```
import numpy as np
import pandas as pd
import seaborn as sns

from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
import matplotlib.pyplot as plt

data = pd.read_csv("/content/temperatures.csv")
df =data
data.describe()
```

	YEAR	JAN	FEB	MAR	APR	MAY	JUN
count	117.000000	117.000000	117.000000	117.000000	117.000000	117.000000	117.000000
mean	1959.000000	23.687436	25.597863	29.085983	31.975812	33.565299	32.774274
std	33.919021	0.834588	1.150757	1.068451	0.889478	0.724905	0.633132
min	1901.000000	22.000000	22.830000	26.680000	30.010000	31.930000	31.100000
25%	1930.000000	23.100000	24.780000	28.370000	31.460000	33.110000	32.340000
50%	1959.000000	23.680000	25.480000	29.040000	31.950000	33.510000	32.730000
75%	1988.000000	24.180000	26.310000	29.610000	32.420000	34.030000	33.180000
max	2017.000000	26.940000	29.720000	32.620000	35.380000	35.840000	34.480000

```
data.head()
```

	YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	D
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
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
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
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

```
data.shape
```

```
(117, 18)
```

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 117 entries, 0 to 116
Data columns (total 18 columns):
 #   Column   Non-Null Count  Dtype  
---  ------   --------------  -----  
 0   YEAR     117 non-null    int64  
 1   JAN      117 non-null    float64
 2   FEB      117 non-null    float64
 3   MAR      117 non-null    float64
 4   APR      117 non-null    float64
 5   MAY      117 non-null    float64
 6   JUN      117 non-null    float64
 7   JUL      117 non-null    float64
 8   AUG      117 non-null    float64
 9   SEP      117 non-null    float64
 10  OCT      117 non-null    float64
 11  NOV      117 non-null    float64
 12  DEC      117 non-null    float64
 13  ANNUAL   117 non-null    float64
 14  JAN-FEB  117 non-null    float64
 15  MAR-MAY  117 non-null    float64
 16  JUN-SEP  117 non-null    float64
 17  OCT-DEC  117 non-null    float64
dtypes: float64(17), int64(1)
memory usage: 16.6 KB
```

```
count = (data["JAN"]==22).sum()
print(count)
```

```
1
```

```
column = data
count = column[column==0].count()
print(count)
```

```
YEAR       0
JAN        0
FEB        0
MAR        0
APR        0
MAY        0
JUN        0
JUL        0
AUG        0
SEP        0
OCT        0
NOV        0
DEC        0
ANNUAL     0
JAN-FEB    0
MAR-MAY    0
JUN-SEP    0
OCT-DEC    0
dtype: int64
```

```
data.isnull().head()
```

	YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DI
0	False	False	False	False	False	False	False	False	False	False	False	False	Fal
1	False	False	False	False	False	False	False	False	False	False	False	False	Fal
2	False	False	False	False	False	False	False	False	False	False	False	False	Fal
3	False	False	False	False	False	False	False	False	False	False	False	False	Fal

```
data.info()
```

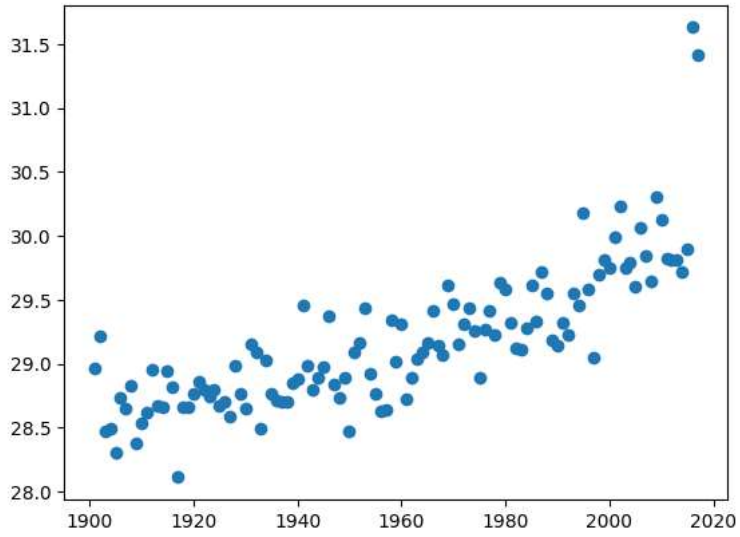
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 117 entries, 0 to 116
Data columns (total 18 columns):
 #   Column   Non-Null Count  Dtype  
---  ------   --------------  -----  
 0   YEAR     117 non-null    int64  
 1   JAN      117 non-null    float64
 2   FEB      117 non-null    float64
 3   MAR      117 non-null    float64
 4   APR      117 non-null    float64
 5   MAY      117 non-null    float64
 6   JUN      117 non-null    float64
 7   JUL      117 non-null    float64
 8   AUG      117 non-null    float64
 9   SEP      117 non-null    float64
 10  OCT      117 non-null    float64
 11  NOV      117 non-null    float64
 12  DEC      117 non-null    float64
 13  ANNUAL   117 non-null    float64
 14  JAN-FEB  117 non-null    float64
 15  MAR-MAY  117 non-null    float64
 16  JUN-SEP  117 non-null    float64
 17  OCT-DEC  117 non-null    float64
dtypes: float64(17), int64(1)
memory usage: 16.6 KB
```

```
data.head()
```

	YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AI
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	

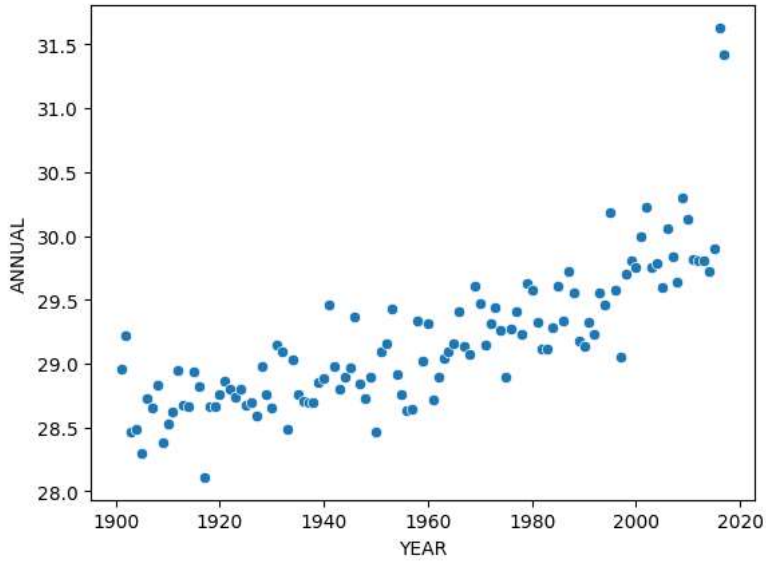
```
x = data["YEAR"]
y =data["ANNUAL"]
plt.plot(x,y,'o')
```

```
[<matplotlib.lines.Line2D at 0x7cd5e4ad34f0>]
```




```
sns.scatterplot(x=x,y=y,data=df)
```

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




```
type(x)
```

```
pandas.core.series.Series
```

```
x.shape
```

```
(117,)
```

```
x= x.values
```

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

```
x.shape
```

```
(117, 1)
```

```
type(x)
```

```
numpy.ndarray
```

```
x_train, x_test, y_train, y_test = train_test_split(x,y,test_size=0.25)
print(f"x Training dataset: {x_train.shape}")
print(f"y training dataset: {y_train.shape}")
print(f"x testing dataset:: {x_test.shape}")
print(f"y testing dataset: {y_test.shape}")
```

```
x Training dataset: (87, 1)
y training dataset: (87,)
x testing dataset:: (30, 1)
y testing dataset: (30,)
```

```
model = LinearRegression()
```

```
model.fit(x_train,y_train)
```

```
▾ LinearRegression
LinearRegression()
```

```
model.coef_
```

```
array([0.01256663])
```

```
model.intercept_
```

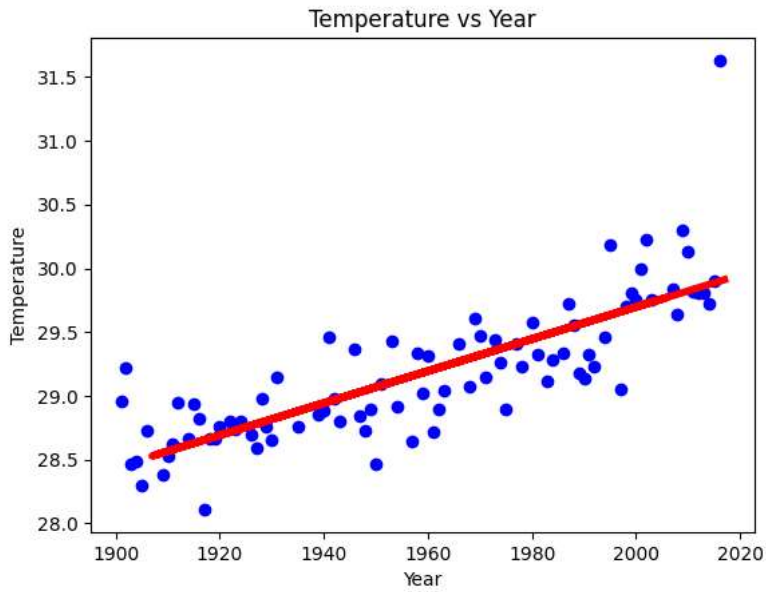
```
4.5634835301266286
```

```
y_pred=model.predict(x_test)
```

```
y_pred.shape
```

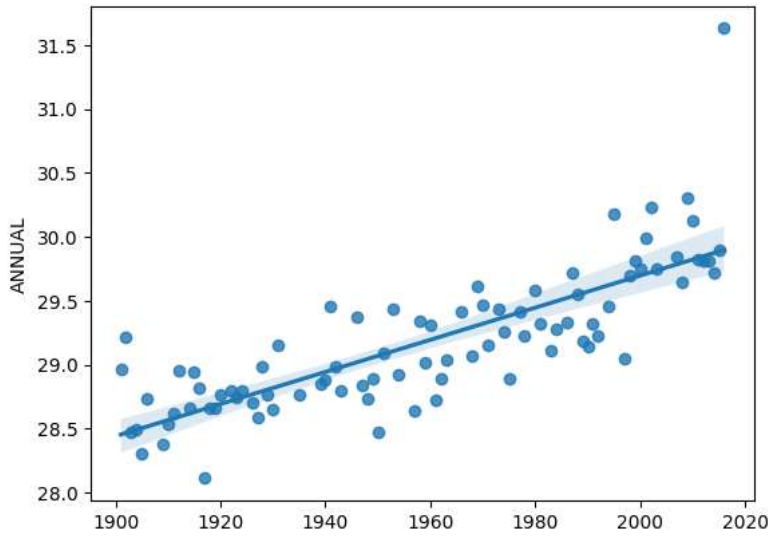
```
(30,)
```

```
plt.scatter(x_train,y_train,color='blue')
plt.plot(x_test,y_pred,color='red', linewidth=4)
plt.title("Temperature vs Year")
plt.xlabel("Year")
plt.ylabel("Temperature")
plt.show()
```



```
sns.regplot(data=df,x=x_train,y=y_train,)
```

```
<Axes: ylabel='ANNUAL'>
```




```
from sklearn.metrics import mean_absolute_error,mean_squared_error,r2_score
print(f"MSE:  {mean_squared_error(y_test,y_pred)}")
print(f"MAE:  {mean_absolute_error(y_test,y_pred)}")
print(f"R-Sqaure :  {r2_score(y_test,y_pred)}")
```

```
MSE:  0.1178536191421496
MAE:  0.21722208361861348
R-Sqaure :  0.6422588176102666
```

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