```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
```

```
IceCream = pd.read_csv(r'/IceCream.csv')
IceCream.head(100)
```

	Temperature	Revenue
0	24.566884	534.799028
1	26.005191	625.190122
2	27.790554	660.632289
3	20.595335	487.706960
4	11.503498	316.240194
...	...	...
95	9.018860	212.591740
96	20.265012	474.749392
97	19.363153	460.402500
98	14.685944	343.362905
99	9.954357	283.834327

100 rows × 2 columns

```
IceCream.tail()
```

	Temperature	Revenue
495	22.274899	524.746364
496	32.893092	755.818399
497	12.588157	306.090719
498	22.362402	566.217304
499	28.957736	655.660388

```
IceCream.describe()
```

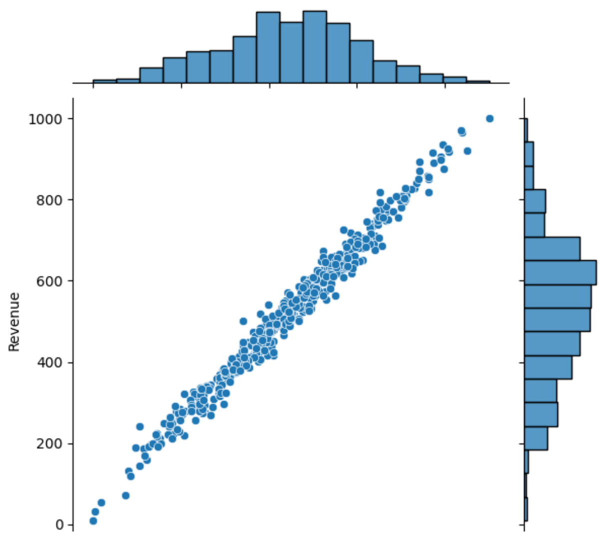
	Temperature	Revenue
count	500.000000	500.000000
mean	22.232225	521.570777
std	8.096388	175.404751
min	0.000000	10.000000
25%	17.122258	405.558681
50%	22.392791	529.368565
75%	27.740674	642.257922
max	45.000000	1000.000000

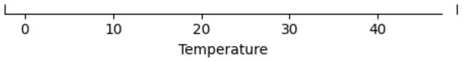
```
IceCream.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 500 entries, 0 to 499
Data columns (total 2 columns):
 #   Column       Non-Null Count  Dtype
---  ------       --------------  -----
 0   Temperature  500 non-null    float64
 1   Revenue      500 non-null    float64
dtypes: float64(2)
memory usage: 7.9 KB
```

```
sns.jointplot(x='Temperature', y='Revenue', data = IceCream)
```

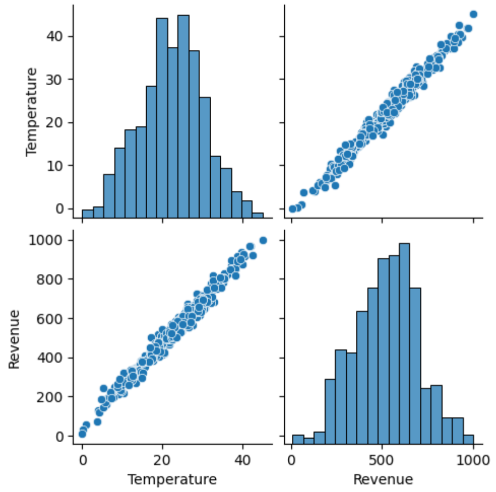
```
<seaborn.axisgrid.JointGrid at 0x7ca27728bf40>
```





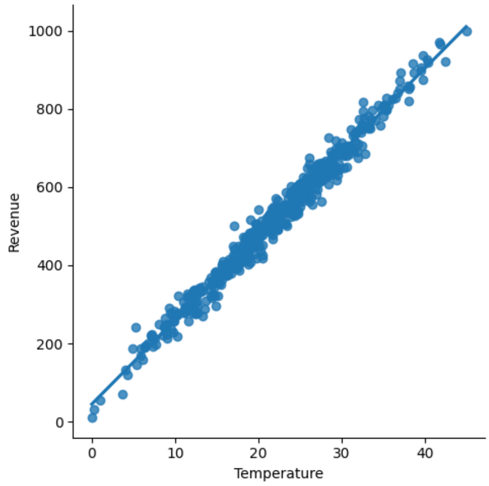

```
sns.pairplot(IceCream)
```

<seaborn.axisgrid.PairGrid at 0x7ca26c75aef0>




```
sns.lmplot(x='Temperature', y='Revenue', data=IceCream)
```

<seaborn.axisgrid.FacetGrid at 0x7ca26c58a0e0>




```
y = IceCream['Revenue']
```

```
X = IceCream[['Temperature']]
```

```
X
```

	Temperature
0	24.566884
1	26.005191
2	27.790554
3	20.595335
4	11.503498
...	...
495	22.274899
496	32.893092
497	12.588157
498	22.362402
499	28.957736

500 rows × 1 columns

```
from sklearn.model_selection import train_test_split
```

```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.25)
```

```
X_train.shape
```

(375, 1)

```
from sklearn.linear_model import LinearRegression
```

```
regressor  = LinearRegression(fit_intercept =True)
```

```
regressor.fit(X_train,y_train)
```

```
▾ LinearRegression
LinearRegression()
```

```
print('Linear Model Coefficient (m): ', regressor.coef_)
print('Linear Model Coefficient (b): ', regressor.intercept_)
```

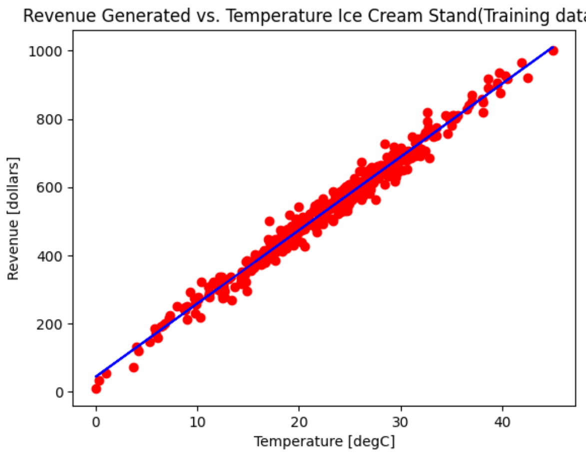
```
Linear Model Coefficient (m):  [21.4676156]
Linear Model Coefficient (b):  44.104951851985504
```

```
y_pred = regressor.predict(X_test)
y_test
```

```
20     612.153949
276    535.708920
425    450.708589
439    264.123914
385    278.418265
          ...
322    463.480508
72     643.648601
477    682.808566
459    526.547065
405    242.509855
Name: Revenue, Length: 125, dtype: float64
```

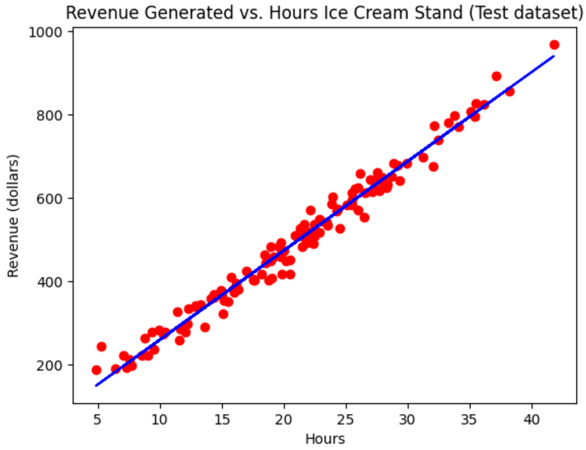
```
plt.scatter(X_train, y_train, color = 'red')
plt.plot(X_train, regressor.predict(X_train), color = 'blue')
plt.ylabel('Revenue [dollars]')
plt.xlabel('Temperature [degC]')
plt.title('Revenue Generated vs. Temperature Ice Cream Stand(Training dataset)')
```

```
Text(0.5, 1.0, 'Revenue Generated vs. Temperature Ice Cream Stand(Training dataset)')
```




```
#VISUALIZE TEST SET RESULTS
plt.scatter(X_test, y_test, color='red')
plt.plot(X_test, regressor.predict (X_test), color = 'blue')
plt.ylabel('Revenue (dollars)')
plt.xlabel('Hours')
plt.title('Revenue Generated vs. Hours Ice Cream Stand (Test dataset)')
```

```
Text(0.5, 1.0, 'Revenue Generated vs. Hours Ice Cream Stand (Test dataset)')
```




```
from sklearn import metrics
from sklearn.metrics import r2_score
print('R2 score', r2_score(y_test,y_pred))
print('Mean Absolute Error',metrics.mean_absolute_error(y_test,y_pred))
print('Mean Squared Error', metrics.mean_squared_error(y_test,y_pred))
print('Root Mean Squared Error',np.sqrt(metrics.mean_squared_error(y_test,y_pred)))
```

```
R2 score 0.9778277188752224
Mean Absolute Error 19.909938925872133
Mean Squared Error 641.3951329487671
Root Mean Squared Error 25.325780006719775
```

Conclusion:

there is a linear relation between temperature and revenue and R2_Score is 97.7%

```
#importing libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

```
#importing dataset and declaring independent and dependent variable #the dependent variable is in last column, hence y is assigned with [: lumn)
ds = pd.read_csv('/50_Startups.csv')
x = ds.iloc[:,:-1].values
y = ds.iloc[:,-1].values
```

```
ds.head()
```

	R&D Spend	Administration	Marketing Spend	State	Profit
0	165349.20	136897.80	471784.10	New York	192261.83
1	162597.70	151377.59	443898.53	California	191792.06
2	153441.51	101145.55	407934.54	Florida	191050.39
3	144372.41	118671.85	383199.62	New York	182901.99
4	142107.34	91391.77	366168.42	Florida	166187.94

```
ds.isnull().any()
```

```
R&D Spend          False
Administration     False
Marketing Spend    False
State              False
Profit             False
dtype: bool
```

```
#categorical data found in column [3]
#encoding categorical data using OneHotEncoding
from sklearn.preprocessing import OneHotEncoder
from sklearn.compose import ColumnTransformer
ct = ColumnTransformer(transformers = [('encoding', OneHotEncoder(), [3])], remainder = 'passthrough')
x= np.array(ct.fit_transform(x))
```

```
print(x)
```

```
[[0.0 0.0 1.0 165349.2 136897.8 471784.1]
 [1.0 0.0 0.0 162597.7 151377.59 443898.53]
 [0.0 1.0 0.0 153441.51 101145.55 407934.54]
 [0.0 0.0 1.0 144372.41 118671.85 383199.62]
 [0.0 1.0 0.0 142107.34 91391.77 366168.42]
 [0.0 0.0 1.0 131876.9 99814.71 362861.36]
 [1.0 0.0 0.0 134615.46 147198.87 127716.82]
 [0.0 1.0 0.0 130298.13 145530.06 323876.68]
 [0.0 0.0 1.0 120542.52 148718.95 311613.29]
 [1.0 0.0 0.0 123334.88 108679.17 304981.62]
 [0.0 1.0 0.0 101913.08 110594.11 229160.95]
 [1.0 0.0 0.0 100671.96 91790.61 249744.55]
 [0.0 1.0 0.0 93863.75 127320.38 249839.44]
 [1.0 0.0 0.0 91992.39 135495.07 252664.93]
 [0.0 1.0 0.0 119943.24 156547.42 256512.92]
 [0.0 0.0 1.0 114523.61 122616.84 261776.23]
 [1.0 0.0 0.0 78013.11 121597.55 264346.06]
 [0.0 0.0 1.0 94657.16 145077.58 282574.31]
 [0.0 1.0 0.0 91749.16 114175.79 294919.57]
 [0.0 0.0 1.0 86419.7 153514.11 0.0]
 [1.0 0.0 0.0 76253.86 113867.3 298664.47]
 [0.0 0.0 1.0 78389.47 153773.43 299737.29]
 [0.0 1.0 0.0 73994.56 122782.75 303319.26]
 [0.0 1.0 0.0 67532.53 105751.03 304768.73]
 [0.0 0.0 1.0 77044.01 99281.34 140574.81]
 [1.0 0.0 0.0 64664.71 139553.16 137962.62]
 [0.0 1.0 0.0 75328.87 144135.98 134050.07]
 [0.0 0.0 1.0 72107.6 127864.55 353183.81]
 [0.0 1.0 0.0 66051.52 182645.56 118148.2]
 [0.0 0.0 1.0 65605.48 153032.06 107138.38]
 [0.0 1.0 0.0 61994.48 115641.28 91131.24]
 [0.0 0.0 1.0 61136.38 152701.92 88218.23]
 [1.0 0.0 0.0 63408.86 129219.61 46085.25]
 [0.0 1.0 0.0 55493.95 103057.49 214634.81]
 [1.0 0.0 0.0 46426.07 157693.92 210797.67]
 [0.0 0.0 1.0 46014.02 85047.44 205517.64]
 [0.0 1.0 0.0 28663.76 127056.21 201126.82]
 [1.0 0.0 0.0 44069.95 51283.14 197029.42]
 [0.0 0.0 1.0 20229.59 65947.93 185265.1]
 [1.0 0.0 0.0 38558.51 82982.09 174999.3]
 [1.0 0.0 0.0 28754.33 118546.05 172795.67]
 [0.0 1.0 0.0 27892.92 84710.77 164470.71]
 [1.0 0.0 0.0 23640.93 96189.63 148001.11]
 [0.0 0.0 1.0 15505.73 127382.3 35534.17]
 [1.0 0.0 0.0 22177.74 154806.14 28334.72]
 [0.0 0.0 1.0 1000.23 124153.04 1903.93]
 [0.0 1.0 0.0 1315.46 115816.21 297114.46]
 [1.0 0.0 0.0 0.0 135426.92 0.0]
 [0.0 0.0 1.0 542.05 51743.15 0.0]
 [1.0 0.0 0.0 0.0 116983.8 45173.06]]
```

```
#splitting dataset in training and testing set
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)
```

```
#training the model
from sklearn.linear_model import LinearRegression
lr = LinearRegression()
lr.fit(x_train, y_train)
```

```
▾ LinearRegression
LinearRegression()
```

```
from sklearn.metrics import r2_score
r2_score(y_test, lr.predict(x_test))
```

```
0.9347068473282546
```

Conclusion:

there are multiple independent variable and one dependent variable we have applied multiple linear regression to find the realationship between the independent and dependent variable the R2_score is 93.4% Higher the R2_Score better the fit of the model.

```
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
import seaborn as sns
from sklearn.linear_model import LinearRegression
```

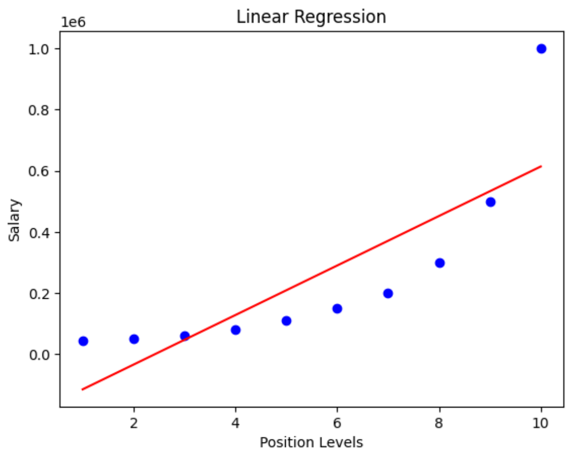
```
dataset = pd.read_csv(r'/PositionSalaries_Data.csv')
dataset
```

	Position	Level	Salary
0	Business Analyst	1	45000
1	Junior Consultant	2	50000
2	Senior Consultant	3	60000
3	Manager	4	80000
4	Country Manager	5	110000
5	Region Manager	6	150000
6	Partner	7	200000
7	Senior Partner	8	300000
8	C-level	9	500000
9	CEO	10	1000000

```
X = dataset.iloc[:, 1:-1].values
y = dataset.iloc[:, -1].values
regressor = LinearRegression()
regressor.fit(X, y)
```

```
▾ LinearRegression
LinearRegression()
```

```
#Visulaizing the result for Linear Regression model
plt.scatter (X, y, color="blue")
plt.plot(X, regressor.predict (X), color="red")
plt.title("Linear Regression")
plt.xlabel("Position Levels")
plt.ylabel("Salary")
plt.show()
```

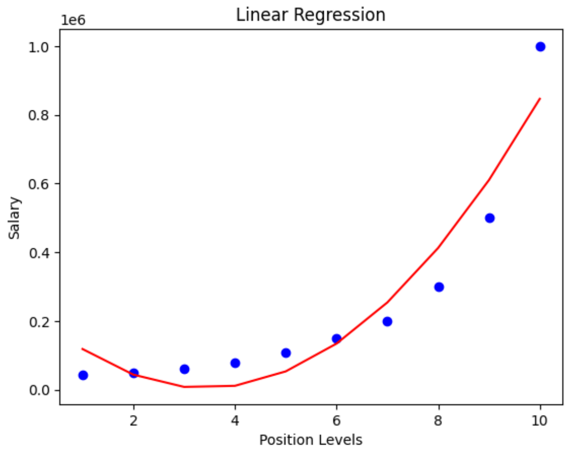



```
from sklearn.preprocessing import PolynomialFeatures
from sklearn.linear_model import LinearRegression
poly_reg = PolynomialFeatures(degree = 2)
X_poly = poly_reg.fit_transform(X)
lin_reg = LinearRegression()
lin_reg.fit(X_poly, y)
```

```
▾ LinearRegression
LinearRegression()
```

```
# Visulaizing the result for Linear Regression model
plt.scatter (X, y, color="blue")
plt.plot(X, lin_reg.predict(poly_reg.fit_transform(X)),color="red")
plt.title("Linear Regression")
plt.xlabel("Position Levels")
```

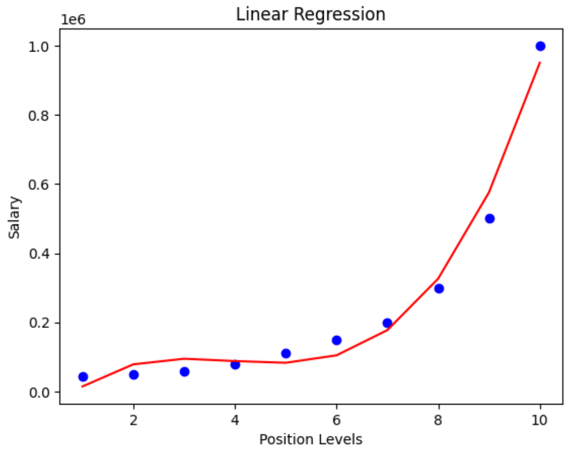
```
plt.ylabel("Salary")
plt.show()
```




```
from sklearn.preprocessing import PolynomialFeatures
from sklearn.linear_model import LinearRegression
poly_regs =  PolynomialFeatures (degree =  3)
X_polyn  = poly_regs.fit_transform(X)
lin_reg  = LinearRegression()
lin_reg.fit (X_polyn, y)
```

```
▾ LinearRegression
LinearRegression()
```

```
#Visulaizing the result for Linear Regression model
plt.scatter (X,y,color="blue")
plt.plot(X, lin_reg.predict(poly_regs.fit_transform(X)),color="red")
plt.title("Linear Regression")
plt.xlabel("Position Levels")
plt.ylabel("Salary")
plt.show()
```




```
poly_pred  = lin_reg.predict(poly_regs.fit_transform([[6.5]]))
print(poly_pred)
```

```
[133259.46969697]
```

Conclusion:

As the degree increases the model train well with the data and fit more accurately