7
8	8.6
75	16.9
118	125.7
143	104.6
71	109.8
124	229.5
184	253.8
97	184.9
149	44.7

```
24    62.3
30   292.9
160  172.5
40   202.5
56     7.3
```

In [ ]:
```
print(y_test)
```

	Sales
18	11.3
170	8.4
107	12.0
98	25.4
177	16.7
182	8.7
5	7.2
146	18.2
12	9.2
152	16.6
61	24.2
125	10.6
180	15.5
154	20.6
80	11.8
7	13.2
33	17.4
130	1.6
37	14.7
74	17.0
183	26.2
145	10.3
45	16.1
159	12.9
60	8.1
123	15.2
179	17.6
185	22.6
122	16.6
44	8.5
16	12.5
55	23.7
150	16.1
111	21.8
22	5.6
189	6.7
129	9.7
4	17.9
83	13.6
106	7.2
134	10.8
66	11.0
26	15.0
113	20.9
168	17.1
63	14.0
8	4.8
75	8.7
118	15.9
143	10.4
71	12.4
124	19.7
184	17.6
97	20.5
149	10.1

```
24     9.7
30    21.4
160   16.4
40    16.6
56     5.5
```

In [ ]:
```
from sklearn.linear_model import LinearRegression
model = LinearRegression()
model.fit(X_train,y_train)
```

Out[ ]:
```
▾ LinearRegression

LinearRegression()
```

In [ ]:
```
res= model.predict(X_test)
print(res)
```

```
[[10.93127621]
 [ 9.88042193]
 [12.09159447]
 [22.99968079]
 [16.45920756]
 [10.21976029]
 [ 7.6199906 ]
 [20.28497391]
 [ 8.4464437 ]
 [17.95886418]
 [21.44529217]
 [11.91645209]
 [15.71485245]
 [17.42249065]
 [11.32534656]
 [13.72260788]
 [21.68063975]
 [ 7.18213465]
 [11.23230217]
 [18.82362968]
 [22.88474361]
 [14.82272095]
 [16.72739433]
 [14.35202581]
 [10.07198391]
 [13.88133066]
 [16.20744039]
 [18.36388094]
 [19.40378881]
 [ 8.51759529]
 [10.85465142]
 [18.03001578]
 [22.50709285]
 [20.3725451 ]
 [ 7.86628457]
 [ 8.16731053]
 [10.40584907]
 [17.03936669]
 [10.88749061]
 [ 8.51212209]
 [ 9.16343282]
 [ 8.86788005]
 [14.96502414]
 [18.61564811]
 [18.93309367]
 [12.76479799]
 [ 7.6145174 ]
 [ 8.06879294]
 [14.02363385]
 [12.86878878]
 [13.15339515]
 [19.70481478]
 [21.03480222]
 [17.26376787]
 [ 9.59034237]
 [10.55362545]
```

```
[23.17482317]
[16.58509115]
[18.22705095]
[ 7.54336581]]
```

In [ ]:
```
print("Accuracy Score: ", model.score(X_test,y_test)*100)
```

```
Accuracy Score:  81.50168765722069
```

In [ ]:
```
model.coef_
```

Out[ ]:
```
array([[0.05473199]])
```

In [ ]:
```
model.intercept_
```

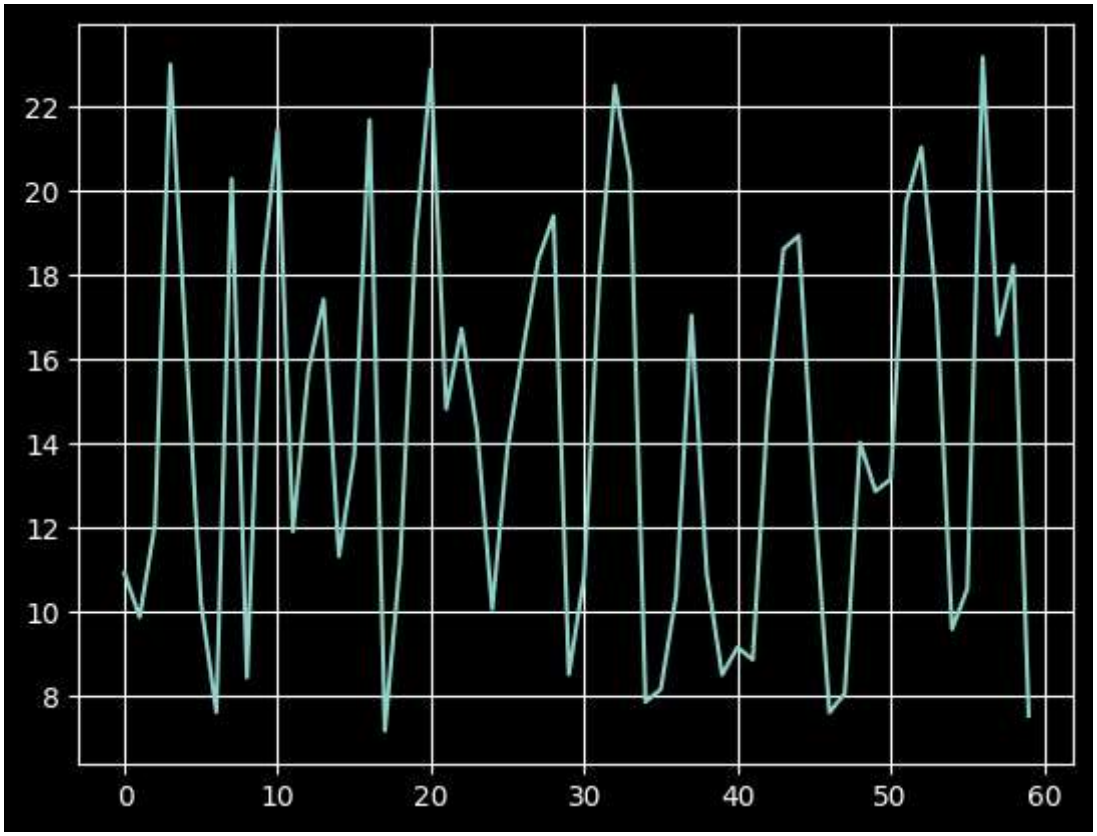
Out[ ]:
```
array([7.14382225])
```

In [ ]:
```
0.05473199* 69.2 + 7.14382225
```

Out[ ]:
```
10.931275958
```

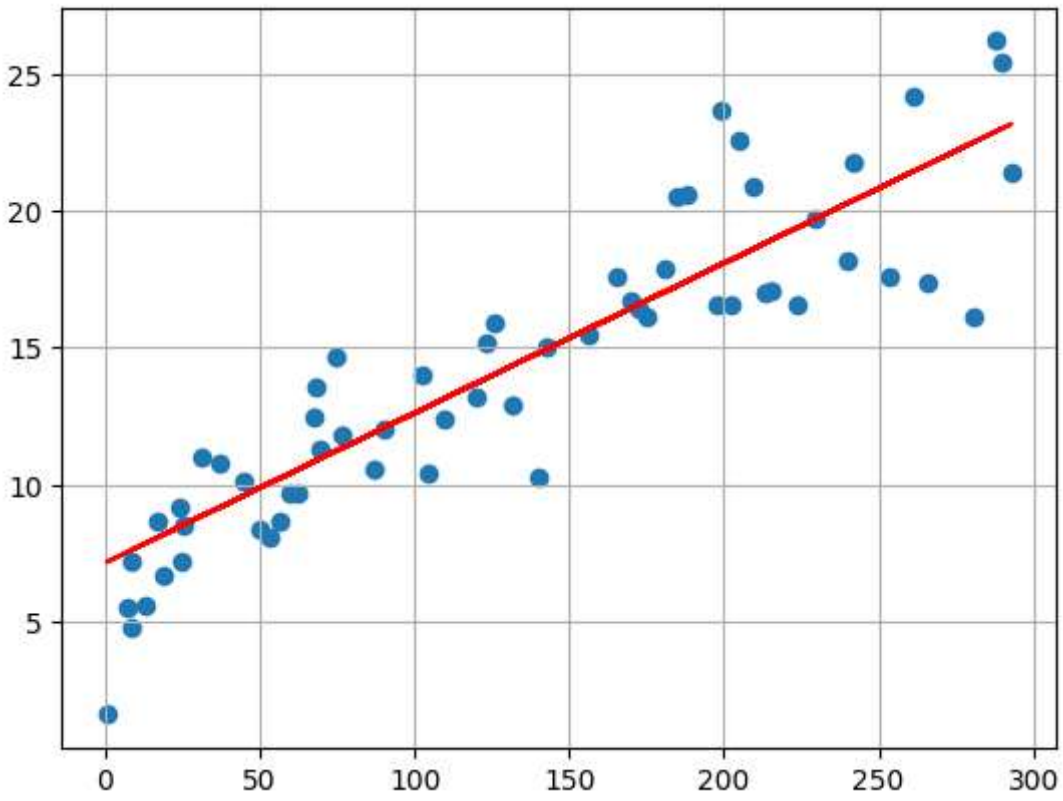
In [ ]:
```
plt.style.use('dark_background')
plt.grid()
plt.plot(res)
```

Out[ ]:
```
[<matplotlib.lines.Line2D at 0x7cad365487f0>]
```



In [ ]:
```
plt.style.use('default')
plt.grid()
plt.scatter(X_test, y_test)
```

```
plt.plot(X_test, 7.14382225 + 0.05473199 * X_test, 'r')
plt.show()
```



The solution mentioned above effectively predicts sales using advertising platform datasets.