# practical-2-1

March 4, 2025

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.

[1]:
```
import pandas as pd
import numpy as np
```

[2]:
```
data=pd.read_csv("Desktop\StudentPerformance.csv")
```

[3]:
```
data
```

[3]:

| | math_score | reading_score | writing_score | placement_score | \ |
|---|---|---|---|---|---|
| 0 | 74 | 67 | 80 | 88 | |
| 1 | 77 | 74 | 66 | 84 | |
| 2 | 66 | 68 | 63 | 79 | |
| 3 | 80 | 78 | 69 | 79 | |
| 4 | 62 | 79 | 69 | 82 | |
| 5 | 65 | 75 | 62 | 89 | |
| 6 | 63 | 79 | 68 | 71 | |
| 7 | 72 | 72 | 64 | 65 | |
| 8 | 77 | 73 | 72 | 99 | |
| 9 | 67 | 71 | 64 | 76 | |
| 10 | 66 | 70 | 60 | 63 | |
| 11 | 77 | 74 | 62 | 66 | |
| 12 | 60 | 80 | 67 | 97 | |
| 13 | 75 | 61 | 63 | 68 | |
| 14 | 78 | 78 | 69 | 85 | |
| 15 | 66 | 77 | 68 | 60 | |
| 16 | 76 | 64 | 69 | 71 | |
| 17 | 71 | 73 | 79 | 72 | |
| 18 | 67 | 80 | 80 | 64 | |
| 19 | 66 | 72 | 69 | 95 | |
| 20 | 72 | 74 | 69 | 81 | |

| | | | | |
|---|---|---|---|---|
| 21 | 79 | 69 | 74 | 68 |
| 22 | 70 | 71 | 70 | 80 |
| 23 | 60 | 61 | 63 | 98 |
| 24 | 71 | 65 | 66 | 79 |
| 25 | 70 | 69 | 68 | 75 |
| 26 | 73 | 62 | 63 | 94 |
| 27 | 70 | 65 | 71 | 71 |
| 28 | 74 | 72 | 74 | 83 |
| 29 | 67 | 72 | 72 | 82 |

| | club_join_year | placement_offer_count |
|---|---|---|
| 0 | 2016 | 3 |
| 1 | 2025 | 2 |
| 2 | 2025 | 2 |
| 3 | 2024 | 2 |
| 4 | 2024 | 2 |
| 5 | 2024 | 3 |
| 6 | 2022 | 1 |
| 7 | 2024 | 1 |
| 8 | 2022 | 3 |
| 9 | 2023 | 2 |
| 10 | 2025 | 1 |
| 11 | 2015 | 1 |
| 12 | 2024 | 3 |
| 13 | 2021 | 1 |
| 14 | 2020 | 3 |
| 15 | 2021 | 1 |
| 16 | 2017 | 1 |
| 17 | 2024 | 1 |
| 18 | 2016 | 1 |
| 19 | 2021 | 3 |
| 20 | 2015 | 2 |
| 21 | 2025 | 1 |
| 22 | 2015 | 2 |
| 23 | 2024 | 3 |
| 24 | 2023 | 2 |
| 25 | 2015 | 2 |
| 26 | 2022 | 3 |
| 27 | 2016 | 1 |
| 28 | 2016 | 2 |
| 29 | 2016 | 2 |

[4]:
```
data.isnull()
```

[4]:

| | math_score | reading_score | writing_score | placement_score | \ |
|---|---|---|---|---|---|
| 0 | False | False | False | False | |
| 1 | False | False | False | False | |

| | | | | |
|---|---|---|---|---|
| 2 | False | False | False | False |
| 3 | False | False | False | False |
| 4 | False | False | False | False |
| 5 | False | False | False | False |
| 6 | False | False | False | False |
| 7 | False | False | False | False |
| 8 | False | False | False | False |
| 9 | False | False | False | False |
| 10 | False | False | False | False |
| 11 | False | False | False | False |
| 12 | False | False | False | False |
| 13 | False | False | False | False |
| 14 | False | False | False | False |
| 15 | False | False | False | False |
| 16 | False | False | False | False |
| 17 | False | False | False | False |
| 18 | False | False | False | False |
| 19 | False | False | False | False |
| 20 | False | False | False | False |
| 21 | False | False | False | False |
| 22 | False | False | False | False |
| 23 | False | False | False | False |
| 24 | False | False | False | False |
| 25 | False | False | False | False |
| 26 | False | False | False | False |
| 27 | False | False | False | False |
| 28 | False | False | False | False |
| 29 | False | False | False | False |

| | club_join_year | placement_offer_count |
|---|---|---|
| 0 | False | False |
| 1 | False | False |
| 2 | False | False |
| 3 | False | False |
| 4 | False | False |
| 5 | False | False |
| 6 | False | False |
| 7 | False | False |
| 8 | False | False |
| 9 | False | False |
| 10 | False | False |
| 11 | False | False |
| 12 | False | False |
| 13 | False | False |
| 14 | False | False |
| 15 | False | False |
| 16 | False | False |

```
17          False                 False
18          False                 False
19          False                 False
20          False                 False
21          False                 False
22          False                 False
23          False                 False
24          False                 False
25          False                 False
26          False                 False
27          False                 False
28          False                 False
29          False                 False
```

[9]:
```
series = pd.isnull(data['math_score '])
data[series]
```

[9]:
```
Empty DataFrame
Columns: [math_score , reading_score, writing_score, placement_score,
club_join_year, placement_offer_count]
Index: []
```

[14]:
```
print(data.columns)
```

```
Index(['math_score ', 'reading_score', 'writing_score', 'placement_score',
       'club_join_year', 'placement_offer_count'],
      dtype='object')
```

[10]:
```
data.notnull()
```

[10]:
```
    math_score   reading_score  writing_score  placement_score  \
0          True           True           True             True
1          True           True           True             True
2          True           True           True             True
3          True           True           True             True
4          True           True           True             True
5          True           True           True             True
6          True           True           True             True
7          True           True           True             True
8          True           True           True             True
9          True           True           True             True
10         True           True           True             True
11         True           True           True             True
12         True           True           True             True
13         True           True           True             True
14         True           True           True             True
15         True           True           True             True
```

| | | | | |
|---|---|---|---|---|
| 16 | True | True | True | True |
| 17 | True | True | True | True |
| 18 | True | True | True | True |
| 19 | True | True | True | True |
| 20 | True | True | True | True |
| 21 | True | True | True | True |
| 22 | True | True | True | True |
| 23 | True | True | True | True |
| 24 | True | True | True | True |
| 25 | True | True | True | True |
| 26 | True | True | True | True |
| 27 | True | True | True | True |
| 28 | True | True | True | True |
| 29 | True | True | True | True |

| | club_join_year | placement_offer_count |
|---|---|---|
| 0 | True | True |
| 1 | True | True |
| 2 | True | True |
| 3 | True | True |
| 4 | True | True |
| 5 | True | True |
| 6 | True | True |
| 7 | True | True |
| 8 | True | True |
| 9 | True | True |
| 10 | True | True |
| 11 | True | True |
| 12 | True | True |
| 13 | True | True |
| 14 | True | True |
| 15 | True | True |
| 16 | True | True |
| 17 | True | True |
| 18 | True | True |
| 19 | True | True |
| 20 | True | True |
| 21 | True | True |
| 22 | True | True |
| 23 | True | True |
| 24 | True | True |
| 25 | True | True |
| 26 | True | True |
| 27 | True | True |
| 28 | True | True |
| 29 | True | True |

[11]:
```
series1 = pd.notnull(data['math_score '])
data[series1]
```

[11]:

| | math_score | reading_score | writing_score | placement_score | club_join_year | placement_offer_count |
|---|---|---|---|---|---|---|
| 0 | 74 | 67 | 80 | 88 | 2016 | 3 |
| 1 | 77 | 74 | 66 | 84 | 2025 | 2 |
| 2 | 66 | 68 | 63 | 79 | 2025 | 2 |
| 3 | 80 | 78 | 69 | 79 | 2024 | 2 |
| 4 | 62 | 79 | 69 | 82 | 2024 | 2 |
| 5 | 65 | 75 | 62 | 89 | 2024 | 3 |
| 6 | 63 | 79 | 68 | 71 | 2022 | 1 |
| 7 | 72 | 72 | 64 | 65 | 2024 | 1 |
| 8 | 77 | 73 | 72 | 99 | 2022 | 3 |
| 9 | 67 | 71 | 64 | 76 | 2023 | 2 |
| 10 | 66 | 70 | 60 | 63 | 2025 | 1 |
| 11 | 77 | 74 | 62 | 66 | | |
| 12 | 60 | 80 | 67 | 97 | | |
| 13 | 75 | 61 | 63 | 68 | | |
| 14 | 78 | 78 | 69 | 85 | | |
| 15 | 66 | 77 | 68 | 60 | | |
| 16 | 76 | 64 | 69 | 71 | | |
| 17 | 71 | 73 | 79 | 72 | | |
| 18 | 67 | 80 | 80 | 64 | | |
| 19 | 66 | 72 | 69 | 95 | | |
| 20 | 72 | 74 | 69 | 81 | | |
| 21 | 79 | 69 | 74 | 68 | | |
| 22 | 70 | 71 | 70 | 80 | | |
| 23 | 60 | 61 | 63 | 98 | | |
| 24 | 71 | 65 | 66 | 79 | | |
| 25 | 70 | 69 | 68 | 75 | | |
| 26 | 73 | 62 | 63 | 94 | | |
| 27 | 70 | 65 | 71 | 71 | | |
| 28 | 74 | 72 | 74 | 83 | | |
| 29 | 67 | 72 | 72 | 82 | | |

| | | |
|---|---|---|
| 11 | 2015 | 1 |
| 12 | 2024 | 3 |
| 13 | 2021 | 1 |
| 14 | 2020 | 3 |
| 15 | 2021 | 1 |
| 16 | 2017 | 1 |
| 17 | 2024 | 1 |
| 18 | 2016 | 1 |
| 19 | 2021 | 3 |
| 20 | 2015 | 2 |
| 21 | 2025 | 1 |
| 22 | 2015 | 2 |
| 23 | 2024 | 3 |
| 24 | 2023 | 2 |
| 25 | 2015 | 2 |
| 26 | 2022 | 3 |
| 27 | 2016 | 1 |
| 28 | 2016 | 2 |
| 29 | 2016 | 2 |

[16]:
```
print(data.columns)
```

```
Index(['math_score ', 'reading_score', 'writing_score', 'placement_score',
       'club_join_year', 'placement_offer_count'],
      dtype='object')
```

[6]:
```
import pandas as pd
import numpy as np
```

[7]:
```
data=pd.read_csv("Desktop\StudentPerformance.csv")
```

[8]:
```
data
```

[8]:

| | gender | math_score | reading_score | writing_score | placement_score | \ |
|---|---|---|---|---|---|---|
| 0 | female | 74.0 | 67.0 | 80.0 | 88.0 | |
| 1 | male | 77.0 | 74.0 | 66.0 | 84.0 | |
| 2 | male | 66.0 | 68.0 | 63.0 | 79.0 | |
| 3 | female | 80.0 | 78.0 | 69.0 | 79.0 | |
| 4 | male | 62.0 | 79.0 | 69.0 | 82.0 | |
| 5 | female | 65.0 | 75.0 | NaN | 89.0 | |
| 6 | male | NaN | 79.0 | 68.0 | 71.0 | |
| 7 | female | 72.0 | 72.0 | 64.0 | 65.0 | |
| 8 | female | 77.0 | 73.0 | 72.0 | 99.0 | |
| 9 | male | 67.0 | 71.0 | 64.0 | NaN | |
| 10 | male | 66.0 | 70.0 | 60.0 | 63.0 | |
| 11 | male | 77.0 | 74.0 | 62.0 | 66.0 | |
| 12 | female | 60.0 | 80.0 | 67.0 | 97.0 | |

| | | | | | |
|---|---|---|---|---|---|
| 13 | male | 75.0 | NaN | 63.0 | 68.0 |
| 14 | male | 78.0 | 78.0 | 69.0 | 85.0 |
| 15 | female | 66.0 | 77.0 | 68.0 | NaN |
| 16 | female | 76.0 | 64.0 | 69.0 | 71.0 |
| 17 | male | 71.0 | 73.0 | 79.0 | 72.0 |
| 18 | female | 67.0 | 80.0 | 80.0 | 64.0 |
| 19 | male | 66.0 | 72.0 | 69.0 | 95.0 |
| 20 | male | 72.0 | 74.0 | 69.0 | 81.0 |
| 21 | female | 79.0 | 69.0 | 74.0 | 68.0 |
| 22 | male | 70.0 | 71.0 | 70.0 | 80.0 |
| 23 | male | 60.0 | 61.0 | 63.0 | NaN |
| 24 | male | 71.0 | 65.0 | 66.0 | 79.0 |
| 25 | female | 70.0 | 69.0 | 68.0 | 75.0 |
| 26 | male | 73.0 | 62.0 | 63.0 | 94.0 |
| 27 | male | 70.0 | 65.0 | 71.0 | 71.0 |
| 28 | male | 74.0 | 72.0 | 74.0 | 83.0 |
| 29 | female | 67.0 | 72.0 | 72.0 | 82.0 |

| | club_join_year | placement_offer_count | Region |
|---|---|---|---|
| 0 | NaN | 3 | Pune |
| 1 | 2025.0 | 2 | Nashik |
| 2 | 2025.0 | 2 | NaN |
| 3 | 2024.0 | 2 | Pune |
| 4 | 2024.0 | 2 | na |
| 5 | 2024.0 | 3 | Nashik |
| 6 | 2022.0 | 1 | na |
| 7 | 2024.0 | 1 | Pune |
| 8 | 2022.0 | 3 | NaN |
| 9 | 2023.0 | 2 | Nashik |
| 10 | 2025.0 | 1 | na |
| 11 | 2015.0 | 1 | NaN |
| 12 | 2024.0 | 3 | na |
| 13 | 2021.0 | 1 | Pune |
| 14 | 2020.0 | 3 | Nashik |
| 15 | 2021.0 | 1 | NaN |
| 16 | 2017.0 | 1 | Na |
| 17 | 2024.0 | 1 | Pune |
| 18 | 2016.0 | 1 | na |
| 19 | 2021.0 | 3 | Nashik |
| 20 | 2015.0 | 2 | NaN |
| 21 | 2025.0 | 1 | Na |
| 22 | 2015.0 | 2 | Pune |
| 23 | 2024.0 | 3 | Nashik |
| 24 | 2023.0 | 2 | Na |
| 25 | 2015.0 | 2 | NaN |
| 26 | 2022.0 | 3 | Pune |
| 27 | 2016.0 | 1 | Nashik |

```
28          2016.0                     2      Na
29          2016.0                     2    Pune
```

[9]:
```
from sklearn.preprocessing import LabelEncoder
le = LabelEncoder()
data['gender'] = le.fit_transform(data['gender'])
newdata=data
data
```

[9]:

| | gender | math_score | reading_score | writing_score | placement_score | club_join_year | placement_offer_count | Region |
|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 74.0 | 67.0 | 80.0 | 88.0 | NaN | 3 | Pune |
| 1 | 1 | 77.0 | 74.0 | 66.0 | 84.0 | 2025.0 | 2 | Nashik |
| 2 | 1 | 66.0 | 68.0 | 63.0 | 79.0 | 2025.0 | 2 | NaN |
| 3 | 0 | 80.0 | 78.0 | 69.0 | 79.0 | 2024.0 | 2 | Pune |
| 4 | 1 | 62.0 | 79.0 | 69.0 | 82.0 | 2024.0 | 2 | na |
| 5 | 0 | 65.0 | 75.0 | NaN | 89.0 | 2024.0 | 2 | Pune |
| 6 | 1 | NaN | 79.0 | 68.0 | 71.0 | 2024.0 | 2 | Pune |
| 7 | 0 | 72.0 | 72.0 | 64.0 | 65.0 | 2024.0 | 2 | Pune |
| 8 | 0 | 77.0 | 73.0 | 72.0 | 99.0 | 2024.0 | 2 | Pune |
| 9 | 1 | 67.0 | 71.0 | 64.0 | NaN | 2024.0 | 2 | Pune |
| 10 | 1 | 66.0 | 70.0 | 60.0 | 63.0 | 2024.0 | 2 | Pune |
| 11 | 1 | 77.0 | 74.0 | 62.0 | 66.0 | 2024.0 | 2 | Pune |
| 12 | 0 | 60.0 | 80.0 | 67.0 | 97.0 | 2024.0 | 2 | Pune |
| 13 | 1 | 75.0 | NaN | 63.0 | 68.0 | 2024.0 | 2 | Pune |
| 14 | 1 | 78.0 | 78.0 | 69.0 | 85.0 | 2024.0 | 2 | Pune |
| 15 | 0 | 66.0 | 77.0 | 68.0 | NaN | 2024.0 | 2 | Pune |
| 16 | 0 | 76.0 | 64.0 | 69.0 | 71.0 | 2024.0 | 2 | Pune |
| 17 | 1 | 71.0 | 73.0 | 79.0 | 72.0 | 2024.0 | 2 | Pune |
| 18 | 0 | 67.0 | 80.0 | 80.0 | 64.0 | 2024.0 | 2 | Pune |
| 19 | 1 | 66.0 | 72.0 | 69.0 | 95.0 | 2024.0 | 2 | Pune |
| 20 | 1 | 72.0 | 74.0 | 69.0 | 81.0 | 2024.0 | 2 | Pune |
| 21 | 0 | 79.0 | 69.0 | 74.0 | 68.0 | 2024.0 | 2 | Pune |
| 22 | 1 | 70.0 | 71.0 | 70.0 | 80.0 | 2024.0 | 2 | Pune |
| 23 | 1 | 60.0 | 61.0 | 63.0 | NaN | 2024.0 | 2 | Pune |
| 24 | 1 | 71.0 | 65.0 | 66.0 | 79.0 | 2024.0 | 2 | Pune |
| 25 | 0 | 70.0 | 69.0 | 68.0 | 75.0 | 2024.0 | 2 | Pune |
| 26 | 1 | 73.0 | 62.0 | 63.0 | 94.0 | 2024.0 | 2 | Pune |
| 27 | 1 | 70.0 | 65.0 | 71.0 | 71.0 | 2024.0 | 2 | Pune |
| 28 | 1 | 74.0 | 72.0 | 74.0 | 83.0 | 2016.0 | 2 | Na |
| 29 | 0 | 67.0 | 72.0 | 72.0 | 82.0 | 2016.0 | 2 | Pune |

```
5           2024.0                     3  Nashik
6           2022.0                     1      na
7           2024.0                     1    Pune
8           2022.0                     3     NaN
9           2023.0                     2  Nashik
10          2025.0                     1      na
11          2015.0                     1     NaN
12          2024.0                     3      na
13          2021.0                     1    Pune
14          2020.0                     3  Nashik
15          2021.0                     1     NaN
16          2017.0                     1      Na
17          2024.0                     1    Pune
18          2016.0                     1      na
19          2021.0                     3  Nashik
20          2015.0                     2     NaN
21          2025.0                     1      Na
22          2015.0                     2    Pune
23          2024.0                     3  Nashik
24          2023.0                     2      Na
25          2015.0                     2     NaN
26          2022.0                     3    Pune
27          2016.0                     1  Nashik
28          2016.0                     2      Na
29          2016.0                     2    Pune
```

[10]:
```
series = pd.isnull(data["math_score "])
data[series]
```

[10]:
```
   gender  math_score   reading_score  writing_score  placement_score  \
6       1          NaN           79.0           68.0             71.0

   club_join_year  placement_offer_count Region
6          2022.0                     1     na
```

[11]:
```
series = pd.isnull(data["placement_score"])
data[series]
```

[11]:
```
    gender  math_score   reading_score  writing_score  placement_score  \
9        1        67.0           71.0           64.0              NaN
15       0        66.0           77.0           68.0              NaN
23       1        60.0           61.0           63.0              NaN

    club_join_year  placement_offer_count  Region
9           2023.0                     2  Nashik
15          2021.0                     1     NaN
23          2024.0                     3  Nashik
```

[12]:
```
data.notnull()
```

[12]:

| | gender | math_score | reading_score | writing_score | placement_score | club_join_year | placement_offer_count | Region |
|---|---|---|---|---|---|---|---|---|
| 0 | True | True | True | True | True | False | True | True |
| 1 | True | True | True | True | True | True | True | True |
| 2 | True | True | True | True | True | True | True | False |
| 3 | True | True | True | True | True | True | True | True |
| 4 | True | True | True | True | True | True | True | True |
| 5 | True | True | True | False | True | True | True | True |
| 6 | True | False | True | True | True | True | True | True |
| 7 | True | True | True | True | True | True | True | True |
| 8 | True | True | True | True | True | True | True | False |
| 9 | True | True | True | True | False | True | True | True |
| 10 | True | True | True | True | True | True | True | True |
| 11 | True | True | True | True | True | True | True | True |
| 12 | True | True | True | True | True | True | True | True |
| 13 | True | True | False | True | True | True | True | True |
| 14 | True | True | True | True | True | True | True | True |
| 15 | True | True | True | True | False | True | True | True |
| 16 | True | True | True | True | True | True | True | True |
| 17 | True | True | True | True | True | True | True | True |
| 18 | True | True | True | True | True | True | True | True |
| 19 | True | True | True | True | True | True | True | True |
| 20 | True | True | True | True | True | True | True | True |
| 21 | True | True | True | True | True | True | True | True |
| 22 | True | True | True | True | True | True | True | True |
| 23 | True | True | True | True | False | True | True | True |
| 24 | True | True | True | True | True | True | True | True |
| 25 | True | True | True | True | True | True | True | True |
| 26 | True | True | True | True | True | True | True | True |
| 27 | True | True | True | True | True | True | True | True |
| 28 | True | True | True | True | True | True | True | True |
| 29 | True | True | True | True | True | True | True | True |

| | | | |
|---|---|---|---|
| 12 | True | True | True |
| 13 | True | True | True |
| 14 | True | True | True |
| 15 | True | True | False |
| 16 | True | True | True |
| 17 | True | True | True |
| 18 | True | True | True |
| 19 | True | True | True |
| 20 | True | True | False |
| 21 | True | True | True |
| 22 | True | True | True |
| 23 | True | True | True |
| 24 | True | True | True |
| 25 | True | True | False |
| 26 | True | True | True |
| 27 | True | True | True |
| 28 | True | True | True |
| 29 | True | True | True |

[32]:
```
series = pd.notnull(data["math_score "])
data[series]
```

[32]:

| | gender | math_score | reading_score | writing_score | placement_score | \ |
|---|---|---|---|---|---|---|
| 0 | female | 74.0 | 67.0 | 80.0 | 88.0 | |
| 1 | male | 77.0 | 74.0 | 66.0 | 84.0 | |
| 2 | male | 66.0 | 68.0 | 63.0 | 79.0 | |
| 3 | female | 80.0 | 78.0 | 69.0 | 79.0 | |
| 4 | male | 62.0 | 79.0 | 69.0 | 82.0 | |
| 5 | female | 65.0 | 75.0 | NaN | 89.0 | |
| 7 | female | 72.0 | 72.0 | 64.0 | 65.0 | |
| 8 | female | 77.0 | 73.0 | 72.0 | 99.0 | |
| 9 | male | 67.0 | 71.0 | 64.0 | NaN | |
| 10 | male | 66.0 | 70.0 | 60.0 | 63.0 | |
| 11 | male | 77.0 | 74.0 | 62.0 | 66.0 | |
| 12 | female | 60.0 | 80.0 | 67.0 | 97.0 | |
| 13 | male | 75.0 | NaN | 63.0 | 68.0 | |
| 14 | male | 78.0 | 78.0 | 69.0 | 85.0 | |
| 15 | female | 66.0 | 77.0 | 68.0 | NaN | |
| 16 | female | 76.0 | 64.0 | 69.0 | 71.0 | |
| 17 | male | 71.0 | 73.0 | 79.0 | 72.0 | |
| 18 | female | 67.0 | 80.0 | 80.0 | 64.0 | |
| 19 | male | 66.0 | 72.0 | 69.0 | 95.0 | |
| 20 | male | 72.0 | 74.0 | 69.0 | 81.0 | |
| 21 | female | 79.0 | 69.0 | 74.0 | 68.0 | |
| 22 | male | 70.0 | 71.0 | 70.0 | 80.0 | |
| 23 | male | 60.0 | 61.0 | 63.0 | NaN | |
| 24 | male | 71.0 | 65.0 | 66.0 | 79.0 | |

```
25  female         70.0           69.0           68.0           75.0
26    male         73.0           62.0           63.0           94.0
27    male         70.0           65.0           71.0           71.0
28    male         74.0           72.0           74.0           83.0
29  female         67.0           72.0           72.0           82.0

    club_join_year  placement_offer_count  Region
0              NaN                      3    Pune
1           2025.0                      2  Nashik
2           2025.0                      2     NaN
3           2024.0                      2    Pune
4           2024.0                      2      na
5           2024.0                      3  Nashik
7           2024.0                      1    Pune
8           2022.0                      3     NaN
9           2023.0                      2  Nashik
10          2025.0                      1      na
11          2015.0                      1     NaN
12          2024.0                      3      na
13          2021.0                      1    Pune
14          2020.0                      3  Nashik
15          2021.0                      1     NaN
16          2017.0                      1      Na
17          2024.0                      1    Pune
18          2016.0                      1      na
19          2021.0                      3  Nashik
20          2015.0                      2     NaN
21          2025.0                      1      Na
22          2015.0                      2    Pune
23          2024.0                      3  Nashik
24          2023.0                      2      Na
25          2015.0                      2     NaN
26          2022.0                      3    Pune
27          2016.0                      1  Nashik
28          2016.0                      2      Na
29          2016.0                      2    Pune
```

[13]:
```
missing_values = ["Na", "na"]
data= pd.read_csv("Desktop\StudentPerformance.csv", na_values =
missing_values)
data
```

[13]:
```
    gender  math_score   reading_score  writing_score  placement_score  \
0   female         74.0           67.0           80.0             88.0
1     male         77.0           74.0           66.0             84.0
2     male         66.0           68.0           63.0             79.0
3   female         80.0           78.0           69.0             79.0
```

| | | | | | |
|---|---|---|---|---|---|
| 4 | male | 62.0 | 79.0 | 69.0 | 82.0 |
| 5 | female | 65.0 | 75.0 | NaN | 89.0 |
| 6 | male | NaN | 79.0 | 68.0 | 71.0 |
| 7 | female | 72.0 | 72.0 | 64.0 | 65.0 |
| 8 | female | 77.0 | 73.0 | 72.0 | 99.0 |
| 9 | male | 67.0 | 71.0 | 64.0 | NaN |
| 10 | male | 66.0 | 70.0 | 60.0 | 63.0 |
| 11 | male | 77.0 | 74.0 | 62.0 | 66.0 |
| 12 | female | 60.0 | 80.0 | 67.0 | 97.0 |
| 13 | male | 75.0 | NaN | 63.0 | 68.0 |
| 14 | male | 78.0 | 78.0 | 69.0 | 85.0 |
| 15 | female | 66.0 | 77.0 | 68.0 | NaN |
| 16 | female | 76.0 | 64.0 | 69.0 | 71.0 |
| 17 | male | 71.0 | 73.0 | 79.0 | 72.0 |
| 18 | female | 67.0 | 80.0 | 80.0 | 64.0 |
| 19 | male | 66.0 | 72.0 | 69.0 | 95.0 |
| 20 | male | 72.0 | 74.0 | 69.0 | 81.0 |
| 21 | female | 79.0 | 69.0 | 74.0 | 68.0 |
| 22 | male | 70.0 | 71.0 | 70.0 | 80.0 |
| 23 | male | 60.0 | 61.0 | 63.0 | NaN |
| 24 | male | 71.0 | 65.0 | 66.0 | 79.0 |
| 25 | female | 70.0 | 69.0 | 68.0 | 75.0 |
| 26 | male | 73.0 | 62.0 | 63.0 | 94.0 |
| 27 | male | 70.0 | 65.0 | 71.0 | 71.0 |
| 28 | male | 74.0 | 72.0 | 74.0 | 83.0 |
| 29 | female | 67.0 | 72.0 | 72.0 | 82.0 |

| | club_join_year | placement_offer_count | Region |
|---|---|---|---|
| 0 | NaN | 3 | Pune |
| 1 | 2025.0 | 2 | Nashik |
| 2 | 2025.0 | 2 | NaN |
| 3 | 2024.0 | 2 | Pune |
| 4 | 2024.0 | 2 | NaN |
| 5 | 2024.0 | 3 | Nashik |
| 6 | 2022.0 | 1 | NaN |
| 7 | 2024.0 | 1 | Pune |
| 8 | 2022.0 | 3 | NaN |
| 9 | 2023.0 | 2 | Nashik |
| 10 | 2025.0 | 1 | NaN |
| 11 | 2015.0 | 1 | NaN |
| 12 | 2024.0 | 3 | NaN |
| 13 | 2021.0 | 1 | Pune |
| 14 | 2020.0 | 3 | Nashik |
| 15 | 2021.0 | 1 | NaN |
| 16 | 2017.0 | 1 | NaN |
| 17 | 2024.0 | 1 | Pune |
| 18 | 2016.0 | 1 | NaN |

```
19          2021.0                    3  Nashik
20          2015.0                    2     NaN
21          2025.0                    1     NaN
22          2015.0                    2    Pune
23          2024.0                    3  Nashik
24          2023.0                    2     NaN
25          2015.0                    2     NaN
26          2022.0                    3    Pune
27          2016.0                    1  Nashik
28          2016.0                    2     NaN
29          2016.0                    2    Pune
```

[14]:
```
ndf=data
ndf.fillna(1)
```

[14]:

| | gender | math_score | reading_score | writing_score | placement_score | \ |
|---|---|---|---|---|---|---|
| 0 | female | 74.0 | 67.0 | 80.0 | 88.0 | |
| 1 | male | 77.0 | 74.0 | 66.0 | 84.0 | |
| 2 | male | 66.0 | 68.0 | 63.0 | 79.0 | |
| 3 | female | 80.0 | 78.0 | 69.0 | 79.0 | |
| 4 | male | 62.0 | 79.0 | 69.0 | 82.0 | |
| 5 | female | 65.0 | 75.0 | 1.0 | 89.0 | |
| 6 | male | 1.0 | 79.0 | 68.0 | 71.0 | |
| 7 | female | 72.0 | 72.0 | 64.0 | 65.0 | |
| 8 | female | 77.0 | 73.0 | 72.0 | 99.0 | |
| 9 | male | 67.0 | 71.0 | 64.0 | 1.0 | |
| 10 | male | 66.0 | 70.0 | 60.0 | 63.0 | |
| 11 | male | 77.0 | 74.0 | 62.0 | 66.0 | |
| 12 | female | 60.0 | 80.0 | 67.0 | 97.0 | |
| 13 | male | 75.0 | 1.0 | 63.0 | 68.0 | |
| 14 | male | 78.0 | 78.0 | 69.0 | 85.0 | |
| 15 | female | 66.0 | 77.0 | 68.0 | 1.0 | |
| 16 | female | 76.0 | 64.0 | 69.0 | 71.0 | |
| 17 | male | 71.0 | 73.0 | 79.0 | 72.0 | |
| 18 | female | 67.0 | 80.0 | 80.0 | 64.0 | |
| 19 | male | 66.0 | 72.0 | 69.0 | 95.0 | |
| 20 | male | 72.0 | 74.0 | 69.0 | 81.0 | |
| 21 | female | 79.0 | 69.0 | 74.0 | 68.0 | |
| 22 | male | 70.0 | 71.0 | 70.0 | 80.0 | |
| 23 | male | 60.0 | 61.0 | 63.0 | 1.0 | |
| 24 | male | 71.0 | 65.0 | 66.0 | 79.0 | |
| 25 | female | 70.0 | 69.0 | 68.0 | 75.0 | |
| 26 | male | 73.0 | 62.0 | 63.0 | 94.0 | |
| 27 | male | 70.0 | 65.0 | 71.0 | 71.0 | |
| 28 | male | 74.0 | 72.0 | 74.0 | 83.0 | |
| 29 | female | 67.0 | 72.0 | 72.0 | 82.0 | |

| | club_join_year | placement_offer_count | Region |
|---|---|---|---|
| 0 | 1.0 | 3 | Pune |
| 1 | 2025.0 | 2 | Nashik |
| 2 | 2025.0 | 2 | 1 |
| 3 | 2024.0 | 2 | Pune |
| 4 | 2024.0 | 2 | 1 |
| 5 | 2024.0 | 3 | Nashik |
| 6 | 2022.0 | 1 | 1 |
| 7 | 2024.0 | 1 | Pune |
| 8 | 2022.0 | 3 | 1 |
| 9 | 2023.0 | 2 | Nashik |
| 10 | 2025.0 | 1 | 1 |
| 11 | 2015.0 | 1 | 1 |
| 12 | 2024.0 | 3 | 1 |
| 13 | 2021.0 | 1 | Pune |
| 14 | 2020.0 | 3 | Nashik |
| 15 | 2021.0 | 1 | 1 |
| 16 | 2017.0 | 1 | 1 |
| 17 | 2024.0 | 1 | Pune |
| 18 | 2016.0 | 1 | 1 |
| 19 | 2021.0 | 3 | Nashik |
| 20 | 2015.0 | 2 | 1 |
| 21 | 2025.0 | 1 | 1 |
| 22 | 2015.0 | 2 | Pune |
| 23 | 2024.0 | 3 | Nashik |
| 24 | 2023.0 | 2 | 1 |
| 25 | 2015.0 | 2 | 1 |
| 26 | 2022.0 | 3 | Pune |
| 27 | 2016.0 | 1 | Nashik |
| 28 | 2016.0 | 2 | 1 |
| 29 | 2016.0 | 2 | Pune |

[15]:
```
m_v=data['math_score '].mean()
data['math_score '].fillna(value=m_v, inplace=True)
data
```

[15]:

| | gender | math_score | reading_score | writing_score | placement_score | \ |
|---|---|---|---|---|---|---|
| 0 | female | 74.00000 | 67.0 | 80.0 | 88.0 | |
| 1 | male | 77.00000 | 74.0 | 66.0 | 84.0 | |
| 2 | male | 66.00000 | 68.0 | 63.0 | 79.0 | |
| 3 | female | 80.00000 | 78.0 | 69.0 | 79.0 | |
| 4 | male | 62.00000 | 79.0 | 69.0 | 82.0 | |
| 5 | female | 65.00000 | 75.0 | NaN | 89.0 | |
| 6 | male | 70.62069 | 79.0 | 68.0 | 71.0 | |
| 7 | female | 72.00000 | 72.0 | 64.0 | 65.0 | |
| 8 | female | 77.00000 | 73.0 | 72.0 | 99.0 | |
| 9 | male | 67.00000 | 71.0 | 64.0 | NaN | |

| | | | | | |
|---|---|---|---|---|---|
| 10 | male | 66.00000 | 70.0 | 60.0 | 63.0 |
| 11 | male | 77.00000 | 74.0 | 62.0 | 66.0 |
| 12 | female | 60.00000 | 80.0 | 67.0 | 97.0 |
| 13 | male | 75.00000 | NaN | 63.0 | 68.0 |
| 14 | male | 78.00000 | 78.0 | 69.0 | 85.0 |
| 15 | female | 66.00000 | 77.0 | 68.0 | NaN |
| 16 | female | 76.00000 | 64.0 | 69.0 | 71.0 |
| 17 | male | 71.00000 | 73.0 | 79.0 | 72.0 |
| 18 | female | 67.00000 | 80.0 | 80.0 | 64.0 |
| 19 | male | 66.00000 | 72.0 | 69.0 | 95.0 |
| 20 | male | 72.00000 | 74.0 | 69.0 | 81.0 |
| 21 | female | 79.00000 | 69.0 | 74.0 | 68.0 |
| 22 | male | 70.00000 | 71.0 | 70.0 | 80.0 |
| 23 | male | 60.00000 | 61.0 | 63.0 | NaN |
| 24 | male | 71.00000 | 65.0 | 66.0 | 79.0 |
| 25 | female | 70.00000 | 69.0 | 68.0 | 75.0 |
| 26 | male | 73.00000 | 62.0 | 63.0 | 94.0 |
| 27 | male | 70.00000 | 65.0 | 71.0 | 71.0 |
| 28 | male | 74.00000 | 72.0 | 74.0 | 83.0 |
| 29 | female | 67.00000 | 72.0 | 72.0 | 82.0 |

| | club_join_year | placement_offer_count | Region |
|---|---|---|---|
| 0 | NaN | 3 | Pune |
| 1 | 2025.0 | 2 | Nashik |
| 2 | 2025.0 | 2 | NaN |
| 3 | 2024.0 | 2 | Pune |
| 4 | 2024.0 | 2 | NaN |
| 5 | 2024.0 | 3 | Nashik |
| 6 | 2022.0 | 1 | NaN |
| 7 | 2024.0 | 1 | Pune |
| 8 | 2022.0 | 3 | NaN |
| 9 | 2023.0 | 2 | Nashik |
| 10 | 2025.0 | 1 | NaN |
| 11 | 2015.0 | 1 | NaN |
| 12 | 2024.0 | 3 | NaN |
| 13 | 2021.0 | 1 | Pune |
| 14 | 2020.0 | 3 | Nashik |
| 15 | 2021.0 | 1 | NaN |
| 16 | 2017.0 | 1 | NaN |
| 17 | 2024.0 | 1 | Pune |
| 18 | 2016.0 | 1 | NaN |
| 19 | 2021.0 | 3 | Nashik |
| 20 | 2015.0 | 2 | NaN |
| 21 | 2025.0 | 1 | NaN |
| 22 | 2015.0 | 2 | Pune |
| 23 | 2024.0 | 3 | Nashik |
| 24 | 2023.0 | 2 | NaN |

```
25          2015.0                    2     NaN
26          2022.0                    3    Pune
27          2016.0                    1  Nashik
28          2016.0                    2     NaN
29          2016.0                    2    Pune
```

[16]:
```
ndf.replace(to_replace = np.nan, value = -99)
```

[16]:
```
    gender  math_score   reading_score  writing_score  placement_score  \
0   female     74.00000           67.0           80.0             88.0
1     male     77.00000           74.0           66.0             84.0
2     male     66.00000           68.0           63.0             79.0
3   female     80.00000           78.0           69.0             79.0
4     male     62.00000           79.0           69.0             82.0
5   female     65.00000           75.0          -99.0             89.0
6     male     70.62069           79.0           68.0             71.0
7   female     72.00000           72.0           64.0             65.0
8   female     77.00000           73.0           72.0             99.0
9     male     67.00000           71.0           64.0            -99.0
10    male     66.00000           70.0           60.0             63.0
11    male     77.00000           74.0           62.0             66.0
12  female     60.00000           80.0           67.0             97.0
13    male     75.00000          -99.0           63.0             68.0
14    male     78.00000           78.0           69.0             85.0
15  female     66.00000           77.0           68.0            -99.0
16  female     76.00000           64.0           69.0             71.0
17    male     71.00000           73.0           79.0             72.0
18  female     67.00000           80.0           80.0             64.0
19    male     66.00000           72.0           69.0             95.0
20    male     72.00000           74.0           69.0             81.0
21  female     79.00000           69.0           74.0             68.0
22    male     70.00000           71.0           70.0             80.0
23    male     60.00000           61.0           63.0            -99.0
24    male     71.00000           65.0           66.0             79.0
25  female     70.00000           69.0           68.0             75.0
26    male     73.00000           62.0           63.0             94.0
27    male     70.00000           65.0           71.0             71.0
28    male     74.00000           72.0           74.0             83.0
29  female     67.00000           72.0           72.0             82.0

    club_join_year  placement_offer_count  Region
0            -99.0                      3    Pune
1           2025.0                      2  Nashik
2           2025.0                      2     -99
3           2024.0                      2    Pune
4           2024.0                      2     -99
5           2024.0                      3  Nashik
```

```
6           2022.0                     1     -99
7           2024.0                     1    Pune
8           2022.0                     3     -99
9           2023.0                     2  Nashik
10          2025.0                     1     -99
11          2015.0                     1     -99
12          2024.0                     3     -99
13          2021.0                     1    Pune
14          2020.0                     3  Nashik
15          2021.0                     1     -99
16          2017.0                     1     -99
17          2024.0                     1    Pune
18          2016.0                     1     -99
19          2021.0                     3  Nashik
20          2015.0                     2     -99
21          2025.0                     1     -99
22          2015.0                     2    Pune
23          2024.0                     3  Nashik
24          2023.0                     2     -99
25          2015.0                     2     -99
26          2022.0                     3    Pune
27          2016.0                     1  Nashik
28          2016.0                     2     -99
29          2016.0                     2    Pune
```

[17]:
```
ndf.dropna()
```

[17]:
```
    gender  math_score   reading_score  writing_score  placement_score  \
1     male         77.0           74.0           66.0             84.0
3   female         80.0           78.0           69.0             79.0
7   female         72.0           72.0           64.0             65.0
14    male         78.0           78.0           69.0             85.0
17    male         71.0           73.0           79.0             72.0
19    male         66.0           72.0           69.0             95.0
22    male         70.0           71.0           70.0             80.0
26    male         73.0           62.0           63.0             94.0
27    male         70.0           65.0           71.0             71.0
29  female         67.0           72.0           72.0             82.0

    club_join_year  placement_offer_count  Region
1           2025.0                      2  Nashik
3           2024.0                      2    Pune
7           2024.0                      1    Pune
14          2020.0                      3  Nashik
17          2024.0                      1    Pune
19          2021.0                      3  Nashik
22          2015.0                      2    Pune
```

```
26          2022.0                    3    Pune
27          2016.0                    1  Nashik
29          2016.0                    2    Pune
```

[18]:
```
ndf.dropna(how = 'all')
```

[18]:
```
    gender  math_score   reading_score  writing_score  placement_score  \
0   female     74.00000           67.0           80.0             88.0
1     male     77.00000           74.0           66.0             84.0
2     male     66.00000           68.0           63.0             79.0
3   female     80.00000           78.0           69.0             79.0
4     male     62.00000           79.0           69.0             82.0
5   female     65.00000           75.0            NaN             89.0
6     male     70.62069           79.0           68.0             71.0
7   female     72.00000           72.0           64.0             65.0
8   female     77.00000           73.0           72.0             99.0
9     male     67.00000           71.0           64.0              NaN
10    male     66.00000           70.0           60.0             63.0
11    male     77.00000           74.0           62.0             66.0
12  female     60.00000           80.0           67.0             97.0
13    male     75.00000            NaN           63.0             68.0
14    male     78.00000           78.0           69.0             85.0
15  female     66.00000           77.0           68.0              NaN
16  female     76.00000           64.0           69.0             71.0
17    male     71.00000           73.0           79.0             72.0
18  female     67.00000           80.0           80.0             64.0
19    male     66.00000           72.0           69.0             95.0
20    male     72.00000           74.0           69.0             81.0
21  female     79.00000           69.0           74.0             68.0
22    male     70.00000           71.0           70.0             80.0
23    male     60.00000           61.0           63.0              NaN
24    male     71.00000           65.0           66.0             79.0
25  female     70.00000           69.0           68.0             75.0
26    male     73.00000           62.0           63.0             94.0
27    male     70.00000           65.0           71.0             71.0
28    male     74.00000           72.0           74.0             83.0
29  female     67.00000           72.0           72.0             82.0

    club_join_year  placement_offer_count  Region
0              NaN                      3    Pune
1           2025.0                      2  Nashik
2           2025.0                      2     NaN
3           2024.0                      2    Pune
4           2024.0                      2     NaN
5           2024.0                      3  Nashik
6           2022.0                      1     NaN
7           2024.0                      1    Pune
```

| | | | |
|---|---|---|---|
| 8 | 2022.0 | 3 | NaN |
| 9 | 2023.0 | 2 | Nashik |
| 10 | 2025.0 | 1 | NaN |
| 11 | 2015.0 | 1 | NaN |
| 12 | 2024.0 | 3 | NaN |
| 13 | 2021.0 | 1 | Pune |
| 14 | 2020.0 | 3 | Nashik |
| 15 | 2021.0 | 1 | NaN |
| 16 | 2017.0 | 1 | NaN |
| 17 | 2024.0 | 1 | Pune |
| 18 | 2016.0 | 1 | NaN |
| 19 | 2021.0 | 3 | Nashik |
| 20 | 2015.0 | 2 | NaN |
| 21 | 2025.0 | 1 | NaN |
| 22 | 2015.0 | 2 | Pune |
| 23 | 2024.0 | 3 | Nashik |
| 24 | 2023.0 | 2 | NaN |
| 25 | 2015.0 | 2 | NaN |
| 26 | 2022.0 | 3 | Pune |
| 27 | 2016.0 | 1 | Nashik |
| 28 | 2016.0 | 2 | NaN |
| 29 | 2016.0 | 2 | Pune |

[19]:
```
ndf.dropna(axis = 1)
```

[19]:

| | gender | math_score | placement_offer_count |
|---|---|---|---|
| 0 | female | 74.00000 | 3 |
| 1 | male | 77.00000 | 2 |
| 2 | male | 66.00000 | 2 |
| 3 | female | 80.00000 | 2 |
| 4 | male | 62.00000 | 2 |
| 5 | female | 65.00000 | 3 |
| 6 | male | 70.62069 | 1 |
| 7 | female | 72.00000 | 1 |
| 8 | female | 77.00000 | 3 |
| 9 | male | 67.00000 | 2 |
| 10 | male | 66.00000 | 1 |
| 11 | male | 77.00000 | 1 |
| 12 | female | 60.00000 | 3 |
| 13 | male | 75.00000 | 1 |
| 14 | male | 78.00000 | 3 |
| 15 | female | 66.00000 | 1 |
| 16 | female | 76.00000 | 1 |
| 17 | male | 71.00000 | 1 |
| 18 | female | 67.00000 | 1 |
| 19 | male | 66.00000 | 3 |
| 20 | male | 72.00000 | 2 |

```
21  female     79.00000                    1
22    male     70.00000                    2
23    male     60.00000                    3
24    male     71.00000                    2
25  female     70.00000                    2
26    male     73.00000                    3
27    male     70.00000                    1
28    male     74.00000                    2
29  female     67.00000                    2
```

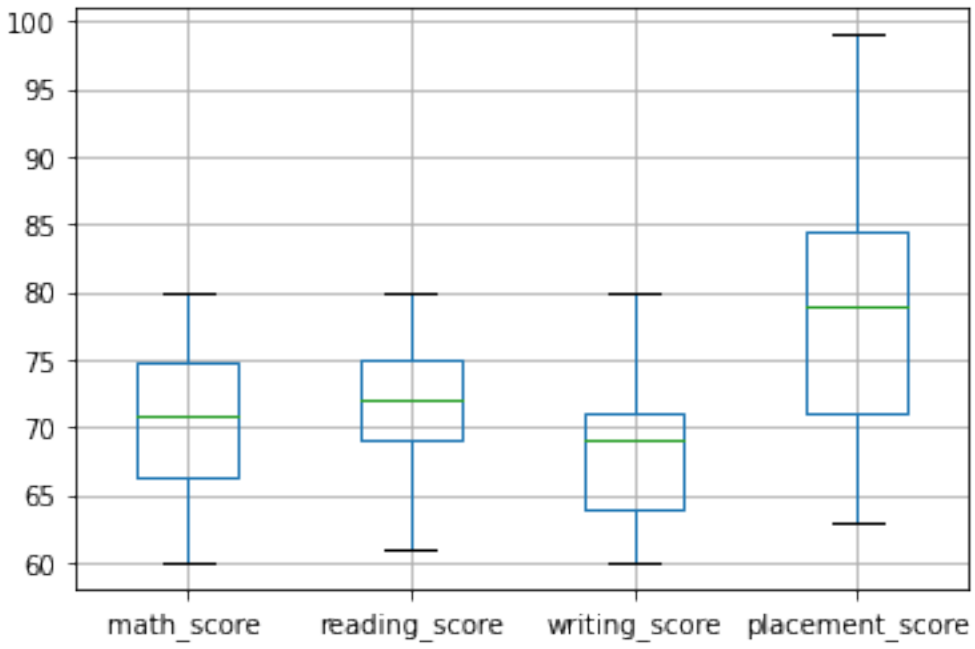
[20]:
```
new_data = ndf.dropna(axis = 0, how ='any')
new_data
```

[20]:
```
    gender  math_score   reading_score  writing_score  placement_score  \
1     male         77.0           74.0           66.0             84.0
3   female         80.0           78.0           69.0             79.0
7   female         72.0           72.0           64.0             65.0
14    male         78.0           78.0           69.0             85.0
17    male         71.0           73.0           79.0             72.0
19    male         66.0           72.0           69.0             95.0
22    male         70.0           71.0           70.0             80.0
26    male         73.0           62.0           63.0             94.0
27    male         70.0           65.0           71.0             71.0
29  female         67.0           72.0           72.0             82.0

    club_join_year  placement_offer_count  Region
1           2025.0                      2  Nashik
3           2024.0                      2    Pune
7           2024.0                      1    Pune
14          2020.0                      3  Nashik
17          2024.0                      1    Pune
19          2021.0                      3  Nashik
22          2015.0                      2    Pune
26          2022.0                      3    Pune
27          2016.0                      1  Nashik
29          2016.0                      2    Pune
```

[21]:
```
col = ['math_score ', 'reading_score' , 'writing_score','placement_score']
data.boxplot(col)
```

[21]:
```
<AxesSubplot:>
```




[22]:
```
print(np.where(data['math_score ']>90))
```

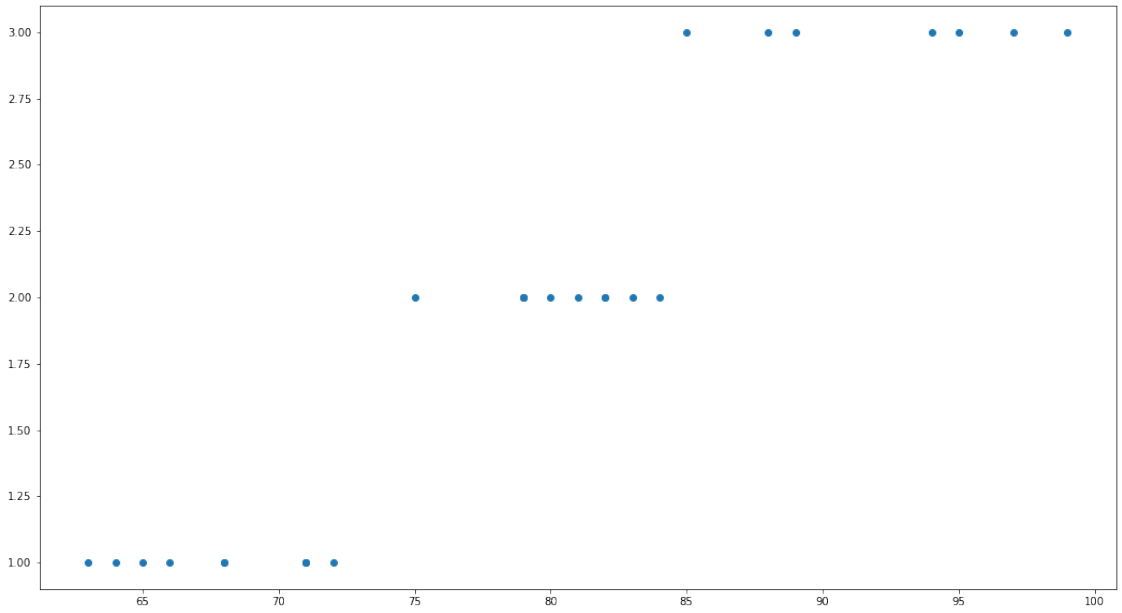
```
(array([], dtype=int64),)
```

[23]:
```
print(np.where(data['reading_score']<25))
```

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

[24]:
```
import matplotlib.pyplot as plt
```

[25]:
```
fig, ax = plt.subplots(figsize = (18,10))
ax.scatter(data['placement_score'], data['placement_offer_count'])
plt.show()
ax.set_xlabel('(Proportion non-retail business acres)/(town)')
ax.set_ylabel('(Full-value property-tax rate)/( $10,000)')
```




[25]: Text(3.200000000000017, 0.5, '(Full-value property-tax rate)/( $10,000)')

[26]:
```
print(np.where((data['placement_score']<50) &␣
  ↪(data['placement_offer_count']>1)))
print(np.where((data['placement_score']>85) &␣
  ↪(data['placement_offer_count']<3)))
```

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

[27]:
```
import numpy as np
from scipy import stats
```

[28]:
```
z = np.abs(stats.zscore(data['math_score ']))
```

[29]:
```
print(z)
```

```
0    0.626505
1    1.182688
2    0.856650
3    1.738871
4    1.598227
5    1.042044
6    0.000000
7    0.255716
8    1.182688
9    0.671255
```

```
10    0.856650
11    1.182688
12    1.969015
13    0.811899
14    1.368082
15    0.856650
16    0.997294
17    0.070322
18    0.671255
19    0.856650
20    0.255716
21    1.553476
22    0.115072
23    1.969015
24    0.070322
25    0.115072
26    0.441111
27    0.115072
28    0.626505
29    0.671255
Name: math_score , dtype: float64
```

[30]:
```
threshold = 0.18
```

[31]:
```
sample_outliers = np.where(z <threshold)
sample_outliers
```

[31]:
```
(array([ 6, 17, 22, 24, 25, 27], dtype=int64),)
```

[32]:
```
sorted_rscore= sorted(data['reading_score'])
```

[33]:
```
sorted_rscore
```

[33]:
```
[61.0,
 62.0,
 64.0,
 65.0,
 65.0,
 67.0,
 68.0,
 69.0,
 69.0,
 70.0,
 71.0,
 71.0,
 72.0,
 72.0,
```

```
 72.0,
 72.0,
 73.0,
 73.0,
 74.0,
 74.0,
 74.0,
 75.0,
 77.0,
 78.0,
 78.0,
 79.0,
 79.0,
 80.0,
 nan,
 80.0]
```

[34]:
```
q1 = np.percentile(sorted_rscore, 25)
q3 = np.percentile(sorted_rscore, 75)
print(q1,q3)
```

```
nan nan
```

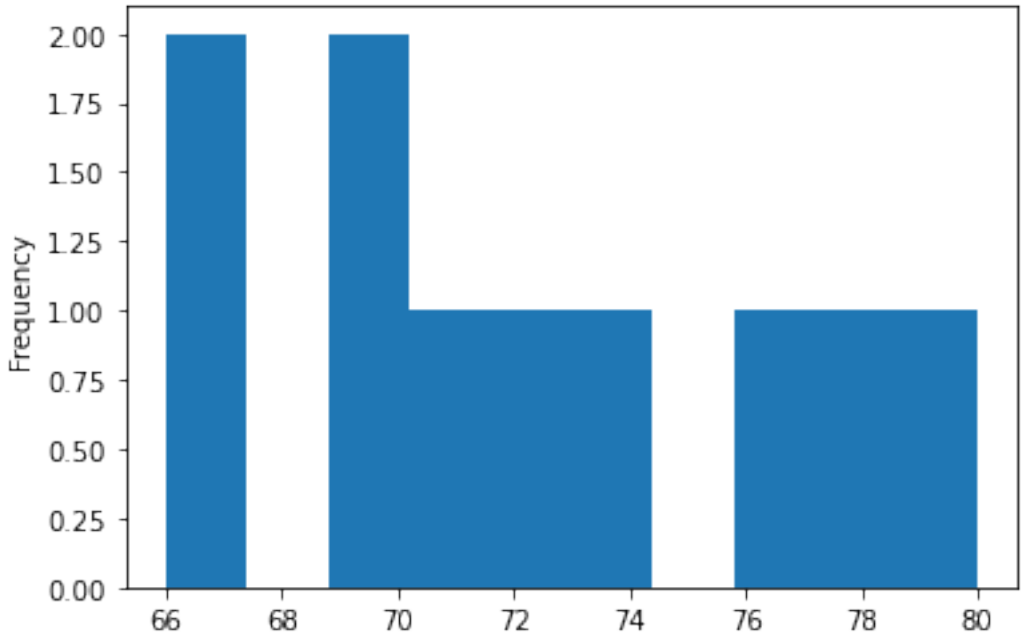
[35]:
```
IQR = q3-q1
```

[36]:
```
lwr_bound = q1-(1.5*IQR)
upr_bound = q3+(1.5*IQR)
print(lwr_bound, upr_bound)
```

```
nan nan
```

[39]:
```
import matplotlib.pyplot as plt
new_data['math_score '].plot(kind = 'hist')
```

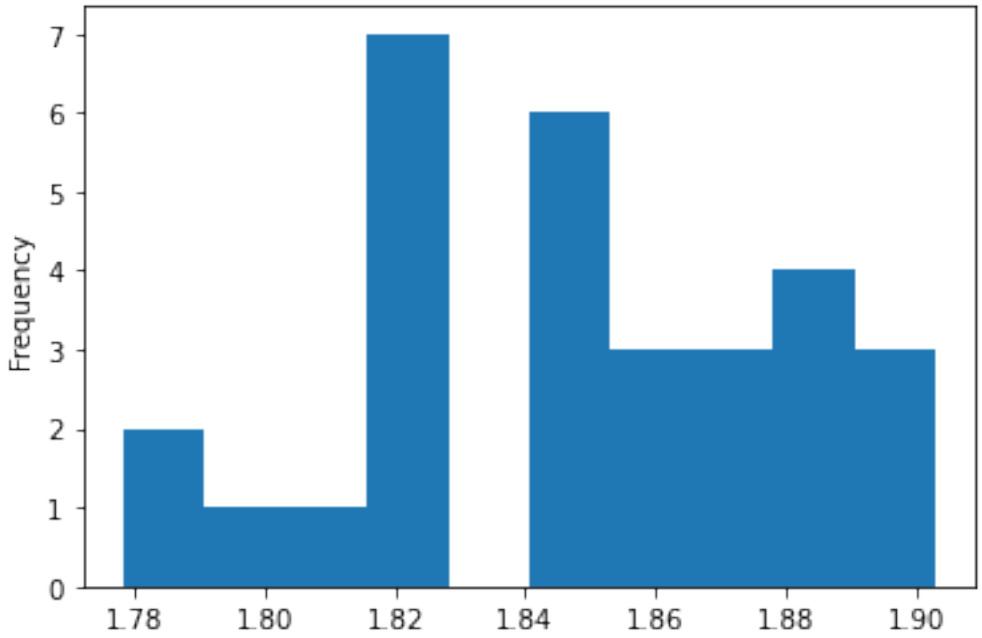
[39]: <AxesSubplot:ylabel='Frequency'>




[40]:
```
data['log_math'] = np.log10(data['math_score '])
```

[41]:
```
data['log_math'].plot(kind = 'hist')
```

[41]: <AxesSubplot:ylabel='Frequency'>



[ ]:
```
Name= akash pachrne
roll no :13254
```