```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import math
import warnings
warnings.filterwarnings("ignore")
%matplotlib inline
```

Creating the dataset

```
rollno = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15]
name = ["a", "b", "c", "d", "e", "f", "g", "h", "i", "j", np.nan,
np.nan, "k", "l", "m"]
marks = [40, 23, 50, 78, 48, 89, 90, 67, 84, 96, 76, np.nan, 97,
np.nan, 65]
grade = ["F", "F", "P", "P", "P", "P", "P", "P", "P", "P", "P", "F",
"P", np.nan, np.nan]

df = pd.DataFrame({"rollno" : rollno, "name" : name, "marks" : marks,
"grade" : grade})

df
```

	rollno	name	marks	grade
0	1	a	40.0	F
1	2	b	23.0	F
2	3	c	50.0	P
3	4	d	78.0	P
4	5	e	48.0	P
5	6	f	89.0	P
6	7	g	90.0	P
7	8	h	67.0	P
8	9	i	84.0	P
9	10	j	96.0	P
10	11	NaN	76.0	P
11	12	NaN	NaN	F
12	13	k	97.0	P
13	14	l	NaN	NaN
14	15	m	65.0	NaN

Dataset Statistics

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 15 entries, 0 to 14
```

```
Data columns (total 4 columns):
 #   Column  Non-Null Count  Dtype
---  ------  --------------  -----
 0   rollno  15 non-null     int64
 1   name    13 non-null     object
 2   marks   13 non-null     float64
 3   grade   13 non-null     object
dtypes: float64(1), int64(1), object(2)
memory usage: 608.0+ bytes
```

```
df.describe()
```

```
          rollno      marks
count  15.000000  13.000000
mean    8.000000  69.461538
std     4.472136  23.247277
min     1.000000  23.000000
25%     4.500000  50.000000
50%     8.000000  76.000000
75%    11.500000  89.000000
max    15.000000  97.000000
```

```
df.dtypes
```

```
rollno      int64
name       object
marks     float64
grade      object
dtype: object
```

```
df.columns
```

```
Index(['rollno', 'name', 'marks', 'grade'], dtype='object')
```

```
df.isna().sum()
```

```
rollno    0
name      2
marks     2
grade     2
dtype: int64
```

```
df.to_csv("academic_performance.csv")
```

Null values

```
df.isna().sum()
```

```
rollno    0
name      2
```

```
marks     2
grade     2
dtype: int64
```

```
df["marks"] = df["marks"].fillna(df["marks"].mean())
```

```
df
```

```
    rollno name      marks grade
0        1    a  40.000000     F
1        2    b  23.000000     F
2        3    c  50.000000     P
3        4    d  78.000000     P
4        5    e  48.000000     P
5        6    f  89.000000     P
6        7    g  90.000000     P
7        8    h  67.000000     P
8        9    i  84.000000     P
9       10    j  96.000000     P
10      11  NaN  76.000000     P
11      12  NaN  69.461538     F
12      13    k  97.000000     P
13      14    l  69.461538   NaN
14      15    m  65.000000   NaN
```

```
def fun1(value):
    return int(math.floor(value))
```

```
df["marks"] = df["marks"].apply(fun1)
```

```
df
```

```
    rollno name  marks grade
0        1    a     40     F
1        2    b     23     F
2        3    c     50     P
3        4    d     78     P
4        5    e     48     P
5        6    f     89     P
6        7    g     90     P
7        8    h     67     P
8        9    i     84     P
9       10    j     96     P
10      11  NaN     76     P
11      12  NaN     69     F
12      13    k     97     P
13      14    l     69   NaN
14      15    m     65   NaN
```

```
df = df[df['name'].notna()]
```

```
df
```

	rollno	name	marks	grade
0	1	a	40	F
1	2	b	23	F
2	3	c	50	P
3	4	d	78	P
4	5	e	48	P
5	6	f	89	P
6	7	g	90	P
7	8	h	67	P
8	9	i	84	P
9	10	j	96	P
12	13	k	97	P
13	14	l	69	NaN
14	15	m	65	NaN

```
for index, row in df.iterrows():
    # print(row['marks'], row['grade'])
    if (row['marks'] > 40):
        df.loc[index, 'grade'] = 'P'
    else:
        df.loc[index, 'grade'] = 'F'
```

```
df
```

	rollno	name	marks	grade
0	1	a	40	F
1	2	b	23	F
2	3	c	50	P
3	4	d	78	P
4	5	e	48	P
5	6	f	89	P
6	7	g	90	P
7	8	h	67	P
8	9	i	84	P
9	10	j	96	P
12	13	k	97	P
13	14	l	69	P
14	15	m	65	P

Outliers

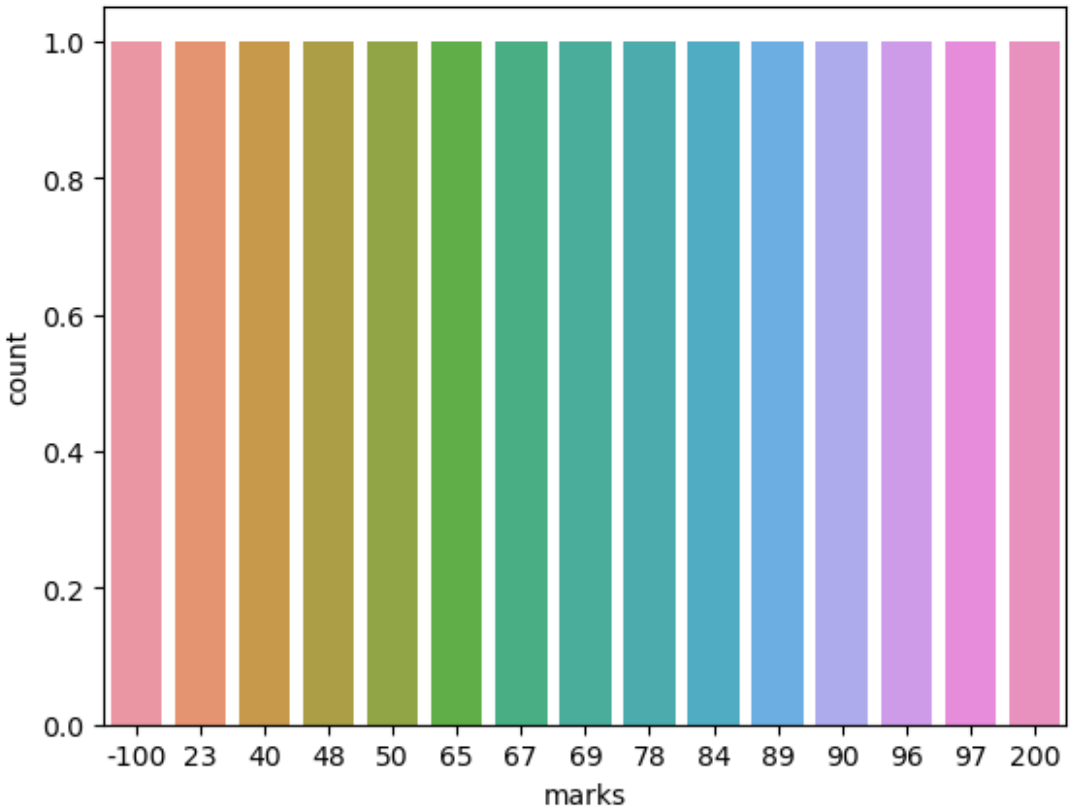
```
first_outlier = [16, 'n', 200, 'P']
second_outlier = [17, 'o', -100, 'F']

df.loc[15] = first_outlier
df.loc[16] = second_outlier
```

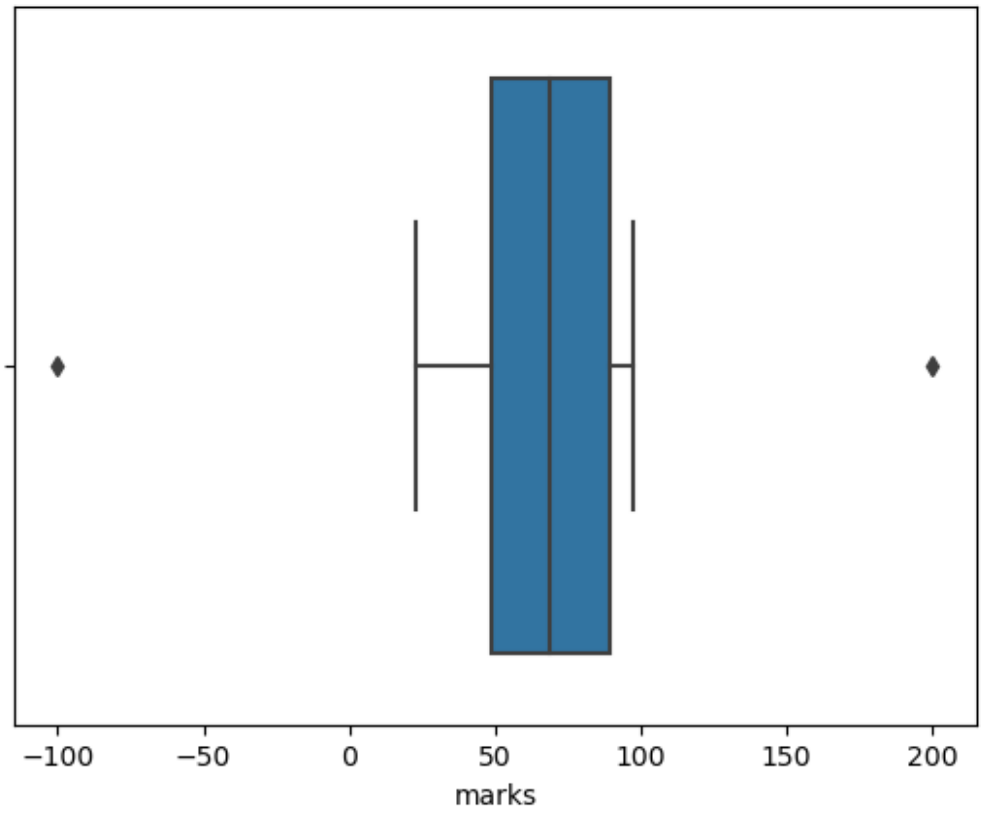
```
df
```

	rollno	name	marks	grade
0	1	a	40	F
1	2	b	23	F
2	3	c	50	P
3	4	d	78	P
4	5	e	48	P
5	6	f	89	P
6	7	g	90	P
7	8	h	67	P
8	9	i	84	P
9	10	j	96	P
12	13	k	97	P
13	14	l	69	P
14	15	m	65	P
15	16	n	200	P
16	17	o	-100	F

```
sns.countplot(data=df, x=df['marks']);
```




```
sns.boxplot(data=df, x='marks');
```




```
from matplotlib.cbook import boxplot_stats
outliers = boxplot_stats(df['marks']).pop(0)['fliers']
outliers
```

```
array([-100,  200], dtype=int64)
```

```
df
```

	rollno	name	marks	grade
0	1	a	40	F
1	2	b	23	F
2	3	c	50	P
3	4	d	78	P
4	5	e	48	P
5	6	f	89	P
6	7	g	90	P
7	8	h	67	P
8	9	i	84	P
9	10	j	96	P
12	13	k	97	P
13	14	l	69	P
14	15	m	65	P
15	16	n	200	P
16	17	o	-100	F

```
df = df.drop([15,16], axis=0)

df
```

	rollno	name	marks	grade
0	1	a	40	F
1	2	b	23	F
2	3	c	50	P
3	4	d	78	P
4	5	e	48	P
5	6	f	89	P
6	7	g	90	P
7	8	h	67	P
8	9	i	84	P
9	10	j	96	P
12	13	k	97	P
13	14	l	69	P
14	15	m	65	P

Scaling the marks column

```
from sklearn.preprocessing import MinMaxScaler

scaler = MinMaxScaler()

df[['marks']] = scaler.fit_transform(df[['marks']])

df
```

	rollno	name	marks	grade
0	1	a	0.229730	F
1	2	b	0.000000	F
2	3	c	0.364865	P
3	4	d	0.743243	P
4	5	e	0.337838	P
5	6	f	0.891892	P
6	7	g	0.905405	P
7	8	h	0.594595	P
8	9	i	0.824324	P
9	10	j	0.986486	P
12	13	k	1.000000	P
13	14	l	0.621622	P
14	15	m	0.567568	P