**Assignment -3**

Python Programming

| | |
|---|---|
| Assignment Date | 9 October 2022 |
| Student Name | G.Raghul |
| Student Roll Number | 621319106072 |
| Maximum Marks | 2 Marks |

**Question-1:**

AFTER DOWNLOADING THE DATASET ,IMPORT NECESSARY LIBRARIES

```
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.linear_model import LinearRegression
from sklearn.tree import DecisionTreeRegressor
```

LOAD THE DATASET

```
data = pd.read_csv('abalone.csv')
data
```

**Solution:**

```
data = pd.read_csv('abalone.csv')
data
```

| | Sex | Length | Diameter | Height | Whole weight | Shucked weight | Viscera weight | Shell weight | Rings |
|---|---|---|---|---|---|---|---|---|---|
| 0 | M | 0.455 | 0.365 | 0.095 | 0.5140 | 0.2245 | 0.1010 | 0.1500 | 15 |
| 1 | M | 0.350 | 0.265 | 0.090 | 0.2255 | 0.0995 | 0.0485 | 0.0700 | 7 |
| 2 | F | 0.530 | 0.420 | 0.135 | 0.6770 | 0.2565 | 0.1415 | 0.2100 | 9 |
| 3 | M | 0.440 | 0.365 | 0.125 | 0.5160 | 0.2155 | 0.1140 | 0.1550 | 10 |
| 4 | I | 0.330 | 0.255 | 0.080 | 0.2050 | 0.0895 | 0.0395 | 0.0550 | 7 |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 4172 | F | 0.565 | 0.450 | 0.165 | 0.8870 | 0.3700 | 0.2390 | 0.2490 | 11 |
| 4173 | M | 0.590 | 0.440 | 0.135 | 0.9660 | 0.4390 | 0.2145 | 0.2605 | 10 |
| 4174 | M | 0.600 | 0.475 | 0.205 | 1.1760 | 0.5255 | 0.2875 | 0.3080 | 9 |
| 4175 | F | 0.625 | 0.485 | 0.150 | 1.0945 | 0.5310 | 0.2610 | 0.2960 | 10 |
| 4176 | M | 0.710 | 0.555 | 0.195 | 1.9485 | 0.9455 | 0.3765 | 0.4950 | 12 |

4177 rows × 9 columns

```
data.info()
```

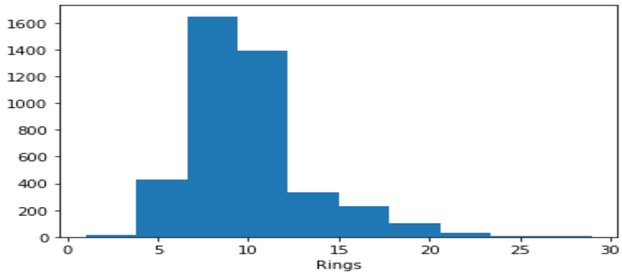
**Solution:**

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 4177 entries, 0 to 4176
Data columns (total 9 columns):
 #   Column          Non-Null Count  Dtype
---  ------          --------------  -----
 0   Sex             4177 non-null   object
 1   Length          4177 non-null   float64
 2   Diameter        4177 non-null   float64
 3   Height          4177 non-null   float64
 4   Whole weight    4177 non-null   float64
 5   Shucked weight  4177 non-null   float64
 6   Viscera weight  4177 non-null   float64
 7   Shell weight    4177 non-null   float64
 8   Rings           4177 non-null   int64
dtypes: float64(7), int64(1), object(1)
memory usage: 293.8+ KB
```

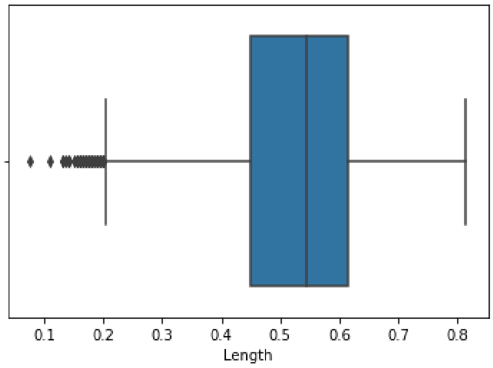
```
plt.hist(data['Rings']);
plt.xlabel('Rings');
```

**Solution:**



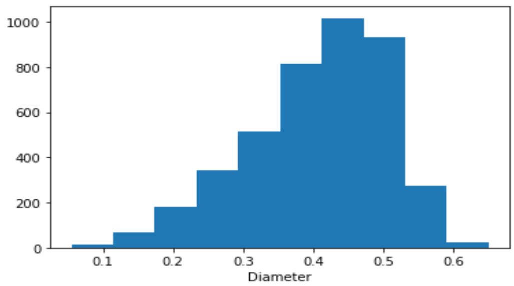

```
sns.boxplot(x=data['Length'])
plt.xlabel('Length');
```

**Solution:**



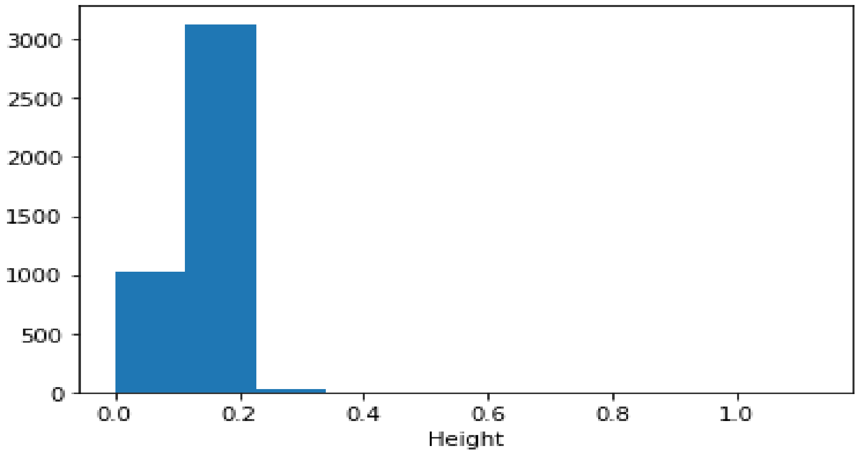

```
plt.hist(data['Diameter']);
plt.xlabel('Diameter');
```

**Solution:**



```
plt.hist(data['Height']);
plt.xlabel('Height');
```

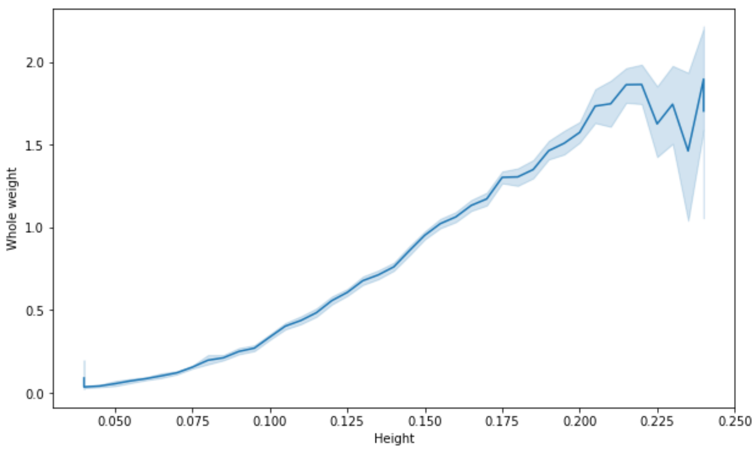
**Solution:**




**Question-2:**

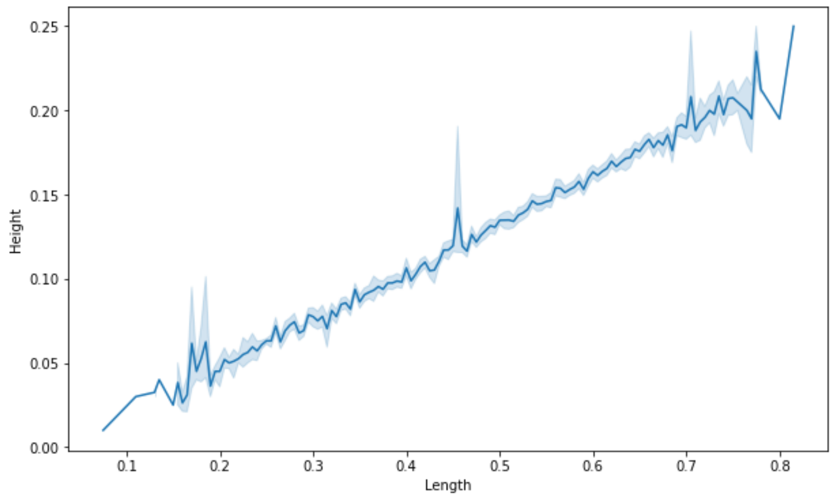
```
#Bivariate Analysis
plt.figure(figsize=(10, 6))
sns.lineplot(x=data["Height"], y=data["Whole weight"]);
plt.xlabel('Height');
plt.ylabel('Whole weight');
```

**Solution:**



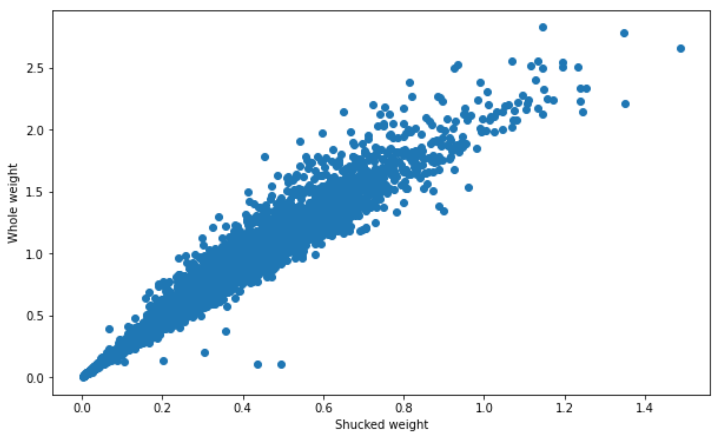
```
plt.figure(figsize=(10, 6))
sns.lineplot(x=data["Length"], y=data["Height"]);
plt.xlabel('Length');
plt.ylabel('Height');
```

**Solution:**



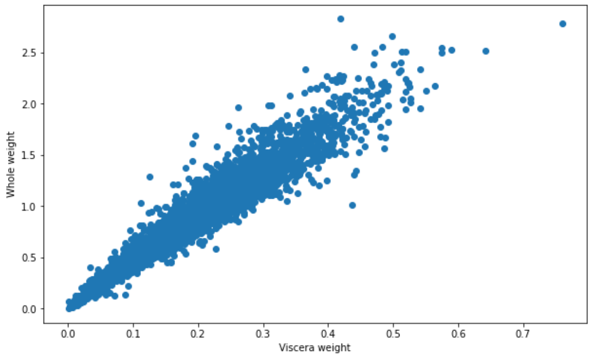

```
plt.figure(figsize=(10, 6))
plt.scatter(x=data["Shucked weight"], y=data["Whole weight"]);
plt.xlabel('Shucked weight');
plt.ylabel('Whole weight');
```

**Solution:**



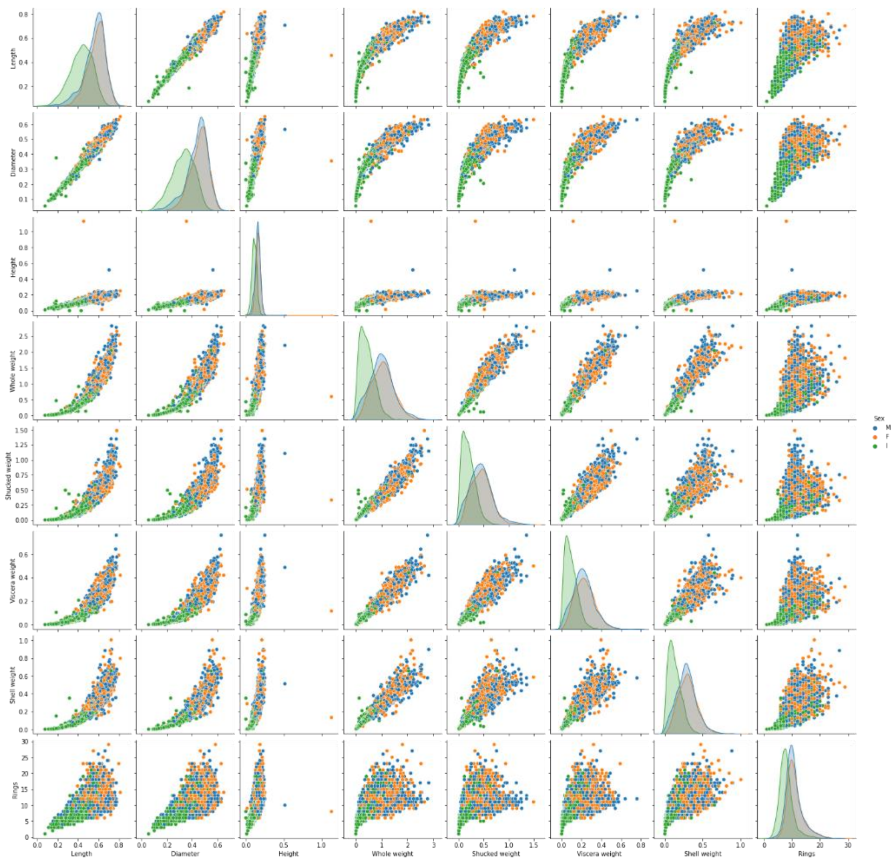
```python
plt.figure(figsize=(10, 6))
plt.scatter(x=data["Viscera weight"], y=data["Whole weight"]);
plt.xlabel('Viscera weight');
plt.ylabel('Whole weight');
```

**Solution:**



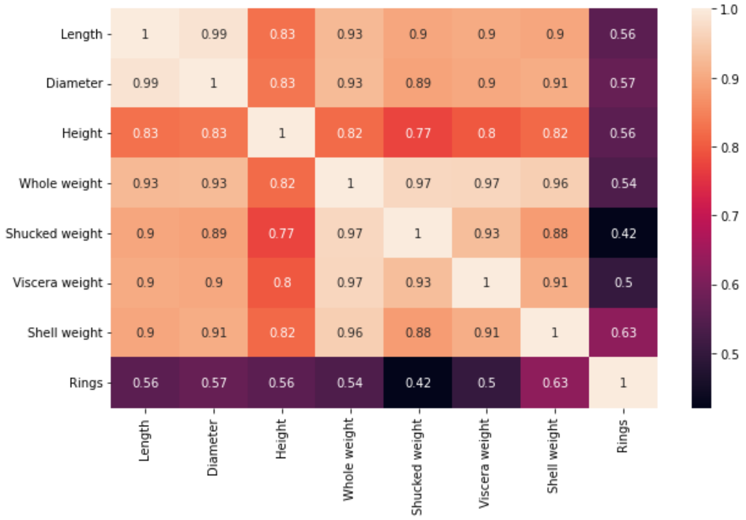

**Question-3:**

```python
#Multi-variate Analysis
sns.pairplot(data, hue='Sex');
```



```
plt.figure(figsize=(10, 6));
sns.heatmap(data.corr(), annot=True);
```

**Solution:**




**Question-4:**

```
#Descriptive Statistics
data.describe()
```

**Solution:**

```
#Descriptive Statistics
data.describe()
```

| | Length | Diameter | Height | Whole weight | Shucked weight | Viscera weight | Shell weight | Rings | Sex_F | Sex_I | Sex_M |
|---|---|---|---|---|---|---|---|---|---|---|---|
| count | 4177.000000 | 4177.000000 | 4177.000000 | 4177.000000 | 4177.000000 | 4177.000000 | 4177.000000 | 4177.000000 | 4177.000000 | 4177.000000 | 4177.000000 |
| mean | 0.524373 | 0.408271 | 0.139318 | 0.827425 | 0.357809 | 0.180285 | 0.238049 | 9.766100 | 0.312904 | 0.321283 | 0.365813 |
| std | 0.118984 | 0.098159 | 0.038272 | 0.486184 | 0.216794 | 0.108577 | 0.136487 | 2.764243 | 0.463731 | 0.467025 | 0.481715 |
| min | 0.202500 | 0.155000 | 0.040000 | 0.002000 | 0.001000 | 0.000500 | 0.001500 | 3.500000 | 0.000000 | 0.000000 | 0.000000 |
| 25% | 0.450000 | 0.350000 | 0.115000 | 0.441500 | 0.186000 | 0.093500 | 0.130000 | 8.000000 | 0.000000 | 0.000000 | 0.000000 |
| 50% | 0.545000 | 0.425000 | 0.140000 | 0.799500 | 0.336000 | 0.171000 | 0.234000 | 9.000000 | 0.000000 | 0.000000 | 0.000000 |
| 75% | 0.615000 | 0.480000 | 0.165000 | 1.153000 | 0.502000 | 0.253000 | 0.329000 | 11.000000 | 1.000000 | 1.000000 | 1.000000 |
| max | 0.815000 | 0.650000 | 0.240000 | 2.220250 | 0.976000 | 0.492250 | 0.627500 | 15.500000 | 1.000000 | 1.000000 | 1.000000 |

**Question-5:**

```
#Handling Missing Values
data.isna().sum()
```

**Solution:**

```
#Handling Missing Values
data.isna().sum()
```

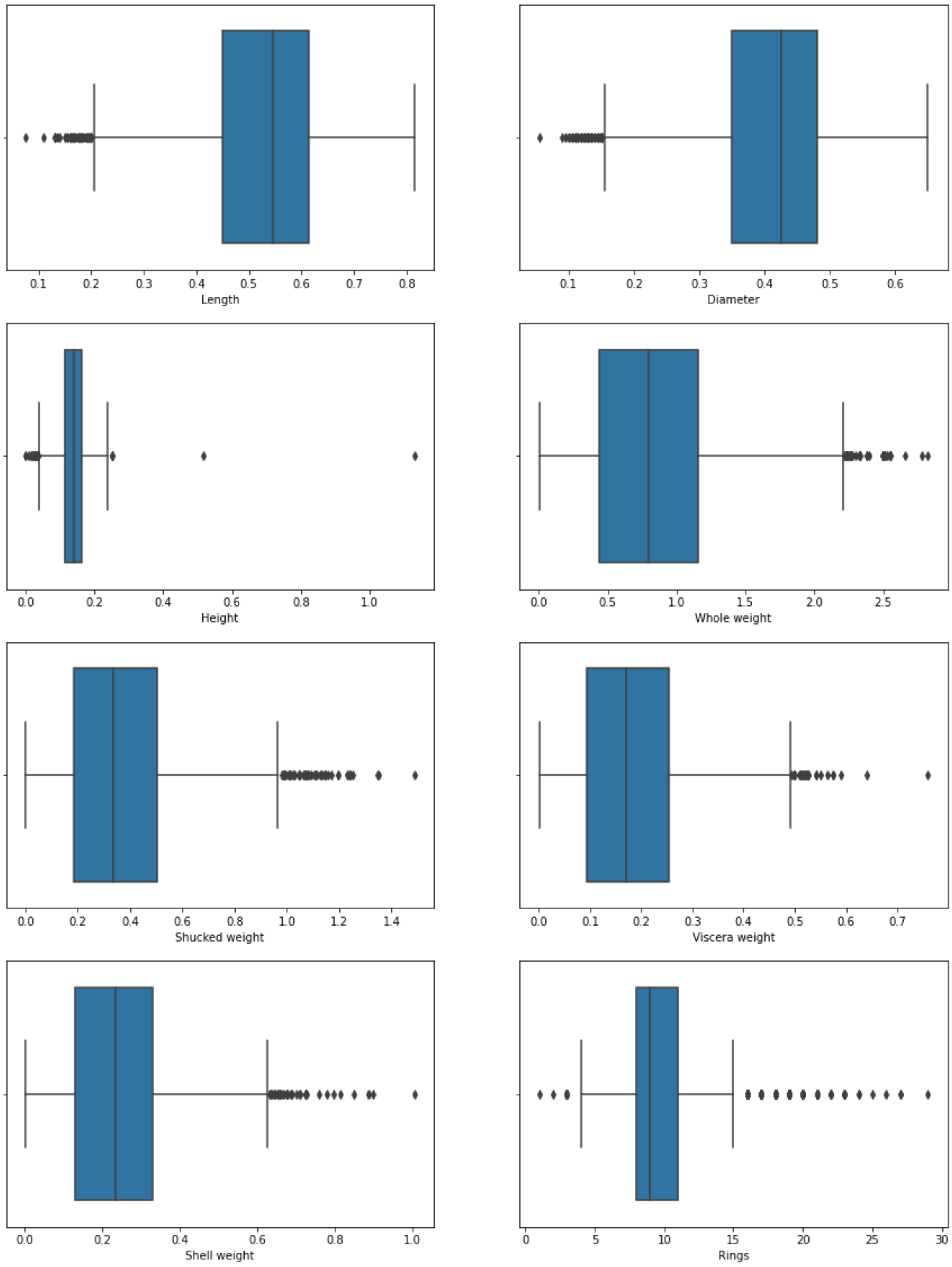
```
Sex               0
Length            0
Diameter          0
Height            0
Whole weight      0
Shucked weight    0
Viscera weight    0
Shell weight      0
Rings             0
dtype: int64
```

**Question-6:**

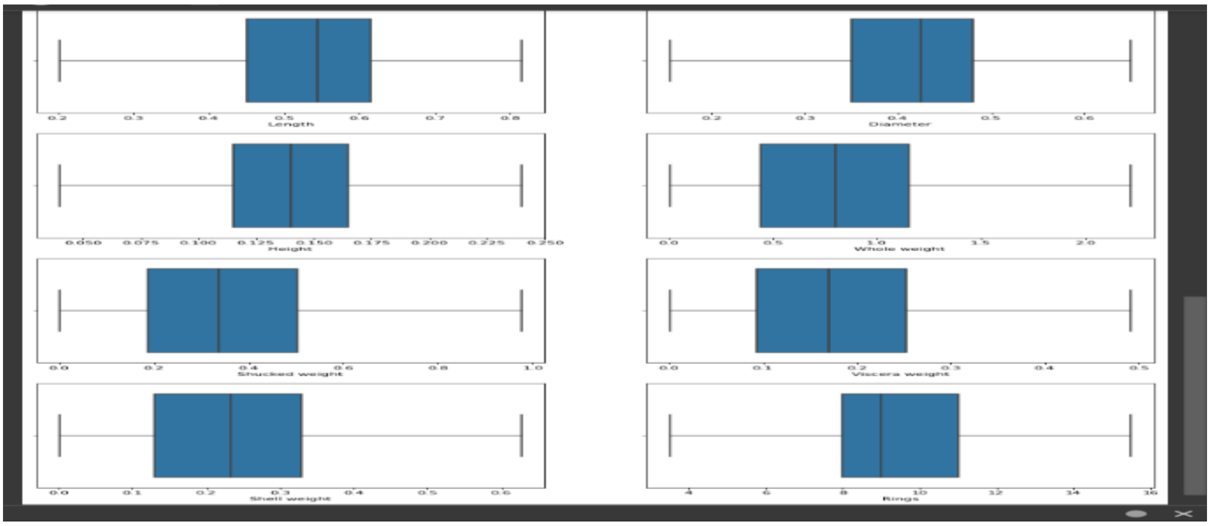
```
#Outlier Handling
numeric_cols = ['Length', 'Diameter', 'Height', 'Whole weight', 'Shucked weight', 'Viscera weight', 'Shell weight', 'Rings']

def boxplots(cols):
    fig, axes = plt.subplots(4, 2, figsize=(15, 20))

    t=0
    for i in range(4):
        for j in range(2):
            sns.boxplot(ax=axes[i][j], data=data, x=cols[t])
            t+=1

    plt.show()
def Flooring_outlier(col):
    Q1 = data[col].quantile(0.25)
    Q3 = data[col].quantile(0.75)
    IQR = Q3 - Q1
    whisker_width = 1.5
    lower_whisker = Q1 -(whisker_width*IQR)
    upper_whisker = Q3 + (whisker_width*IQR)
    data[col]=np.where(data[col]>upper_whisker,upper_whisker,np.where(data[col]<lower_whisker,lower_whisker,data[col]))
print('Before Outliers Handling')
print('='*100)
boxplots(numeric_cols)
for col in numeric_cols:
    Flooring_outlier(col)
print('\n\n\nAfter Outliers Handling')
print('='*100)
boxplots(numeric_cols)
```

**Solution:**

Before Outliers Handling




After Outliers Handling




**Question-7:**

```
#Encode Categorical Columns
data = pd.get_dummies(data, columns = ['Sex'])
data
```

**Solution:**

```
data = pd.get_dummies(data, columns = ['Sex'])
data
```

| | Length | Diameter | Height | Whole weight | Shucked weight | Viscera weight | Shell weight | Rings | Sex_F | Sex_I | Sex_M |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.455 | 0.365 | 0.095 | 0.5140 | 0.2245 | 0.1010 | 0.1500 | 15.0 | 0 | 0 | 1 |
| 1 | 0.350 | 0.265 | 0.090 | 0.2255 | 0.0995 | 0.0485 | 0.0700 | 7.0 | 0 | 0 | 1 |
| 2 | 0.530 | 0.420 | 0.135 | 0.6770 | 0.2565 | 0.1415 | 0.2100 | 9.0 | 1 | 0 | 0 |
| 3 | 0.440 | 0.365 | 0.125 | 0.5160 | 0.2155 | 0.1140 | 0.1550 | 10.0 | 0 | 0 | 1 |
| 4 | 0.330 | 0.255 | 0.080 | 0.2050 | 0.0895 | 0.0395 | 0.0550 | 7.0 | 0 | 1 | 0 |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 4172 | 0.565 | 0.450 | 0.165 | 0.8870 | 0.3700 | 0.2390 | 0.2490 | 11.0 | 1 | 0 | 0 |
| 4173 | 0.590 | 0.440 | 0.135 | 0.9660 | 0.4390 | 0.2145 | 0.2605 | 10.0 | 0 | 0 | 1 |
| 4174 | 0.600 | 0.475 | 0.205 | 1.1760 | 0.5255 | 0.2875 | 0.3080 | 9.0 | 0 | 0 | 1 |
| 4175 | 0.625 | 0.485 | 0.150 | 1.0945 | 0.5310 | 0.2610 | 0.2960 | 10.0 | 1 | 0 | 0 |
| 4176 | 0.710 | 0.555 | 0.195 | 1.9485 | 0.9455 | 0.3765 | 0.4950 | 12.0 | 0 | 0 | 1 |

4177 rows × 11 columns

**Question-8:**

```
#Scale the independent Variables
scaler = StandardScaler()
X = scaler.fit_transform(X)
X
```

**Solution:**

```
#Scale the independent Variables
scaler = StandardScaler()
X = scaler.fit_transform(X)
X
```

```
array([[-0.58311728, -0.44088378, -1.15809314, ..., -0.67483383,
        -0.68801788,  1.31667716],
       [-1.46569411, -1.45976205, -1.28875125, ..., -0.67483383,
        -0.68801788,  1.31667716],
       [ 0.04729474,  0.11949927, -0.1128283 , ...,  1.48184628,
        -0.68801788, -0.75948762],
       ...,
       [ 0.63567929,  0.67988232,  1.71638519, ..., -0.67483383,
        -0.68801788,  1.31667716],
       [ 0.84581663,  0.78177015,  0.27914602, ...,  1.48184628,
        -0.68801788, -0.75948762],
       [ 1.56028358,  1.49498494,  1.45506898, ..., -0.67483383,
        -0.68801788,  1.31667716]])
```

```
#Train Test Split
X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size=0.2
, random_state=42)
X_train.shape, X_test.shape, Y_train.shape, Y_test.shape
```

**Solution:**

```
((3341, 10), (836, 10), (3341, 1), (836, 1
```

**Question-9:**

```
#Model Training & Testing
model = LinearRegression()
model.fit(X_train, Y_train)
model.score(X_train, Y_train), model.score(X_test, Y_test)
```

**Solution:**

```
(0.5743537797259437, 0.574066914479568)
```

```
model = DecisionTreeRegressor(max_depth=15, max_leaf_nodes=40)
model.fit(X_train, Y_train)
model.score(X_train, Y_train), model.score(X_test, Y_test)
```

**Solution:**

```
(0.6299341126842184, 0.5533377990647702)
```