In [1]:

```
import pandas as pd
from matplotlib import pyplot as plt
%matplotlib inline
import seaborn as sns
import numpy as np
from scipy import stats
import statsmodels.formula.api as smf

import warnings
warnings.filterwarnings('ignore')
```

1)

In [2]:

```
delivery_data =pd.read_csv('delivery_time.csv')
delivery_data
```

Out[2]:

	Delivery Time	Sorting Time
0	21.00	10
1	13.50	4
2	19.75	6
3	24.00	9
4	29.00	10
5	15.35	6
6	19.00	7
7	9.50	3
8	17.90	10
9	18.75	9
10	19.83	8
11	10.75	4
12	16.68	7
13	11.50	3
14	12.03	3
15	14.88	4
16	13.75	6
17	18.11	7
18	8.00	2
19	17.83	7
20	21.50	5

In [3]:
```
delivery_data.shape
```

Out[3]:
```
(21, 2)
```

In [4]:
```
delivery_data.isna().sum()
```

Out[4]:
```
Delivery Time    0
Sorting Time     0
dtype: int64
```

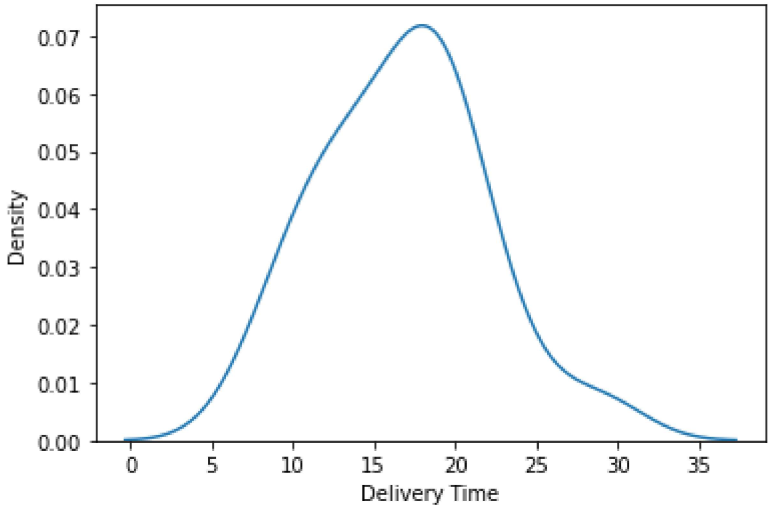
In [5]:
```
delivery_data.dtypes
```

Out[5]:
```
Delivery Time    float64
Sorting Time       int64
dtype: object
```

In [6]:
```
delivery_data.info(show_counts = all)
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 21 entries, 0 to 20
Data columns (total 2 columns):
 #   Column         Non-Null Count  Dtype  
---  ------         --------------  -----  
 0   Delivery Time  21 non-null     float64
 1   Sorting Time   21 non-null     int64  
dtypes: float64(1), int64(1)
memory usage: 464.0 bytes
```

In [7]:
```
sns.distplot(a=delivery_data['Delivery Time'],hist=False)
plt.show()
```



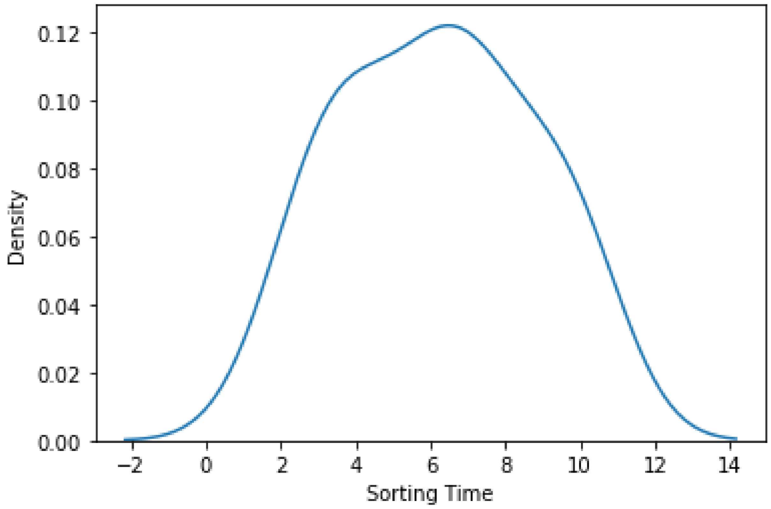
In [8]:
```
delivery_data['Delivery Time'].skew()
```

Out[8]:
```
0.3523900822831107
```

In [9]:
```
delivery_data['Delivery Time'].kurtosis()
```

Out[9]:
```
0.31795982942685397
```

In [10]:
```
sns.distplot(a=delivery_data['Sorting Time'],hist=False)
plt.show()
```



In [11]:
```
delivery_data['Sorting Time'].skew()
```

Out[11]:
```
0.047115474210530174
```

In [12]:
```
delivery_data['Sorting Time'].kurtosis()
```

Out[12]:
```
-1.14845514534878
```

In [13]:
```
delivery_data = delivery_data.rename({'Delivery Time':'Delivery_Time','Sorting Ti
```

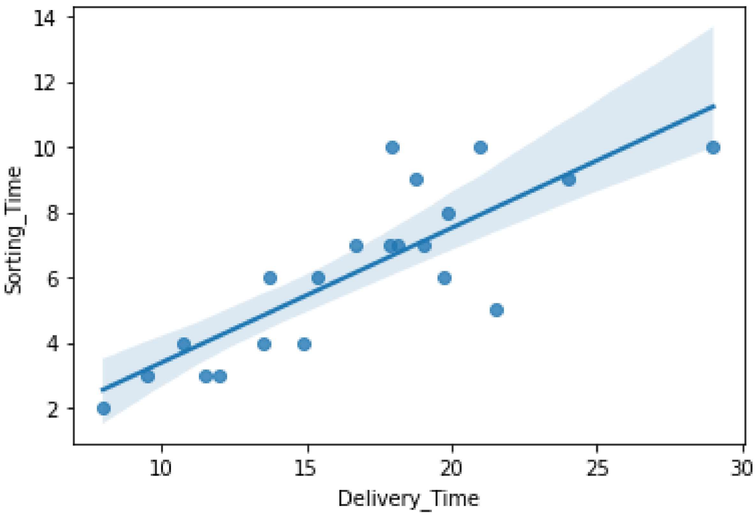
In [14]:
```
delivery_data.corr()
```

Out[14]:

	Delivery_Time	Sorting_Time
Delivery_Time	1.000000	0.825997
Sorting_Time	0.825997	1.000000

In [15]:

```
sns.regplot(x=delivery_data['Delivery_Time'],y=delivery_data['Sorting_Time'])
plt.show()
```



In [16]:

```
model = smf.ols(formula = 'Delivery_Time ~ Sorting_Time',data= delivery_data).fit
```

In [17]:

```
model.params
```

Out[17]:

```
Intercept       6.582734
Sorting_Time    1.649020
dtype: float64
```

In [18]:

```
model.pvalues,model.tvalues
```

Out[18]:

```
(Intercept       0.001147
 Sorting_Time    0.000004
 dtype: float64,
 Intercept       3.823349
 Sorting_Time    6.387447
 dtype: float64)
```

In [19]:

```
round(model.rsquared,4),round(model.rsquared_adj,4)
```

Out[19]:

```
(0.6823, 0.6655)
```

In [20]:

```
delivery_time = 6.582734+(1.649020*6)
delivery_time
```

Out[20]:

```
16.476854
```

In [21]:

```
test_data = pd.DataFrame(data={'Sorting_Time':[5,6,7,8]})
```

In [22]:
```
test_data
```

Out[22]:

	Sorting_Time
0	5
1	6
2	7
3	8

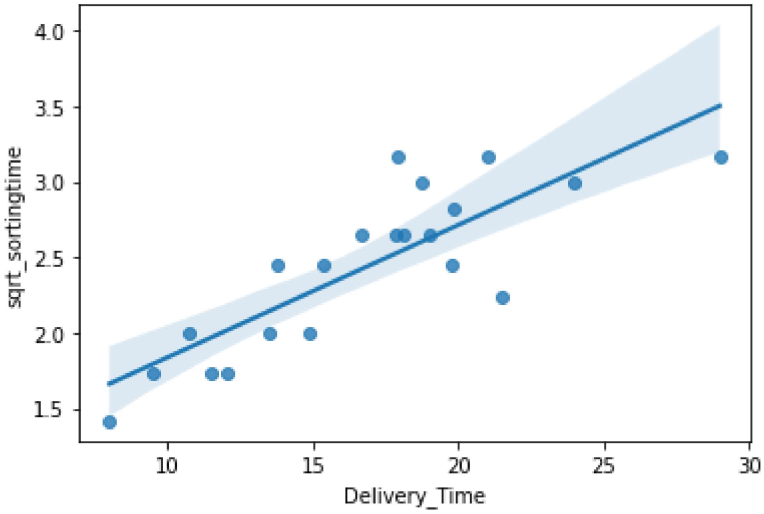
In [23]:
```
model.predict(test_data)
```

Out[23]:
```
0    14.827833
1    16.476853
2    18.125873
3    19.774893
dtype: float64
```

In [61]:
```
x_sqrt = np.sqrt(delivery_data['Sorting_Time'])
delivery_data['sqrt_sortingtime'] = pd.DataFrame(x_sqrt)
delivery_data
```

6	19.00	7	2.645751
7	9.50	3	1.732051
8	17.90	10	3.162278
9	18.75	9	3.000000
10	19.83	8	2.828427
11	10.75	4	2.000000
12	16.68	7	2.645751
13	11.50	3	1.732051
14	12.03	3	1.732051
15	14.88	4	2.000000
16	13.75	6	2.449490
17	18.11	7	2.645751
18	8.00	2	1.414214

```
In [62]: sns.regplot(x=delivery_data['Delivery_Time'],y=delivery_data['sqrt_sortingtime'])
         plt.show()
```



```
In [64]: sqrt_model = smf.ols(formula = 'Delivery_Time ~sqrt_sortingtime',data= delivery_d
```

```
In [65]: sqrt_model.params
```

```
Out[65]: Intercept          -2.518837
         sqrt_sortingtime    7.936591
         dtype: float64
```

```
In [66]: sqrt_model.pvalues,model.tvalues
```

```
Out[66]: (Intercept           0.410857
          sqrt_sortingtime    0.000003
          dtype: float64,
          Intercept          -0.840911
          sqrt_sortingtime    6.592434
          dtype: float64)
```

```
In [67]: round(sqrt_model.rsquared,4),round(sqrt_model.rsquared_adj,4)
```

```
Out[67]: (0.6958, 0.6798)
```

```
In [20]: delivery_time = 6.582734+(1.649020*6)
         delivery_time
```

```
Out[20]: 16.476854
```

```
In [68]: test_data = pd.DataFrame(data={'sqrt_sortingtime':[5,6,7,8]})
```

In [69]:
```
test_data
```

Out[69]:

	sqrt_sortingtime
0	5
1	6
2	7
3	8

In [70]:
```
model.predict(test_data)
```

Out[70]:
```
0    37.164117
1    45.100708
2    53.037299
3    60.973889
dtype: float64
```

2)

In [24]:
```
data = pd.read_csv('Salary_Data.csv')
```

In [25]:
```
data
```

Out[25]:

	YearsExperience	Salary
0	1.1	39343.0
1	1.3	46205.0
2	1.5	37731.0
3	2.0	43525.0
4	2.2	39891.0
5	2.9	56642.0
6	3.0	60150.0
7	3.2	54445.0
8	3.2	64445.0
9	3.7	57189.0
10	3.9	63218.0
11	4.0	55794.0
12	4.0	56957.0
13	4.1	57081.0
14	4.5	61111.0
15	4.9	67938.0
16	5.1	66029.0
17	5.3	83088.0
18	5.9	81363.0
19	6.0	93940.0
20	6.8	91738.0
21	7.1	98273.0
22	7.9	101302.0
23	8.2	113812.0
24	8.7	109431.0
25	9.0	105582.0
26	9.5	116969.0
27	9.6	112635.0
28	10.3	122391.0
29	10.5	121872.0

In [26]:
```
data.shape
```

Out[26]:
```
(30, 2)
```

```
In [27]: data.isna().sum()
```

```
Out[27]: YearsExperience    0
         Salary             0
         dtype: int64
```

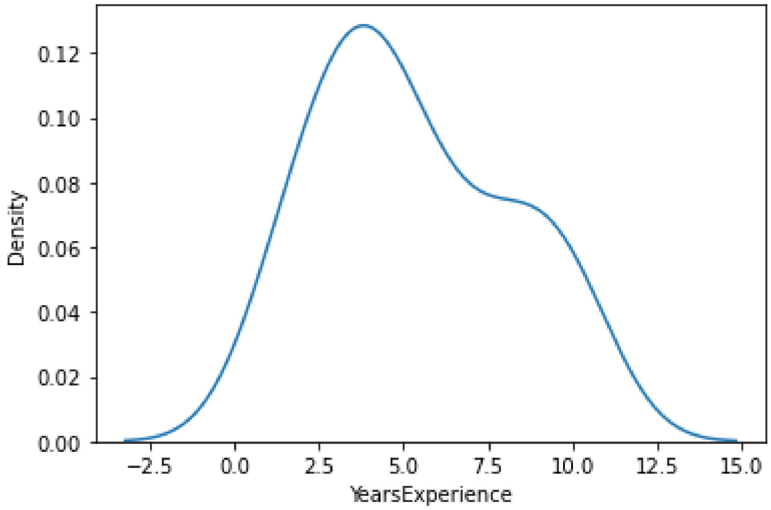
```
In [28]: data.info(show_counts ='all')
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 30 entries, 0 to 29
Data columns (total 2 columns):
 #   Column           Non-Null Count  Dtype  
---  ------           --------------  -----  
 0   YearsExperience  30 non-null     float64
 1   Salary           30 non-null     float64
dtypes: float64(2)
memory usage: 608.0 bytes
```

```
In [29]: data.dtypes
```

```
Out[29]: YearsExperience    float64
         Salary             float64
         dtype: object
```

```
In [30]: sns.distplot(a=data['YearsExperience'],hist = False)
         plt.show()
```



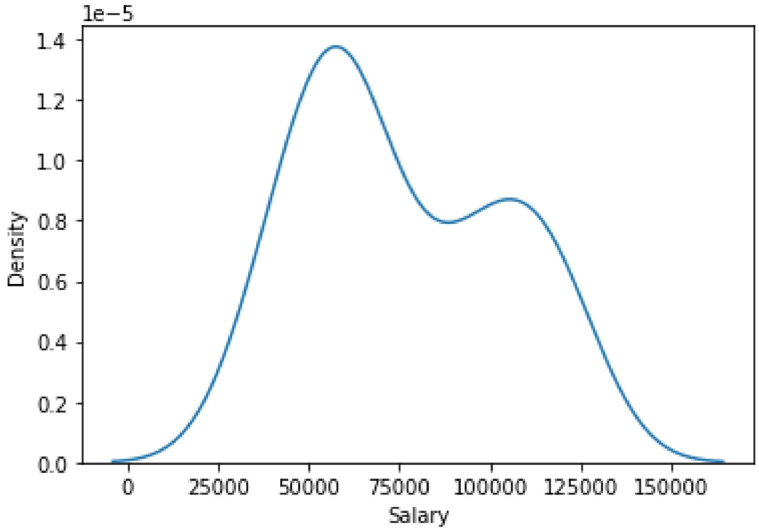
```
In [31]: data['YearsExperience'].skew()
```

```
Out[31]: 0.37956024064804106
```

```
In [32]: data['YearsExperience'].kurt()
```

```
Out[32]: -1.0122119403325072
```

In [33]:
```
sns.distplot(a=data['Salary'],hist=False)
plt.show()
```



In [34]:
```
data['Salary'].skew()
```

Out[34]:
```
0.35411967922959153
```

In [35]:
```
data['Salary'].kurt()
```

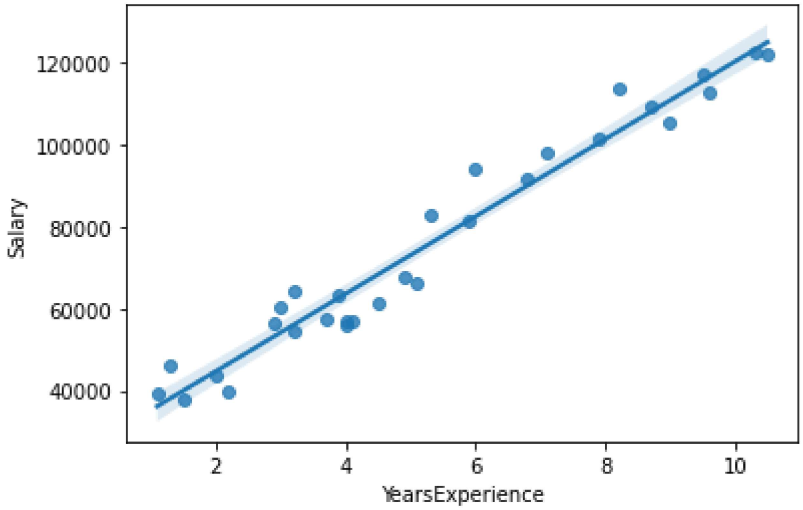
Out[35]:
```
-1.295421086394517
```

In [36]:
```
data.corr()
```

Out[36]:

	YearsExperience	Salary
YearsExperience	1.000000	0.978242
Salary	0.978242	1.000000

In [37]:
```
sns.regplot( x= data['YearsExperience'],y= data['Salary'])
plt.show()
```



In [38]:
```
linear_model = smf.ols(formula = 'Salary~YearsExperience',data = data).fit()
```

In [39]:
```
linear_model.params
```

Out[39]:
```
Intercept          25792.200199
YearsExperience     9449.962321
dtype: float64
```

In [40]:
```
linear_model.tvalues
```

Out[40]:
```
Intercept          11.346940
YearsExperience    24.950094
dtype: float64
```

In [41]:
```
linear_model.pvalues
```

Out[41]:
```
Intercept          5.511950e-12
YearsExperience    1.143068e-20
dtype: float64
```

In [42]:
```
round(linear_model.rsquared,4)
```

Out[42]:
```
0.957
```

In [43]:
```
round(linear_model.rsquared_adj,4)
```

Out[43]:
```
0.9554
```

In [44]:
```
salary_hike = 25792.2001+(9449.9623*3)
salary_hike
```

Out[44]:
```
54142.087
```

In [45]:
```
salary_data_predct = pd.DataFrame(data = {'YearsExperience':[3,4,5,6,7]})
salary_data_predct
```

Out[45]:

	YearsExperience
0	3
1	4
2	5
3	6
4	7

In [46]:
```
linear_model.predict(salary_data_predct)
```

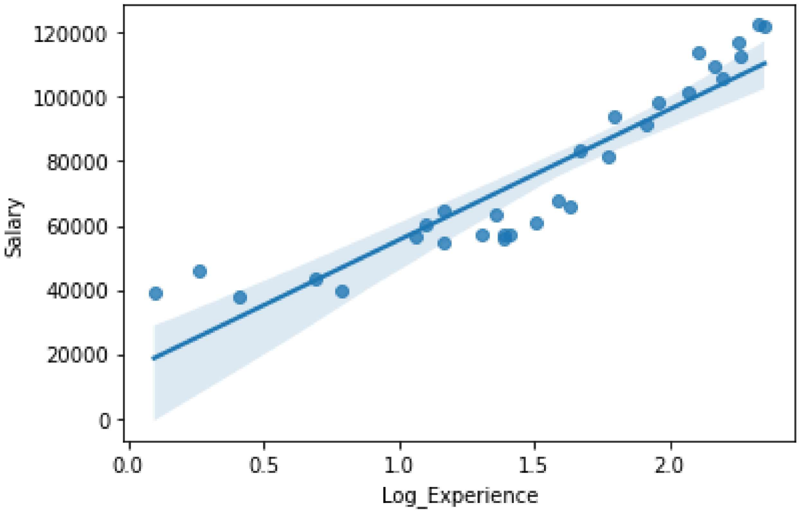
Out[46]:
```
0    54142.087163
1    63592.049484
2    73042.011806
3    82491.974127
4    91941.936449
dtype: float64
```

In [47]:
```
data['Log_Experience']= np.log(data['YearsExperience'])
data.head()
```

Out[47]:

	YearsExperience	Salary	Log_Experience
0	1.1	39343.0	0.095310
1	1.3	46205.0	0.262364
2	1.5	37731.0	0.405465
3	2.0	43525.0	0.693147
4	2.2	39891.0	0.788457

In [50]:
```
sns.regplot( x= data['Log_Experience'],y= data['Salary'])
plt.show()
```



In [51]:
```
log_model = smf.ols(formula = 'Salary~Log_Experience',data = data).fit()
```

In [53]:
```
log_model.params
```

Out[53]:
```
Intercept         14927.97177
Log_Experience    40581.98796
dtype: float64
```

In [54]:
```
log_model.tvalues
```

Out[54]:
```
Intercept          2.895135
Log_Experience    12.791989
dtype: float64
```

In [55]:
```
log_model.pvalues
```

Out[55]:
```
Intercept         7.268813e-03
Log_Experience    3.250155e-13
dtype: float64
```

In [56]:
```
round(log_model.rsquared,4)
```

Out[56]:
```
0.8539
```

In [57]:
```
round(log_model.rsquared_adj,4)
```

Out[57]:
```
0.8487
```

In [58]:
```
salary_hike = 25792.2001+(9449.9623*3)
salary_hike
```

Out[58]:
```
54142.087
```

In [59]:
```
salary_data_predct = pd.DataFrame(data = {'Log_Experience':[3,4,5,6,7]})
salary_data_predct
```

Out[59]:

	Log_Experience
0	3
1	4
2	5
3	6
4	7

In [60]:
```
log_model.predict(salary_data_predct)
```

Out[60]:
```
0    136673.935649
1    177255.923609
2    217837.911569
3    258419.899529
4    299001.887489
dtype: float64
```

In [ ]: