Define the Problem

Identify the Business Problem: Understand the business context and define the problem you are trying to solve.
Define the Goals: Clearly state the objectives and what success looks like.

2. Collect Data

   Identify Data Sources: Determine where to get the data from (databases, web scraping, APIs, etc.). Gather Data: Collect the data required for the analysis. Understand Data Privacy: Ensure compliance with data privacy and protection regulations.

3. Explore and Preprocess Data

   Understand the Data: Perform initial analysis to understand the data (types, structure, missing values). Clean the Data: Handle missing values, remove duplicates, correct errors, etc. Transform the Data: Feature engineering, scaling, encoding categorical variables, etc. Visualize the Data: Use visualizations to gain insights and understand data distributions and relationships.

4. Modeling

   Select the Model: Choose the appropriate modeling techniques (e.g., regression, classification, clustering). Train the Model: Split the data into training and test sets and train the model on the training set. Evaluate the Model: Use metrics to evaluate model performance on the test set.

Student Performance (Multiple Linear Regression) Description:

The Student Performance Dataset is a dataset designed to examine the factors influencing academic student performance. The dataset consists of 10,000 student records, with each record containing information about various predictors and a performance index. Variables:/ features/input

Hours Studied: The total number of hours spent studying by each student. Previous Scores: The scores obtained by students in previous tests. Extracurricular Activities: Whether the student participates in extracurricular activities (Yes or No). Sleep Hours: The average number of hours of sleep the student had per day. Sample Question Papers Practiced: The number of sample question papers the student practiced.

Target Variable/target/output:

Performance Index: A measure of the overall performance of each student. The performance index represents the student's academic performance and has been rounded to the nearest integer. The index ranges from 10 to 100, with higher values indicating better performance.

1 . Load datasets

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

```
data = pd.read_csv('/content/students perfomance - mark.csv')
data.head()
```

	Hours Studied	Previous Scores	Extracurricular Activities	Sleep Hours	Sample Question Papers Practiced	Performance Index
0	7	99	Yes	9	1	91
1	4	82	No	4	2	65
2	8	51	Yes	7	2	45
3	5	52	Yes	5	2	36
4	7	75	No	8	5	66

Next steps: Generate code with data | View recommended plots | New interactive sheet

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10000 entries, 0 to 9999
Data columns (total 6 columns):
 #   Column                            Non-Null Count  Dtype
---  ------                            --------------  -----
 0   Hours Studied                     10000 non-null  int64
 1   Previous Scores                   10000 non-null  int64
```

```
 2   Extracurricular Activities        10000 non-null  object
 3   Sleep Hours                       10000 non-null  int64
 4   Sample Question Papers Practiced  10000 non-null  int64
 5   Performance Index                 10000 non-null  int64
dtypes: int64(5), object(1)
memory usage: 468.9+ KB
```

```
data.describe()
```

	Hours Studied	Previous Scores	Sleep Hours	Sample Question Papers Practiced	Performance Index
count	10000.000000	10000.000000	10000.000000	10000.000000	10000.000000
mean	4.992900	69.445700	6.530600	4.583300	55.224800
std	2.589309	17.343152	1.695863	2.867348	19.212558
min	1.000000	40.000000	4.000000	0.000000	10.000000
25%	3.000000	54.000000	5.000000	2.000000	40.000000
50%	5.000000	69.000000	7.000000	5.000000	55.000000
75%	7.000000	85.000000	8.000000	7.000000	71.000000
max	9.000000	99.000000	9.000000	9.000000	100.000000

```
data.shape
```

```
(10000, 6)
```

```
data.isnull().sum()
```

	0
Hours Studied	0
Previous Scores	0
Extracurricular Activities	0
Sleep Hours	0
Sample Question Papers Practiced	0
Performance Index	0

dtype: int64

Data pre processing

```
data.duplicated().sum()
```

```
127
```

```
data=data.drop_duplicates()
```

```
data.duplicated().sum()
```

```
0
```

```
data.columns
```

```
Index(['Hours Studied', 'Previous Scores', 'Extracurricular Activities',
       'Sleep Hours', 'Sample Question Papers Practiced', 'Performance Index'],
      dtype='object')
```

Checking outlier

```
df = data.select_dtypes(include=np.number)
df.head()
```

	Hours Studied	Previous Scores	Sleep Hours	Sample Question Papers Practiced	Performance Index
0	7	99	9	1	91
1	4	82	4	2	65
2	8	51	7	2	45
3	5	52	5	2	36
4	7	75	8	5	66

Next steps: Generate code with df | View recommended plots | New interactive sheet

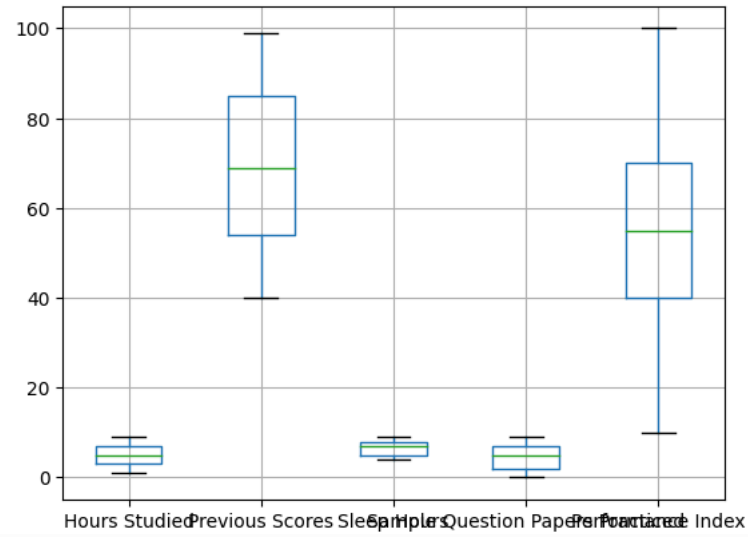
```
df.skew()
```

	0
Hours Studied	-0.003348
Previous Scores	0.005581
Sleep Hours	-0.041350
Sample Question Papers Practiced	-0.034893
Performance Index	-0.000412

dtype: float64

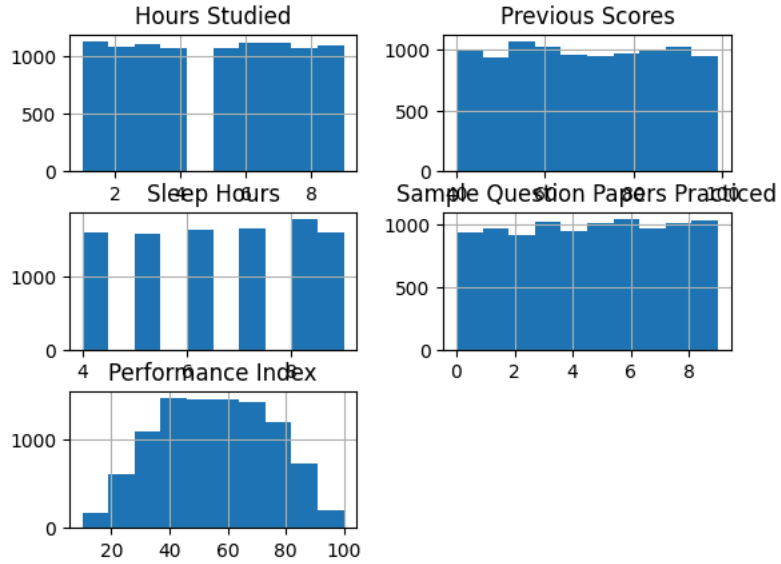
```
df.boxplot()
```

<Axes: >




```
df.hist()
```

```
array([[<Axes: title={'center': 'Hours Studied'}>,
        <Axes: title={'center': 'Previous Scores'}>],
       [<Axes: title={'center': 'Sleep Hours'}>,
        <Axes: title={'center': 'Sample Question Papers Practiced'}>],
       [<Axes: title={'center': 'Performance Index'}>, <Axes: >]],
      dtype=object)
```



Visualization

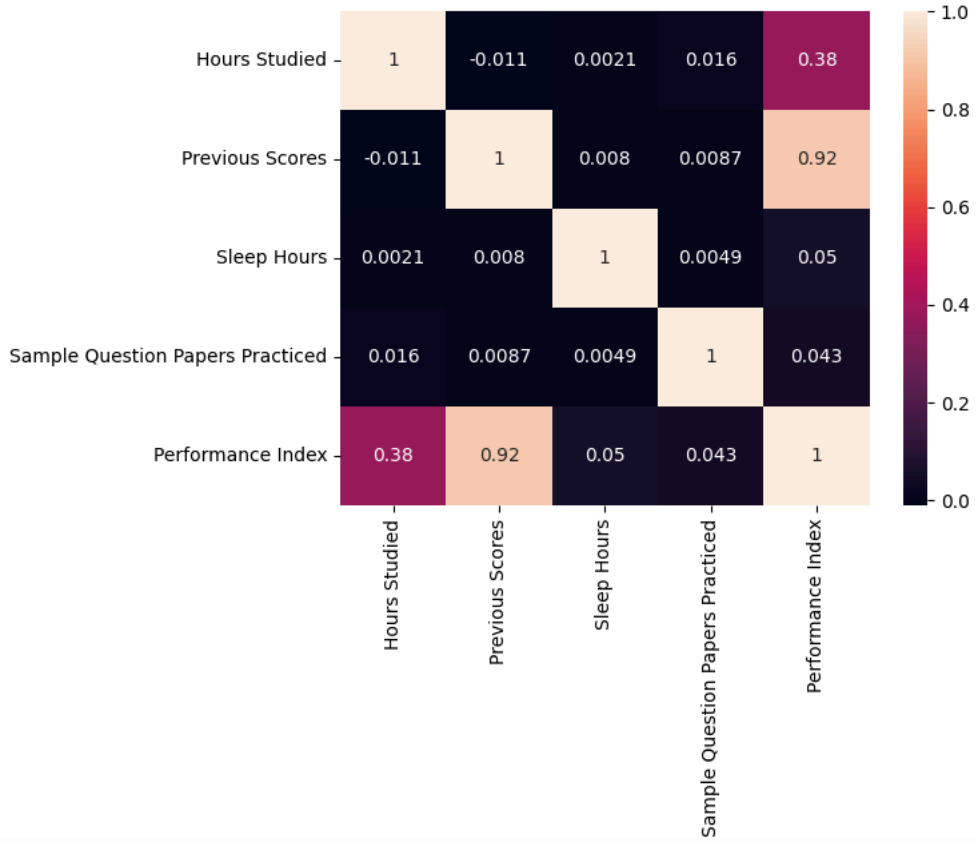
```
corr = df.corr()
corr
```

	Hours Studied	Previous Scores	Sleep Hours	Sample Question Papers Practiced	Performance Index
Hours Studied	1.000000	-0.010676	0.002131	0.015740	0.375332
Previous Scores	-0.010676	1.000000	0.007975	0.008719	0.915135
Sleep Hours	0.002131	0.007975	1.000000	0.004907	0.050352
Sample Question Papers Practiced	0.015740	0.008719	0.004907	1.000000	0.043436
Performance Index	0.375332	0.915135	0.050352	0.043436	1.000000

Next steps: Generate code with corr | View recommended plots | New interactive sheet

```
sns.heatmap(corr,annot=True)
```

<Axes: >




```
from sklearn.preprocessing import LabelEncoder
```

```
label_encoder = LabelEncoder()
data['Extracurricular Activities'] = label_encoder.fit_transform(data['Extracurricular Activities'])
data
```

	Hours Studied	Previous Scores	Extracurricular Activities	Sleep Hours	Sample Question Papers Practiced	Performance Index
0	7	99	1	9	1	91
1	4	82	0	4	2	65
2	8	51	1	7	2	45
3	5	52	1	5	2	36
4	7	75	0	8	5	66
...	...	...	...	...	...	...
9995	1	49	1	4	2	23
9996	7	64	1	8	5	58
9997	6	83	1	8	5	74
9998	9	97	1	7	0	95
9999	7	74	0	8	1	64

Next steps: Generate code with `data` View recommended plots New interactive sheet

```
x = data[['Hours Studied', 'Previous Scores', 'Extracurricular Activities', 'Sleep Hours', 'Sample Question Papers Practiced']]
x
```

	Hours Studied	Previous Scores	Extracurricular Activities	Sleep Hours	Sample Question Papers Practiced
0	7	99	1	9	1
1	4	82	0	4	2
2	8	51	1	7	2
3	5	52	1	5	2
4	7	75	0	8	5
...	...	...	...	...	...
9995	1	49	1	4	2
9996	7	64	1	8	5
9997	6	83	1	8	5
9998	9	97	1	7	0
9999	7	74	0	8	1

9873 rows × 5 columns

Next steps: Generate code with x | View recommended plots | New interactive sheet

Suggested code may be subject to a license | 13rianlucero/CrabAgePrediction

```
y=data['Performance Index']
y
```

	Performance Index
0	91
1	65
2	45
3	36
4	66
...	...
9995	23
9996	58
9997	74
9998	95
9999	64

9873 rows × 1 columns

dtype: int64

```
from sklearn.preprocessing import StandardScaler

scaler = StandardScaler()
x = scaler.fit_transform(x)


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=42)

x_train.shape
```

```
(7898, 5)
```

```
y_train.shape
```

```
(7898,)
```

```
x_test.shape
```

```
(1975, 5)
```

```
y_test.shape
```

```
(1975,)
```

```
from sklearn.linear_model import LinearRegression

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

```
LinearRegression()
```

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

	Performance Index
0	91
1	65
2	45
3	36
4	66
...	...
9995	23
9996	58
9997	74
9998	95
9999	64

9873 rows × 1 columns

dtype: int64

```
result = pd.DataFrame({'Actual': y_test, 'Predicted': y_pred})
result
```

	Actual	Predicted
6099	47	46.480013
106	76	80.285379
9265	62	61.065188
4707	23	22.706315
2155	76	74.836868
...	...	...
8732	19	18.277835
3112	39	40.310084
5297	77	77.084436
6116	88	86.246766
5088	34	35.879338

1975 rows × 2 columns

Next steps: Generate code with result | View recommended plots | New interactive sheet


```
from sklearn.metrics import mean_absolute_error, mean_squared_error, r2_score
```

```
mae = mean_absolute_error(y_test, y_pred)
mse = mean_squared_error(y_test, y_pred)
r2 = r2_score(y_test, y_pred)

print("Mean Absolute Error:", mae)
print("Mean Squared Error:", mse)
print("R-squared:", r2)
```