ASSESSMENT 3

ASSESSMENT DATE	06-11-2022
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MAXIMUM MARKS	2 Marks

```python
import pandas as pd
import numpy as np
```

```python
#1. Download the dataset

from google.colab import files
uploaded = files.upload()
```

```python
#2. Load the dataset into the tool.

df=pd.read_csv('abalone - abalone.csv')
df.head()
```

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings	Age
0	M	0.455	0.365	0.095	0.5140	0.2245	0.1010	0.150	15	16.5
1	M	0.350	0.265	0.090	0.2255	0.0995	0.0485	0.070	7	8.5
2	F	0.530	0.420	0.135	0.6770	0.2565	0.1415	0.210	9	10.5
3	M	0.440	0.365	0.125	0.5160	0.2155	0.1140	0.155	10	11.5
4	I	0.330	0.255	0.080	0.2050	0.0895	0.0395	0.055	7	8.5

0s

```python
df['age'] = df['Rings']+1.5
df.drop('Rings', axis = 1, inplace = True)
df.age
```

```
[6] 0        16.5
    1         8.5
    2        10.5
    3        11.5
    4         8.5
             ...
    4172     12.5
    4173     11.5
    4174     10.5
    4175     11.5
    4176     13.5
    Name: age, Length: 4177, dtype: float64
```

```
df.shape
```

```
(4177, 10)
```

```
df.info()
```

```
[8] 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    Unnamed: 9      4177 non-null    float64
    9    age             4177 non-null    float64
    dtypes: float64(9), object(1)
    memory usage: 326.5+ KB
```

```
# 3. Perform Below Visualizations.
#univariate analysis
import matplotlib.pyplot as plt
import seaborn as sns
plt.scatter(df.index,df['Height'])
plt.show()
```
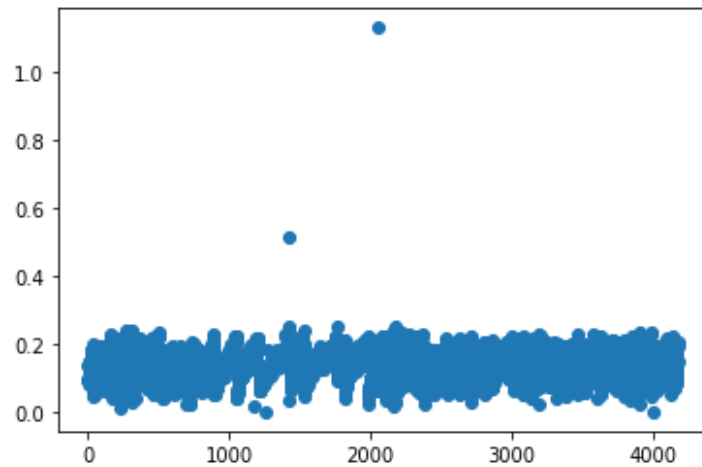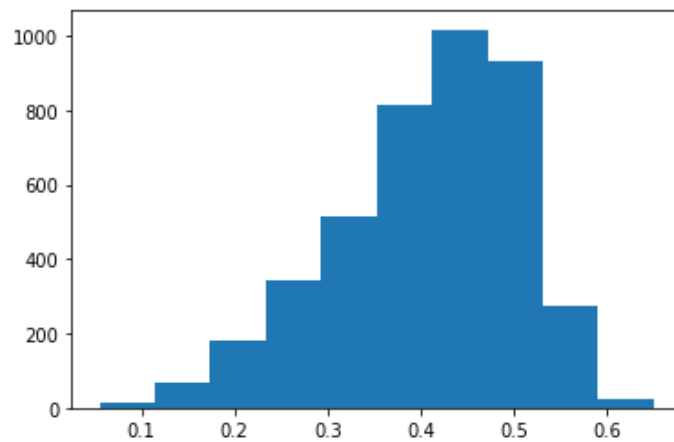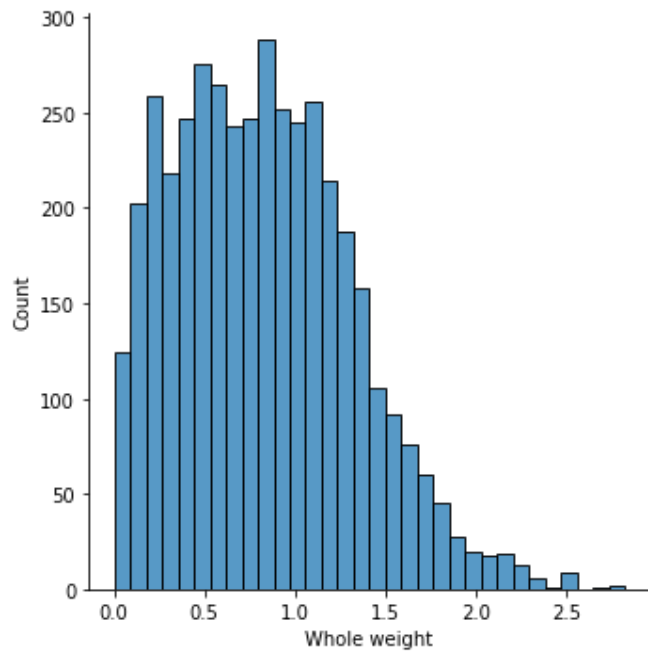
```python
plt.hist(df['Diameter'])
```
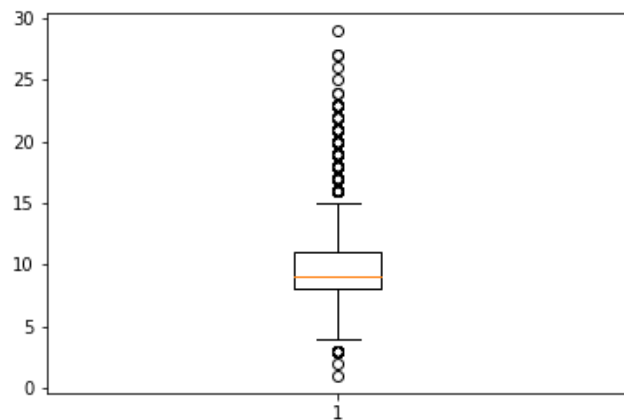
```
(array([  13.,   66.,  180.,  344.,  513.,  812., 1017.,  934.,  275.,
          23.]),
 array([0.055 , 0.1145, 0.174 , 0.2335, 0.293 , 0.3525, 0.412 , 0.4715,
        0.531 , 0.5905, 0.65  ]),
 <a list of 10 Patch objects>)
```



```python
sns.displot(df['Whole weight'])
```

```
<seaborn.axisgrid.FacetGrid at 0x7f400117f050>
```

```
plt.boxplot(df['age'])
```

```
{'whiskers': [<matplotlib.lines.Line2D at 0x7f3ffe636e50>,
  <matplotlib.lines.Line2D at 0x7f3ffe636b50>],
 'caps': [<matplotlib.lines.Line2D at 0x7f3ffe6384d0>,
  <matplotlib.lines.Line2D at 0x7f3ffe638b50>],
 'boxes': [<matplotlib.lines.Line2D at 0x7f3ffe6368d0>],
 'medians': [<matplotlib.lines.Line2D at 0x7f3ffe5dff90>],
 'fliers': [<matplotlib.lines.Line2D at 0x7f3ffe5df790>],
 'means': []}
```



```
sns.boxplot(df['Shell weight'])
```
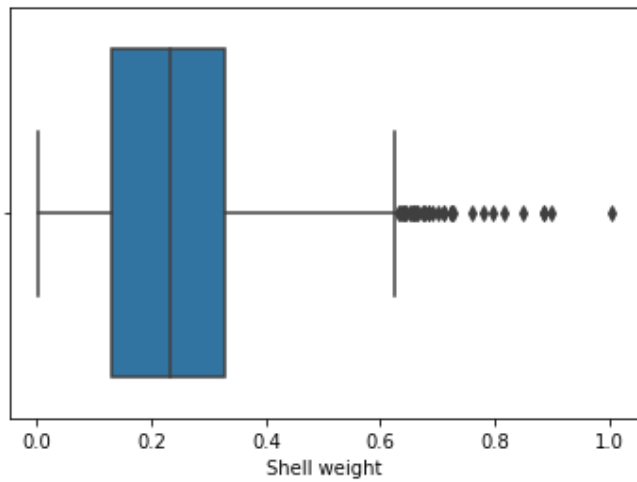
```
sns.countplot(df['age'])
```


#Bivariate analysis

```
plt.scatter(df.Length,df.Height)
plt.title('length vs Height')
plt.xlabel('length')
plt.ylabel('height')
```

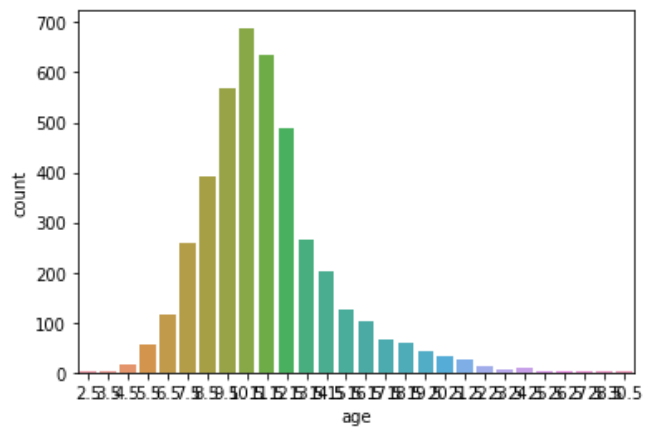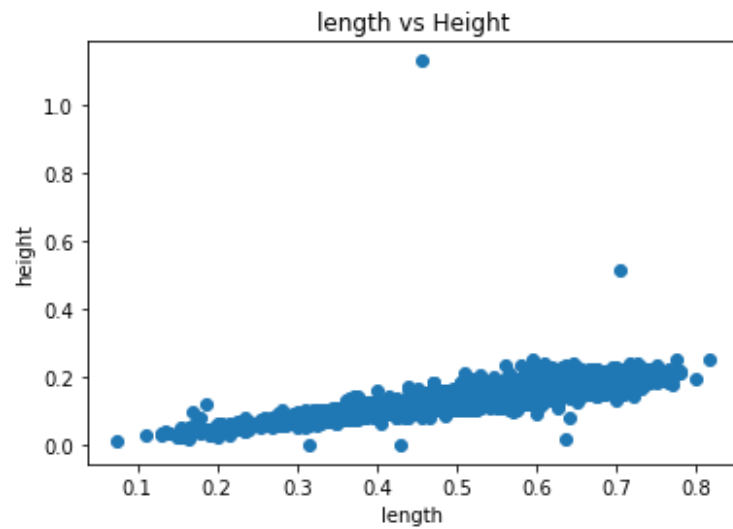## length vs Height


```
df.corr()
```

	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Unnamed: 9	age
Length	1.000000	0.986812	0.827554	0.925261	0.897914	0.903018	0.897706	0.556720	0.556720
Diameter	0.986812	1.000000	0.833684	0.925452	0.893162	0.899724	0.905330	0.574660	0.574660
Height	0.827554	0.833684	1.000000	0.819221	0.774972	0.798319	0.817338	0.557467	0.557467
Whole weight	0.925261	0.925452	0.819221	1.000000	0.969405	0.966375	0.955355	0.540390	0.540390
Shucked weight	0.897914	0.893162	0.774972	0.969405	1.000000	0.931961	0.882617	0.420884	0.420884
Viscera weight	0.903018	0.899724	0.798319	0.966375	0.931961	1.000000	0.907656	0.503819	0.503819
Shell weight	0.897706	0.905330	0.817338	0.955355	0.882617	0.907656	1.000000	0.627574	0.627574

#multivariate analysis

```
sns.pairplot(df)
plt.show
```
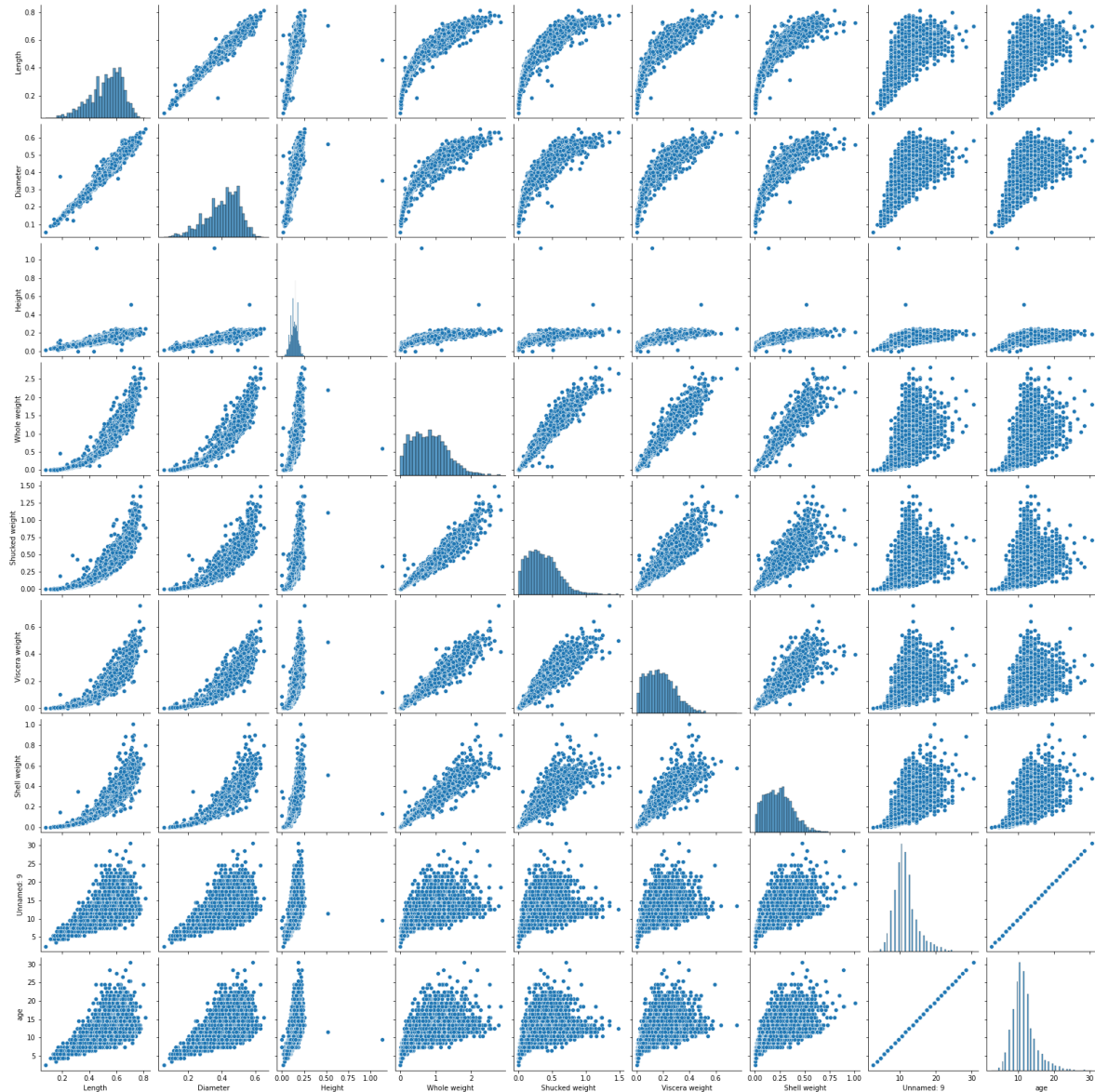
4.Perform descriptive statistics on the dataset.

```
df.describe()
```

	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Unnamed: 9	age
count	4177.000000	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	11.433684	11.433684
std	0.120093	0.099240	0.041827	0.490389	0.221963	0.109614	0.139203	3.224169	3.224169
min	0.075000	0.055000	0.000000	0.002000	0.001000	0.000500	0.001500	2.500000	2.500000
25%	0.450000	0.350000	0.115000	0.441500	0.186000	0.093500	0.130000	9.500000	9.500000
50%	0.545000	0.425000	0.140000	0.799500	0.336000	0.171000	0.234000	10.500000	10.500000

#5.Check for Missing values and deal with them.

```
df.info()
```

```
Data columns (total 10 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   Unnamed: 9     4177 non-null   float64
 9   age            4177 non-null   float64
dtypes: float64(9), object(1)
memory usage: 326.5+ KB
```

```
df.isnull()
```

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Unnamed: 9	age
0	False	False	False	False	False	False	False	False	False	False
1	False	False	False	False	False	False	False	False	False	False
2	False	False	False	False	False	False	False	False	False	False
3	False	False	False	False	False	False	False	False	False	False
4	False	False	False	False	False	False	False	False	False	False
...	...	...	...	...	...	...	...	...	...	...
4172	False	False	False	False	False	False	False	False	False	False
4173	False	False	False	False	False	False	False	False	False	False
4174	False	False	False	False	False	False	False	False	False	False

```
df.notnull()
```

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Unnamed: 9	age
0	True	True	True	True	True	True	True	True	True	True
1	True	True	True	True	True	True	True	True	True	True
2	True	True	True	True	True	True	True	True	True	True
3	True	True	True	True	True	True	True	True	True	True
4	True	True	True	True	True	True	True	True	True	True
...	...	...	...	...	...	...	...	...	...	...
4172	True	True	True	True	True	True	True	True	True	True

```
df.fillna(0)
```

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Unnamed: 9	age
0	M	0.455	0.365	0.095	0.5140	0.2245	0.1010	0.1500	16.5	16.5
1	M	0.350	0.265	0.090	0.2255	0.0995	0.0485	0.0700	8.5	8.5
2	F	0.530	0.420	0.135	0.6770	0.2565	0.1415	0.2100	10.5	10.5
3	M	0.440	0.365	0.125	0.5160	0.2155	0.1140	0.1550	11.5	11.5
4	I	0.330	0.255	0.080	0.2050	0.0895	0.0395	0.0550	8.5	8.5
...	...	...	...	...	...	...	...	...	...	...

```
df['Length'].fillna('No Length',inplace=True)
df.head()
```

	Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Unnamed: 9	age
0	M	0.455	0.365	0.095	0.5140	0.2245	0.1010	0.150	16.5	16.5
1	M	0.350	0.265	0.090	0.2255	0.0995	0.0485	0.070	8.5	8.5
2	F	0.530	0.420	0.135	0.6770	0.2565	0.1415	0.210	10.5	10.5
3	M	0.440	0.365	0.125	0.5160	0.2155	0.1140	0.155	11.5	11.5
4	I	0.330	0.255	0.080	0.2050	0.0895	0.0395	0.055	8.5	8.5

```
df.drop('Shucked weight',axis=1,inplace=True)
df.tail()
```

	Sex	Length	Diameter	Height	Whole weight	Viscera weight	Shell weight	Unnamed: 9	age
4172	F	0.565	0.450	0.165	0.8870	0.2390	0.2490	12.5	12.5
4173	M	0.590	0.440	0.135	0.9660	0.2145	0.2605	11.5	11.5
4174	M	0.600	0.475	0.205	1.1760	0.2875	0.3080	10.5	10.5
4175	F	0.625	0.485	0.150	1.0945	0.2610	0.2960	11.5	11.5
4176	M	0.710	0.555	0.195	1.9485	0.3765	0.4950	13.5	13.5

```
print(df.isnull().sum())
```

```
Sex               0
Length            0
Diameter          0
Height            0
Whole weight      0
Viscera weight    0
Shell weight      0
Unnamed: 9        0
age               0
dtype: int64
```

#6.Find the outliers and replace them outliers

```
Q1=df.quantile(0.25)
```

```
Q3=df.quantile(0.75)
IQR=Q3-Q1
print(IQR)
```

```
Length            0.1650
Diameter          0.1300
Height            0.0500
Whole weight      0.7115
Viscera weight    0.1595
Shell weight      0.1990
Rings             3.0000
Age               3.0000
dtype: float64
```

```
print(df<(Q1-1.5*IQR))
(df>(Q3+1.5*IQR))
```

```
        Age  Diameter  Height  Length  Rings    Sex  Shell weight  \
0     False     False   False   False  False  False         False
1     False     False   False   False  False  False         False
2     False     False   False   False  False  False         False
3     False     False   False   False  False  False         False
4     False     False   False   False  False  False         False
...     ...       ...     ...     ...    ...    ...           ...
4172  False     False   False   False  False  False         False
4173  False     False   False   False  False  False         False
4174  False     False   False   False  False  False         False
4175  False     False   False   False  False  False         False
4176  False     False   False   False  False  False         False

      Viscera weight  Whole weight
0              False         False
1              False         False
2              False         False
3              False         False
4              False         False
```

```
sns.boxplot(df.Rings)
```
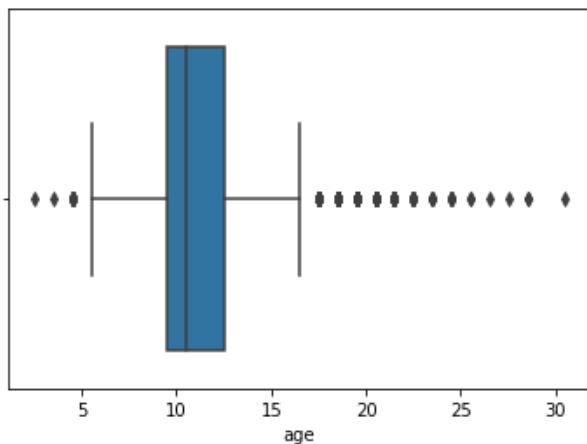
```
sns.heatmap(df.corr(),annot=True)
```
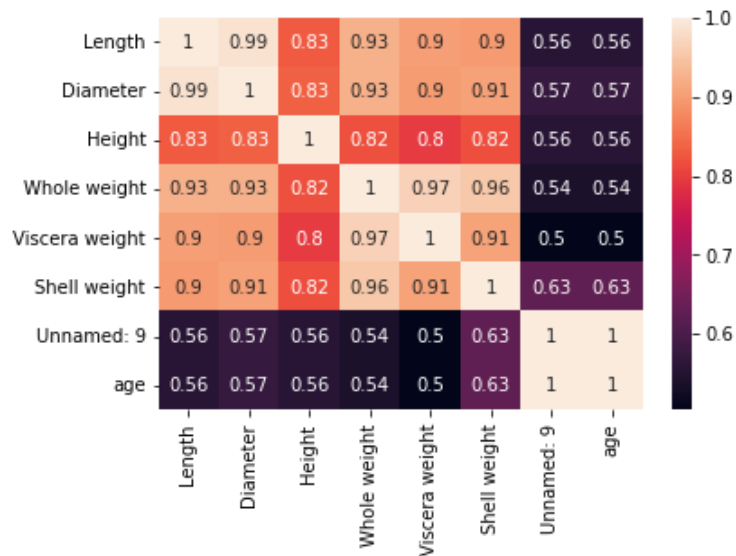


```
np.where(df.age>7,7,df.age)
```

output

```
array([7, 7, 7, ..., 7, 7, 7])
```

```
print(df['Height'].quantile(0.25))
print(df['Height'].quantile(0.75))
df['Height']=np.where(df['Height']>0.090  ,0.125,df['Height'])
df.describe()
```

	Length	Diameter	Height	Whole weight	Viscera weight	Shell weight	Unnamed: 9	age
count	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000	4177.000000
mean	0.523992	0.407881	0.118327	0.828742	0.180594	0.238831	11.433684	11.433684
std	0.120093	0.099240	0.018405	0.490389	0.109614	0.139203	3.224169	3.224169
min	0.075000	0.055000	0.000000	0.002000	0.000500	0.001500	2.500000	2.500000
25%	0.450000	0.350000	0.125000	0.441500	0.093500	0.130000	9.500000	9.500000
50%	0.545000	0.425000	0.125000	0.799500	0.171000	0.234000	10.500000	10.500000
75%	0.615000	0.480000	0.125000	1.153000	0.253000	0.329000	12.500000	12.500000

```python
#  7.Check for Categorical columns and perform encoding.
df['Diameter'].value_counts()
```

```
0.450    139
0.475    120
0.400    111
0.500    110
0.470    100
         ...
0.610      1
0.650      1
0.620      1
0.095      1
0.615      1
Name: Diameter, Length: 111, dtype: int64
```

```python
df.dtypes
```

```
Sex              object
Length          float64
Diameter        float64
Height          float64
Whole weight    float64
Viscera weight  float64
Shell weight    float64
Unnamed: 9      float64
age             float64
dtype: object
```

```python
df['Whole weight'].value_counts().sort_index()
```

```
0.0020    1
0.0080    1
0.0105    1
0.0130    1
0.0140    1
         ..
2.5500    1
2.5550    1
2.6570    1
2.7795    1
2.8255    1
Name: Whole weight, Length: 2429, dtype: int64
```

```python
pd.get_dummies(df,columns=['Whole weight']).tail()
```

	Sex	Length	Diameter	Height	Viscera weight	Shell weight	Unnamed: 9	age	Whole weight_0.002	Whole weight_0.008	...	Whole weight_2.505	Who weight_2.50
4172	F	0.565	0.450	0.125	0.2390	0.2490	12.5	12.5	0	0	...	0	
4173	M	0.590	0.440	0.125	0.2145	0.2605	11.5	11.5	0	0	...	0	
4174	M	0.600	0.475	0.125	0.2875	0.3080	10.5	10.5	0	0	...	0	
4175	F	0.625	0.485	0.125	0.2610	0.2960	11.5	11.5	0	0	...	0	
4176	M	0.710	0.555	0.125	0.3765	0.4950	13.5	13.5	0	0	...	0	

5 rows × 2437 columns

```python
from sklearn.preprocessing import OneHotEncoder

one_encde= OneHotEncoder(sparse=False)
encoded_arr=one_encde.fit_transform(df[['Length','Diameter','Height','Viscera weight']])
encoded_arr
```

```
array([[0., 0., 0., ..., 0., 0., 0.],
       [0., 0., 0., ..., 0., 0., 0.],
       [0., 0., 0., ..., 0., 0., 0.],
       ...,
       [0., 0., 0., ..., 0., 0., 0.],
       [0., 0., 0., ..., 0., 0., 0.],
       [0., 0., 0., ..., 0., 0., 0.]])
```

#8. Split the data into dependent and independent variables.

```python
x=df.iloc[:,1:3]
x
```

	Length	Diameter
0	0.455	0.365
1	0.350	0.265
2	0.530	0.420
3	0.440	0.365
4	0.330	0.255
...	...	...
4172	0.565	0.450
4173	0.590	0.440
4174	0.600	0.475

```python
y=df.iloc[:,1:4]
y
```

	Length	Diameter	Height
0	0.455	0.365	0.095
1	0.350	0.265	0.090
2	0.530	0.420	0.135
3	0.440	0.365	0.125
4	0.330	0.255	0.080
...	...	...	...
4172	0.565	0.450	0.165
4173	0.590	0.440	0.135

#9. Scale the independent variables.

```python
from sklearn.preprocessing import MinMaxScaler
model=MinMaxScaler()
scaled_x=pd.DataFrame(model.fit_transform(x),columns=x.columns)
scaled_x.head()
```

	Length	Diameter
0	0.513514	0.521008
1	0.371622	0.352941
2	0.614865	0.613445
3	0.493243	0.521008
4	0.344595	0.336134

#10. Split the data into training and testing

```python
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2,random_state=0)
x_train.shape
```

(3341, 2)

```python
x_test.shape
```

(836, 2)

```python
y_train.shape
```

```
        (3341, 3)
```

y_test.shape
```
        (836, 3)
```

#11. Build the Model
from sklearn.linear_model import LinearRegression

model = LinearRegression()

model.fit(x,y)
output
LinearRegression()

#12. Train the Model

model.fit(x_train, y_train)
LinearRegression()
output
LinearRegression()

#13. Test the Model
pred1=model.predict(x_train)
pred1
```
    array([[0.18      , 0.135     , 0.08321098],
           [0.215     , 0.15      , 0.08626508],
           [0.66      , 0.53      , 0.13284892],
           ...,
           [0.595     , 0.45      , 0.12504125],
           [0.625     , 0.49      , 0.12877082],
           [0.41      , 0.325     , 0.10702569]])
```

```
predictions=model.predict(x_test)
predictions
pred=model.predict(x_test)
pred
```

```
array([[0.18      , 0.135     , 0.08321098],
       [0.215     , 0.15      , 0.08626508],
       [0.66      , 0.53      , 0.13284892],
       ...,
       [0.595     , 0.45      , 0.12504125],
       [0.625     , 0.49      , 0.12877082],
       [0.41      , 0.325     , 0.10702569]])
```

```
pred=model.predict(x_test)
pred
y_pred=(x_test)
y_pred
```

	Length	Diameter
668	0.550	0.425
1580	0.500	0.400
3784	0.620	0.480
463	0.220	0.165
2615	0.645	0.500

```
y_test
```

	Length	Diameter	Height
668	0.550	0.425	0.125
1580	0.500	0.400	0.125
3784	0.620	0.480	0.125
463	0.220	0.165	0.055
2615	0.645	0.500	0.125
...	...	...	...
575	0.610	0.475	0.125

```python
length=pd.DataFrame({'Actual_y_value':[pred1],'predicted_y_value':[pred]})
length
```

	Actual_y_value	predicted_y_value
0	[[0.18000000000000055, 0.13500000000000023, 0....	[[0.18000000000000055, 0.13500000000000023, 0....

```python
from sklearn import metrics
#Mean Absolute Error (MAE)
metrics.mean_absolute_error(y_test, predictions)
0.0038991947837602914
#Mean Squared Error (MSE)
metrics.mean_squared_error(y_test, predictions)
7.655875085238909e-05
#Root Mean Squared Error (RMSE)
np.sqrt(metrics.mean_squared_error(y_test, predictions))
0.008749785760370884
#14. Measure the performance using Metrics.
from sklearn.metrics import accuracy_score
accuracy_score=(y_test,y_pred)
accuracy_score
```

```
(      Length  Diameter  Height
 668    0.550    0.425   0.125
 1580   0.500    0.400   0.125
 3784   0.620    0.480   0.125
 463    0.220    0.165   0.055
 2615   0.645    0.500   0.125
 ...     ...      ...     ...
 575    0.610    0.475   0.125
 3231   0.410    0.325   0.125
 1084   0.445    0.345   0.125
 290    0.540    0.435   0.125
 2713   0.250    0.175   0.060
```

```python
from sklearn.metrics import classification_report
classification_report(y_test,y_pred)
classification_report
```

```
<function sklearn.metrics._classification.classification_report(y_true,
y_pred, *, labels=None, target_names=None, sample_weight=None, digits=2,
output_dict=False, zero_division='warn')>
```