Assignment No. 2

Aim : Data Wrangling II Create an "Academic performance" dataset of students and perform the following operations using Python. 1. Scan all variables for missing values and inconsistencies. If there are missing values and/or inconsistencies, use any of the suitable techniques to deal with them. 2. Scan all numeric variables for outliers. If there are outliers, use any of the suitable techniques to deal with them. 3. Apply data transformations on at least one of the variables. The purpose of this transformation should be one of the following reasons: to change the scale for better understanding of the variable, to convert a non-linear relation into a linear one, or to decrease the skewness and convert the distribution into a normal distribution.

Code :

[56]:

```
import pandas as pd

df1 = pd.read_csv("StudentsPerformance.csv")
df1
```

[56]:

```
    Math_Score  Reading_Score  Writing_Score  Placement_Score  Club_Join_Date  \
0         75.0           87.0           65.0             80.0          2018.0
1         63.0           88.0           99.0             76.0          2021.0
2         72.0           91.0           62.0             75.0          2020.0
3         85.0            NaN           68.0             85.0          2019.0
4         94.0           89.0           75.0             97.0          2020.0
5         74.0           82.0            NaN             94.0             NaN
6         61.0           87.0           67.0             86.0          2019.0
7         63.0           89.0           68.0              NaN          2019.0
8         78.0           78.0           63.0             83.0          2021.0
9         79.0           76.0           62.0             85.0          2025.0
10        80.0           76.0           45.0             96.0          2018.0
11        76.0           83.0           72.0             98.0          2021.0
12        62.0           91.0           71.0            100.0             NaN
13        67.0           81.0           66.0             91.0          2020.0
14        73.0           83.0            NaN             75.0          2067.0
15         NaN           75.0           75.0             78.0          2021.0
16        69.0           68.0           83.0             99.0          2020.0
17        66.0           33.0           69.0              NaN          2020.0
18        50.0           85.0           75.0             99.0          2018.0
19        68.0           86.0           61.0             84.0          2021.0
20        76.0           75.0           63.0            100.0          2019.0
```

```
21        61.0           82.0           65.0             77.0          2034.0
22         NaN           93.0           74.0              NaN          2018.0
23        79.0           88.0           30.0             76.0             NaN
24        71.0           86.0           69.0             96.0          2018.0
25        68.0           81.0           79.0             86.0          2018.0
26        40.0           92.0           74.0             76.0          2021.0
27        61.0           80.0            NaN             83.0          2000.0
28        69.0           81.0           66.0             78.0          2019.0

    Plcement_Offer_Count
0                    2.0
1                    2.0
2                    2.0
3                    NaN
4                    2.0
5                    2.0
6                    2.0
7                    2.0
8                    2.0
9                    NaN
10                   2.0
11                   2.0
12                   2.0
13                   2.0
14                   1.0
15                   2.0
16                   2.0
17                   2.0
18                   1.0
19                   2.0
20                   2.0
21                   2.0
22                   1.0
23                   2.0
24                   2.0
25                   2.0
26                   NaN
27                   2.0
28                   2.0
```

```
[57]: df1.isnull()
```

```
[57]:     Math_Score  Reading_Score  Writing_Score  Placement_Score  Club_Join_Date  \
      0        False          False          False            False           False
      1        False          False          False            False           False
      2        False          False          False            False           False
      3        False           True          False            False           False
```

```
4        False          False          False            False            False
5        False          False           True            False             True
6        False          False          False            False            False
7        False          False          False             True            False
8        False          False          False            False            False
9        False          False          False            False            False
10       False          False          False            False            False
11       False          False          False            False            False
12       False          False          False            False             True
13       False          False          False            False            False
14       False          False           True            False            False
15        True          False          False            False            False
16       False          False          False            False            False
17       False          False          False             True            False
18       False          False          False            False            False
19       False          False          False            False            False
20       False          False          False            False            False
21       False          False          False            False            False
22        True          False          False             True            False
23       False          False          False            False             True
24       False          False          False            False            False
25       False          False          False            False            False
26       False          False          False            False            False
27       False          False           True            False            False
28       False          False          False            False            False

    Plcement_Offer_Count
0                  False
1                  False
2                  False
3                   True
4                  False
5                  False
6                  False
7                  False
8                  False
9                   True
10                 False
11                 False
12                 False
13                 False
14                 False
15                 False
16                 False
17                 False
18                 False
19                 False
```

```
20                    False
21                    False
22                    False
23                    False
24                    False
25                    False
26                     True
27                    False
28                    False
```

[58]:
```
series = pd.isnull(df1["Math_Score"])
df1[series]
```

[58]:
```
    Math_Score  Reading_Score  Writing_Score  Placement_Score  Club_Join_Date  \
15         NaN           75.0           75.0             78.0          2021.0   
22         NaN           93.0           74.0              NaN          2018.0   

    Plcement_Offer_Count  
15                   2.0  
22                   1.0  
```

[59]:
```
df1.notnull()
```

[59]:
```
    Math_Score  Reading_Score  Writing_Score  Placement_Score  Club_Join_Date  \
0         True           True           True             True            True   
1         True           True           True             True            True   
2         True           True           True             True            True   
3         True          False           True             True            True   
4         True           True           True             True            True   
5         True           True          False             True           False   
6         True           True           True             True            True   
7         True           True           True            False            True   
8         True           True           True             True            True   
9         True           True           True             True            True   
10        True           True           True             True            True   
11        True           True           True             True            True   
12        True           True           True             True           False   
13        True           True           True             True            True   
14        True           True          False             True            True   
15       False           True           True             True            True   
16        True           True           True             True            True   
17        True           True           True            False            True   
18        True           True           True             True            True   
19        True           True           True             True            True   
20        True           True           True             True            True   
21        True           True           True             True            True   
22       False           True           True            False            True   
```

```
23        True           True           True             True           False
24        True           True           True             True            True
25        True           True           True             True            True
26        True           True           True             True            True
27        True           True          False             True            True
28        True           True           True             True            True

    Plcement_Offer_Count
0                   True
1                   True
2                   True
3                  False
4                   True
5                   True
6                   True
7                   True
8                   True
9                  False
10                  True
11                  True
12                  True
13                  True
14                  True
15                  True
16                  True
17                  True
18                  True
19                  True
20                  True
21                  True
22                  True
23                  True
24                  True
25                  True
26                 False
27                  True
28                  True
```

[60]:

```
from sklearn.preprocessing import LabelEncoder
le = LabelEncoder()
df1['Writing_Score'] = le.fit_transform(df1['Writing_Score'])
newdf=df1
df1
```

[60]:

```
    Math_Score  Reading_Score  Writing_Score  Placement_Score  Club_Join_Date  \
0         75.0           87.0              5             80.0          2018.0
1         63.0           88.0             16             76.0          2021.0
```

```
2         72.0           91.0              3             75.0          2020.0
3         85.0            NaN              8             85.0          2019.0
4         94.0           89.0             13             97.0          2020.0
5         74.0           82.0             17             94.0             NaN
6         61.0           87.0              7             86.0          2019.0
7         63.0           89.0              8              NaN          2019.0
8         78.0           78.0              4             83.0          2021.0
9         79.0           76.0              3             85.0          2025.0
10        80.0           76.0              1             96.0          2018.0
11        76.0           83.0             11             98.0          2021.0
12        62.0           91.0             10            100.0             NaN
13        67.0           81.0              6             91.0          2020.0
14        73.0           83.0             17             75.0          2067.0
15         NaN           75.0             13             78.0          2021.0
16        69.0           68.0             15             99.0          2020.0
17        66.0           33.0              9              NaN          2020.0
18        50.0           85.0             13             99.0          2018.0
19        68.0           86.0              2             84.0          2021.0
20        76.0           75.0              4            100.0          2019.0
21        61.0           82.0              5             77.0          2034.0
22         NaN           93.0             12              NaN          2018.0
23        79.0           88.0              0             76.0             NaN
24        71.0           86.0              9             96.0          2018.0
25        68.0           81.0             14             86.0          2018.0
26        40.0           92.0             12             76.0          2021.0
27        61.0           80.0             17             83.0          2000.0
28        69.0           81.0              6             78.0          2019.0

    Plcement_Offer_Count
0                    2.0
1                    2.0
2                    2.0
3                    NaN
4                    2.0
5                    2.0
6                    2.0
7                    2.0
8                    2.0
9                    NaN
10                   2.0
11                   2.0
12                   2.0
13                   2.0
14                   1.0
15                   2.0
16                   2.0
17                   2.0
```

```
18                     1.0
19                     2.0
20                     2.0
21                     2.0
22                     1.0
23                     2.0
24                     2.0
25                     2.0
26                     NaN
27                     2.0
28                     2.0
```

[61]:

```
missing_values = ["Na", "na"]
df1 = pd.read_csv("StudentsPerformance.csv", na_values = missing_values)
df1
```

[61]:

```
    Math_Score  Reading_Score  Writing_Score  Placement_Score  Club_Join_Date  \
0         75.0           87.0           65.0             80.0          2018.0
1         63.0           88.0           99.0             76.0          2021.0
2         72.0           91.0           62.0             75.0          2020.0
3         85.0            NaN           68.0             85.0          2019.0
4         94.0           89.0           75.0             97.0          2020.0
5         74.0           82.0            NaN             94.0             NaN
6         61.0           87.0           67.0             86.0          2019.0
7         63.0           89.0           68.0              NaN          2019.0
8         78.0           78.0           63.0             83.0          2021.0
9         79.0           76.0           62.0             85.0          2025.0
10        80.0           76.0           45.0             96.0          2018.0
11        76.0           83.0           72.0             98.0          2021.0
12        62.0           91.0           71.0            100.0             NaN
13        67.0           81.0           66.0             91.0          2020.0
14        73.0           83.0            NaN             75.0          2067.0
15         NaN           75.0           75.0             78.0          2021.0
16        69.0           68.0           83.0             99.0          2020.0
17        66.0           33.0           69.0              NaN          2020.0
18        50.0           85.0           75.0             99.0          2018.0
19        68.0           86.0           61.0             84.0          2021.0
20        76.0           75.0           63.0            100.0          2019.0
21        61.0           82.0           65.0             77.0          2034.0
22         NaN           93.0           74.0              NaN          2018.0
23        79.0           88.0           30.0             76.0             NaN
24        71.0           86.0           69.0             96.0          2018.0
25        68.0           81.0           79.0             86.0          2018.0
26        40.0           92.0           74.0             76.0          2021.0
27        61.0           80.0            NaN             83.0          2000.0
28        69.0           81.0           66.0             78.0          2019.0
```

```
    Plcement_Offer_Count
0                    2.0
1                    2.0
2                    2.0
3                    NaN
4                    2.0
5                    2.0
6                    2.0
7                    2.0
8                    2.0
9                    NaN
10                   2.0
11                   2.0
12                   2.0
13                   2.0
14                   1.0
15                   2.0
16                   2.0
17                   2.0
18                   1.0
19                   2.0
20                   2.0
21                   2.0
22                   1.0
23                   2.0
24                   2.0
25                   2.0
26                   NaN
27                   2.0
28                   2.0
```

[62]:

```
ndf=df1
ndf.fillna(0)
```

[62]:

```
    Math_Score  Reading_Score  Writing_Score  Placement_Score  Club_Join_Date  \
0         75.0           87.0           65.0             80.0          2018.0
1         63.0           88.0           99.0             76.0          2021.0
2         72.0           91.0           62.0             75.0          2020.0
3         85.0            0.0           68.0             85.0          2019.0
4         94.0           89.0           75.0             97.0          2020.0
5         74.0           82.0            0.0             94.0             0.0
6         61.0           87.0           67.0             86.0          2019.0
7         63.0           89.0           68.0              0.0          2019.0
8         78.0           78.0           63.0             83.0          2021.0
9         79.0           76.0           62.0             85.0          2025.0
10        80.0           76.0           45.0             96.0          2018.0
11        76.0           83.0           72.0             98.0          2021.0
```

```
12        62.0           91.0           71.0            100.0             0.0
13        67.0           81.0           66.0             91.0          2020.0
14        73.0           83.0            0.0             75.0          2067.0
15         0.0           75.0           75.0             78.0          2021.0
16        69.0           68.0           83.0             99.0          2020.0
17        66.0           33.0           69.0              0.0          2020.0
18        50.0           85.0           75.0             99.0          2018.0
19        68.0           86.0           61.0             84.0          2021.0
20        76.0           75.0           63.0            100.0          2019.0
21        61.0           82.0           65.0             77.0          2034.0
22         0.0           93.0           74.0              0.0          2018.0
23        79.0           88.0           30.0             76.0             0.0
24        71.0           86.0           69.0             96.0          2018.0
25        68.0           81.0           79.0             86.0          2018.0
26        40.0           92.0           74.0             76.0          2021.0
27        61.0           80.0            0.0             83.0          2000.0
28        69.0           81.0           66.0             78.0          2019.0

    Plcement_Offer_Count
0                    2.0
1                    2.0
2                    2.0
3                    0.0
4                    2.0
5                    2.0
6                    2.0
7                    2.0
8                    2.0
9                    0.0
10                   2.0
11                   2.0
12                   2.0
13                   2.0
14                   1.0
15                   2.0
16                   2.0
17                   2.0
18                   1.0
19                   2.0
20                   2.0
21                   2.0
22                   1.0
23                   2.0
24                   2.0
25                   2.0
26                   0.0
27                   2.0
```

```
28                   2.0
```

[63]:

```
m_v=df1['Math_Score'].mean()
df1['Math_Score'].fillna(value=m_v, inplace=True)
df1
```

[63]:

```
    Math_Score  Reading_Score  Writing_Score  Placement_Score  Club_Join_Date  \
0     75.00000           87.0           65.0             80.0          2018.0   
1     63.00000           88.0           99.0             76.0          2021.0   
2     72.00000           91.0           62.0             75.0          2020.0   
3     85.00000            NaN           68.0             85.0          2019.0   
4     94.00000           89.0           75.0             97.0          2020.0   
5     74.00000           82.0            NaN             94.0             NaN   
6     61.00000           87.0           67.0             86.0          2019.0   
7     63.00000           89.0           68.0              NaN          2019.0   
8     78.00000           78.0           63.0             83.0          2021.0   
9     79.00000           76.0           62.0             85.0          2025.0   
10    80.00000           76.0           45.0             96.0          2018.0   
11    76.00000           83.0           72.0             98.0          2021.0   
12    62.00000           91.0           71.0            100.0             NaN   
13    67.00000           81.0           66.0             91.0          2020.0   
14    73.00000           83.0            NaN             75.0          2067.0   
15    69.62963           75.0           75.0             78.0          2021.0   
16    69.00000           68.0           83.0             99.0          2020.0   
17    66.00000           33.0           69.0              NaN          2020.0   
18    50.00000           85.0           75.0             99.0          2018.0   
19    68.00000           86.0           61.0             84.0          2021.0   
20    76.00000           75.0           63.0            100.0          2019.0   
21    61.00000           82.0           65.0             77.0          2034.0   
22    69.62963           93.0           74.0              NaN          2018.0   
23    79.00000           88.0           30.0             76.0             NaN   
24    71.00000           86.0           69.0             96.0          2018.0   
25    68.00000           81.0           79.0             86.0          2018.0   
26    40.00000           92.0           74.0             76.0          2021.0   
27    61.00000           80.0            NaN             83.0          2000.0   
28    69.00000           81.0           66.0             78.0          2019.0   

    Plcement_Offer_Count
0                    2.0
1                    2.0
2                    2.0
3                    NaN
4                    2.0
5                    2.0
6                    2.0
7                    2.0
8                    2.0
```

```
9                    NaN
10                   2.0
11                   2.0
12                   2.0
13                   2.0
14                   1.0
15                   2.0
16                   2.0
17                   2.0
18                   1.0
19                   2.0
20                   2.0
21                   2.0
22                   1.0
23                   2.0
24                   2.0
25                   2.0
26                   NaN
27                   2.0
28                   2.0
```

[64]:
```python
df1.dropna()
```

[64]:
```
    Math_Score  Reading_Score  Writing_Score  Placement_Score  Club_Join_Date  \
0     75.00000           87.0           65.0             80.0          2018.0
1     63.00000           88.0           99.0             76.0          2021.0
2     72.00000           91.0           62.0             75.0          2020.0
4     94.00000           89.0           75.0             97.0          2020.0
6     61.00000           87.0           67.0             86.0          2019.0
8     78.00000           78.0           63.0             83.0          2021.0
10    80.00000           76.0           45.0             96.0          2018.0
11    76.00000           83.0           72.0             98.0          2021.0
13    67.00000           81.0           66.0             91.0          2020.0
15    69.62963           75.0           75.0             78.0          2021.0
16    69.00000           68.0           83.0             99.0          2020.0
18    50.00000           85.0           75.0             99.0          2018.0
19    68.00000           86.0           61.0             84.0          2021.0
20    76.00000           75.0           63.0            100.0          2019.0
21    61.00000           82.0           65.0             77.0          2034.0
24    71.00000           86.0           69.0             96.0          2018.0
25    68.00000           81.0           79.0             86.0          2018.0
28    69.00000           81.0           66.0             78.0          2019.0

    Plcement_Offer_Count
0                    2.0
1                    2.0
2                    2.0
```

```
4                     2.0
6                     2.0
8                     2.0
10                    2.0
11                    2.0
13                    2.0
15                    2.0
16                    2.0
18                    1.0
19                    2.0
20                    2.0
21                    2.0
24                    2.0
25                    2.0
28                    2.0
```

[65]:
```
df1.dropna(axis = 1)
```

[65]:
```
    Math_Score
0     75.00000
1     63.00000
2     72.00000
3     85.00000
4     94.00000
5     74.00000
6     61.00000
7     63.00000
8     78.00000
9     79.00000
10    80.00000
11    76.00000
12    62.00000
13    67.00000
14    73.00000
15    69.62963
16    69.00000
17    66.00000
18    50.00000
19    68.00000
20    76.00000
21    61.00000
22    69.62963
23    79.00000
24    71.00000
25    68.00000
26    40.00000
27    61.00000
```

```
28    69.00000
```

[66]:

```
new_data = df1.dropna(axis = 0, how ='any')
new_data
```

[66]:

```
    Math_Score  Reading_Score  Writing_Score  Placement_Score  Club_Join_Date  \
0     75.00000           87.0           65.0             80.0          2018.0
1     63.00000           88.0           99.0             76.0          2021.0
2     72.00000           91.0           62.0             75.0          2020.0
4     94.00000           89.0           75.0             97.0          2020.0
6     61.00000           87.0           67.0             86.0          2019.0
8     78.00000           78.0           63.0             83.0          2021.0
10    80.00000           76.0           45.0             96.0          2018.0
11    76.00000           83.0           72.0             98.0          2021.0
13    67.00000           81.0           66.0             91.0          2020.0
15    69.62963           75.0           75.0             78.0          2021.0
16    69.00000           68.0           83.0             99.0          2020.0
18    50.00000           85.0           75.0             99.0          2018.0
19    68.00000           86.0           61.0             84.0          2021.0
20    76.00000           75.0           63.0            100.0          2019.0
21    61.00000           82.0           65.0             77.0          2034.0
24    71.00000           86.0           69.0             96.0          2018.0
25    68.00000           81.0           79.0             86.0          2018.0
28    69.00000           81.0           66.0             78.0          2019.0

    Plcement_Offer_Count
0                    2.0
1                    2.0
2                    2.0
4                    2.0
6                    2.0
8                    2.0
10                   2.0
11                   2.0
13                   2.0
15                   2.0
16                   2.0
18                   1.0
19                   2.0
20                   2.0
21                   2.0
24                   2.0
25                   2.0
28                   2.0
```

[68]:

```
import numpy as np
import matplotlib.pyplot as plt
```

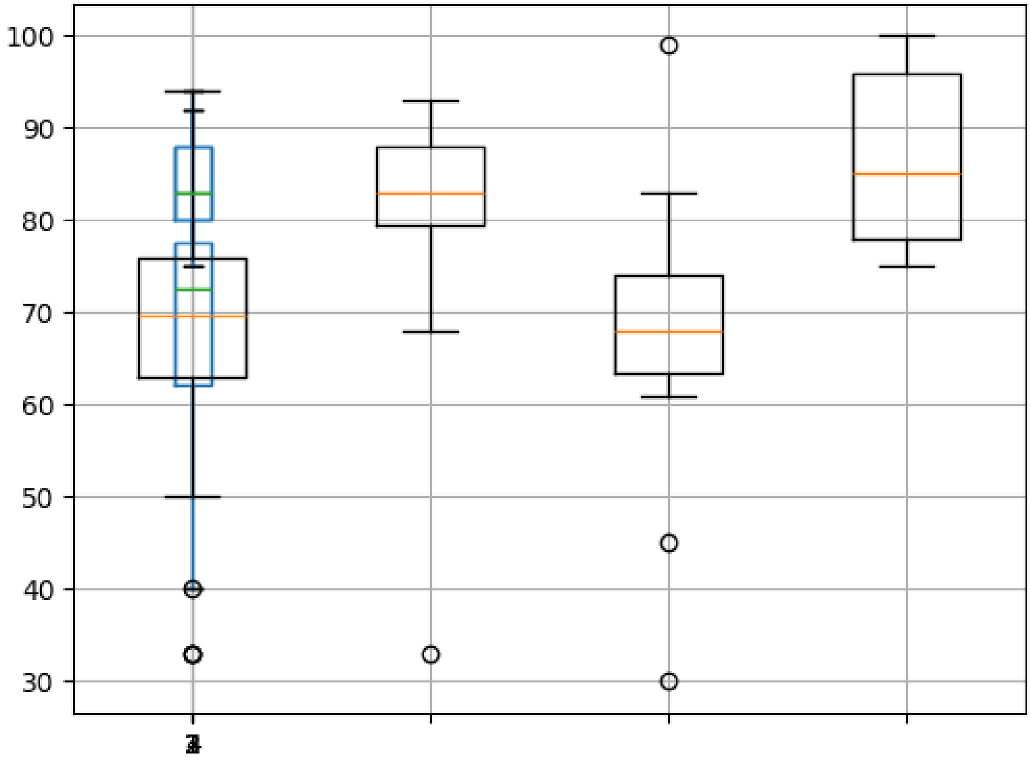
```
print(np.where(df1['Math_Score']>90))
print(np.where(df1['Reading_Score']<25))
print(np.where(df1['Writing_Score']<30))
```

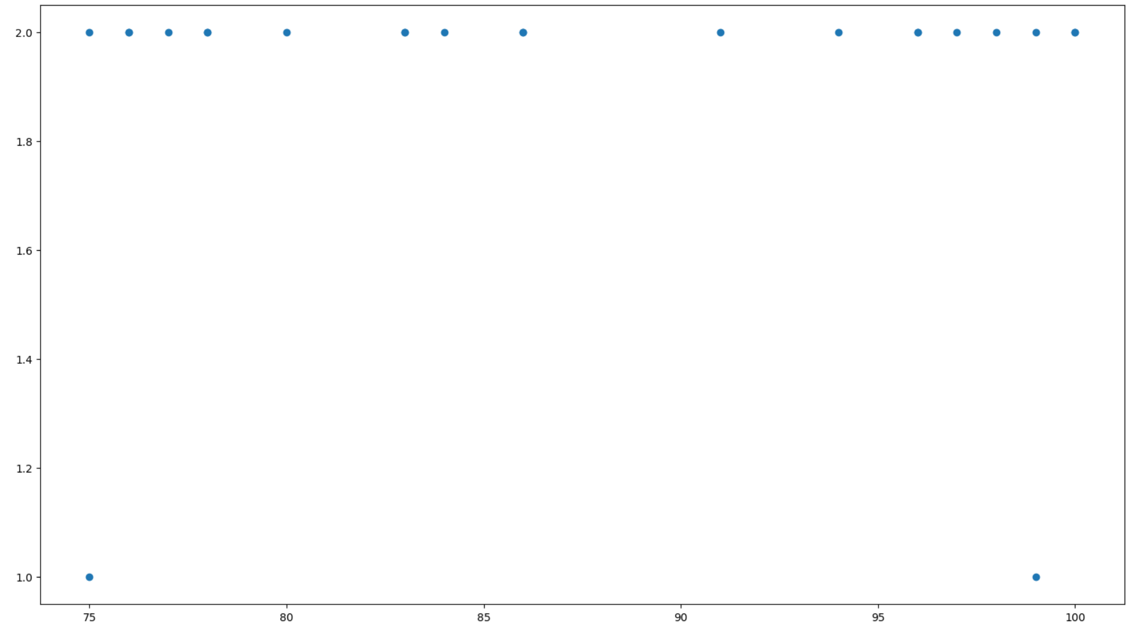
```
(array([4], dtype=int64),)
(array([], dtype=int64),)
(array([], dtype=int64),)
```

[69]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

[70]:
```
fig, ax = plt.subplots(figsize = (18,10))
ax.scatter(df1['Placement_Score'], df1['Plcement_Offer_Count'])
plt.show()

ax.set_xlabel('(Proportion non-retail business acres)/(town)')
ax.set_ylabel('(Full-value property-tax rate)/($10,000)'
```





[70]:
```
Text(4.444444444444452, 0.5, '(Full-value property-tax rate)/($10,000)')
```

[71]:
```
print(np.where((df1['Placement_Score']<50) & (df1['Plcement_Offer_Count']>1)))
print(np.where((df1['Placement_Score']>85) & (df1['Plcement_Offer_Count']<3)))
```

```
(array([], dtype=int64),)
(array([ 4,  5,  6, 10, 11, 12, 13, 16, 18, 20, 24, 25], dtype=int64),)
```

[72]:
```
import numpy as np
from scipy import stats
```

[73]:
```
z = np.abs(stats.zscore(df1['Math_Score']))
print(z)
```

```
0     5.288666e-01
1     6.528767e-01
2     2.334308e-01
3     1.513653e+00
4     2.399960e+00
5     4.303880e-01
6     8.498339e-01
7     6.528767e-01
8     8.243024e-01
9     9.227810e-01
10    1.021260e+00
11    6.273452e-01
12    7.513553e-01
```

```
13    2.589623e-01
14    3.319094e-01
15    1.399465e-15
16    6.200505e-02
17    3.574409e-01
18    1.933099e+00
19    1.604837e-01
20    6.273452e-01
21    8.498339e-01
22    1.399465e-15
23    9.227810e-01
24    1.349522e-01
25    1.604837e-01
26    2.917885e+00
27    8.498339e-01
28    6.200505e-02
Name: Math_Score, dtype: float64
```

[74]:
```
threshold = 0.18
sample_outliers = np.where(z <threshold)
sample_outliers
```

[74]:
```
(array([15, 16, 19, 22, 24, 25, 28], dtype=int64),)
```

[75]:
```
sorted_rscore= sorted(df1['Reading_Score'])
```

[76]:
```
sorted_rscore
```

[76]:
```
[33.0,
 68.0,
 75.0,
 75.0,
 76.0,
 76.0,
 78.0,
 80.0,
 81.0,
 81.0,
 81.0,
 82.0,
 82.0,
 83.0,
 83.0,
 86.0,
 87.0,
 87.0,
 88.0,
 91.0,
 nan,
 85.0,
 86.0,
 88.0,
 89.0,
 89.0,
 91.0,
 92.0,
 93.0]
```

[77]:
```
q1 = np.percentile(sorted_rscore, 33.0)
q3 = np.percentile(sorted_rscore, 91.0)
print(q1,q3)
```

```
nan nan
```

[78]:
```
IQR = q3-q1
lwr_bound = q1-(1.5*IQR)
upr_bound = q3+(1.5*IQR)
print(lwr_bound, upr_bound)
```

```
nan nan
```

[79]:
```
r_outliers = []
for i in sorted_rscore:
    if (i<lwr_bound or i>upr_bound):
        r_outliers.append(i)
print(r_outliers)
```

```
[]
```

[80]:
```
new_df=df1
for i in sample_outliers:
    new_df.drop(i,inplace=True)
new_df
```

[80]:
```
   Math_Score  Reading_Score  Writing_Score  Placement_Score  Club_Join_Date  \
0        75.0           87.0           65.0             80.0          2018.0
1        63.0           88.0           99.0             76.0          2021.0
2        72.0           91.0           62.0             75.0          2020.0
3        85.0            NaN           68.0             85.0          2019.0
4        94.0           89.0           75.0             97.0          2020.0
5        74.0           82.0            NaN             94.0             NaN
6        61.0           87.0           67.0             86.0          2019.0
7        63.0           89.0           68.0              NaN          2019.0
8        78.0           78.0           63.0             83.0          2021.0
```

```
9         79.0           76.0           62.0             85.0          2025.0
10        80.0           76.0           45.0             96.0          2018.0
11        76.0           83.0           72.0             98.0          2021.0
12        62.0           91.0           71.0            100.0             NaN
13        67.0           81.0           66.0             91.0          2020.0
14        73.0           83.0            NaN             75.0          2067.0
17        66.0           33.0           69.0              NaN          2020.0
18        50.0           85.0           75.0             99.0          2018.0
20        76.0           75.0           63.0            100.0          2019.0
21        61.0           82.0           65.0             77.0          2034.0
23        79.0           88.0           30.0             76.0             NaN
26        40.0           92.0           74.0             76.0          2021.0
27        61.0           80.0            NaN             83.0          2000.0

    Plcement_Offer_Count
0                    2.0
1                    2.0
2                    2.0
3                    NaN
4                    2.0
5                    2.0
6                    2.0
7                    2.0
8                    2.0
9                    NaN
10                   2.0
11                   2.0
12                   2.0
13                   2.0
14                   1.0
17                   2.0
18                   1.0
20                   2.0
21                   2.0
23                   2.0
26                   NaN
27                   2.0
```

[81]:

```
df_stud=df1
ninetieth_percentile = np.percentile(df_stud['Math_Score'], 90)
b = np.where(df_stud['Math_Score']>ninetieth_percentile,
ninetieth_percentile, df_stud['Math_Score'])
print("New array:",b)
```

```
New array: [75.   63.   72.   79.9 79.9 74.   61.   63.   78.   79.   79.9 76.   62.   67.
 73.   66.   50.   76.   61.   79.   40.   61. ]
```

[82]:
```
df_stud.insert(1,"m score",b,True)
df_stud
```

[82]:
```
    Math_Score  m score  Reading_Score  Writing_Score  Placement_Score  \
0         75.0     75.0           87.0           65.0             80.0
1         63.0     63.0           88.0           99.0             76.0
2         72.0     72.0           91.0           62.0             75.0
3         85.0     79.9            NaN           68.0             85.0
4         94.0     79.9           89.0           75.0             97.0
5         74.0     74.0           82.0            NaN             94.0
6         61.0     61.0           87.0           67.0             86.0
7         63.0     63.0           89.0           68.0              NaN
8         78.0     78.0           78.0           63.0             83.0
9         79.0     79.0           76.0           62.0             85.0
10        80.0     79.9           76.0           45.0             96.0
11        76.0     76.0           83.0           72.0             98.0
12        62.0     62.0           91.0           71.0            100.0
13        67.0     67.0           81.0           66.0             91.0
14        73.0     73.0           83.0            NaN             75.0
17        66.0     66.0           33.0           69.0              NaN
18        50.0     50.0           85.0           75.0             99.0
20        76.0     76.0           75.0           63.0            100.0
21        61.0     61.0           82.0           65.0             77.0
23        79.0     79.0           88.0           30.0             76.0
26        40.0     40.0           92.0           74.0             76.0
27        61.0     61.0           80.0            NaN             83.0

    Club_Join_Date  Plcement_Offer_Count
0           2018.0                   2.0
1           2021.0                   2.0
2           2020.0                   2.0
3           2019.0                   NaN
4           2020.0                   2.0
5              NaN                   2.0
6           2019.0                   2.0
7           2019.0                   2.0
8           2021.0                   2.0
9           2025.0                   NaN
10          2018.0                   2.0
11          2021.0                   2.0
12             NaN                   2.0
13          2020.0                   2.0
14          2067.0                   1.0
17          2020.0                   2.0
18          2018.0                   1.0
20          2019.0                   2.0
21          2034.0                   2.0
```

```
23             NaN                    2.0
26          2021.0                    NaN
27          2000.0                    2.0
```

[93]:
```
col = ['Reading_Score']
df1.boxplot(col)
median=np.median(sorted_rscore)
median
refined_df1=df1
```

[95]:
```
refined_df1['Reading_Score'] = np.where(refined_df1['Reading_Score']␣
 ↪>upr_bound, median,refined_df1['Reading_Score'])
refined_df1
```

[95]:
```
    Math_Score  m score  Reading_Score  Writing_Score  Placement_Score  \
0         75.0     75.0           87.0           65.0             80.0
1         63.0     63.0           88.0           99.0             76.0
2         72.0     72.0           91.0           62.0             75.0
3         85.0     79.9            NaN           68.0             85.0
4         94.0     79.9           89.0           75.0             97.0
5         74.0     74.0           82.0            NaN             94.0
6         61.0     61.0           87.0           67.0             86.0
7         63.0     63.0           89.0           68.0              NaN
8         78.0     78.0           78.0           63.0             83.0
9         79.0     79.0           76.0           62.0             85.0
10        80.0     79.9           76.0           45.0             96.0
11        76.0     76.0           83.0           72.0             98.0
12        62.0     62.0           91.0           71.0            100.0
13        67.0     67.0           81.0           66.0             91.0
14        73.0     73.0           83.0            NaN             75.0
17        66.0     66.0           33.0           69.0              NaN
18        50.0     50.0           85.0           75.0             99.0
20        76.0     76.0           75.0           63.0            100.0
21        61.0     61.0           82.0           65.0             77.0
23        79.0     79.0           88.0           30.0             76.0
26        40.0     40.0           92.0           74.0             76.0
27        61.0     61.0           80.0            NaN             83.0

    Club_Join_Date  Plcement_Offer_Count
0           2018.0                   2.0
1           2021.0                   2.0
2           2020.0                   2.0
3           2019.0                   NaN
4           2020.0                   2.0
5              NaN                   2.0
6           2019.0                   2.0
7           2019.0                   2.0
```

```
8          2021.0                   2.0
9          2025.0                   NaN
10         2018.0                   2.0
11         2021.0                   2.0
12            NaN                   2.0
13         2020.0                   2.0
14         2067.0                   1.0
17         2020.0                   2.0
18         2018.0                   1.0
20         2019.0                   2.0
21         2034.0                   2.0
23            NaN                   2.0
26         2021.0                   NaN
27         2000.0                   2.0
```

[96]:

```
refined_df1['Reading_Score'] = np.where(refined_df1['Reading_Score']␣
 ↪<lwr_bound, median,refined_df1['Reading_Score'])
refined_df1
```

[96]:

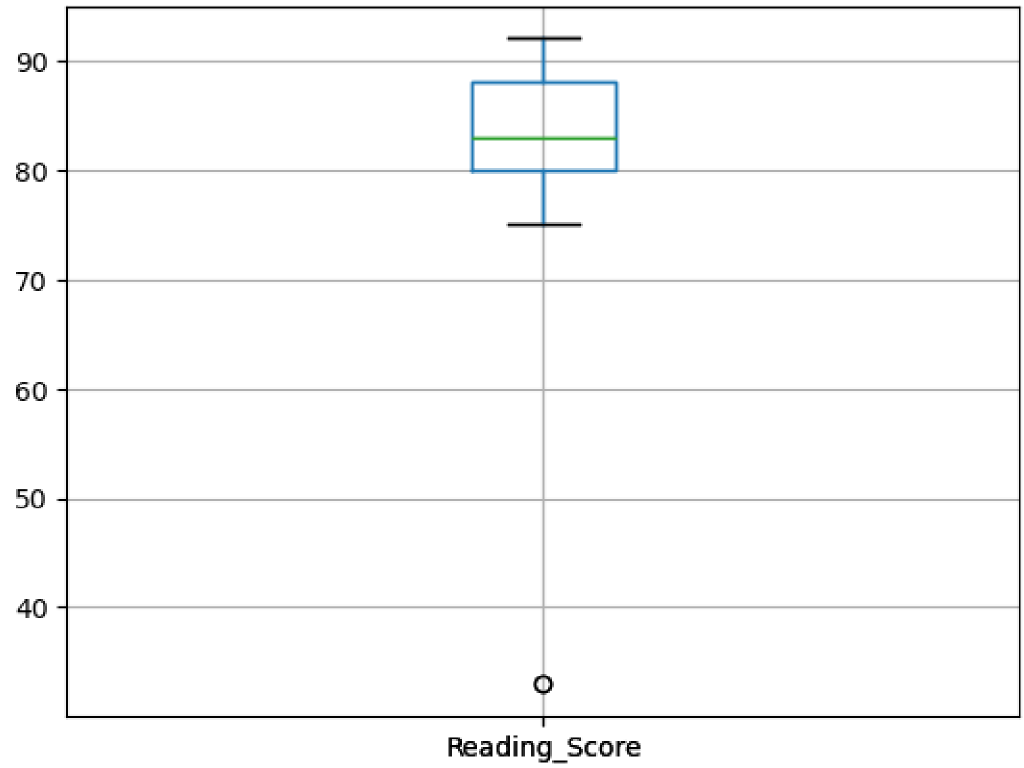
```
    Math_Score  m score  Reading_Score  Writing_Score  Placement_Score  \
0         75.0     75.0           87.0           65.0             80.0
1         63.0     63.0           88.0           99.0             76.0
2         72.0     72.0           91.0           62.0             75.0
3         85.0     79.9            NaN           68.0             85.0
4         94.0     79.9           89.0           75.0             97.0
5         74.0     74.0           82.0            NaN             94.0
6         61.0     61.0           87.0           67.0             86.0
7         63.0     63.0           89.0           68.0              NaN
8         78.0     78.0           78.0           63.0             83.0
9         79.0     79.0           76.0           62.0             85.0
10        80.0     79.9           76.0           45.0             96.0
11        76.0     76.0           83.0           72.0             98.0
12        62.0     62.0           91.0           71.0            100.0
13        67.0     67.0           81.0           66.0             91.0
14        73.0     73.0           83.0            NaN             75.0
17        66.0     66.0           33.0           69.0              NaN
18        50.0     50.0           85.0           75.0             99.0
20        76.0     76.0           75.0           63.0            100.0
21        61.0     61.0           82.0           65.0             77.0
23        79.0     79.0           88.0           30.0             76.0
26        40.0     40.0           92.0           74.0             76.0
27        61.0     61.0           80.0            NaN             83.0

    Club_Join_Date  Plcement_Offer_Count
0           2018.0                   2.0
1           2021.0                   2.0
2           2020.0                   2.0
```

```
3           2019.0                    NaN
4           2020.0                    2.0
5              NaN                    2.0
6           2019.0                    2.0
7           2019.0                    2.0
8           2021.0                    2.0
9           2025.0                    NaN
10          2018.0                    2.0
11          2021.0                    2.0
12             NaN                    2.0
13          2020.0                    2.0
14          2067.0                    1.0
17          2020.0                    2.0
18          2018.0                    1.0
20          2019.0                    2.0
21          2034.0                    2.0
23             NaN                    2.0
26          2021.0                    NaN
27          2000.0                    2.0
```

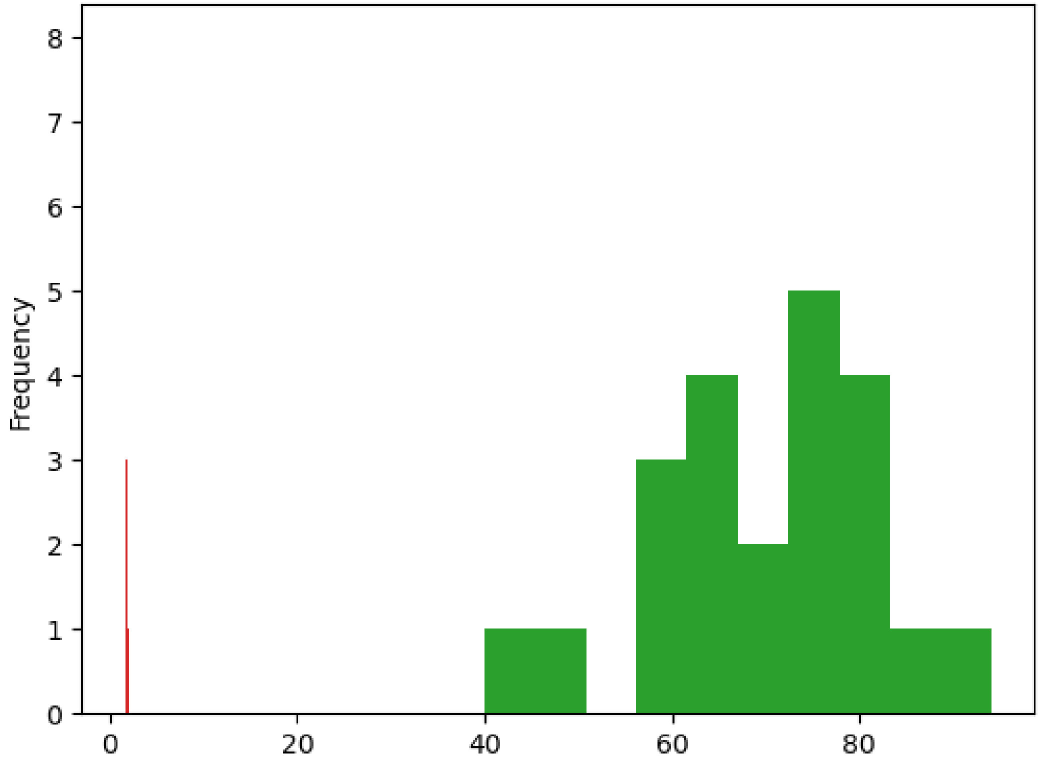
[119]:

```
col = ['Reading_Score']
refined_df.boxplot(col)
plt.show()
```



[117]:

```
import matplotlib.pyplot as plt
new_df['Math_Score'].plot(kind = 'hist')
df1['log_math'] = np.log10(df1['Math_Score'])
df1['log_math'].plot(kind = 'hist')
plt.show()
```



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