ASSIGNMENT-3

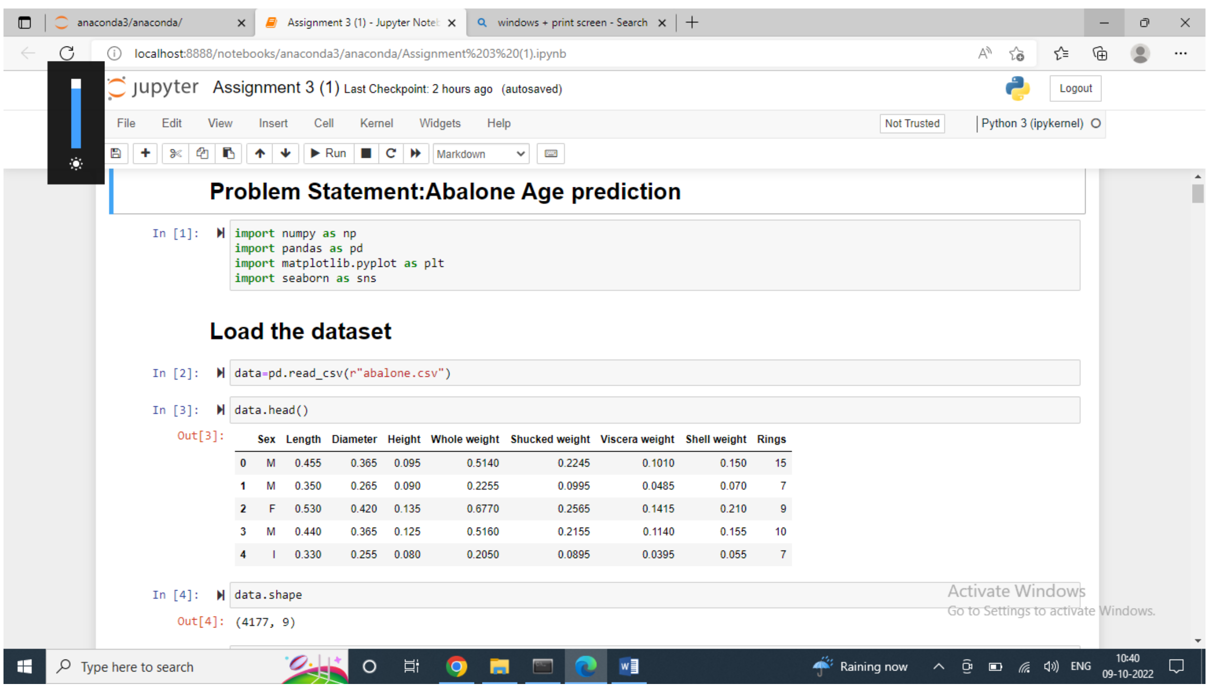
Applied Data Science

Assignment Date:30 september 2022

Student name :Ms.Mythili

Student roll number:721719104053

Maximum marks:2 marks



Problem Statement:Abalone Age prediction

In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

Load the dataset

In [2]:
```
data=pd.read_csv(r"abalone.csv")
```

In [3]:
```
data.head()
```

Out[3]:

	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	0.150	15
1	M	0.350	0.265	0.090	0.2255	0.0995	0.0485	0.070	7
2	F	0.530	0.420	0.135	0.6770	0.2565	0.1415	0.210	9
3	M	0.440	0.365	0.125	0.5160	0.2155	0.1140	0.155	10
4	I	0.330	0.255	0.080	0.2050	0.0895	0.0395	0.055	7

In [4]:
```
data.shape
```

Out[4]: (4177, 9)

localhost:8888/notebooks/anaconda3/anaconda/Assignment%203%20(1).ipynb

jupyter Assignment 3 (1) Last Checkpoint: 2 hours ago (autosaved)

In [5]:
```
data.size
```
Out[5]: 37593

In [6]:
```
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
```

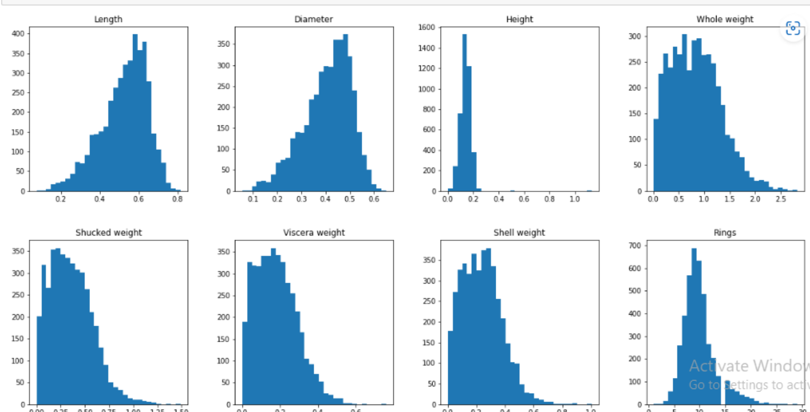
Data Analysis & Visualization

Univariate Analysis

localhost:8888/notebooks/anaconda3/anaconda/Assignment%203%20(1).ipynb

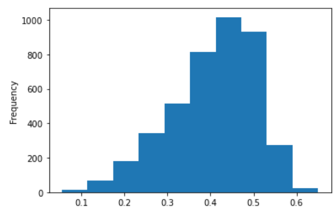
jupyter Assignment 3 (1) Last Checkpoint: 2 hours ago (autosaved)

In [7]:
```
data.hist(figsize=(20,10), grid=False, layout=(2,4), bins=30)
plt.show()
```

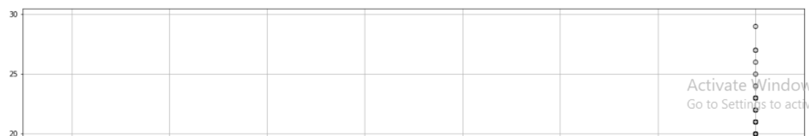


jupyter Assignment 3 (1) Last Checkpoint: 2 hours ago (autosaved)

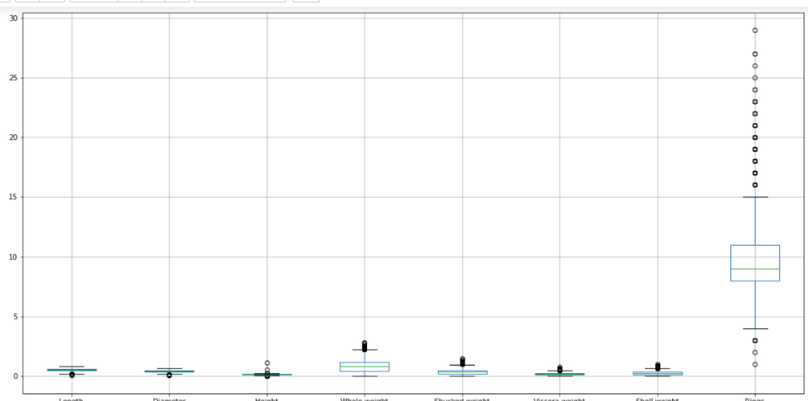
In [8]:
```
data["Diameter"].plot(kind='hist')
```
Out[8]: <AxesSubplot:ylabel='Frequency'>



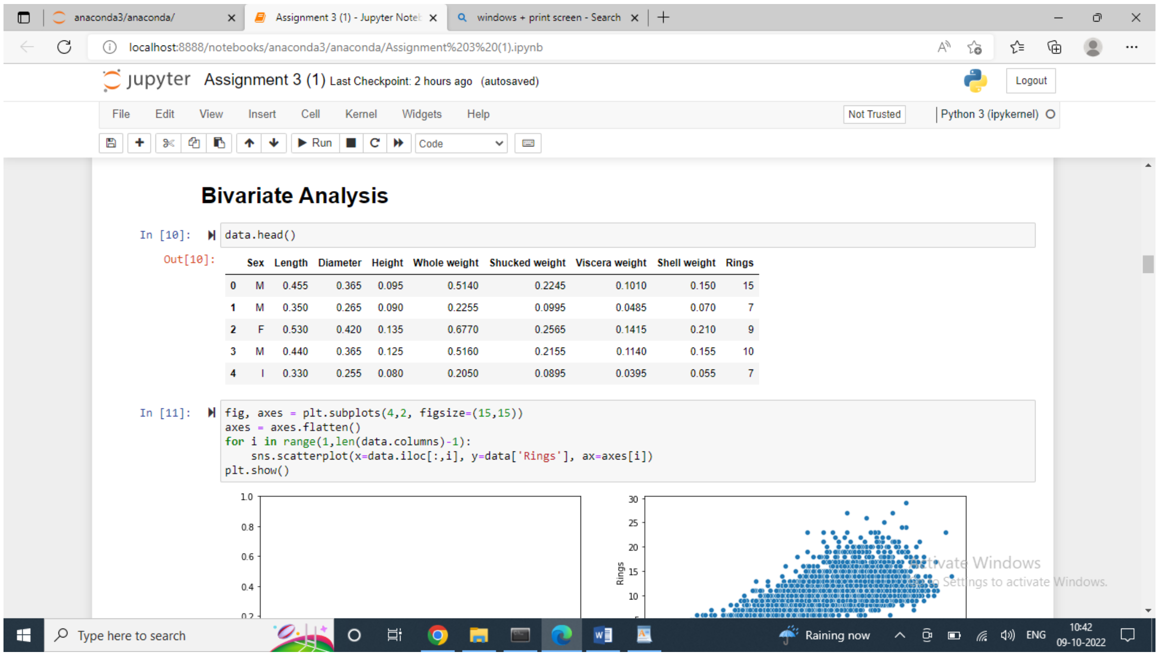
In [9]:
```
data.boxplot(figsize=(20,10))
plt.show()
```



jupyter Assignment 3 (1) Last Checkpoint: 2 hours ago (autosaved)



Bivariate Analysis



Bivariate Analysis

In [10]:

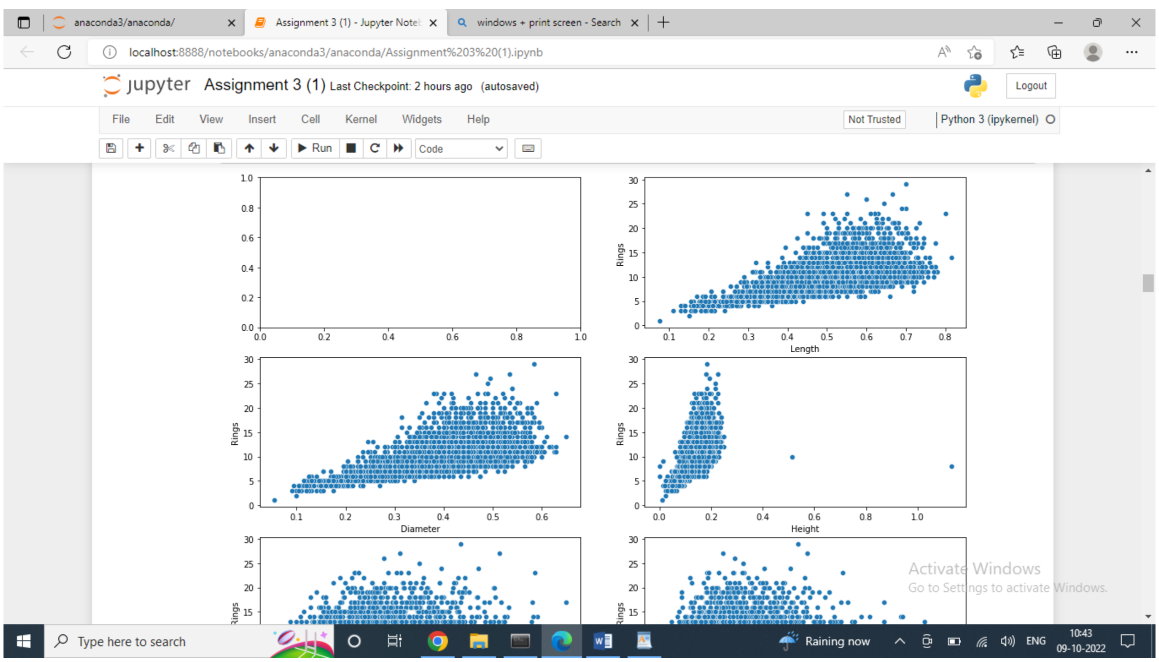
```
data.head()
```

Out[10]:

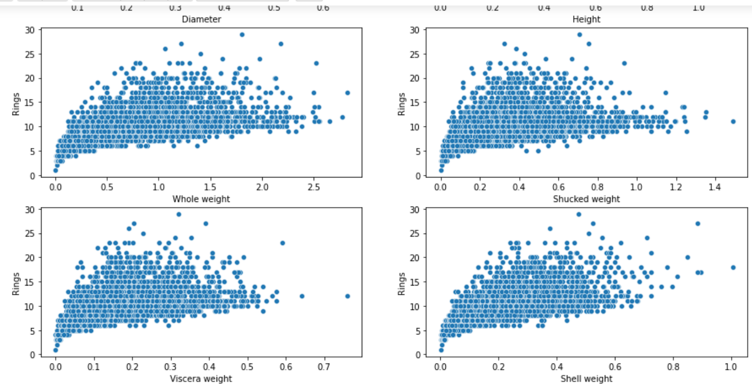
	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
0	M	0.455	0.365	0.095	0.5140	0.2245	0.1010	0.150	15
1	M	0.350	0.265	0.090	0.2255	0.0995	0.0485	0.070	7
2	F	0.530	0.420	0.135	0.6770	0.2565	0.1415	0.210	9
3	M	0.440	0.365	0.125	0.5160	0.2155	0.1140	0.155	10
4	I	0.330	0.255	0.080	0.2050	0.0895	0.0395	0.055	7

In [11]:

```
fig, axes = plt.subplots(4,2, figsize=(15,15))
axes = axes.flatten()
for i in range(1,len(data.columns)-1):
    sns.scatterplot(x=data.iloc[:,i], y=data['Rings'], ax=axes[i])
plt.show()
```



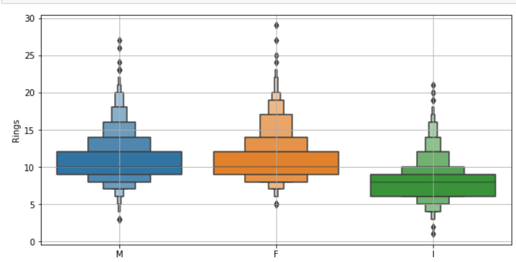
jupyter Assignment 3 (1) Last Checkpoint: 2 hours ago (autosaved)



In [12]:
```
plt.figure(figsize=(10,5))
sns.boxenplot(y=data['Rings'], x=data['Sex'])
plt.grid()
plt.show()
```

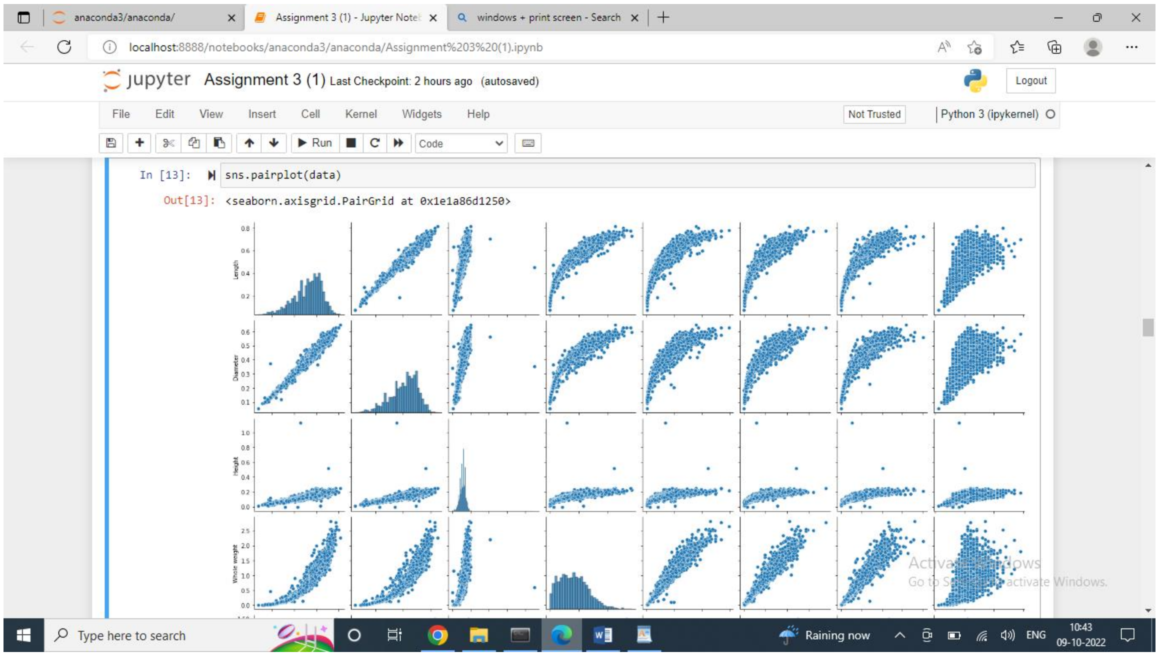
jupyter Assignment 3 (1) Last Checkpoint: 2 hours ago (autosaved)

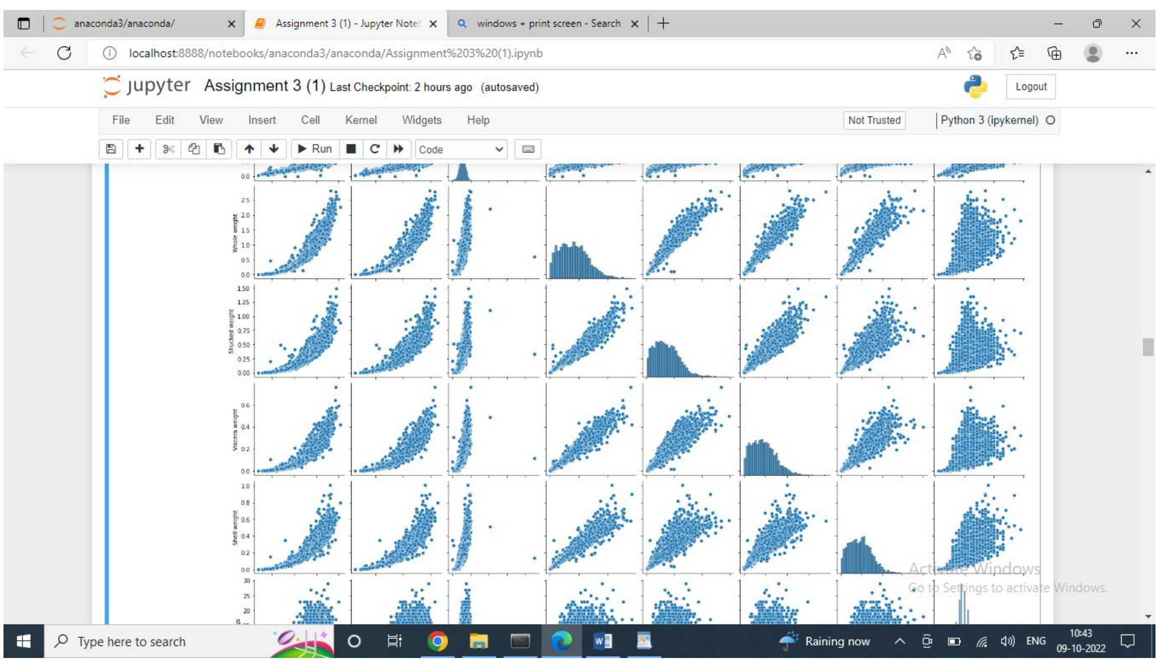
In [12]:
```
plt.figure(figsize=(10,5))
sns.boxenplot(y=data['Rings'], x=data['Sex'])
plt.grid()
plt.show()
data.groupby('Sex')['Rings'].describe()
```



Out[12]:

Sex	count	mean	std	min	25%	50%	75%	max
F	1307.0	11.129304	3.104256	5.0	9.0	10.0	12.0	29.0
I	1342.0	7.890462	2.511554	1.0	6.0	8.0	9.0	21.0


Assignment 3 (1) Last Checkpoint: 2 hours ago (autosaved)
In [13]: sns.pairplot(data)
Out[13]: <seaborn.axisgrid.PairGrid at 0x1e1a86d1250>
Length
Diameter
Height
Whole weight


Assignment 3 (1) Last Checkpoint: 2 hours ago (autosaved)
Whole weight
Shucked weight
Viscera weight
Shell weight

Descriptive statistics

In [14]:
```
data.describe()
```

Out[14]:

	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
count	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000
mean	0.523992	0.407881	0.139516	0.828742	0.359367	0.180594	0.238831	9.933684
std	0.120093	0.099240	0.041827	0.490389	0.221963	0.109614	0.139203	3.224169
min	0.075000	0.055000	0.000000	0.002000	0.001000	0.000500	0.001500	1.000000
25%	0.450000	0.350000	0.115000	0.441500	0.186000	0.093500	0.130000	8.000000
50%	0.545000	0.425000	0.140000	0.799500	0.336000	0.171000	0.234000	9.000000
75%	0.615000	0.480000	0.165000	1.153000	0.502000	0.253000	0.329000	11.000000
max	0.815000	0.650000	1.130000	2.825500	1.488000	0.760000	1.005000	29.000000

Handle The Missing Values

In [15]:
```
data.isnull().any()
```

Out[15]:
```
Sex               False
Length            False
Diameter          False
Height            False
Whole weight      False
Shucked weight    False
```

In [16]:
```
data.isnull().sum()
```

Out[16]:
```
Sex               0
Length            0
Diameter          0
Height            0
Whole weight      0
Shucked weight    0
Viscera weight    0
Shell weight      0
Rings             0
dtype: int64
```

Find the outliers

In [17]:
```
data.skew()
```

```
C:\Users\admin\AppData\Local\Temp\ipykernel_11300\1188251951.py:1: FutureWarning: Dropping of nuisance columns in DataFrame reductions (with 'numeric_only=None') is deprecated; in a future version this will raise TypeError.  Select only valid columns before calling the reduction.
  data.skew()
```

Out[17]:
```
Length           -0.639873
Diameter         -0.609198
Height            3.128817
Whole weight      0.530959
Shucked weight    0.719098
Viscera weight    0.591852
Shell weight      0.620927
Rings             1.114102
```

Find the outliers

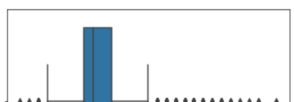
In [17]:
```
data.skew()
```

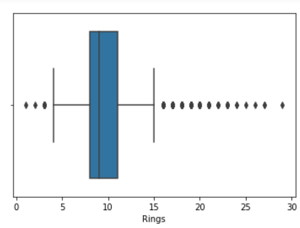
```
C:\Users\admin\AppData\Local\Temp\ipykernel_11300\1188251951.py:1: FutureWarning: Dropping of nuisance columns in DataFrame reductions (with 'numeric_only=None') is deprecated; in a future version this will raise TypeError.  Select only valid columns before calling the reduction.
  data.skew()
```

Out[17]:
```
Length           -0.639873
Diameter         -0.609198
Height            3.128817
Whole weight      0.530959
Shucked weight    0.719098
Viscera weight    0.591852
Shell weight      0.620927
Rings             1.114102
dtype: float64
```

In [18]:
```
sns.boxplot(x=data['Rings'],data=data)
```

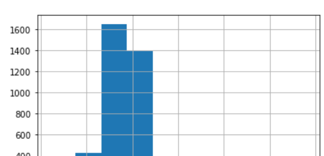
Out[18]: <AxesSubplot:xlabel='Rings'>





In [19]:
```
data['Rings'].hist()
```

Out[19]: <AxesSubplot:>



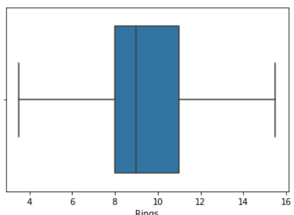
In [20]:
```python
print('skewness value of Age: ',data['Rings'].skew())
```

```
skewness value of Age:  1.114101898355677
```

In [21]:
```python
Q1 = data['Rings'].quantile(0.25)
Q3 = data['Rings'].quantile(0.75)
IQR = Q3 - Q1
whisker_width = 1.5
lower_whisker = Q1 -(whisker_width*IQR)
upper_whisker = Q3 +(whisker_width*IQR)
data['Rings']=np.where(data['Rings']>upper_whisker,upper_whisker,np.where(data['Rings']<lower_whisker,lower_whisker,data['Rir
```

In [23]:
```python
sns.boxplot(x=data['Rings'],data=data)
```

Out[23]: `<AxesSubplot:xlabel='Rings'>`



Categorical encoding

In [24]:
```python
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   float64
dtypes: float64(8), object(1)
memory usage: 293.8+ KB
```

In [25]:
```python
from sklearn.preprocessing import LabelEncoder

le=LabelEncoder()

data['Sex']=le.fit_transform(data['Sex'])
```

In [26]:
```python
data.head()
```

```
In [25]: from sklearn.preprocessing import LabelEncoder

         le=LabelEncoder()

         data['Sex']=le.fit_transform(data['Sex'])
```

```
In [26]: data.head()
```

Out[26]:

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
0	2	0.455	0.365	0.095	0.5140	0.2245	0.1010	0.150	15.0
1	2	0.350	0.265	0.090	0.2255	0.0995	0.0485	0.070	7.0
2	0	0.530	0.420	0.135	0.6770	0.2565	0.1415	0.210	9.0
3	2	0.440	0.365	0.125	0.5160	0.2155	0.1140	0.155	10.0
4	1	0.330	0.255	0.080	0.2050	0.0895	0.0395	0.055	7.0

```
In [28]: data["Sex"].unique()
Out[28]: array([2, 0, 1])
```

Split the data into training and testing

```
In [29]: data.head(5)
```

Out[29]:

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
0	2	0.455	0.365	0.095	0.5140	0.2245	0.1010	0.150	15.0

Split the data into training and testing

```
In [29]: data.head(5)
```

Out[29]:

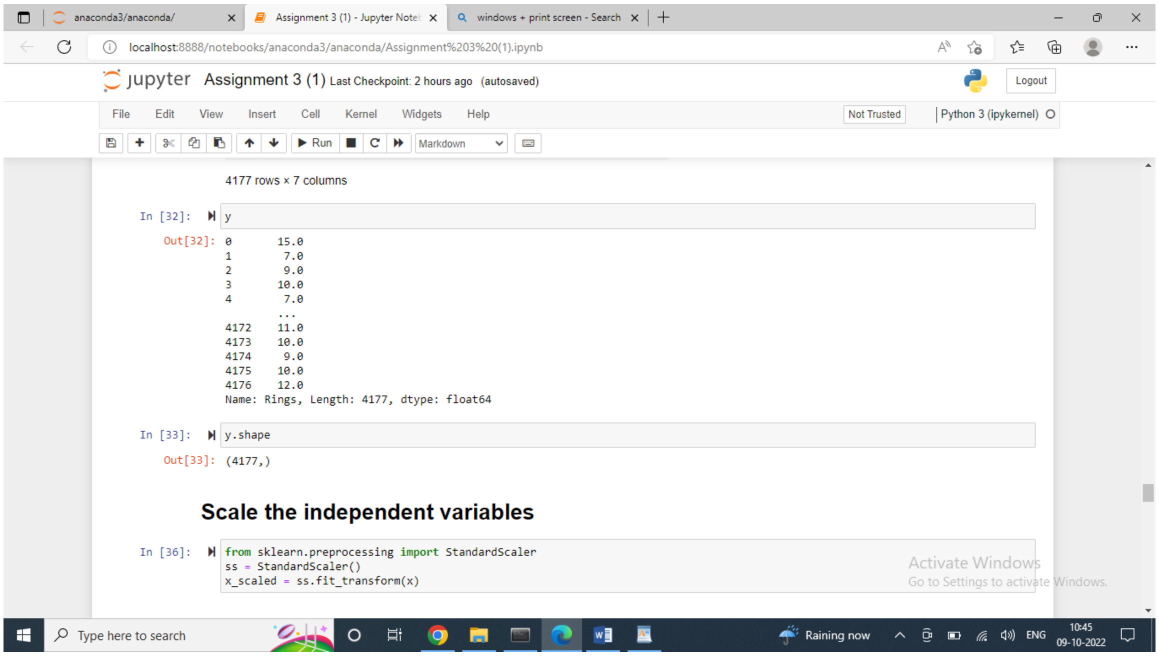
	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
0	2	0.455	0.365	0.095	0.5140	0.2245	0.1010	0.150	15.0
1	2	0.350	0.265	0.090	0.2255	0.0995	0.0485	0.070	7.0
2	0	0.530	0.420	0.135	0.6770	0.2565	0.1415	0.210	9.0
3	2	0.440	0.365	0.125	0.5160	0.2155	0.1140	0.155	10.0
4	1	0.330	0.255	0.080	0.2050	0.0895	0.0395	0.055	7.0


```
In [30]: x=data.iloc[:,0:7]
         y=data.iloc[:,-1]
```

```
In [31]: x
```

Out[31]:

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight
0	2	0.455	0.365	0.095	0.5140	0.2245	0.1010
1	2	0.350	0.265	0.090	0.2255	0.0995	0.0485
2	0	0.530	0.420	0.135	0.6770	0.2565	0.1415
3	2	0.440	0.365	0.125	0.5160	0.2155	0.1140
4	1	0.330	0.255	0.080	0.2050	0.0895	0.0395
...	...	...	...	...	...	...	...



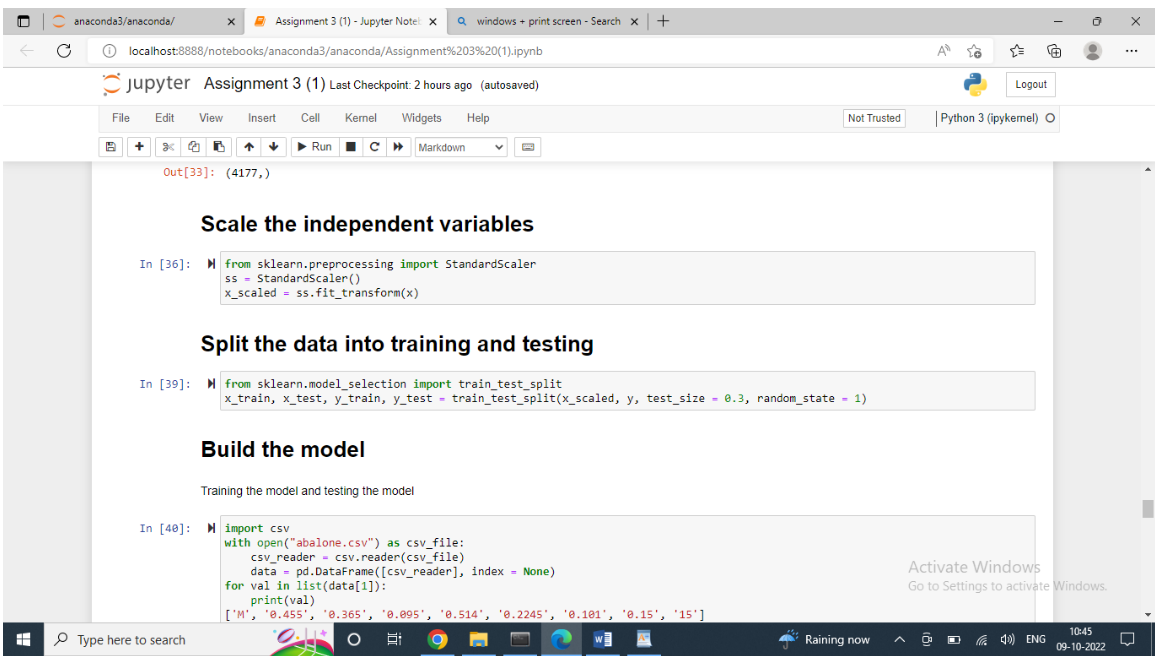
4177 rows × 7 columns

In [32]:
```
y
```
Out[32]:
```
0       15.0
1        7.0
2        9.0
3       10.0
4        7.0
        ... 
4172    11.0
4173    10.0
4174     9.0
4175    10.0
4176    12.0
Name: Rings, Length: 4177, dtype: float64
```

In [33]:
```
y.shape
```
Out[33]:
```
(4177,)
```

Scale the independent variables

In [36]:
```
from sklearn.preprocessing import StandardScaler
ss = StandardScaler()
x_scaled = ss.fit_transform(x)
```



Out[33]:
```
(4177,)
```

Scale the independent variables

In [36]:
```
from sklearn.preprocessing import StandardScaler
ss = StandardScaler()
x_scaled = ss.fit_transform(x)
```

Split the data into training and testing

In [39]:
```
from sklearn.model_selection import train_test_split
x_train, x_test, y_train, y_test = train_test_split(x_scaled, y, test_size = 0.3, random_state = 1)
```

Build the model

Training the model and testing the model

In [40]:
```
import csv
with open("abalone.csv") as csv_file:
    csv_reader = csv.reader(csv_file)
    data = pd.DataFrame([csv_reader], index = None)
for val in list(data[1]):
    print(val)
['M', '0.455', '0.365', '0.095', '0.514', '0.2245', '0.101', '0.15', '15']
```

Training and testing Module

1.Linear Regressiion 2.Ridge 3.Decision tree Regression 4.KNeighborsRegressor

In [41]:
```
from sklearn.linear_model import LinearRegression
from sklearn.linear_model import Ridge
from sklearn.tree import DecisionTreeRegressor
from sklearn.neighbors import KNeighborsRegressor

from sklearn.metrics import mean_squared_error, r2_score
```

1.Linear Regression

In [42]:
```
lr = LinearRegression()
lr.fit(x_train, y_train)
```
Out[42]:
```
LinearRegression()
```

In [43]:
```
lr_test_pred = lr.predict(x_test)
```

In [44]:
```
lr_test_pred
```
Out[44]:
```
array([8.49722433, 7.64369059, 7.82520883, ..., 8.55677832, 9.02884473,
       5.96561877])
```


In [42]:
```
lr = LinearRegression()
lr.fit(x_train, y_train)
```
Out[42]:
```
LinearRegression()
```

In [43]:
```
lr_test_pred = lr.predict(x_test)
```

In [44]:
```
lr_test_pred
```
Out[44]:
```
array([8.49722433, 7.64369059, 7.82520883, ..., 8.55677832, 9.02884473,
       5.96561877])
```


In [46]:
```
mse = mean_squared_error(y_test, lr_test_pred)
print('Mean Squared error of testing Set: %2f'%mse)
```
```
Mean Squared error of testing Set: 3.524602
```

In [47]:
```
p = r2_score(y_test, lr_test_pred)
print('R2 Score of testing set:%.2f'%p)
```
```
R2 Score of testing set:0.52
```

1.Ridge

In [48]:
```
ridge_mod = Ridge(alpha=0.01, normalize=True)
ridge_mod.fit(x_train, y_train)
ridge_mod.fit(x_test, y_test)
```

```
Out[48]: Ridge(alpha=0.01, normalize=True)

In [49]: ridge_model_pred = ridge_mod.predict(x_test)

In [50]: ridge_model_pred

Out[50]: array([8.54031033, 8.48463396, 7.96838487, ..., 8.77493484, 9.03881023,
        5.83582085])

In [51]: acc = r2_score(y_test, ridge_model_pred)
         print('Score of testing Set: %2f'%acc)

         Score of testing Set: 0.523227
```

1.Decision Tree Regression

```
In [52]: dt =  DecisionTreeRegressor()
         dt.fit(x_train, y_train)

Out[52]: DecisionTreeRegressor()

In [53]: dt_test_pred = dt.predict(x_test)

In [54]: dt_test_pred

Out[54]: array([12.,  9., 10., ...,  6.,  9.,  4.])

In [55]: dacc = mean_squared_error(y_test, dt_test_pred)
```

```
In [55]: dacc = mean_squared_error(y_test, dt_test_pred)
         print('Mean Squared Error of testing Set: %2f'%dacc)

         Mean Squared Error of testing Set: 6.182217
```

1.KNN Regression

```
In [56]: knn = KNeighborsRegressor(n_neighbors = 4 )
         knn.fit(x_train, y_train)
         knn.fit(x_test, y_test)

Out[56]: KNeighborsRegressor(n_neighbors=4)

In [57]: knn_test_pred = knn.predict(x_test)

In [58]: knn_test_pred

Out[58]: array([ 8.75,  9.5 , 10.5 , ...,  8.  ,  7.5 ,  5.  ])

In [59]: kacc= r2_score(knn_test_pred,y_test)
         print('Score of testing Set: %2f'%kacc)

         Score of testing Set: 0.400555

In [60]: kmse = mean_squared_error(knn_test_pred,y_test)
         print('Score of testing Set: %2f'%kmse)

         Score of testing Set: 2.602460
```