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

```
data=pd.read_csv('Walmart_Store_sales.csv')
```

```
data.head()
```

```
   Store        Date  Weekly_Sales  Holiday_Flag  Temperature
Fuel_Price  \
0      1  05-02-2010    1643690.90             0        42.31
2.572
1      1  12-02-2010    1641957.44             1        38.51
2.548
2      1  19-02-2010    1611968.17             0        39.93
2.514
3      1  26-02-2010    1409727.59             0        46.63
2.561
4      1  05-03-2010    1554806.68             0        46.50
2.625

          CPI  Unemployment
0  211.096358         8.106
1  211.242170         8.106
2  211.289143         8.106
3  211.319643         8.106
4  211.350143         8.106
```

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 6435 entries, 0 to 6434
Data columns (total 8 columns):
 #   Column        Non-Null Count  Dtype  
---  ------        --------------  -----  
 0   Store         6435 non-null   int64  
 1   Date          6435 non-null   object 
 2   Weekly_Sales  6435 non-null   float64
 3   Holiday_Flag  6435 non-null   int64  
 4   Temperature   6435 non-null   float64
 5   Fuel_Price    6435 non-null   float64
 6   CPI           6435 non-null   float64
 7   Unemployment  6435 non-null   float64
dtypes: float64(5), int64(2), object(1)
memory usage: 402.3+ KB
```

```
data['Date']=pd.to_datetime(data['Date'])
```

```
data.Date
```

```
0      2010-05-02
1      2010-12-02
```

```
2      2010-02-19
3      2010-02-26
4      2010-05-03
          ...
6430   2012-09-28
6431   2012-05-10
6432   2012-12-10
6433   2012-10-19
6434   2012-10-26
Name: Date, Length: 6435, dtype: datetime64[ns]
```

```
data.describe()
```

```
             Store  Weekly_Sales  Holiday_Flag  Temperature
Fuel_Price  \
count  6435.000000  6.435000e+03   6435.000000  6435.000000
6435.000000
mean     23.000000  1.046965e+06      0.069930    60.663782
3.358607
std      12.988182  5.643666e+05      0.255049    18.444933
0.459020
min       1.000000  2.099862e+05      0.000000    -2.060000
2.472000
25%      12.000000  5.533501e+05      0.000000    47.460000
2.933000
50%      23.000000  9.607460e+05      0.000000    62.670000
3.445000
75%      34.000000  1.420159e+06      0.000000    74.940000
3.735000
max      45.000000  3.818686e+06      1.000000   100.140000
4.468000


               CPI  Unemployment
count  6435.000000   6435.000000
mean    171.578394      7.999151
std      39.356712      1.875885
min     126.064000      3.879000
25%     131.735000      6.891000
50%     182.616521      7.874000
75%     212.743293      8.622000
max     227.232807     14.313000
```

```
data.isna().sum()
```

```
Store           0
Date            0
Weekly_Sales    0
Holiday_Flag    0
Temperature     0
Fuel_Price      0
CPI             0
```

```
Unemployment    0
dtype: int64
```

```
df=data.groupby('Store')
['Weekly_Sales'].sum().round().sort_values(ascending=False)
df.head(1)
```

```
Store
20    301397792.0
Name: Weekly_Sales, dtype: float64
```

store 20 has got maximum sales

```
dfs=data.groupby('Store')
['Weekly_Sales'].std().round().sort_values(ascending=False)
dfs.head(1)
```

```
Store
14    317570.0
Name: Weekly_Sales, dtype: float64
```

Store 14 has got maximum standard deviation

```
dfg=pd.DataFrame(dfs)
dfg
```

```
       Weekly_Sales
Store
14         317570.0
10         302262.0
20         275901.0
4          266201.0
13         265507.0
23         249788.0
27         239930.0
2          237684.0
39         217466.0
6          212526.0
35         211243.0
19         191723.0
41         187907.0
28         181759.0
18         176642.0
24         167746.0
11         165834.0
22         161251.0
1          155981.0
12         139167.0
32         138017.0
45         130169.0
21         128753.0
31         125856.0
```

```
15          120539.0
40          119002.0
25          112977.0
7           112585.0
17          112163.0
26          110431.0
8           106281.0
34          104630.0
29           99120.0
16           85770.0
9            69029.0
36           60725.0
42           50263.0
3            46320.0
38           42768.0
43           40598.0
5            37738.0
44           24763.0
33           24133.0
30           22810.0
37           21837.0
```

```
dfr=dfg.Weekly_Sales
mean_to_std=dfr.std()/dfr.mean()*100
```

```
mean_to_std
```

```
57.31319188682552
```

```
quaterly_2=data[(data['Date']>='2012-04-01')&(data['Date']<='2012-06-
01')].groupby('Store')['Weekly_Sales'].sum().round()
```

```
quaterly_2
```

```
Store
1     12668560.0
2     15182877.0
3      3363691.0
4     17129626.0
5      2700979.0
6     12103096.0
7      4127903.0
8      7256587.0
9      4503094.0
10    14354671.0
11    10751056.0
12     8105634.0
13    16062365.0
14    15031820.0
15     4582054.0
16     3759754.0
```

```
17     7957484.0
18     8240853.0
19    10838154.0
20    16345164.0
21     5592049.0
22     7806239.0
23    10615957.0
24    10370334.0
25     5508371.0
26     7784268.0
27    13178462.0
28    10386079.0
29     4131687.0
30     3594000.0
31    11120655.0
32     9320624.0
33     2166087.0
34     7833539.0
35     6255679.0
36     2521686.0
37     4274515.0
38     3521214.0
39    12155310.0
40     7534514.0
41    10516909.0
42     4683489.0
43     5094492.0
44     2631045.0
45     6118624.0
Name: Weekly_Sales, dtype: float64
```

```
q3=data[(data['Date']>='2012-07-01')&(data['Date']<='2012-09-
30')].groupby('Store')['Weekly_Sales'].sum()
q3
print("Store {} has {} as maximum sales in
q32012".format(q3.idxmax(),q3.max()))
```

```
Store 4 has 25652119.35 as maximum sales in q32012
```

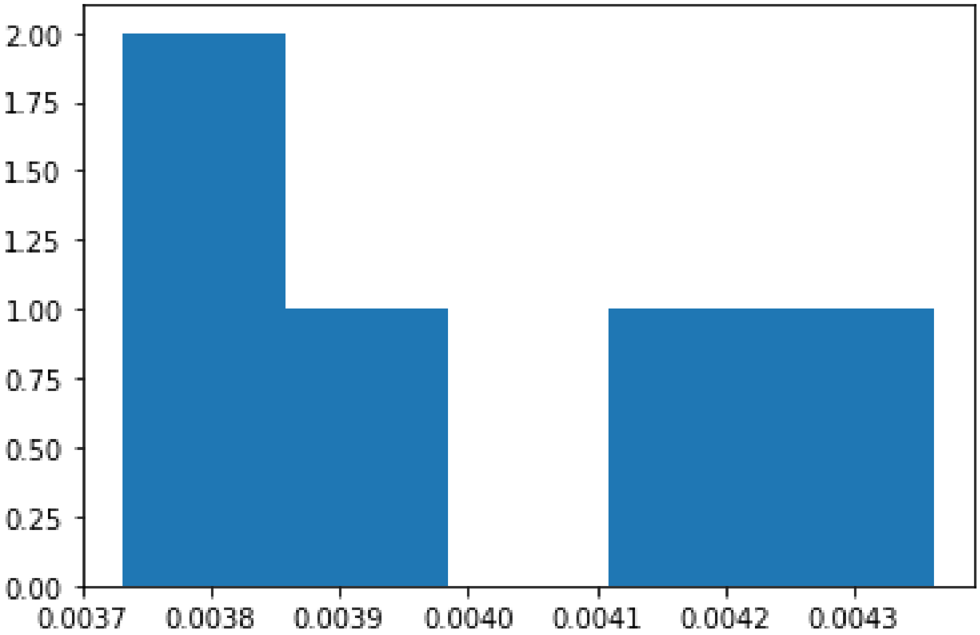
```
q_sales=pd.DataFrame({'Q2':quaterly_2,'Q3':q3,'Diff':q3-
quaterly_2,'Growth':(q3-quaterly_2)/
(q3*100)}).sort_values(by=['Growth'],ascending=False).head()

q_sales
```

```
               Q2           Q3        Diff    Growth
Store
7       4127903.0   7322393.92  3194490.92  0.004363
16      3759754.0   6441311.11  2681557.11  0.004163
35      6255679.0  10252122.68  3996443.68  0.003898
```

```
23     10615957.0  17103654.36  6487697.36  0.003793
26      7784268.0  12417575.35  4633307.35  0.003731
```

```
import matplotlib.pyplot as plt
plt.hist(q_sales.Growth,bins=5)
```

```
(array([2., 1., 0., 1., 1.]),
 array([0.00373125, 0.00385753, 0.0039838 , 0.00411008, 0.00423636,
        0.00436263]),
 <BarContainer object of 5 artists>)
```



```
holiday_sales=data[data.Holiday_Flag==1]
nonholiday_sales=data[data.Holiday_Flag==0]
holiday_sales
type(holiday_sales)
```

```
pandas.core.frame.DataFrame
```

```
SB=['12-02-2010','11-02-2011','10-02-2012','08-02-2013']
store_holiday_sales_superbowl=holiday_sales.loc[holiday_sales.Date.isi
n(SB)]['Weekly_Sales'].sum()
print("Sales during superbowl",store_holiday_sales_superbowl)
LBD=['10-09-2010','09-09-2011','07-09-2012','06-09-2013']
store_holiday_sales_labourday=holiday_sales.loc[holiday_sales.Date.isi
n(LBD)]['Weekly_Sales'].sum()
print("Sales during labour day ",store_holiday_sales_labourday)
TD=['26-11-2010','25-11-2011','23-11-2012','29-11-2013']
store_holiday_sales_thanksgiving=holiday_sales.loc[holiday_sales.Date.
isin(TD)]['Weekly_Sales'].sum()
print("Sales during thanksgiving",store_holiday_sales_thanksgiving)
CS=['31-12-2010','30-12-2011','28-12-2012','27-11-2013']
```

```
store_holiday_sales_christmas=holiday_sales.loc[holiday_sales.Date.isin(CS)]['Weekly_Sales'].sum()
print("Sales during christmas",store_holiday_sales_christmas)
```

```
Sales during superbowl 145682278.34
Sales during labour day  140727684.68
Sales during thanksgiving 132414608.5
Sales during christmas 86474980.03999999
```

```
nonholiday_sales_mean=nonholiday_sales.groupby(['Date']).agg({'Weekly_Sales':'mean'}).round(2)
nonholiday_sales_mean
```

```
            Weekly_Sales
Date
2010-01-10     938663.91
2010-02-04    1120529.58
2010-02-07    1087055.21
2010-02-19    1072822.08
2010-02-26     977079.36
...                  ...
2012-10-08    1053410.02
2012-10-19    1002720.23
2012-10-26    1012091.47
2012-11-05    1042797.31
2012-12-10    1025078.09

[133 rows x 1 columns]
```

```
holiday_sales_sum=holiday_sales.groupby(['Date']).agg({'Weekly_Sales':'sum'}).round(2)
holiday_sales_sum
```

```
            Weekly_Sales
Date
2010-10-09   45634397.84
2010-11-26   65821003.24
2010-12-02   48336677.63
2010-12-31   40432519.00
2011-09-09   46763227.53
2011-11-02   47336192.79
2011-11-25   66593605.26
2011-12-30   46042461.04
2012-07-09   48330059.31
2012-10-02   50009407.92
```

```
import seaborn as sns
```

```
for x in holiday_sales_sum.itertuples():
    for y in nonholiday_sales_mean.itertuples():
        if x.Weekly_Sales > y.Weekly_Sales:
            print("{} Holiday Sales is greater than Non Holiday Sales
and the Sales :- {}".format(x.Index,x.Weekly_Sales))
            break;
```

```
2010-10-09 00:00:00 Holiday Sales is greater than Non Holiday Sales
and the Sales :- 45634397.84
2010-11-26 00:00:00 Holiday Sales is greater than Non Holiday Sales
and the Sales :- 65821003.24
2010-12-02 00:00:00 Holiday Sales is greater than Non Holiday Sales
and the Sales :- 48336677.63
2010-12-31 00:00:00 Holiday Sales is greater than Non Holiday Sales
and the Sales :- 40432519.0
2011-09-09 00:00:00 Holiday Sales is greater than Non Holiday Sales
and the Sales :- 46763227.53
2011-11-02 00:00:00 Holiday Sales is greater than Non Holiday Sales
and the Sales :- 47336192.79
2011-11-25 00:00:00 Holiday Sales is greater than Non Holiday Sales
and the Sales :- 66593605.26
2011-12-30 00:00:00 Holiday Sales is greater than Non Holiday Sales
and the Sales :- 46042461.04
2012-07-09 00:00:00 Holiday Sales is greater than Non Holiday Sales
and the Sales :- 48330059.31
2012-10-02 00:00:00 Holiday Sales is greater than Non Holiday Sales
and the Sales :- 50009407.92
```

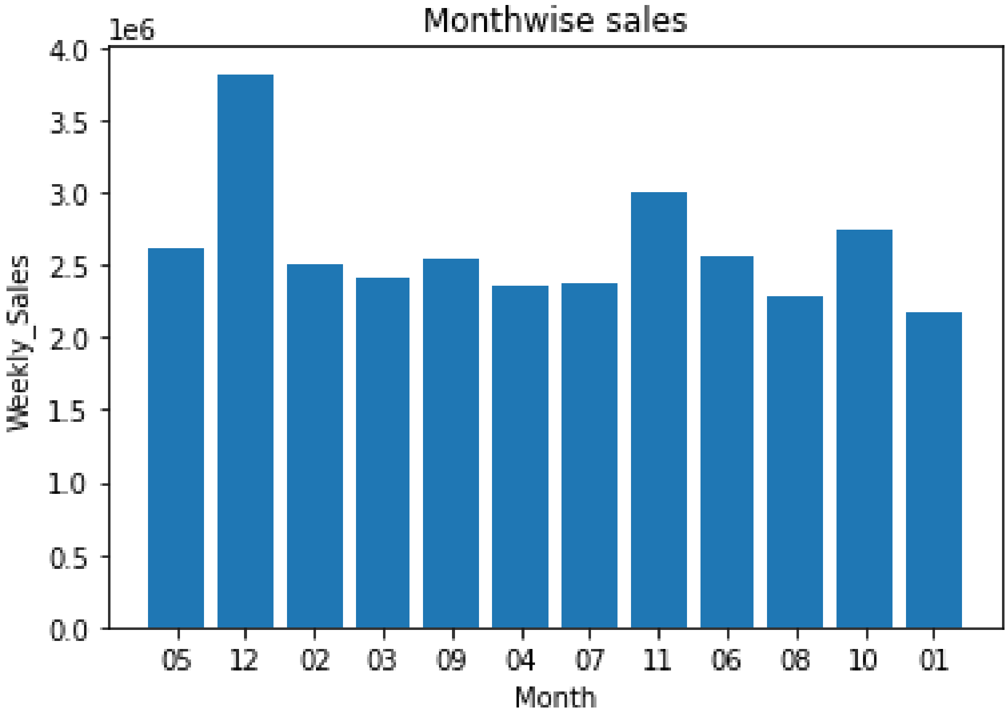
```
data['Months']=data['Date'].apply(lambda x:x.strftime('%m'))
```

```
data['Day']=data['Date'].apply(lambda x:x.strftime('%d'))
```

```
data['Year']=data['Date'].apply(lambda x:x.strftime('%y'))
```

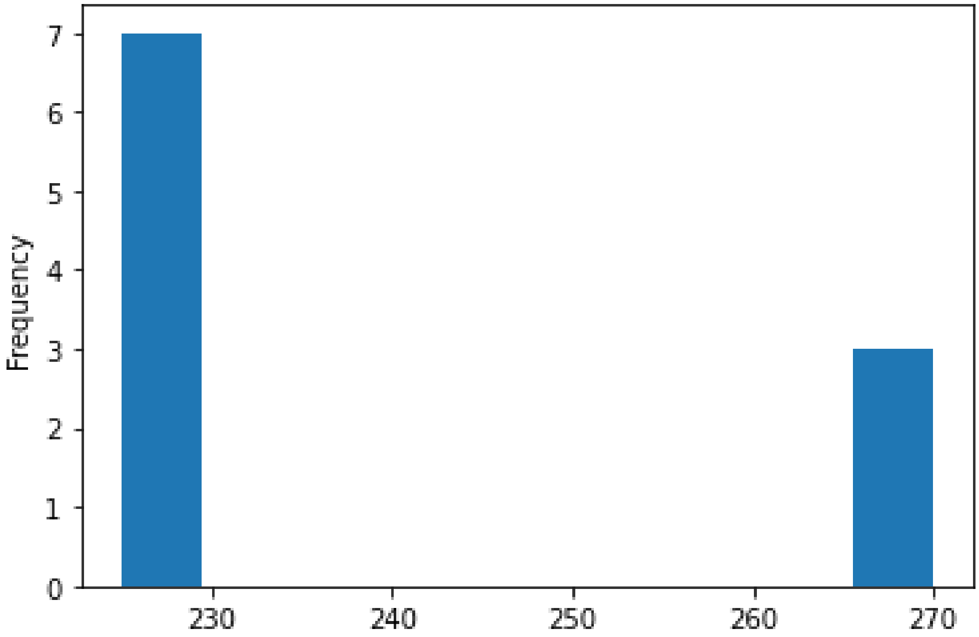
```
plt.bar(data['Months'],data['Weekly_Sales'])
plt.xlabel('Month')
plt.ylabel('Weekly_Sales')
plt.title('Monthwise sales')
```

```
Text(0.5, 1.0, 'Monthwise sales')
```



```
data['Day'].value_counts()[:10].plot(kind='hist')
```

```
<AxesSubplot:ylabel='Frequency'>
```



```
data.index=pd.RangeIndex(start=1,stop=6436,step=1)
data
```

```
      Store       Date  Weekly_Sales  Holiday_Flag  Temperature
Fuel_Price  \
1         1 2010-05-02    1643690.90             0        42.31
2.572
2         1 2010-12-02    1641957.44             1        38.51
2.548
3         1 2010-02-19    1611968.17             0        39.93
2.514
4         1 2010-02-26    1409727.59             0        46.63
2.561
5         1 2010-05-03    1554806.68             0        46.50
2.625
...     ...        ...           ...           ...          ...
...
6431     45 2012-09-28     713173.95             0        64.88
3.997
6432     45 2012-05-10     733455.07             0        64.89
3.985
6433     45 2012-12-10     734464.36             0        54.47
4.000
6434     45 2012-10-19     718125.53             0        56.47
3.969
6435     45 2012-10-26     760281.43             0        58.85
3.882

             CPI  Unemployment Months Day Year
1     211.096358         8.106     05  02   10
2     211.242170         8.106     12  02   10
3     211.289143         8.106     02  19   10
4     211.319643         8.106     02  26   10
5     211.350143         8.106     05  03   10
...          ...           ...    ...  ..  ...
6431  192.013558         8.684     09  28   12
6432  192.170412         8.667     05  10   12
6433  192.327265         8.667     12  10   12
6434  192.330854         8.667     10  19   12
6435  192.308899         8.667     10  26   12

[6435 rows x 11 columns]
```

```
data_part=data[data['Store']==1]
data_part
```

```
     Store       Date  Weekly_Sales  Holiday_Flag  Temperature
Fuel_Price  \
1        1 2010-05-02    1643690.90             0        42.31
2.572
2        1 2010-12-02    1641957.44             1        38.51
2.548
3        1 2010-02-19    1611968.17             0        39.93
```

```
2.514
4        1 2010-02-26    1409727.59             0        46.63
2.561
5        1 2010-05-03    1554806.68             0        46.50
2.625
..     ...        ...           ...           ...          ...
...
139      1 2012-09-28    1437059.26             0        76.08
3.666
140      1 2012-05-10    1670785.97             0        68.55
3.617
141      1 2012-12-10    1573072.81             0        62.99
3.601
142      1 2012-10-19    1508068.77             0        67.97
3.594
143      1 2012-10-26    1493659.74             0        69.16
3.506

            CPI  Unemployment Months Day Year
1    211.096358         8.106     05  02   10
2    211.242170         8.106     12  02   10
3    211.289143         8.106     02  19   10
4    211.319643         8.106     02  26   10
5    211.350143         8.106     05  03   10
..          ...           ...    ...  ..  ...
139  222.981658         6.908     09  28   12
140  223.181477         6.573     05  10   12
141  223.381296         6.573     12  10   12
142  223.425723         6.573     10  19   12
143  223.444251         6.573     10  26   12

[143 rows x 11 columns]
```

```python
x=data_part[['Store','CPI','Unemployment','Day','Months','Year']]

X=data_part[['Store','CPI','Unemployment','Day','Months','Year','Weekly_Sales']]
#df=[{'Store':1,'CPI':223,'Unemployment':11,'Fuel_Price':5.9}]
#x=x.append(df)
```

```python
y=data_part['Weekly_Sales']
Y=data_part['Holiday_Flag']
y.head()
#df1=[{'Store':1,'Weekly_Sales':1645232.22}]
#y=y.append(df1)
```

```
1    1643690.90
2    1641957.44
3    1611968.17
4    1409727.59
```

```
5    1554806.68
Name: Weekly_Sales, dtype: float64
```

```
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_state = 0)
x_train.shape,y_train.shape
```

```
((114, 6), (114,))
```

```
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_state = 0)
X_train.shape,Y_train.shape
```

```
((114, 7), (114,))
```

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

```
LinearRegression()
```

```
pred=sc.predict(x_test)
```

```
pred
```

```
array([1546705.26697127, 1668701.10445977, 1427615.35339617,
       1544165.42012317, 1573357.04891571, 1448555.32543149,
       1614051.26165692, 1508366.12307374, 1597358.82483007,
       1524581.07240867, 1604250.95992181, 1592103.75204   ,
       1542018.27358506, 1679541.54227829, 1660220.80519283,
       1492464.04431375, 1578317.30111606, 1522253.37302981,
       1561329.46036225, 1475838.39073492, 1481734.07886227,
       1519437.07162968, 1546751.22489451, 1561662.41567057,
       1516005.85203333, 1602014.86331816, 1636576.55945427,
       1523529.56150459, 1564696.92170903])
```

```
print("Train Accuracy",sc.score(x_train,y_train)*100)
```

```
Train Accuracy 20.693668397188148
```

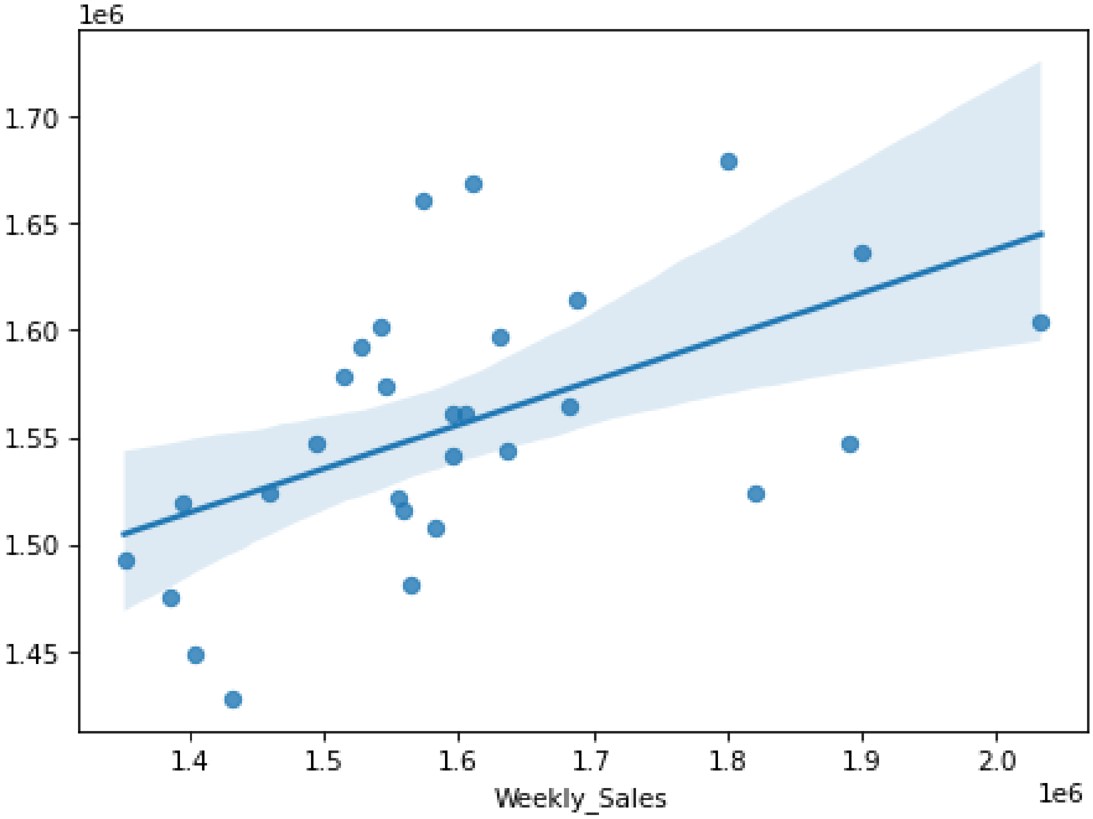
```
from sklearn.metrics import mean_absolute_error,mean_squared_error
print('Mean Absolute Error:', mean_absolute_error(y_test,
pred).round(3))
print('Mean Squared Error:', mean_squared_error(y_test,
pred).round(3))
print('Root Mean Squared Error:', np.sqrt(mean_squared_error(y_test,
pred)).round(3))
```

```
plt.figure(figsize=(7,5), dpi=75)
sns.regplot(y_test, pred)
```

```
Mean Absolute Error: 104088.849
Mean Squared Error: 20706744113.811
Root Mean Squared Error: 143898.381
```

```
C:\Users\MONIKA\AppData\Roaming\Python\Python38\site-packages\seaborn\
_decorators.py:36: FutureWarning: Pass the following variables as
keyword args: x, y. From version 0.12, the only valid positional
argument will be `data`, and passing other arguments without an
explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```

```
<AxesSubplot:xlabel='Weekly_Sales'>
```



```
from sklearn.ensemble import RandomForestRegressor
r1 = RandomForestRegressor()
r1.fit(x_train,y_train)
```

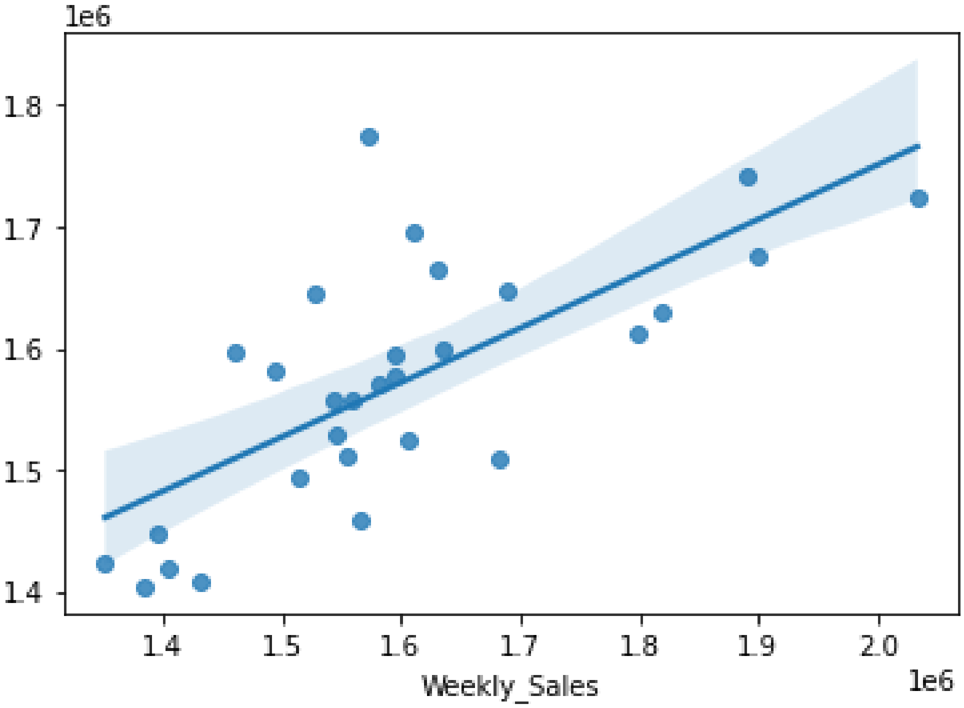
```
RandomForestRegressor()
```

```
from sklearn.metrics import
r2_score,mean_absolute_error,mean_squared_error
y_pred = r1.predict(x_test)
print("Accuracy:",r1.score(x_train,y_train).round(5)*100)
print("R2_Score:", r2_score(y_test, y_pred).round(5)*100)
print("Mean Absolute Error:", mean_absolute_error(y_test, y_pred))
print("Mean Squared Error:", mean_squared_error(y_test, y_pred))
print("Root Mean Squared Error:",np.sqrt(mean_squared_error(y_test,
y_pred)))
sns.regplot(y_test,y_pred)
```

```
Accuracy: 87.82600000000001
R2_Score: 46.861000000000004
Mean Absolute Error: 85356.03821724119
Mean Squared Error: 13551173909.47711
Root Mean Squared Error: 116409.50953198415
```

```
C:\Users\MONIKA\AppData\Roaming\Python\Python38\site-packages\seaborn\
_decorators.py:36: FutureWarning: Pass the following variables as
keyword args: x, y. From version 0.12, the only valid positional
argument will be `data`, and passing other arguments without an
explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```

```
<AxesSubplot:xlabel='Weekly_Sales'>
```



```
data
```

```
      Store       Date  Weekly_Sales  Holiday_Flag  Temperature
Fuel_Price  \
1         1 2010-05-02    1643690.90             0        42.31
2.572
2         1 2010-12-02    1641957.44             1        38.51
2.548
3         1 2010-02-19    1611968.17             0        39.93
2.514
```

```
4         1 2010-02-26    1409727.59             0        46.63
2.561
5         1 2010-05-03    1554806.68             0        46.50
2.625
...     ...        ...           ...           ...          ...
...
6431     45 2012-09-28     713173.95             0        64.88
3.997
6432     45 2012-05-10     733455.07             0        64.89
3.985
6433     45 2012-12-10     734464.36             0        54.47
4.000
6434     45 2012-10-19     718125.53             0        56.47
3.969
6435     45 2012-10-26     760281.43             0        58.85
3.882

             CPI  Unemployment Months Day Year
1     211.096358         8.106     05  02   10
2     211.242170         8.106     12  02   10
3     211.289143         8.106     02  19   10
4     211.319643         8.106     02  26   10
5     211.350143         8.106     05  03   10
...          ...           ...    ...  ..  ...
6431  192.013558         8.684     09  28   12
6432  192.170412         8.667     05  10   12
6433  192.327265         8.667     12  10   12
6434  192.330854         8.667     10  19   12
6435  192.308899         8.667     10  26   12

[6435 rows x 11 columns]
```

```
from sklearn.linear_model import LogisticRegression
s1=LogisticRegression()
```

```
s1.fit(X_train,Y_train)
```

```
LogisticRegression()
```

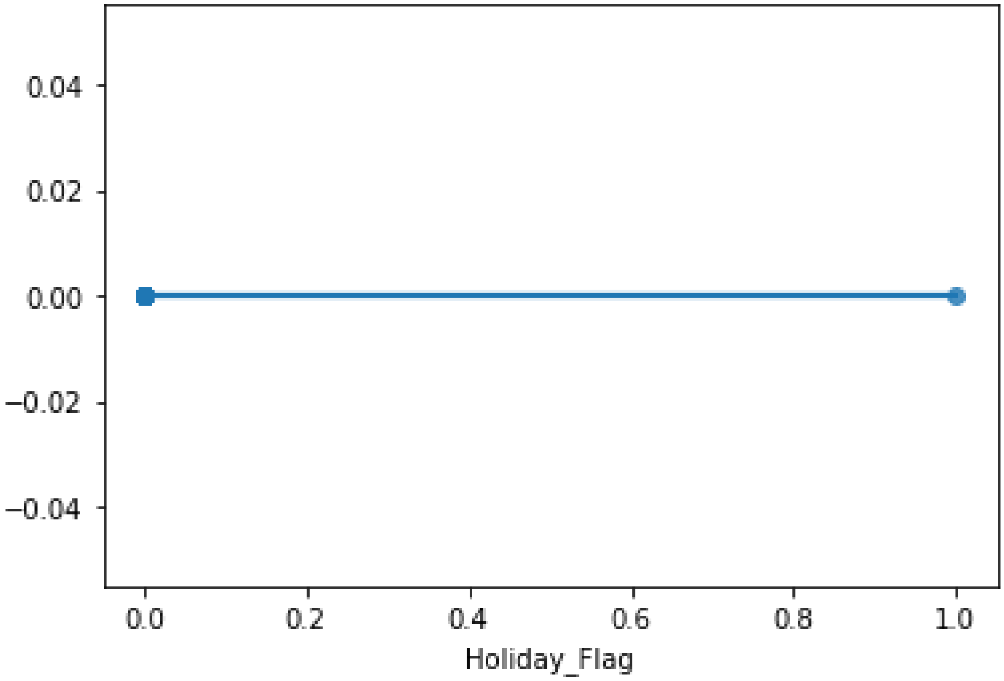
```
spred=s1.predict(X_test)
```

```
spred
```

```
array([0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
0,
       0, 0, 0, 0, 0, 0, 0], dtype=int64)
```

```
from sklearn.metrics import r2_score,mean_absolute_error
print("Accuracy:",s1.score(X_train,Y_train).round(5)*100)
print("Mean Absolute Error:", mean_absolute_error(Y_test, spred))
print("Mean Squared Error:", mean_squared_error(Y_test, spred))
print("Root Mean Squared Error:",np.sqrt(mean_squared_error(Y_test,
spred)))

sns.regplot(Y_test,spred)
```

```
Accuracy: 92.105
Mean Absolute Error: 0.034482758620689655
Mean Squared Error: 0.034482758620689655
Root Mean Squared Error: 0.18569533817705186

C:\Users\MONIKA\AppData\Roaming\Python\Python38\site-packages\seaborn\
_decorators.py:36: FutureWarning: Pass the following variables as
keyword args: x, y. From version 0.12, the only valid positional
argument will be `data`, and passing other arguments without an
explicit keyword will result in an error or misinterpretation.
  warnings.warn(

<AxesSubplot:xlabel='Holiday_Flag'>
```



```
data["Which day"]=pd.to_datetime(data["Date"]).dt.day_name()

data
```

```
      Store       Date  Weekly_Sales  Holiday_Flag  Temperature
Fuel_Price  \
1         1 2010-05-02    1643690.90             0        42.31
2.572
2         1 2010-12-02    1641957.44             1        38.51
2.548
3         1 2010-02-19    1611968.17             0        39.93
```

```
2.514
4         1 2010-02-26    1409727.59             0        46.63
2.561
5         1 2010-05-03    1554806.68             0        46.50
2.625
...     ...        ...           ...           ...          ...
...
6431     45 2012-09-28     713173.95             0        64.88
3.997
6432     45 2012-05-10     733455.07             0        64.89
3.985
6433     45 2012-12-10     734464.36             0        54.47
4.000
6434     45 2012-10-19     718125.53             0        56.47
3.969
6435     45 2012-10-26     760281.43             0        58.85
3.882

             CPI  Unemployment Months Day Year Which day
1     211.096358         8.106     05  02   10    Sunday
2     211.242170         8.106     12  02   10  Thursday
3     211.289143         8.106     02  19   10    Friday
4     211.319643         8.106     02  26   10    Friday
5     211.350143         8.106     05  03   10    Monday
...          ...           ...    ...  ..  ...       ...
6431  192.013558         8.684     09  28   12    Friday
6432  192.170412         8.667     05  10   12  Thursday
6433  192.327265         8.667     12  10   12    Monday
6434  192.330854         8.667     10  19   12    Friday
6435  192.308899         8.667     10  26   12    Friday

[6435 rows x 12 columns]
```