```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

```
df = pd.read_csv('/content/archive temp.zip')
```

```
df
```

	YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0	1901	22.40	24.14	29.07	31.91	33.41	33.18	31.21	30.39	30.47	29.97	27.31	24.49
1	1902	24.93	26.58	29.77	31.78	33.73	32.91	30.92	30.73	29.80	29.12	26.31	24.04
2	1903	23.44	25.03	27.83	31.39	32.91	33.00	31.34	29.98	29.85	29.04	26.08	23.65
3	1904	22.50	24.73	28.21	32.02	32.64	32.07	30.36	30.09	30.04	29.20	26.36	23.63
4	1905	22.00	22.83	26.68	30.01	33.32	33.25	31.44	30.68	30.12	30.67	27.52	23.82
...	...	...	...	...	...	...	...	...	...	...	...	...	...
112	2013	24.56	26.59	30.62	32.66	34.46	32.44	31.07	30.76	31.04	30.27	27.83	25.37
113	2014	23.83	25.97	28.95	32.74	33.77	34.15	31.85	31.32	30.68	30.29	28.05	25.08
114	2015	24.58	26.89	29.07	31.87	34.09	32.48	31.88	31.52	31.55	31.04	28.10	25.67
115	2016	26.94	29.72	32.62	35.38	35.72	34.03	31.64	31.79	31.66	31.98	30.11	28.01
116	2017	26.45	29.46	31.60	34.95	35.84	33.82	31.88	31.72	32.22	32.29	29.60	27.18

```
df.head()
```

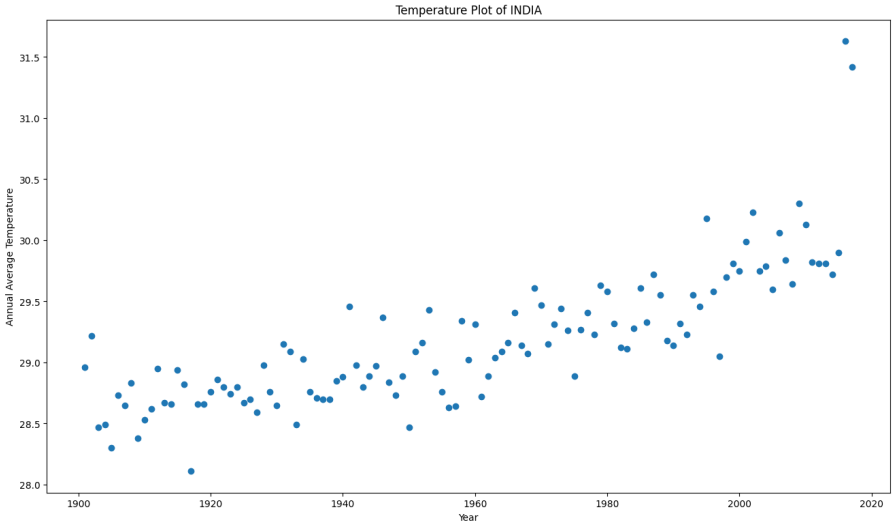
	YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AN
0	1901	22.40	24.14	29.07	31.91	33.41	33.18	31.21	30.39	30.47	29.97	27.31	24.49	
1	1902	24.93	26.58	29.77	31.78	33.73	32.91	30.92	30.73	29.80	29.12	26.31	24.04	
2	1903	23.44	25.03	27.83	31.39	32.91	33.00	31.34	29.98	29.85	29.04	26.08	23.65	
3	1904	22.50	24.73	28.21	32.02	32.64	32.07	30.36	30.09	30.04	29.20	26.36	23.63	

```
#input data
x = df['YEAR']

#output data
y = df['ANNUAL']
```

```
plt.figure(figsize=(16,9))
plt.title('Temperature Plot of INDIA')
plt.xlabel('Year')
plt.ylabel('Annual Average Temperature')
plt.scatter(x, y)
```

```
<matplotlib.collections.PathCollection at 0x795c499c0940>
```




```
x.shape
```

```
(117,)
```

```
x = x.values
```

```
x
```

```
array([1901, 1902, 1903, 1904, 1905, 1906, 1907, 1908, 1909, 1910, 1911,
       1912, 1913, 1914, 1915, 1916, 1917, 1918, 1919, 1920, 1921, 1922,
       1923, 1924, 1925, 1926, 1927, 1928, 1929, 1930, 1931, 1932, 1933,
       1934, 1935, 1936, 1937, 1938, 1939, 1940, 1941, 1942, 1943, 1944,
       1945, 1946, 1947, 1948, 1949, 1950, 1951, 1952, 1953, 1954, 1955,
       1956, 1957, 1958, 1959, 1960, 1961, 1962, 1963, 1964, 1965, 1966,
       1967, 1968, 1969, 1970, 1971, 1972, 1973, 1974, 1975, 1976, 1977,
       1978, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988,
       1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999,
       2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010,
       2011, 2012, 2013, 2014, 2015, 2016, 2017])
```

```
x = x.reshape(117,1)
```

```
x
```

```
[1979],
[1980],
[1981],
[1982],
[1983],
[1984],
[1985],
[1986],
[1987],
[1988],
[1989],
[1990],
[1991],
[1992],
[1993],
[1994],
[1995],
[1996],
[1997],
[1998],
[1999],
[2000],
[2001],
[2002],
[2003],
[2004],
[2005],
[2006],
[2007],
[2008],
[2009],
[2010],
[2011],
```

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

```
regressor = LinearRegression()  #CREATING regressor object of linearregression class
```

```
regressor.fit(x, y)   #model training
```

```
▾ LinearRegression
LinearRegression()
```

```
regressor.coef_
```

```
array([0.01312158])
```

```
regressor.intercept_
```

```
3.4761897126187016
```

```
# Q.1
regressor.predict([[2024]])
```

```
array([30.03427031])
```

```
predicted = regressor.predict(x)
```

```
predicted
```

```
array([28.4203158 , 28.43343739, 28.44655897, 28.45968055, 28.47280213,
       28.48592371, 28.49904529, 28.51216687, 28.52528846, 28.53841004,
       28.55153162, 28.5646532 , 28.57777478, 28.59089636, 28.60401794,
       28.61713952, 28.63026111, 28.64338269, 28.65650427, 28.66962585,
       28.68274743, 28.69586901, 28.70899059, 28.72211218, 28.73523376,
       28.74835534, 28.76147692, 28.7745985 , 28.78772008, 28.80084166,
       28.81396324, 28.82708483, 28.84020641, 28.85332799, 28.86644957,
       28.87957115, 28.89269273, 28.90581431, 28.91893589, 28.93205748,
       28.94517906, 28.95830064, 28.97142222, 28.9845438 , 28.99766538,
       29.01078696, 29.02390855, 29.03703013, 29.05015171, 29.06327329,
       29.07639487, 29.08951645, 29.10263803, 29.11575961, 29.1288812 ,
       29.14200278, 29.15512436, 29.16824594, 29.18136752, 29.1944891 ,
       29.20761068, 29.22073227, 29.23385385, 29.24697543, 29.26009701,
       29.27321859, 29.28634017, 29.29946175, 29.31258333, 29.32570492,
       29.3388265 , 29.35194808, 29.36506966, 29.37819124, 29.39131282,
       29.4044344 , 29.41755599, 29.43067757, 29.44379915, 29.45692073,
```

```
            29.47004231, 29.48316389, 29.49628547, 29.50940705, 29.52252864,
            29.53565022, 29.5487718 , 29.56189338, 29.57501496, 29.58813654,
            29.60125812, 29.6143797 , 29.62750129, 29.64062287, 29.65374445,
            29.66686603, 29.67998761, 29.69310919, 29.70623077, 29.71935236,
            29.73247394, 29.74559552, 29.7587171 , 29.77183868, 29.78496026,
            29.79808184, 29.81120342, 29.82432501, 29.83744659, 29.85056817,
            29.86368975, 29.87681133, 29.88993291, 29.90305449, 29.91617608,
            29.92929766, 29.94241924])
```

```
#Q.2
import numpy as np
```

```
abs(y-predicted)
```

```
0      0.539684
1      0.786563
2      0.023441
3      0.030319
4      0.172802
         ...
112    0.079933
113    0.183054
114    0.016176
115    1.700702
116    1.477581
Name: ANNUAL, Length: 117, dtype: float64
```

```
#mean absolute error
np.mean(abs(y - predicted))    #y=actual
```

```
0.22535284978630413
```

```
from sklearn.metrics import mean_absolute_error
mean_absolute_error(y, predicted)
```

```
0.22535284978630413
```

```
#mean squared error
np.mean((y-predicted) ** 2)
```

```
0.10960795229110352
```

```
from sklearn.metrics import mean_squared_error
mean_squared_error(y, predicted)
```

```
0.10960795229110352
```

```
#R-square
from sklearn.metrics import r2_score
r2_score(y, predicted)
```

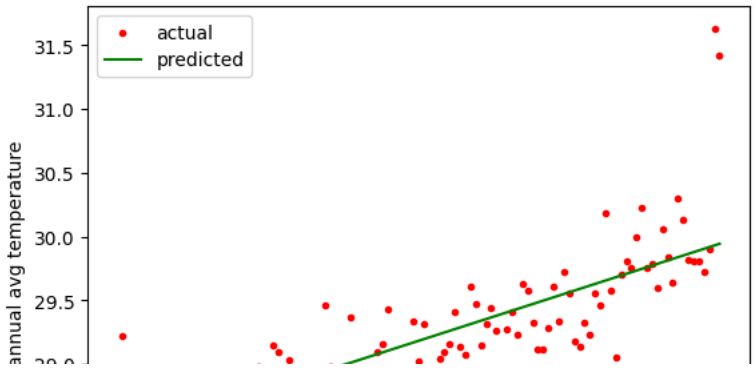
```
0.6418078912783682
```

```
regressor.score(x,y)
```

```
0.6418078912783682
```

```
#Q.3
#plt.title('temperature plot of india')
plt.xlabel('year')
plt.ylabel('annual avg temperature')
plt.scatter(x,y,label='actual',color='r',marker='.')
plt.plot(x,predicted,label='predicted',color='g')
plt.legend()
```

```
<matplotlib.legend.Legend at 0x795c420c6200>
```




```
sns.regplot(x='YEAR',y='ANNUAL',data=df)
```

```
<Axes: xlabel='YEAR', ylabel='ANNUAL'>
```