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Assignment 2 Group A

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:

   a. To change the scale for better understanding of the variable, to convert a non-linear relation into a linear one,

   b. To decrease the skewness and convert the distribution into a normal distribution.

Reason and document your approach properly.

```
import pandas as pd
import numpy as np
import seaborn as sns

df = pd.read_excel('./random_academic_data.xlsx')
df.head(3)
```

```
   RollNo         Name  Sem1  Sem2  Sem3  Sem4  Sem5  Sem6
0  TCOA01  Arjun Verma  9.71  4.14  4.39  6.89  7.56  7.52
1  TCOA02    Isha Shah  6.11  4.62  6.56  5.03  7.72  5.42
2  TCOA03    Riya Nair  4.25  8.48  4.60  5.43  6.88  7.90
```

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 309 entries, 0 to 308
Data columns (total 8 columns):
 #   Column  Non-Null Count  Dtype
---  ------  --------------  -----
 0   RollNo  309 non-null    object
 1   Name    309 non-null    object
 2   Sem1    309 non-null    float64
 3   Sem2    309 non-null    float64
 4   Sem3    309 non-null    float64
 5   Sem4    309 non-null    float64
 6   Sem5    309 non-null    float64
 7   Sem6    309 non-null    float64
dtypes: float64(6), object(2)
memory usage: 19.4+ KB
```

```
df.describe()
```

```
             Sem1        Sem2        Sem3        Sem4        Sem5
Sem6
count  309.000000  309.000000  309.000000  309.000000  309.000000
309.000000
mean     7.077476    6.966084    7.108544    6.982233    7.137087
7.014984
std      3.004871    1.835419    2.758916    2.877877    3.817599
1.809959
min      0.960000    4.000000    4.020000    4.000000    4.010000
4.020000
25%      5.660000    5.250000    5.480000    5.390000    5.520000
5.360000
50%      6.770000    7.000000    6.860000    6.750000    6.910000
7.050000
75%      8.300000    8.530000    8.450000    8.410000    8.390000
8.670000
max     50.600000    9.980000   45.300000   47.500000   67.200000
10.000000
```

```
for column in df.columns:
    print(column)
```

```
RollNo
Name
Sem1
Sem2
Sem3
Sem4
Sem5
Sem6
```

Missing Values

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

```
RollNo    0
Name      0
Sem1      0
Sem2      0
Sem3      0
```

```
Sem4      0
Sem5      0
Sem6      0
dtype: int64
```

Data has no missing values

RollNo is combination of Year, Dept, Div and number. We can extract Div from it and Number

```
df['Year'] = df['RollNo'].str[0]+'E'
df['Dept'] = df['RollNo'].str[1:3]+'MP'
df['Div'] = df['RollNo'].str[3]
df.head(5)

   RollNo          Name  Sem1  Sem2  Sem3  Sem4  Sem5  Sem6 Year 
Dept Div
0  TCOA01   Arjun Verma  9.71  4.14  4.39  6.89  7.56  7.52   TE 
COMP   A
1  TCOA02     Isha Shah  6.11  4.62  6.56  5.03  7.72  5.42   TE 
COMP   A
2  TCOA03     Riya Nair  4.25  8.48  4.60  5.43  6.88  7.90   TE 
COMP   A
3  TCOA04   Sonia Patel  9.09  6.17  9.11  9.25  9.99  7.70   TE 
COMP   A
4  TCOA05  Anjali Mittal  5.40  4.29  9.06  5.14  6.70  5.86   TE 
COMP   A
```

Finally replace rollNo with int

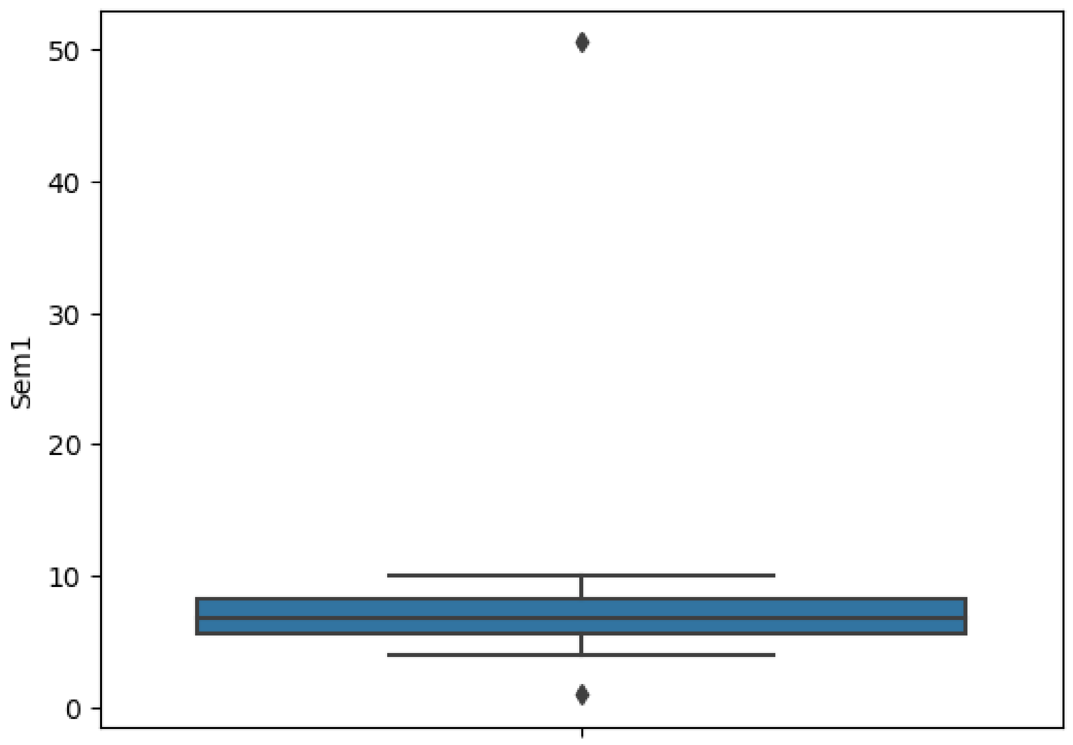
```
df['RollNo'] = df['RollNo'].str[4:].astype(int)
df.head(5)

   RollNo          Name  Sem1  Sem2  Sem3  Sem4  Sem5  Sem6 Year 
Dept Div
0       1   Arjun Verma  9.71  4.14  4.39  6.89  7.56  7.52   TE 
COMP   A
1       2     Isha Shah  6.11  4.62  6.56  5.03  7.72  5.42   TE 
COMP   A
2       3     Riya Nair  4.25  8.48  4.60  5.43  6.88  7.90   TE 
COMP   A
3       4   Sonia Patel  9.09  6.17  9.11  9.25  9.99  7.70   TE 
COMP   A
4       5 Anjali Mittal  5.40  4.29  9.06  5.14  6.70  5.86   TE 
COMP   A

df.dtypes

RollNo       int32
Name        object
Sem1       float64
```

```
Sem2       float64
Sem3       float64
Sem4       float64
Sem5       float64
Sem6       float64
Year        object
Dept        object
Div         object
dtype: object
```

Outliners

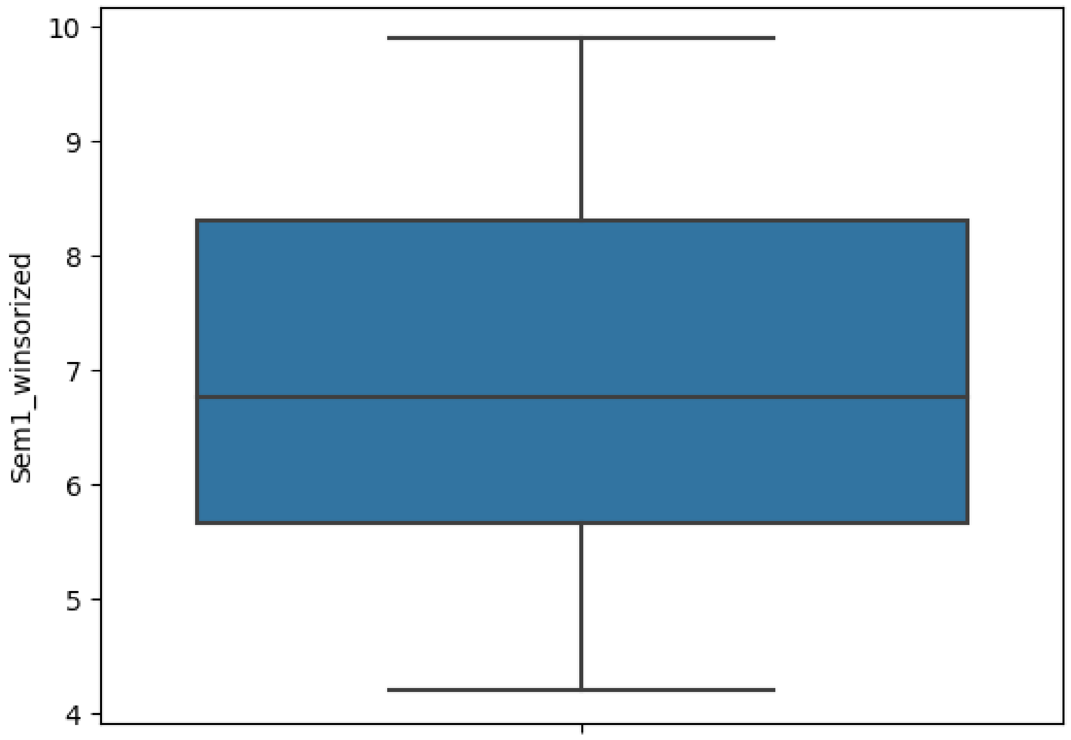
```
sns.boxplot(y=df['Sem1'])
```

```
<Axes: ylabel='Sem1'>
```

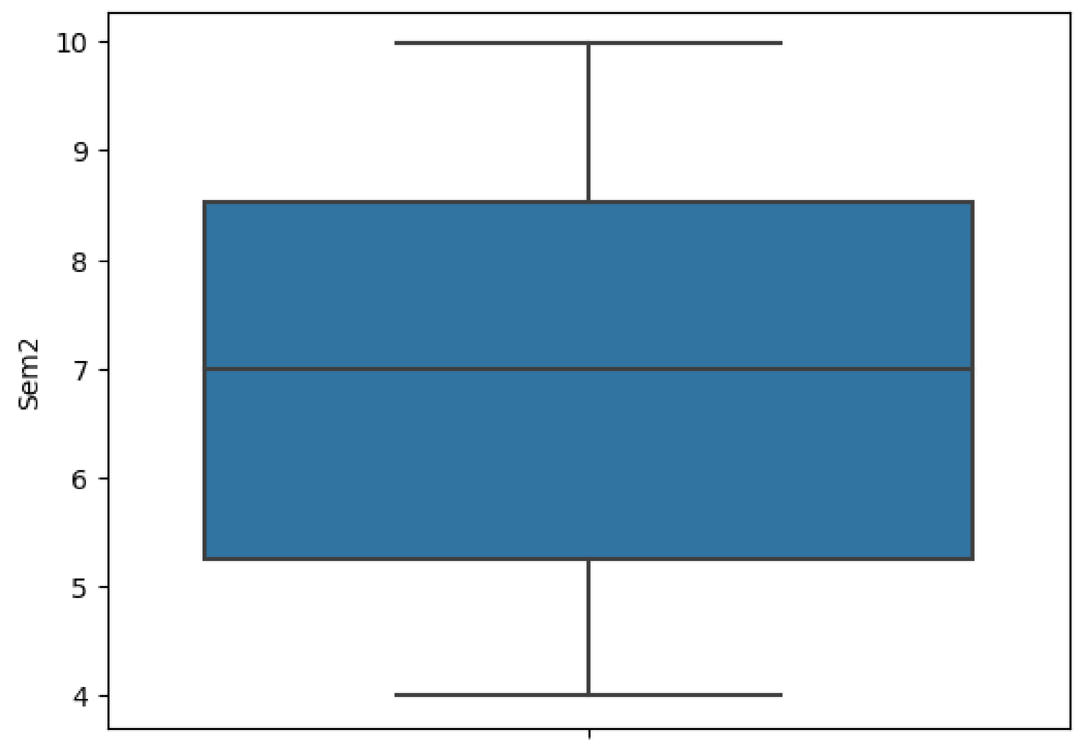


```
def winsorize(data, lower_percentile, upper_percentile):
  lower = np.percentile(data, lower_percentile)
  upper = np.percentile(data, upper_percentile)
  return np.where(data < lower, lower, np.where(data > upper, upper,
data))

df['Sem1_winsorized'] = winsorize(df['Sem1'], 2, 98)
sns.boxplot(y=df['Sem1_winsorized'])
```

```
<Axes: ylabel='Sem1_winsorized'>
```

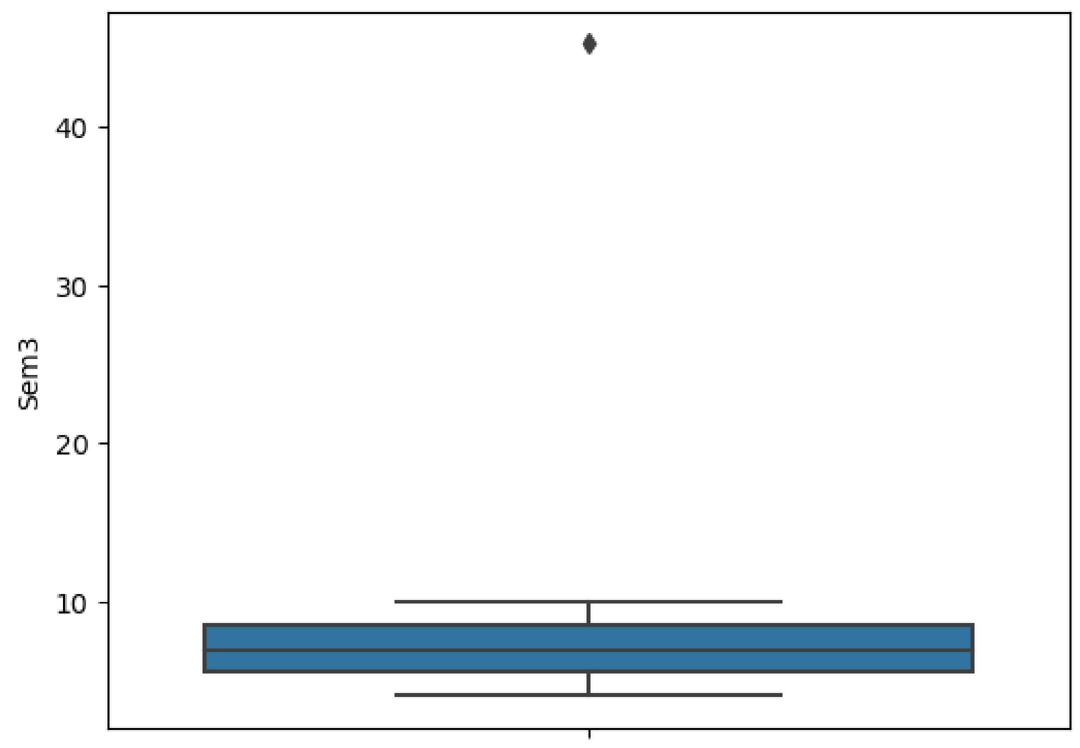


```
new_df = df.copy()
new_df['diff1'] = new_df['Sem1'] - new_df['Sem1_winsorized']
new_df[new_df['diff1']>10]

    RollNo        Name  Sem1  Sem2  Sem3  Sem4  Sem5  Sem6 Year  Dept
Div  \
31      32  Yash Kumar  50.6  5.82  8.99  9.03  9.16  4.59   TE  COMP
A

    Sem1_winsorized    diff1
31           9.8884  40.7116

sns.boxplot(y=df['Sem2'])

<Axes: ylabel='Sem2'>
```

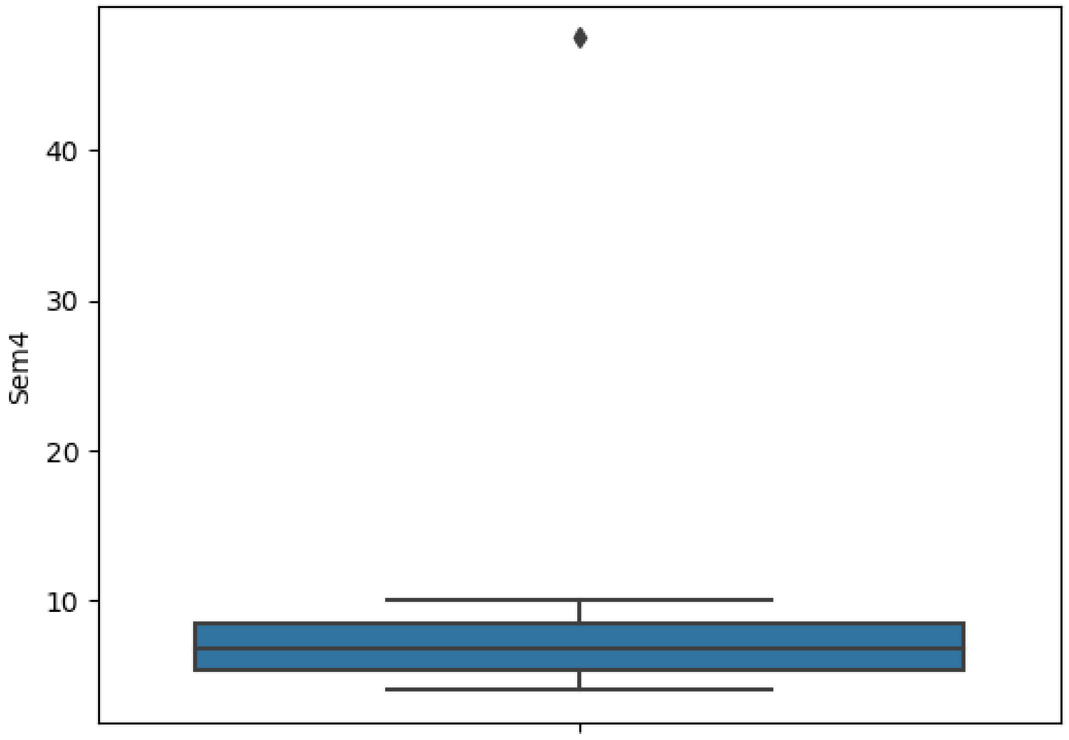


```
sns.boxplot(y=df['Sem3'])
```

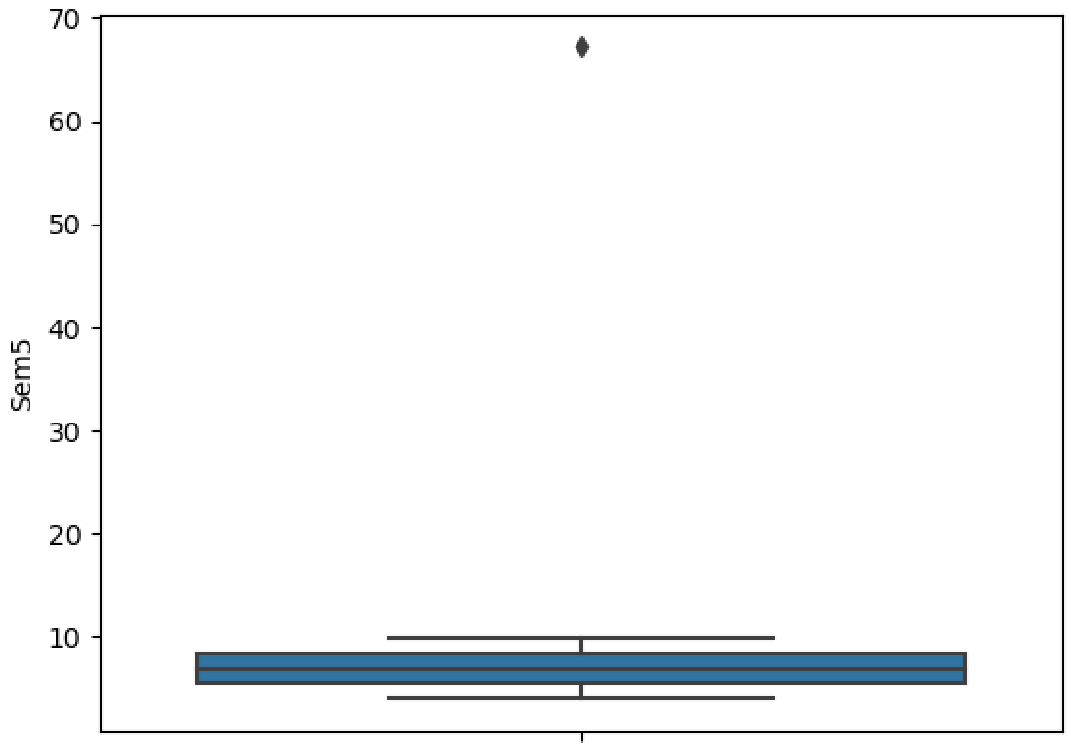
```
<Axes: ylabel='Sem3'>
```



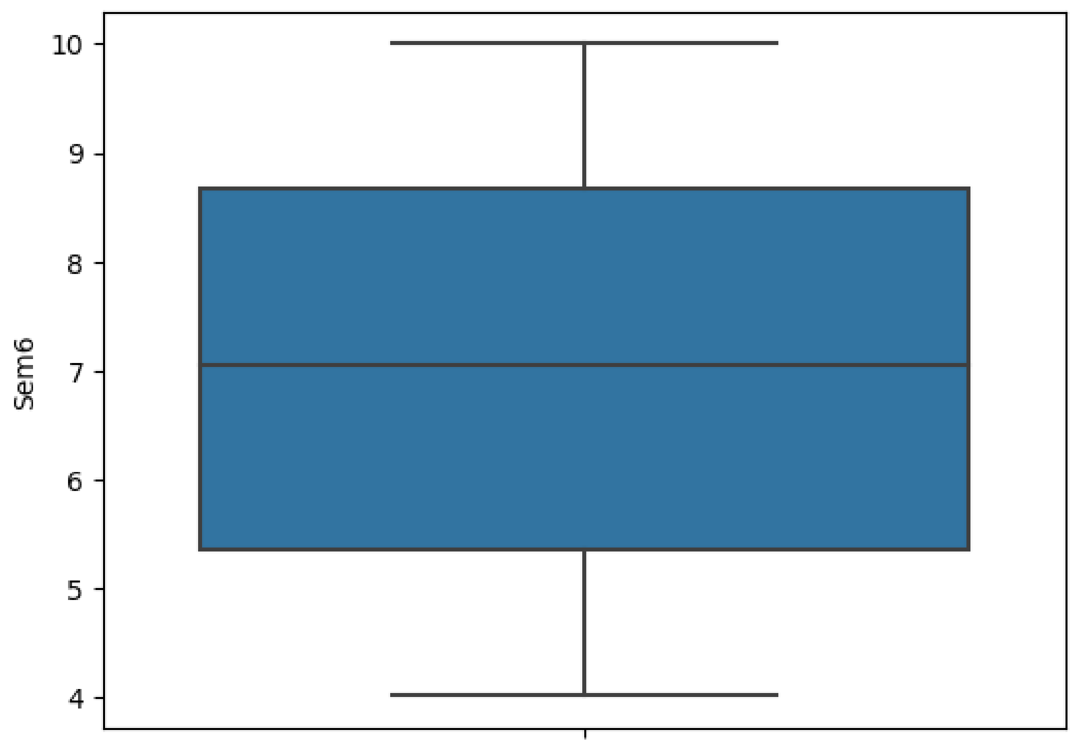
```
df['Sem3'] = winsorize(df['Sem3'], 2, 98)

sns.boxplot(y=df['Sem4'])

<Axes: ylabel='Sem4'>
```



```
df['Sem4'] = winsorize(df['Sem4'], 2, 98)

sns.boxplot(y=df['Sem5'])

<Axes: ylabel='Sem5'>
```

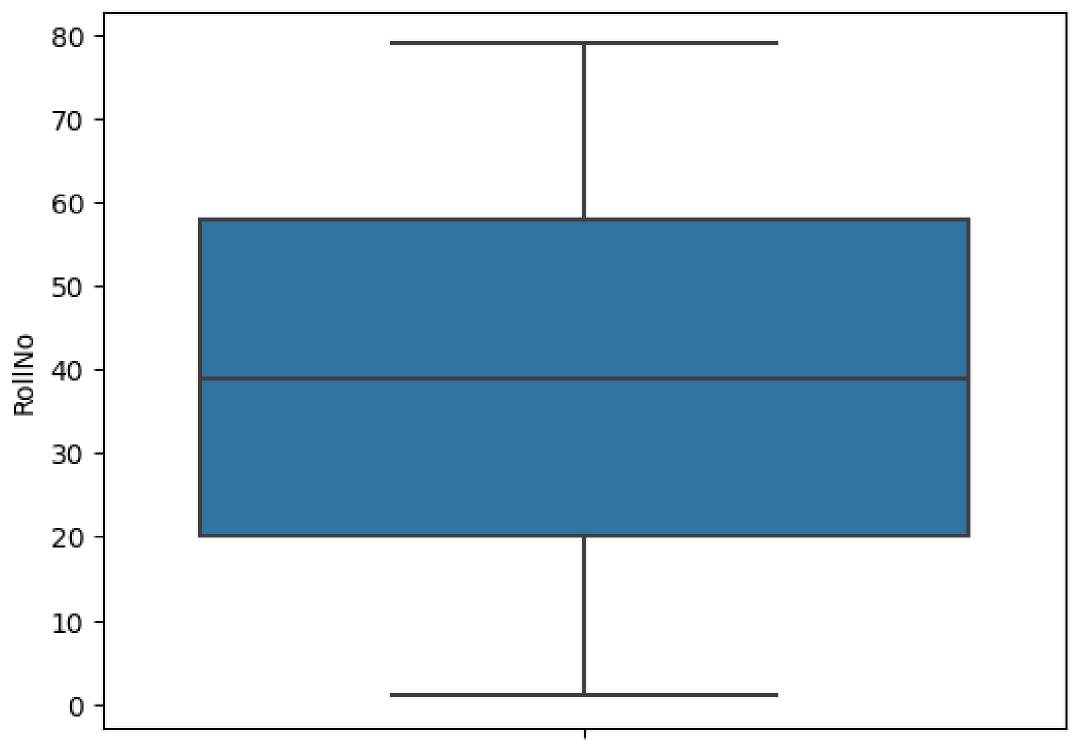


```
df['Sem5'] = winsorize(df['Sem5'], 2, 98)

sns.boxplot(y=df['Sem6'])

<Axes: ylabel='Sem6'>
```



```
sns.boxplot(y=df['RollNo'])
```

```
<Axes: ylabel='RollNo'>
```



Transformation and Scaling

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

le = LabelEncoder()
df['Div'] = le.fit_transform(df['Div'])
df['Div'].value_counts()
```

```
Div
2    79
3    79
1    77
0    74
Name: count, dtype: int64
```

Thus we performed all the operation as specified in problem statement.