Data Wrangling II

Import necessary Libraries

In [ ]:
```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
```

Import Dataset

In [ ]:
```
dataset = pd.read_csv('StudentsPerformance.csv')
dataset.head()
```

Out[ ]:

	gender	race/ethnicity	parental level of education	lunch	test preparation course	math score	reading score	writing score
0	female	group B	bachelor's degree	standard	none	72.0	72.0	74.0
1	female	group C	some college	standard	completed	69.0	90.0	88.0
2	female	group B	master's degree	standard	none	90.0	95.0	93.0
3	male	group A	associate's degree	free/reduced	none	47.0	NaN	44.0
4	male	group C	some college	standard	none	76.0	78.0	75.0

Explore Dataset

In [ ]:
```
print("Shape of dataset :")
print("Number of Rows :-> ", dataset.shape[0])
print("Number of Columns :-> ", dataset.shape[1])
```

```
Shape of dataset :
Number of Rows :->  1000
Number of Columns :->  8
```

In [ ]:
```
dataset.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1000 entries, 0 to 999
Data columns (total 8 columns):
 #   Column                       Non-Null Count  Dtype  
---  ------                       --------------  -----  
 0   gender                       1000 non-null   object 
 1   race/ethnicity               1000 non-null   object 
 2   parental level of education  1000 non-null   object 
 3   lunch                        1000 non-null   object 
 4   test preparation course      1000 non-null   object 
 5   math score                   995 non-null    float64
 6   reading score                995 non-null    float64
 7   writing score                994 non-null    float64
dtypes: float64(3), object(5)
memory usage: 62.6+ KB
```

In [ ]:
```
dataset.describe()
```

Out[ ]:

	math score	reading score	writing score
count	995.000000	995.000000	994.000000
mean	66.152764	69.153769	68.093561
std	15.135630	14.614685	15.151411
min	0.000000	17.000000	10.000000
25%	57.000000	59.000000	58.000000
50%	66.000000	70.000000	69.000000
75%	77.000000	79.000000	79.000000
max	100.000000	100.000000	100.000000

Check for Missing Values

In [ ]:
```
dataset.isnull().sum()
```

Out[ ]:
```
gender                       0
race/ethnicity               0
parental level of education  0
lunch                        0
test preparation course      0
math score                   5
reading score                5
writing score                6
dtype: int64
```

Handling Missing Values

1) Filling Missing values by Mean

In [ ]:
```
math_mean = dataset['math score'].mean()
dataset['math score'].fillna(math_mean, inplace=True)
```

2) Filling Missing Values by interpolation

In [ ]:
```
dataset['reading score']
```

Out[ ]:
```
0      72.0
1      90.0
2      95.0
3       NaN
4      78.0
       ...
995    99.0
996    55.0
997    71.0
998    78.0
999    86.0
Name: reading score, Length: 1000, dtype: float64
```

In [ ]:
```
dataset['reading score'].interpolate(inplace=True)
```

3) Droping Missing Values

In [ ]:
```
dataset.dropna(inplace=True)
```

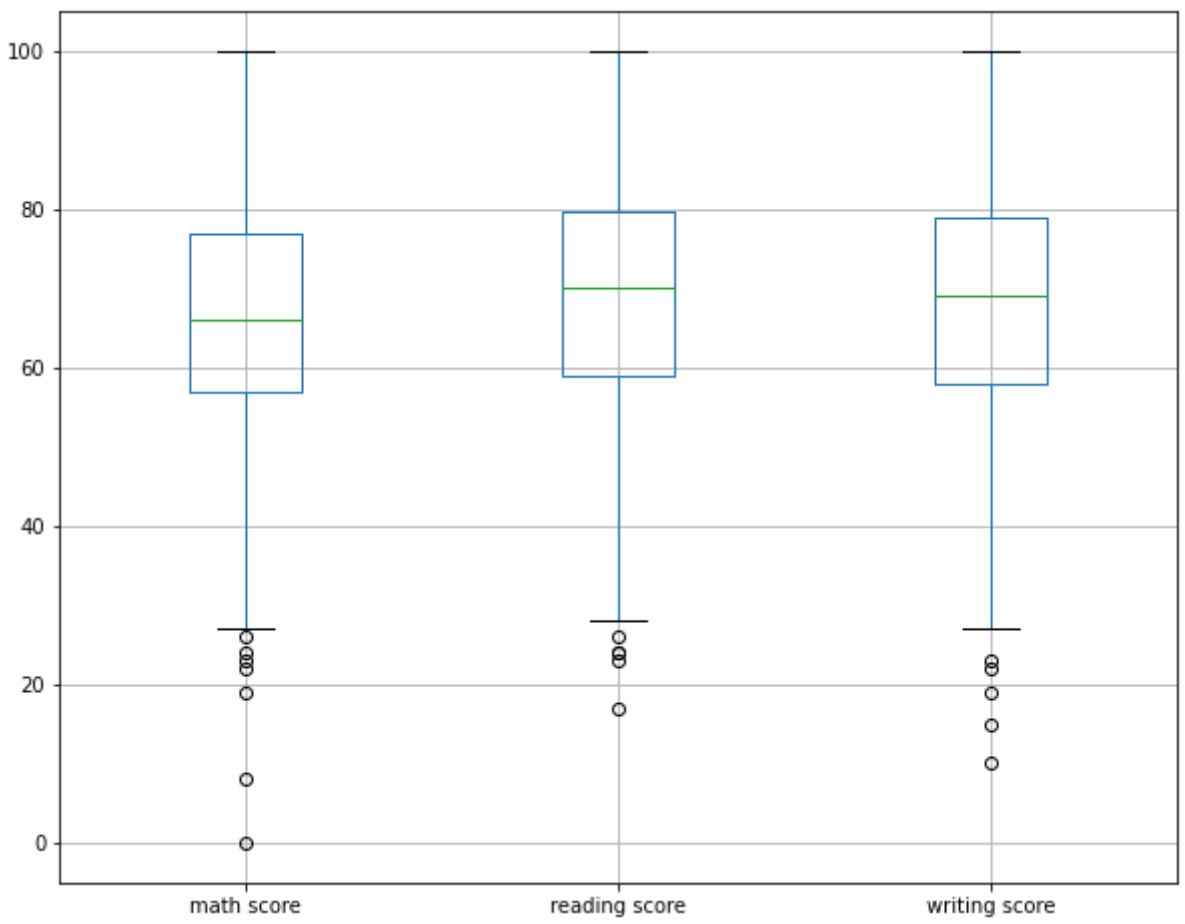
In [ ]:
```
dataset.isnull().sum()
```

Out[ ]:
```
gender                       0
race/ethnicity               0
parental level of education  0
lunch                        0
test preparation course      0
math score                   0
reading score                0
writing score                0
dtype: int64
```

Check for Outliers

Detecting Outlier using Box Plot

In [ ]:
```
plt.figure(figsize=(10,8))
dataset.boxplot()
plt.show()
```



Detecting Outlier using Z-Score

In [ ]:
```
outliers=[]
def detect_outliers(data):

    threshold=3
    mean = np.mean(data)
    std =np.std(data)
```

```
    for i in data:
        z_score= (i - mean)/std
        if np.abs(z_score) > threshold:
            outliers.append(i)
    return outliers
```

In [ ]:
```
num_data = []
for ele in dataset.columns:
    if dataset[ele].dtype != 'object':
        num_data.append(ele)
print("Numeric Data :-> ", num_data)
```

```
Numeric Data :->  ['math score', 'reading score', 'writing score']
```

In [ ]:
```
# Number outliers from each section
for ele in num_data:
    outlier = detect_outliers(dataset[ele])
    if len(outlier) > 0:
        print("Number of Outliers for", ele, ":--->", len(outlier))
```

```
Number of Outliers for math score :---> 3
Number of Outliers for reading score :---> 7
Number of Outliers for writing score :---> 11
```

Detecting and Treating outlier using InterQunatile Range

In [ ]:
```
#Function to find Lower Limit and Upper Limit
def outlier_limits(col):
  Q3, Q1 = np.percentile(col, [75, 25])
  IQR = Q3 - Q1
  UL = Q3 + 1.5*IQR
  LL = Q1 - 1.5*IQR
  return UL, LL
```

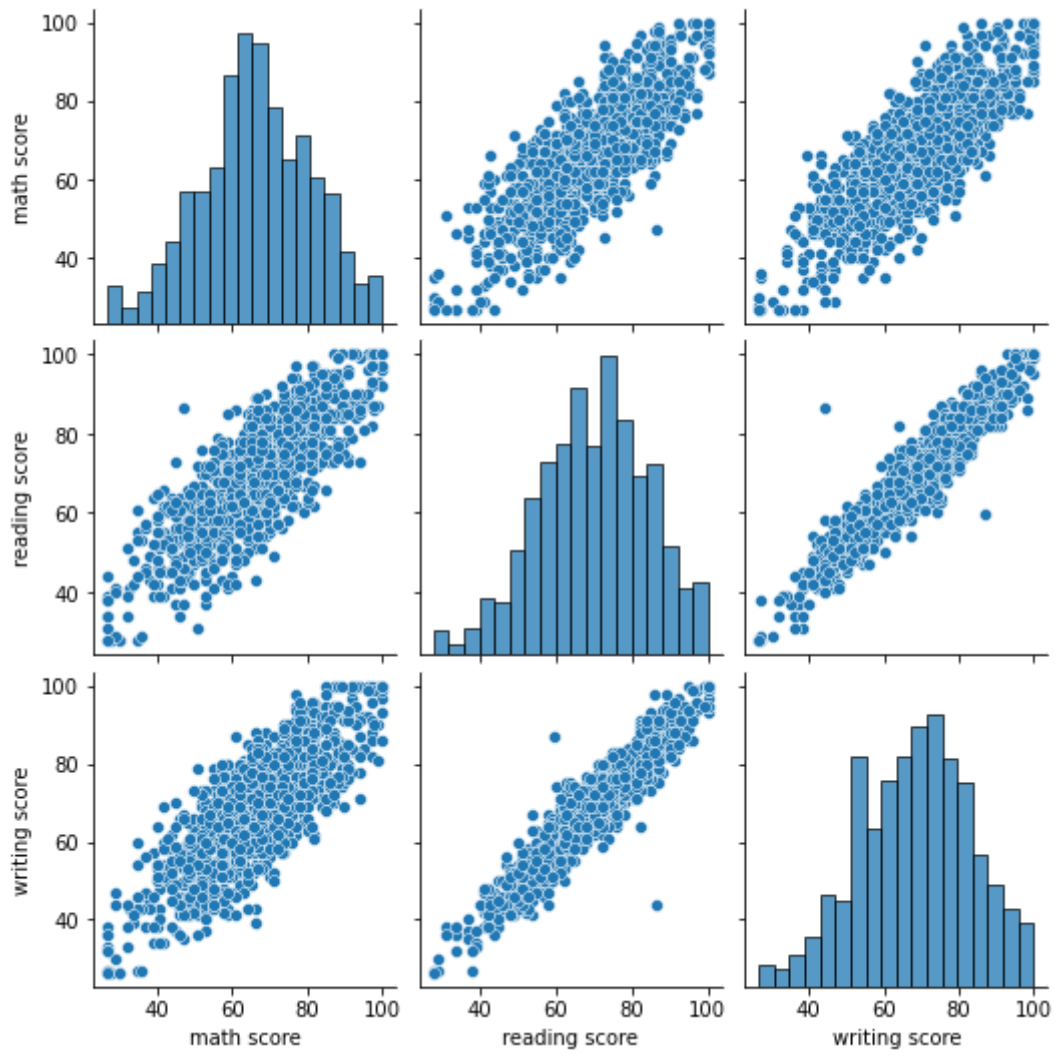
In [ ]:
```
for ele in num_data:
    UL, LL = outlier_limits(dataset[ele])
    print(ele, "--->","Lower Limit :", round(LL), " | ","Upper Limit :", round(UL))
    dataset[ele] =   np.where(dataset[ele]>UL,
                    UL,
                    np.where(
                    dataset[ele]<LL,
                    LL,
                    dataset[ele]))
```

```
math score ---> Lower Limit : 27.0  |  Upper Limit : 107.0
reading score ---> Lower Limit : 28.0  |  Upper Limit : 111.0
writing score ---> Lower Limit : 26.0  |  Upper Limit : 110.0
```

Data Transformation

1) Transformation using log

In [ ]:
```
sns.pairplot(dataset)
plt.show()
```



In [ ]:
```
new_dataset = pd.DataFrame()
new_dataset['math log'] = np.log10(dataset['math score'])
```

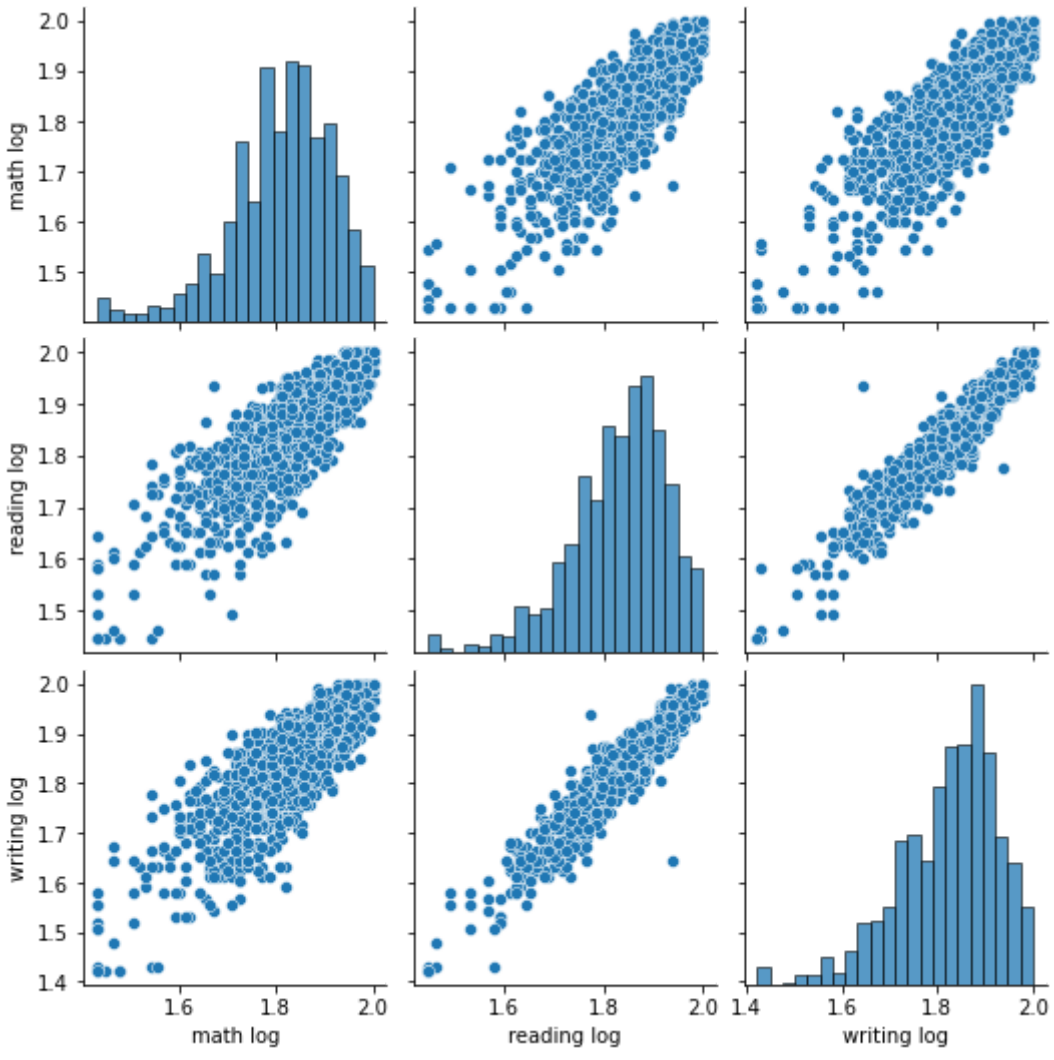
```
new_dataset['reading log'] = np.log10(dataset['reading score'])
new_dataset['writing log'] = np.log10(dataset['writing score'])
new_dataset.head()
```

Out[ ]:

	math log	reading log	writing log
0	1.857332	1.857332	1.869232
1	1.838849	1.954243	1.944483
2	1.954243	1.977724	1.968483
3	1.672098	1.937016	1.643453
4	1.880814	1.892095	1.875061

In [ ]:
```
sns.pairplot(new_dataset)
```

Out[ ]:
```
<seaborn.axisgrid.PairGrid at 0x166f2101880>
```



2) Transformation using Standard Scaler

In [ ]:
```
from sklearn.preprocessing import StandardScaler
sc_scale = StandardScaler()
scaled_math = sc_scale.fit_transform(dataset['math score'].values.reshape(-1,1))
```

In [ ]:
```
scaled_math[:4]
```

Out[ ]:
```
array([[ 0.3875315 ],
       [ 0.18451481],
       [ 1.60563162],
       [-1.30427422]])
```

3) Transformation using MinMax Scaler

In [ ]:
```
from sklearn.preprocessing import MinMaxScaler
mm_scale = MinMaxScaler()
scaled_reading = mm_scale.fit_transform(dataset['reading score'].values.reshape(-1, 1))
```

In [ ]:
```
scaled_reading[:4]
```

Out[ ]:
```
array([[0.6117851 ],
       [0.86135182],
       [0.93067591],
       [0.81282496]])
```