In [1]:
```
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
import numpy as np
```

In [2]:
```
df=pd.read_csv('advertising.csv')
```

In [3]:
```
# First five rows of the dataset
df.head()
```

Out[3]:

	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 [25]:
```
# Last five rows of the dataset
df.tail()
```

Out[25]:

	TV	Radio	Newspaper	Sales
195	38.2	3.7	13.8	7.6
196	94.2	4.9	8.1	14.0
197	177.0	9.3	6.4	14.8
198	283.6	42.0	66.2	25.5
199	232.1	8.6	8.7	18.4

In [26]:
```
# Shape of the dataset
df.shape
```

Out[26]:
```
(200, 4)
```

In [27]:
```
# Columns present in the dataset
df.columns
```

Out[27]:
```
Index(['TV', 'Radio', 'Newspaper', 'Sales'], dtype='object')
```

In [28]:
```
# A concise summary of the dataset
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 200 entries, 0 to 199
Data columns (total 4 columns):
 #   Column     Non-Null Count  Dtype  
---  ------     --------------  -----  
 0   TV         200 non-null    float64
 1   Radio      200 non-null    float64
 2   Newspaper  200 non-null    float64
 3   Sales      200 non-null    float64
dtypes: float64(4)
memory usage: 6.4 KB
```

In [29]:
```
# Checking missing values
df.isna().sum()
```

Out[29]:
```
TV           0
Radio        0
Newspaper    0
Sales        0
dtype: int64
```

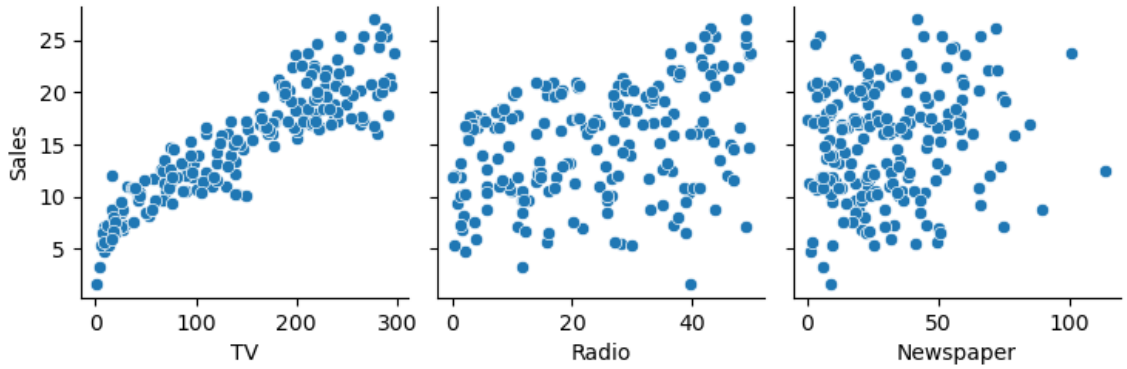
In [30]:
```
# Generating descriptive statistics summary
df.describe().round()
```

Out[30]:

	TV	Radio	Newspaper	Sales
count	200.0	200.0	200.0	200.0
mean	147.0	23.0	31.0	15.0
std	86.0	15.0	22.0	5.0
min	1.0	0.0	0.0	2.0
25%	74.0	10.0	13.0	11.0
50%	150.0	23.0	26.0	16.0
75%	219.0	37.0	45.0	19.0
max	296.0	50.0	114.0	27.0

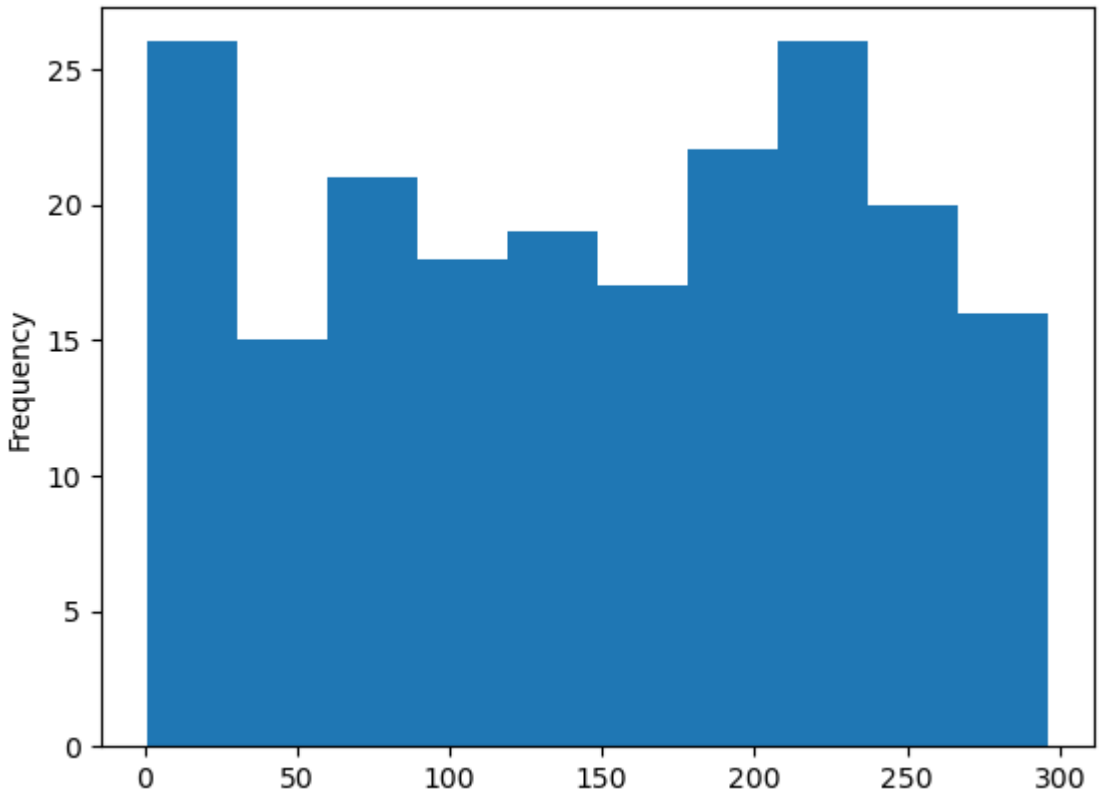
In [32]:
```
sns.pairplot(df, x_vars=['TV', 'Radio','Newspaper'], y_vars='Sales', kind='
plt.show()
```

```
C:\Users\kumar\anaconda3\Lib\site-packages\seaborn\axisgrid.py:118: UserWa
rning: The figure layout has changed to tight
  self._figure.tight_layout(*args, **kwargs)
```



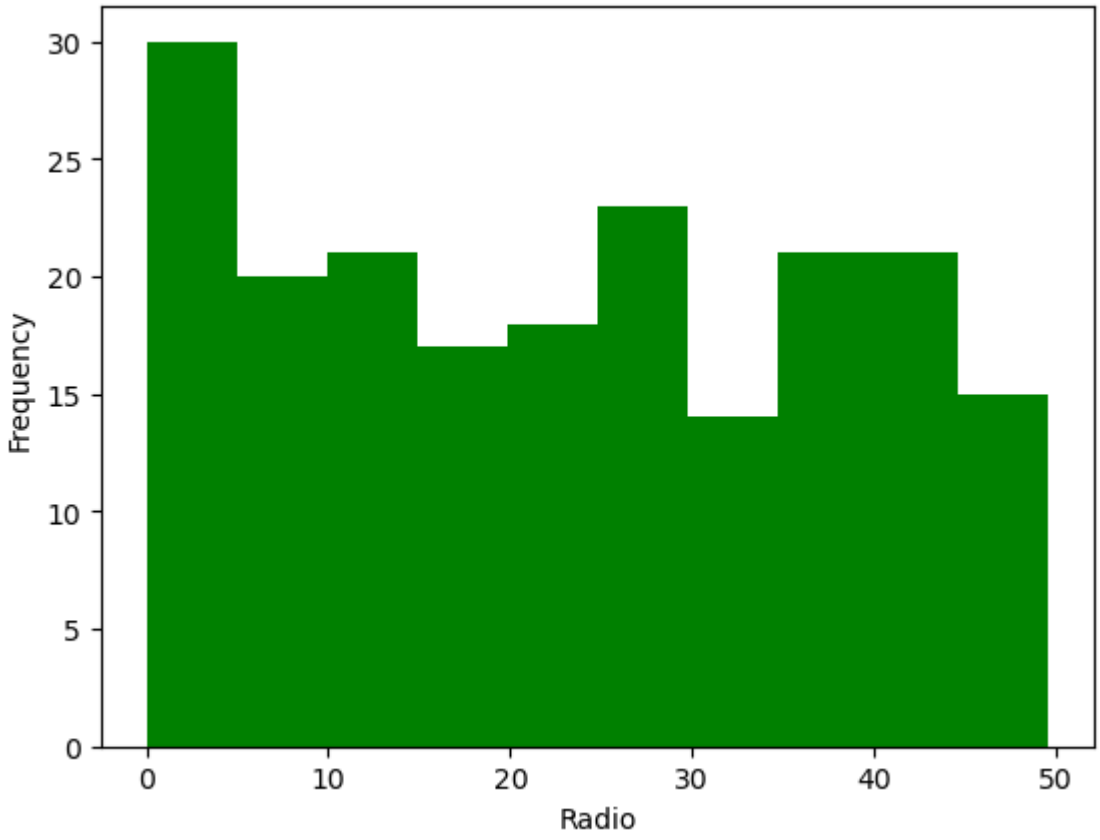
In [33]:
```
df['TV'].plot.hist(bins=10)
```

Out[33]:
```
<Axes: ylabel='Frequency'>
```



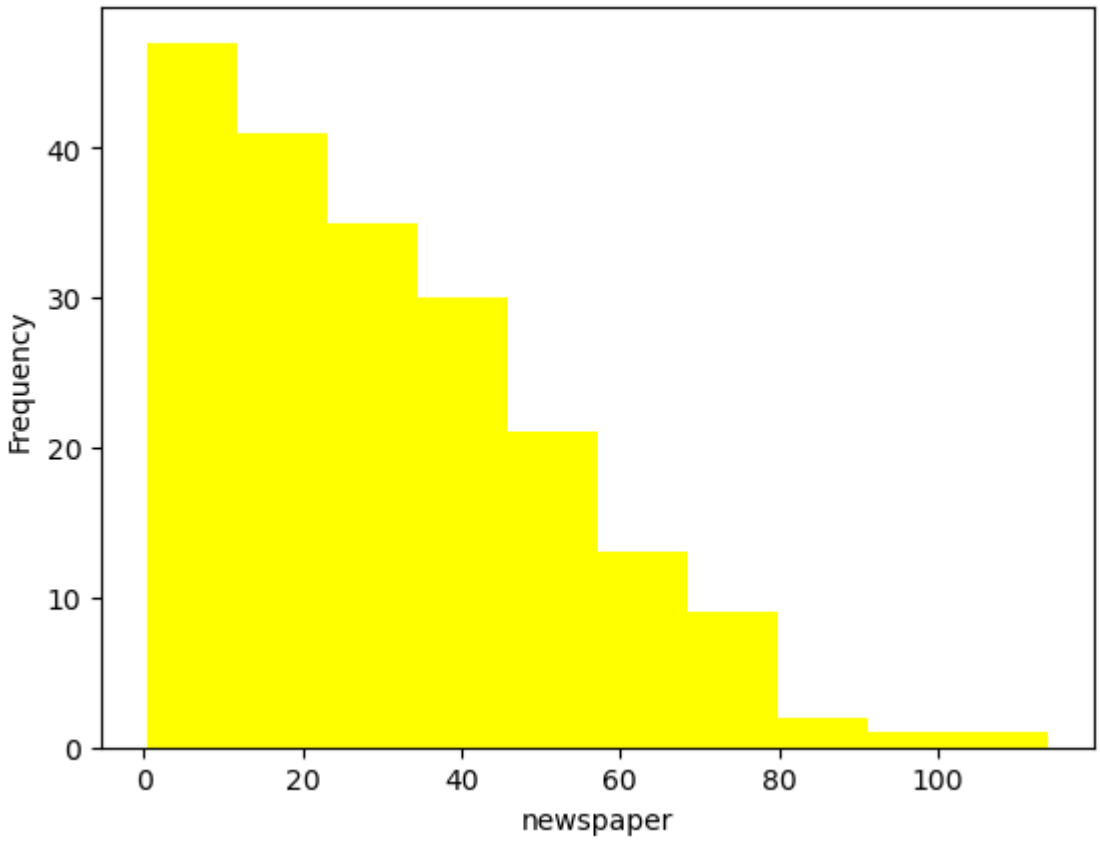
In [34]:
```
df['Radio'].plot.hist(bins=10, color="green", xlabel="Radio")
```

Out[34]:
```
<Axes: xlabel='Radio', ylabel='Frequency'>
```

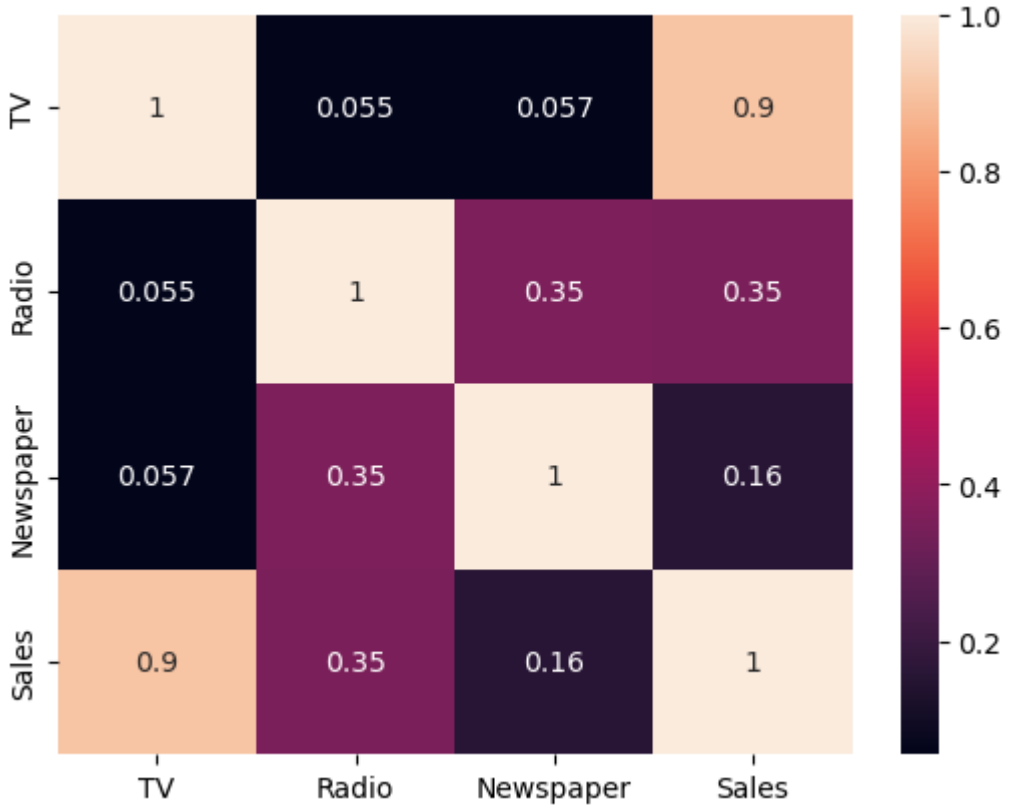


In [50]:
```
df['Newspaper'].plot.hist(bins=10,color="yellow", xlabel="newspaper")
```

Out[50]:
```
<Axes: xlabel='newspaper', ylabel='Frequency'>
```



In [36]:
```
sns.heatmap(df.corr(),annot = True)
plt.show()
```



In [37]:
```
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(df[['TV']], df[['Sales'
```

In [38]:
```
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 [39]:
```
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 [40]:
```
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 [41]:

```
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 [42]:
```
from sklearn.linear_model import LinearRegression
model = LinearRegression()
model.fit(X_train,y_train)
```

Out[42]:
```
▾ LinearRegression

LinearRegression()
```

In [43]:
```
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 [44]:
```
model.coef_
```

Out[44]:
```
array([[0.05473199]])
```

In [45]:
```
model.intercept_
```

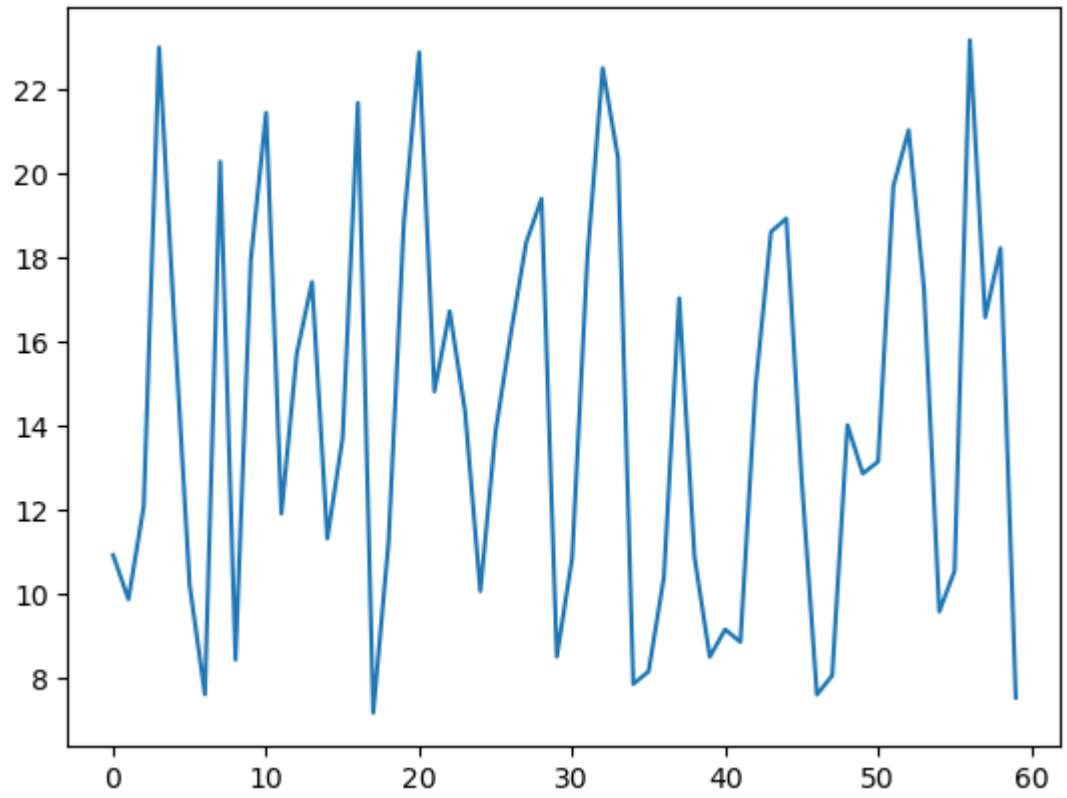
Out[45]:
```
array([7.14382225])
```

In [46]:
```
0.05473199* 69.2 + 7.14382225
```

Out[46]:
```
10.931275958
```

In [47]:
```
plt.plot(res)
```

Out[47]:
```
[<matplotlib.lines.Line2D at 0x2190cfccb90>]
```



In [48]:
```
plt.scatter(X_test, y_test)
plt.plot(X_test, 7.14382225 + 0.05473199 * X_test, 'r')
plt.show()
```