In [ ]:
```
91.330002       88.254997       88.407501
```

In [ ]:
```
50 million rows of data(records) and 100 features(columns)-----> 5 billion
```

In [ ]:
```
#pick only the useful ones


"""
what if correlation of every feature with target column is almost the same???????????
"""
```

In [ ]:
```
PCA
"""
feature selection
dimensionality reduction
"""
```

In [1]:
```
import sklearn
```

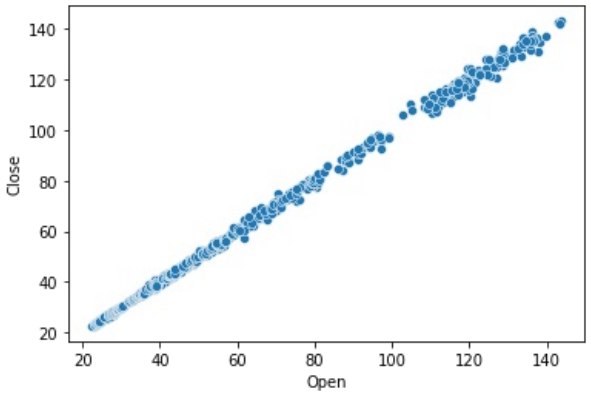
In [2]:
```
import pandas as pd
import seaborn as sns
df=pd.read_csv( "/home/harshit/Downloads/AAPL.csv")
df.sample(5)
```

Out[2]:

	Date	Open	High	Low	Close	Adj Close	Volume
1099	2020-06-26	91.102501	91.330002	88.254997	88.407501	87.964951	205256800
366	2017-07-28	37.472500	37.557499	37.297501	37.375000	35.644234	68854800
1116	2020-07-22	96.692497	97.974998	96.602501	97.272499	96.785568	89001600
732	2019-01-11	38.220001	38.424999	37.877499	38.072498	37.132290	108092800
265	2017-03-06	34.842499	34.942501	34.650002	34.834999	33.085289	87000000

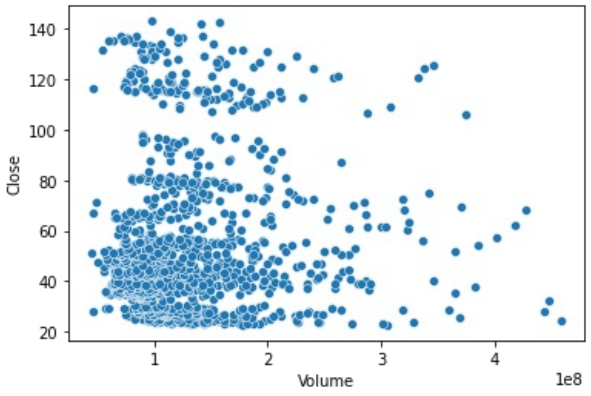
In [3]:
```
sns.scatterplot( x='Open', y = 'Close', data=df  )
```

Out[3]:
```
<AxesSubplot:xlabel='Open', ylabel='Close'>
```



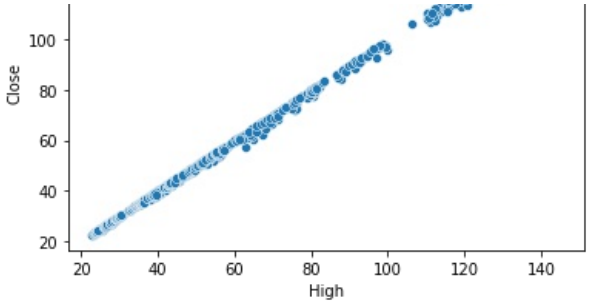
In [4]:
```
sns.scatterplot( x='Volume', y = 'Close', data=df  )
```

Out[4]:
```
<AxesSubplot:xlabel='Volume', ylabel='Close'>
```



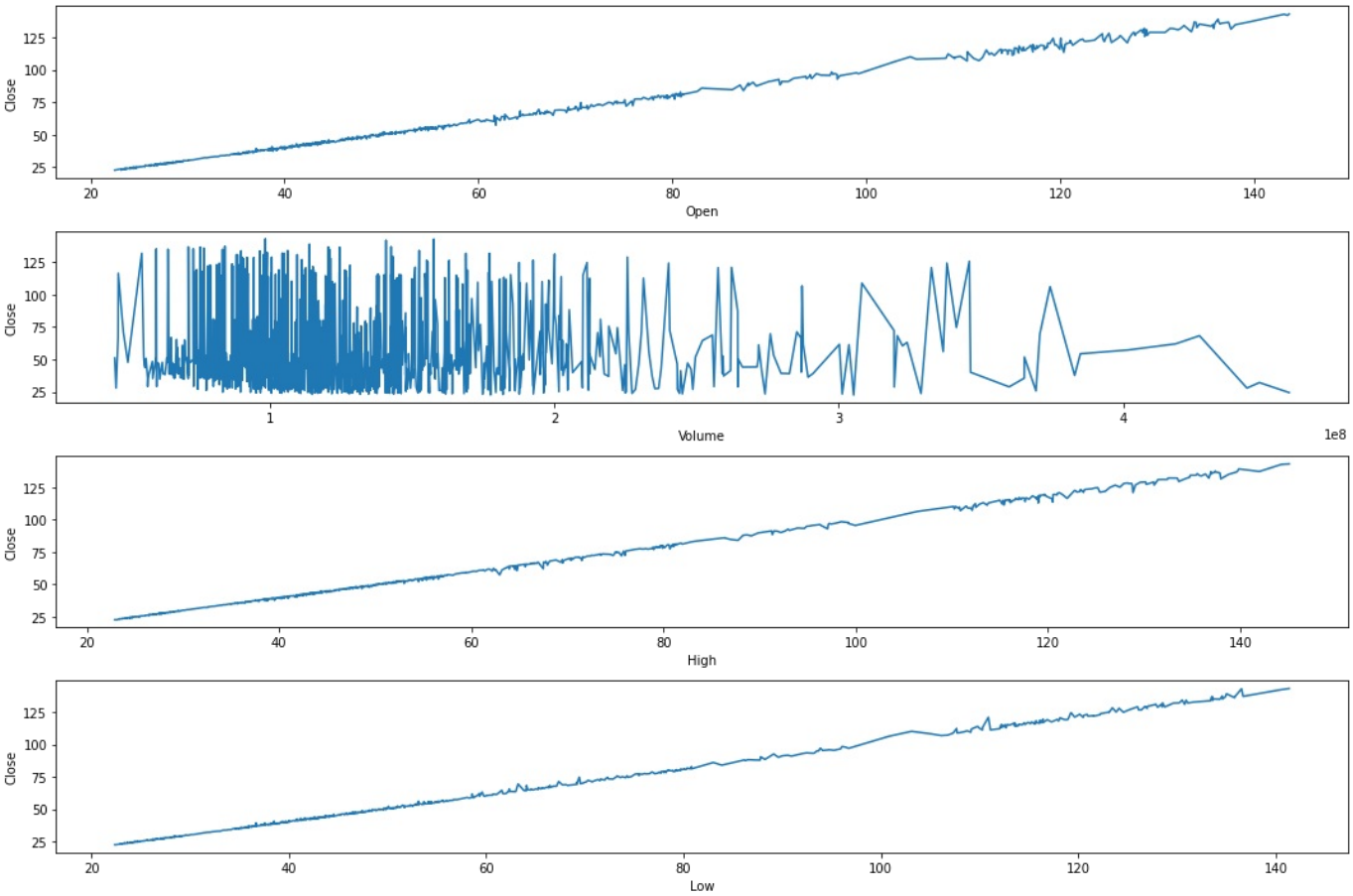
In [5]:
```
sns.scatterplot( x='High', y = 'Close', data=df  )
```

Out[5]:
```
<AxesSubplot:xlabel='High', ylabel='Close'>
```

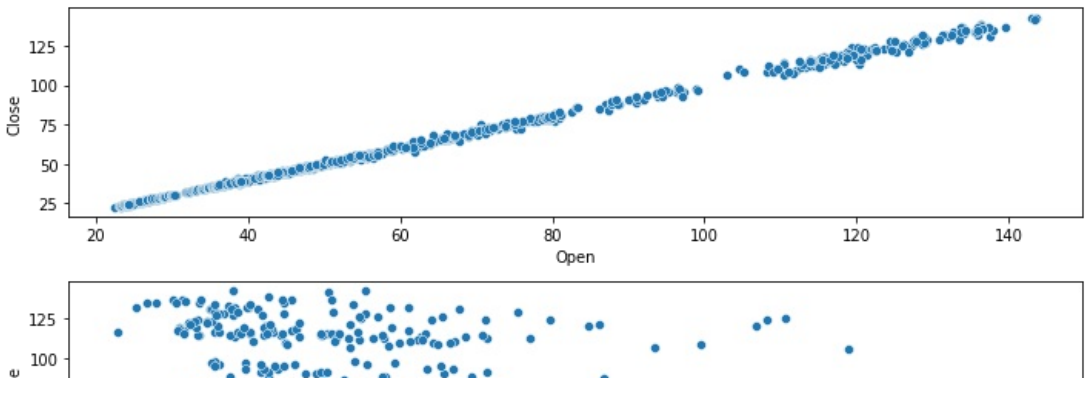


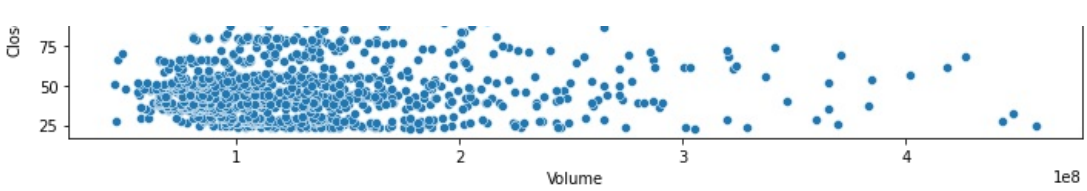
In [6]:
```
features=[  'Open', 'Volume', 'High', 'Low' ]
#close
```

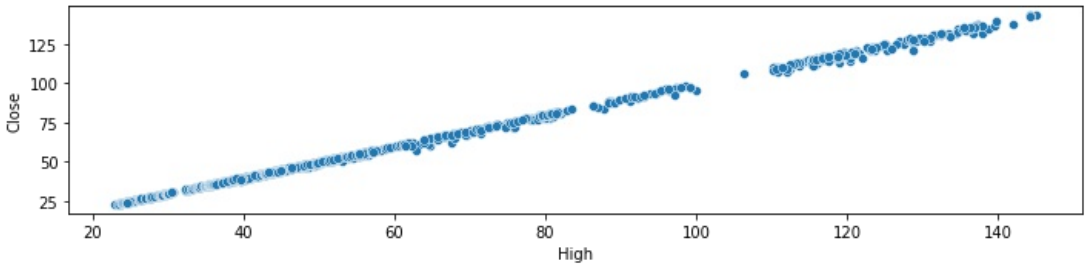
In [7]:
```
import matplotlib.pyplot as plt
fig, ax = plt.subplots(4,1, figsize=(15,10))

for idx,attribute in enumerate(features):
    sns.lineplot(x=attribute, y='Close',data=df,ax=ax[idx])

plt.tight_layout()
plt.show()
```

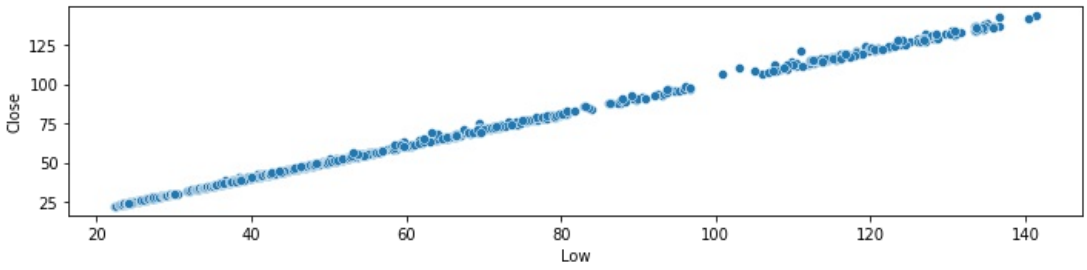


In [8]:
```
features=[  'Open', 'Volume', 'High', 'Low' ]
import matplotlib.pyplot as plt
fig, ax = plt.subplots(4,1, figsize=(10,10))

for idx,attribute in enumerate(features):
    sns.scatterplot(x=attribute, y='Close',data=df,ax=ax[idx])

plt.tight_layout()
plt.show()
```









In [9]:
```
df.corr()[['Close']] #coefficient of correlation
```

Out[9]:

	Close
Open	0.999395
High	0.999680
Low	0.999697
Close	1.000000
Adj Close	0.999948
Volume	0.040214

In [10]:
```
features=df[['Open','Low','High']]
features.sample(2)
```

Out[10]:

	Open	Low	High
299	35.875	35.794998	35.987499
112	24.205	24.105000	24.492500

In [11]:
```
target=df[['Close']] #target

target.sample(2)
```

Out[11]:

	Close
416	38.959999
986	77.834999

In [12]:
```
features.shape
```

Out[12]:
```
(1259, 3)
```

In [13]:
```
features.isna().sum()
```

Out[13]:
```
Open    0
Low     0
High    0
dtype: int64
```

In [14]:
```
target.isna().sum()
```

Out[14]:
```
Close    0
dtype: int64
```

In [15]:
```
#dropping records / rows with missing values

#IF ANY COLUMN IN A SINGLE row HAS MISSING VALUE
#IF ALL COLUMNS IN A SINGLE ROW HAVE MISSING VALUE

features.dropna(axis=0, how='any',inplace=True)
```

```
target.dropna(axis=0, how='any',inplace=True)
```

```
<ipython-input-15-b9eea41cbf96>:6: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  features.dropna(axis=0, how='any',inplace=True)
<ipython-input-15-b9eea41cbf96>:7: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  target.dropna(axis=0, how='any',inplace=True)
```

In [16]:
```
features.isna().sum()
```

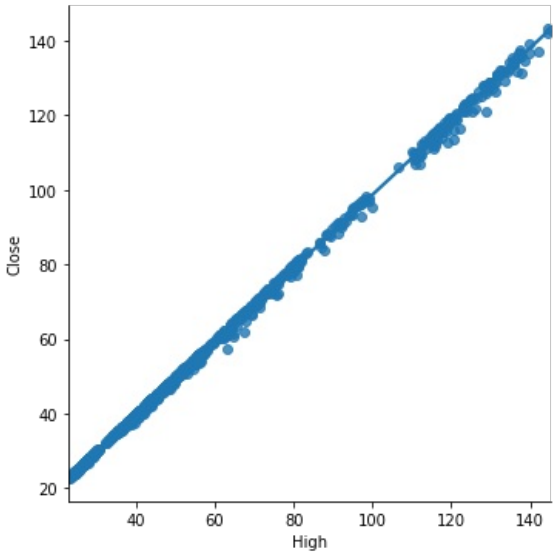
Out[16]:
```
Open    0
Low     0
High    0
dtype: int64
```

In [17]:
```
target.isna().sum()
```

Out[17]:
```
Close    0
dtype: int64
```

In [19]:
```
sns.lmplot(x='High',y='Close',data=df,)
```

Out[19]:
```
<seaborn.axisgrid.FacetGrid at 0x7f6f6f2c1820>
```



In [20]:
```
features
```

Out[20]:

	Open	Low	High
0	23.754999	23.652500	24.212500
1	24.167500	24.037500	24.552500
2	24.709999	24.022499	24.722500
3	24.000000	23.950001	24.190001
4	24.077499	23.980000	24.225000
...	...	...	...
1254	136.029999	134.919998	136.960007
1255	136.619995	135.850006	137.880005
1256	136.479996	134.399994	136.990005
1257	135.899994	133.770004	136.389999
1258	134.350006	133.690002	135.529999

1259 rows × 3 columns

In [21]:
```
target
```

Out[21]:

	Close
0	24.160000
1	24.530001

2	24.065001
3	24.010000
4	24.219999
...	...
1254	136.910004
1255	136.009995
1256	135.389999
1257	135.130005
1258	135.369995

1259 rows × 1 columns

In [22]:
```
#if you have highly correlated records, go for lower percentage of testing

from sklearn.model_selection import train_test_split

x_train, x_test, y_train, y_test = train_test_split(features,target,test_size=0.2)
```

In [23]:
```
x_train
```

Out[23]:

	Open	Low	High
18	25.559999	25.375000	25.570000
378	40.165001	40.035000	40.549999
285	35.927502	35.762501	36.029999
876	50.049999	49.847500	50.882500
806	50.764999	49.777500	50.849998
...	...	...	...
502	39.625000	39.377499	40.972500
26	26.620001	26.475000	26.767500
778	46.557499	46.182499	47.372501
1197	119.440002	117.870003	119.669998
905	55.502499	55.092499	55.939999

1007 rows × 3 columns

In [24]:
```
x_test
```

Out[24]:

	Open	Low	High
489	44.312500	43.299999	44.325001
1096	91.000000	90.567497	93.095001
807	52.470001	52.307499	53.827499
891	52.125000	51.665001	52.330002
1017	70.570000	69.430000	75.360001
...	...	...	...
817	46.567501	46.505001	47.937500
141	26.975000	26.877501	27.075001
413	38.407501	38.115002	38.465000
556	41.602501	41.317501	42.299999
14	25.597500	25.240000	25.707500

252 rows × 3 columns

In [25]:
```
from sklearn.linear_model import LinearRegression

model = LinearRegression()
```

In [26]:
```
#training step

model.fit(  x_train, y_train ) #multivariate linear regression
```

Out[26]:
```
LinearRegression()
```

In [27]:
```
model.score(x_train, y_train) #R squared value--->
```

Out[27]:
```
0.9997012259359366
```

In [28]:
```
predicted_values=pd.DataFrame( model.predict( x_test  ) )



predicted_values
```

Out[28]:

	0
0	43.571337
1	92.248806
2	53.358793
3	51.952016
4	73.211341
...	...
247	47.536774
248	26.981788
249	38.244169
250	41.910805
251	25.411654

252 rows × 1 columns

In [29]:
```
y_test
```

Out[29]:

	Close
489	43.555000
1096	91.632500
807	52.630001
891	52.252499
1017	74.702499
...	...
817	47.730000
141	26.924999
413	38.369999
556	42.275002
14	25.467501

252 rows × 1 columns

In [30]:
```
y_test.reset_index(inplace=True,drop=True)

y_test
# y_test.drop(columns='index',inplace=True)
```

Out[30]:

	Close
0	43.555000
1	91.632500
2	52.630001
3	52.252499
4	74.702499
...	...
247	47.730000
248	26.924999
249	38.369999
250	42.275002
251	25.467501

252 rows × 1 columns

In [31]:
```
ans=pd.concat( [predicted_values, y_test],
          ignore_index=True,
          axis=1,
         )
# ans
ans.rename(  columns={0:'Predicted', 1: 'Actual'},inplace=True  )
```

In [32]:
```
ans
```

Out[32]:

	Predicted	Actual
0	43.571337	43.555000
1	92.248806	91.632500
2	53.358793	52.630001
3	51.952016	52.252499
4	73.211341	74.702499
...	...	...
247	47.536774	47.730000
248	26.981788	26.924999
249	38.244169	38.369999
250	41.910805	42.275002
251	25.411654	25.467501

252 rows × 2 columns

In [33]:
```
model.coef_
```

Out[33]:
```
array([[-0.48715416,  0.76424593,  0.72375407]])
```

In [34]:
```
model.intercept_ #y_intercept
```

Out[34]:
```
array([-0.01389159])
```

In [35]:
```
from sklearn.metrics import r2_score
r2_score(predicted_values, y_test)
```

Out[35]:
```
0.9997053456046444
```

In [36]:
```
from sklearn.metrics import mean_absolute_error
mean_absolute_error(predicted_values, y_test)
```

Out[36]:
```
0.2709800190594849
```

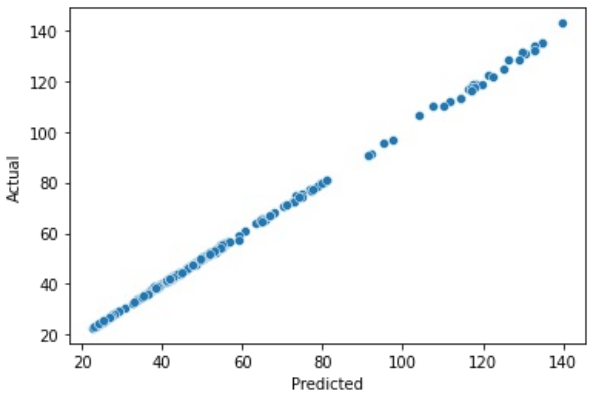
In [37]:
```
from sklearn.metrics import mean_squared_error
mean_squared_error(predicted_values, y_test)
```

Out[37]:
```
0.23519835614563858
```

In [38]:
```
#y =  m1x1 + m2x2 + m3x3 + ..... + mnxn + C
```

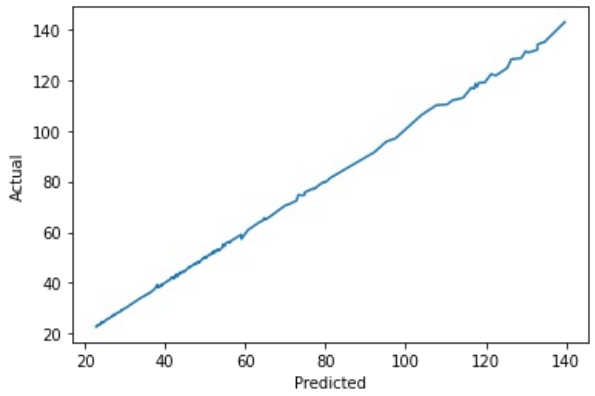
In [39]:
```
sns.scatterplot( x='Predicted', y='Actual',data=ans  )
```

Out[39]:
```
<AxesSubplot:xlabel='Predicted', ylabel='Actual'>
```



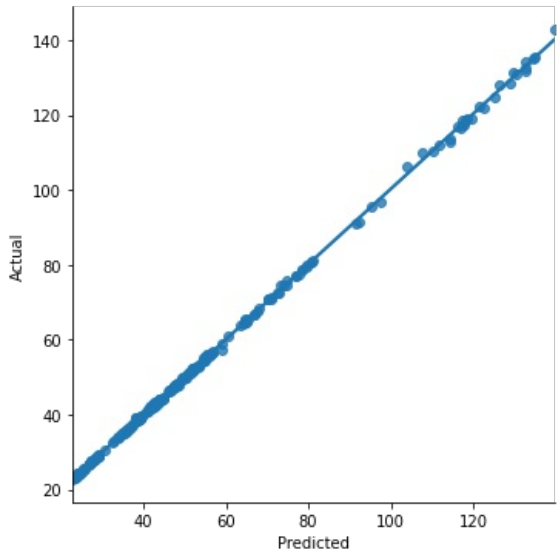
In [40]:
```
sns.lineplot( x='Predicted', y='Actual',data=ans )
```

Out[40]:
```
<AxesSubplot:xlabel='Predicted', ylabel='Actual'>
```



In [41]:
```
sns.lmplot( x='Predicted', y='Actual',data=ans )
```

Out[41]:
```
<seaborn.axisgrid.FacetGrid at 0x7f6f6f11a8b0>
```



In [42]:
```
ans.corr()
```

Out[42]:

	Predicted	Actual
Predicted	1.000000	0.999868
Actual	0.999868	1.000000

In [43]:
```
features.shape
```

Out[43]:
```
(1259, 3)
```

In [44]:
```
"""
we can create csv file or excel file
"""
```

Out[44]:
```
'\nwe can create csv file or excel file\n'
```

In [45]:
```
import numpy as np

l1= [  [311.21, 309.43, 314.65]  ]

data=np.array(   l1  )
```

In [46]:
```
model.predict(data) #close
```

Out[46]:
```
array([[312.58869451]])
```

In [47]:
```
def make_prediction():
    f1=float(input("Enter the opening price: "))
    f2=float(input("Enter the Low price: "))
    f3=float(input("Enter the High price: "))
    data=np.array(  [  [f1,f2,f3]  ]  )
    print(f"The closing price based on your input SHOULD BE: {model.predict(data)}")
```

In [48]:
```
make_prediction() #function call
```

```
Enter the opening price: 343
Enter the Low price: 340
Enter the High price: 350
```

```
The closing price based on your input SHOULD BE: [[346.0497678]]
```

In [ ]:

In [ ]: