```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import numpy as np
from scipy import stats
import statsmodels.api as sm
```

```
df=pd.read_csv('/content/slr (1).csv')
```

```
df.head()
```

	Exam	GPA
0	1714	2.40
1	1664	2.52
2	1760	2.54
3	1685	2.74
4	1693	2.83

Next steps: Generate code with df View recommended plots

DataFrame Observation

```
#continous_column=["Exam","GPA"]
#dependent=GPA
#independent=Exam

#Supervised regression
```

Data cleaning using pandas

Handling Null Values

Handling Duplicates

Data Type Conversion

Standardizing or Normalizing Data

Handling Text Data

Handling Date and Time Data

Handling Outliers

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 84 entries, 0 to 83
Data columns (total 2 columns):
 #   Column  Non-Null Count  Dtype
---  ------  --------------  -----
 0   Exam    84 non-null     int64
 1   GPA     84 non-null     float64
dtypes: float64(1), int64(1)
memory usage: 1.4 KB
```

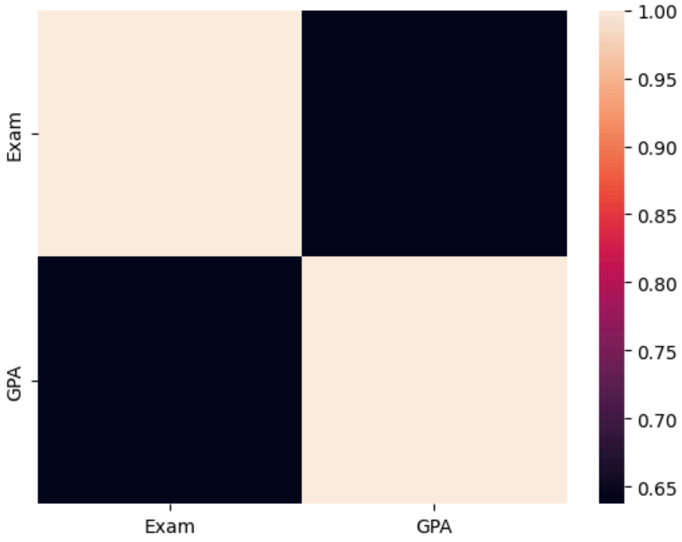
```
df.isnull().sum()
```

```
Exam    0
GPA     0
dtype: int64
```

```
df.corr()
```

	Exam	GPA
Exam	1.000000	0.637184
GPA	0.637184	1.000000

```
sns.heatmap(df.corr())
plt.show()
```



Hypothesis testing

```
continous_column=["Exam","GPA"]
```

```
def central_limit_theorem(continous_column,sample_size,rage):
  result_centrallimit={}
  pop=df[continous_column].values
  population_mean=pop.mean()
  allsample=[]
  for i in range(rage):
     sample=np.random.choice(pop,sample_size)
     allsample.append(sample.mean())
  all_sample_mean=(np.mean(allsample))
  result_centrallimit.update({'Column Name':continous_column,
                     'Population mean':population_mean,
                     'Allsample mean':all_sample_mean
                     })
  if continous_column:
    H0_accepted=0
    H0_rejected=0
    for i in range(rage):
      sample1=df[continous_column].sample(frac=0.04)
      t_test,p_value=stats.ttest_1samp(sample1,df[continous_column].mean())
      if p_value<0.05:
        H0_rejected+=1
      else:
        H0_accepted+=1
      if H0_accepted>H0_rejected:
        result_centrallimit.update({'Onesamplettest':' H0-There is no significant difference','Ttest':t_test,
                            'pvalue':p_value})
      else:
        result_centrallimit.update({'Onesamplettest':' Ha-There is significant difference','Ttest':t_test,'pvalue':p_value})
    return(result_centrallimit)
```

```
res=[]
for i in continous_column:
  s=central_limit_theorem(i,50,10)
  res.append(s)
pd.DataFrame(res)
```

	Column Name	Population mean	Allsample mean	Onesamplettest	Ttest	pvalue
0	Exam	1845.273810	1854.16400	H0-There is no significant difference	0.514925	0.657867

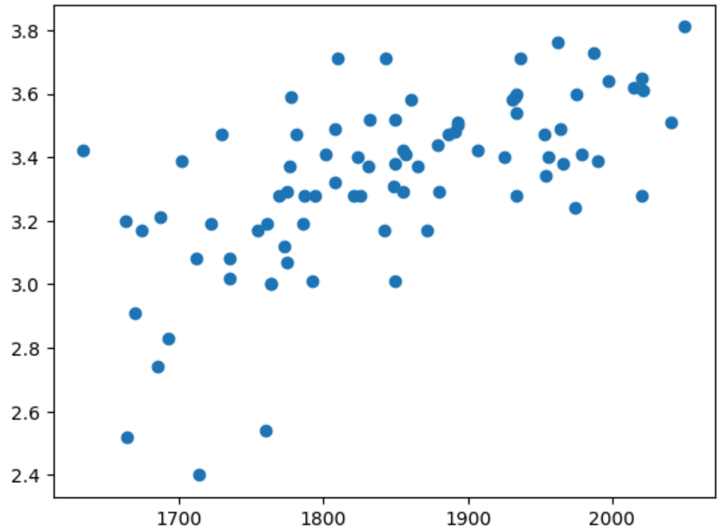
```
def twosamplettest(continous_column1,continous_column2,sample_size,rage):
   H0_accepted=0
   H0_rejected=0
   result={}
   allsample1=[]
   allsample2=[]
   for i in range(rage):
     sample1=df[continous_column1].sample(frac=0.2)
     sample2=df[continous_column2].sample(frac=0.2)
     t_test,p_value=stats.ttest_ind(sample1,sample2)
     if p_value<0.05:
        H0_rejected+=1
     else:
        H0_accepted+=1
     if H0_accepted>H0_rejected:
         result.update({
             'column':continous_column1+"&"+continous_column2,
             'twosamplettest':'H0-There is no significant difference',
             't_test_value':t_test,
              'P_value':p_value})
     else:
         result.update({
              'column':continous_column1+"&"+continous_column2,
             'twosamplettest':' Ha-There is significant difference',
              't_test_value':t_test,
              'P_value':p_value})
   if continous_column1:
     H0_accepted=0
     H0_rejected=0
     for i in range(rage):
         column1=df[continous_column1]
         column2=df[continous_column2]
         sample1=np.random.choice(column1,sample_size)
         sample2=np.random.choice(column2,sample_size)
         allsample1.append(sample1.mean())
         allsample2.append(sample2.mean())
     t_test,p_value=stats.ttest_ind(allsample1,allsample2)
     if p_value<0.05:
              H0_rejected+=1
     else:
            H0_accepted+=1
     if H0_accepted>H0_rejected:
              result.update({
             'column':continous_column1+"&"+continous_column2,
             'twosamplettest central':'H0-There is no significant difference',
             't_test_valuone':t_test,
             'P_valueone':p_value})
     else:
              result.update({
              'column':continous_column1+"&"+continous_column2,
             'twosamplettest central':' Ha-There is significant difference',
             't_test_valuone':t_test,
             'P_valueone':p_value})

   return result
```

```
columns=continous_column
res1=[]
for i in range (len(columns)-1):
  column1=columns[i]
  for j in range(i+1,len(columns)):
      column2=columns[j]
      j=twosamplettest(column1,column2,50,10)
      res1.append(j)
pd.DataFrame(res1)
```

	column	twosamplettest	t_test_value	P_value	twosamplettest central	t_test_valuon

```
# consider independent as x  and dependent as y
x1=df["Exam"]
y=df["GPA"]
```

```
plt.scatter(x1,y)
plt.show()
```




```
x=sm.add_constant(x1)
model=sm.OLS(y,x)# creating a model using dependent and dependent variable through ols method
result=model.fit() #Training the model
```

```
result.summary()
```

OLS Regression Results

Dep. Variable:	GPA	**R-squared:**	0.406
Model:	OLS	**Adj. R-squared:**	0.399
Method:	Least Squares	**F-statistic:**	56.05
Date:	Sat, 30 Mar 2024	**Prob (F-statistic):**	7.20e-11
Time:	15:40:52	**Log-Likelihood:**	12.672
No. Observations:	84	**AIC:**	-21.34
Df Residuals:	82	**BIC:**	-16.48
Df Model:	1		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
const	0.2750	0.409	0.673	0.503	-0.538	1.088
Exam	0.0017	0.000	7.487	0.000	0.001	0.002

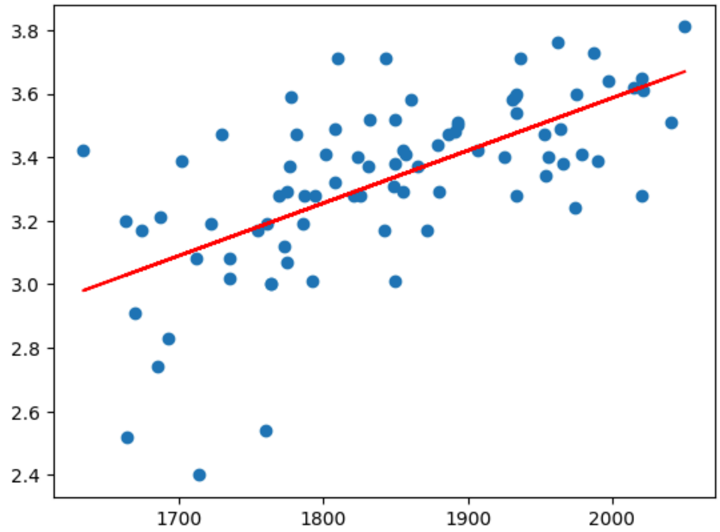
Omnibus:	12.839	**Durbin-Watson:**	0.950
Prob(Omnibus):	0.002	**Jarque-Bera (JB):**	16.155
Skew:	-0.722	**Prob(JB):**	0.000310
Kurtosis:	4.590	**Cond. No.**	3.29e+04

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.
[2] The condition number is large, 3.29e+04. This might indicate that there are
strong multicollinearity or other numerical problems

```
yhat=result.params[0]+result.params[1]*x1
yhat
```

```
0     3.112890
1     3.030105
2     3.189051
3     3.064875
4     3.078120
        ...
79    3.480452
80    3.271836
81    3.564892
82    3.523500
83    3.669201
Name: Exam, Length: 84, dtype: float64
```

```
plt.scatter(x1,y)
plt.plot(x1,yhat,color='red')
plt.show()
```



Start coding or generate with AI.