IMPORTING LIBRARIES

In [ ]:
```
import pandas as pd
import numpy as np
from matplotlib import pyplot as plt
import seaborn as sns
from sklearn.linear_model import LinearRegression
```

2. Load the dataset into the Google Colab

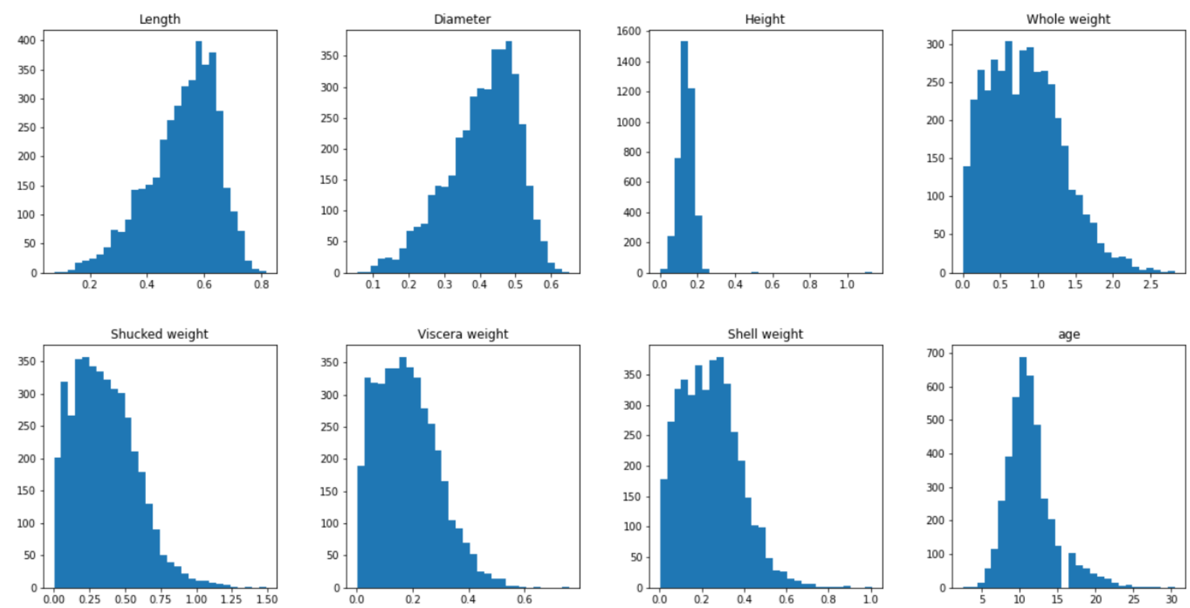
In [ ]:
```
df=pd.read_csv("/content/abalone.csv")
```

In [ ]:
```
df['age'] = df['Rings']+1.5
df = df.drop('Rings', axis = 1)
```

3. UNIVARIATE ANALYSIS

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

Out[ ]:
```
array([[<matplotlib.axes._subplots.AxesSubplot object at 0x7fc8fe4844d0>,
        <matplotlib.axes._subplots.AxesSubplot object at 0x7fc8fe0fdfd0>,
        <matplotlib.axes._subplots.AxesSubplot object at 0x7fc8fe0c3650>,
        <matplotlib.axes._subplots.AxesSubplot object at 0x7fc8fe079c50>],
       [<matplotlib.axes._subplots.AxesSubplot object at 0x7fc8fe03e290>,
        <matplotlib.axes._subplots.AxesSubplot object at 0x7fc8fdff3890>,
        <matplotlib.axes._subplots.AxesSubplot object at 0x7fc8fdfa9f10>,
        <matplotlib.axes._subplots.AxesSubplot object at 0x7fc8fdf6b490>]],
      dtype=object)
```



In [ ]:
```
df.groupby('Sex')[['Length', 'Diameter', 'Height', 'Whole weight', 'Shucked weight',
       'Viscera weight', 'Shell weight', 'age']].mean().sort_values('age')
```

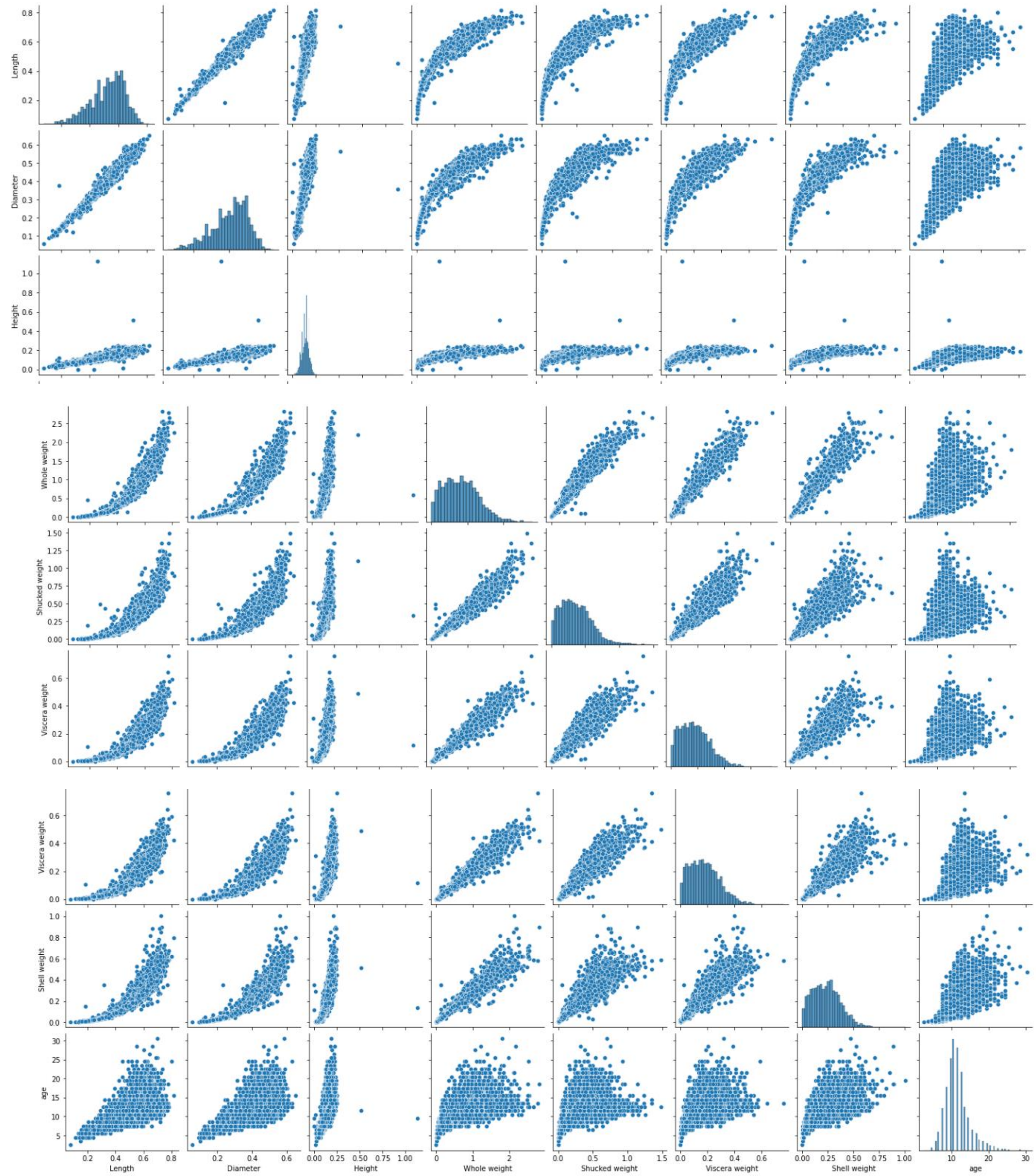
Out[ ]:

Sex	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	age
I	0.427746	0.326494	0.107996	0.431363	0.191035	0.092010	0.128182	9.390462
M	0.561391	0.439287	0.151381	0.991459	0.432946	0.215545	0.281969	12.205497
F	0.579093	0.454732	0.158011	1.046532	0.446188	0.230689	0.302010	12.629304

3. BIVARIATE ANALYSIS & MULTIVARIATE ANALYSIS

In [ ]:
```
numerical_features = df.select_dtypes(include = [np.number]).columns
sns.pairplot(df[numerical_features])
```

Out[ ]:
```
<seaborn.axisgrid.PairGrid at 0x7fc8fde17fd0>
```


Length
Diameter
Height
Whole weight
Shucked weight
Viscera weight
Viscera weight
Shell weight
age
Length
Diameter
Height
Whole weight
Shucked weight
Viscera weight
Shell weight
age

4. Descriptive statistics

In [ ]:
```
df.describe()
```

Out[ ]:

	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	age
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	11.433684
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	2.500000
25%	0.450000	0.350000	0.115000	0.441500	0.186000	0.093500	0.130000	9.500000
50%	0.545000	0.425000	0.140000	0.799500	0.336000	0.171000	0.234000	10.500000
75%	0.615000	0.480000	0.165000	1.153000	0.502000	0.253000	0.329000	12.500000
max	0.815000	0.650000	1.130000	2.825500	1.488000	0.760000	1.005000	30.500000

5. Check for Missing Values

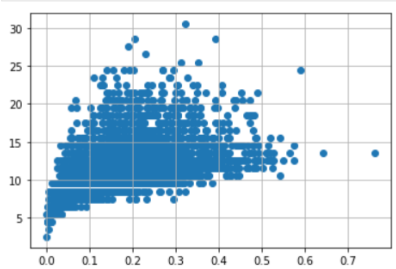
In [ ]:
```
df.isnull().sum()
```

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

6. OUTLIER HANDLING

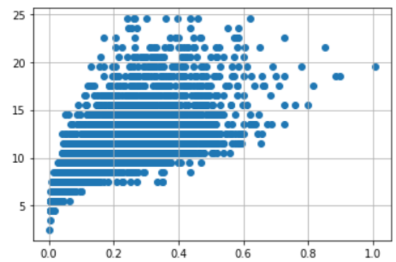
In [ ]:
```
df = pd.get_dummies(df)
dummy_data = df.copy()
```

In [ ]:
```
var = 'Viscera weight'
plt.scatter(x = df[var], y = df['age'],)
plt.grid(True)
```



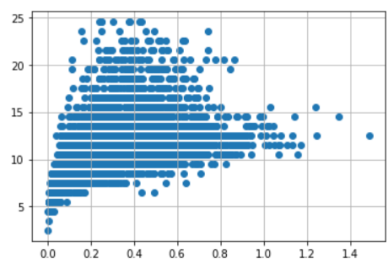
In [ ]:
```
# outliers removal
df.drop(df[(df['Viscera weight']> 0.5) & (df['age'] < 20)].index, inplace=True)
df.drop(df[(df['Viscera weight']<0.5) & (df['age'] > 25)].index, inplace=True)
```

In [ ]:
```
var = 'Shell weight'
plt.scatter(x = df[var], y = df['age'],)
plt.grid(True)
#Outliers removal
df.drop(df[(df['Shell weight']> 0.6) & (df['age'] < 25)].index, inplace=True)
df.drop(df[(df['Shell weight']<0.8) & (df['age'] > 25)].index, inplace=True)
```



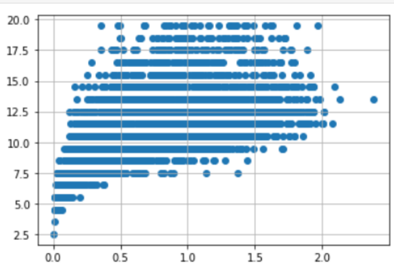
In [ ]:

```
var = 'Shucked weight'
plt.scatter(x = df[var], y = df['age'],)
plt.grid(True)

#Outlier removal
df.drop(df[(df['Shucked weight']>= 1) & (df['age'] < 20)].index, inplace=True)
df.drop(df[(df['Shucked weight']<1) & (df['age'] > 20)].index, inplace=True)
```



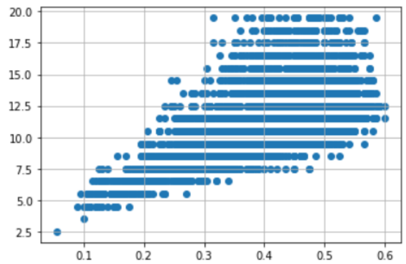
In [ ]:

```
var = 'Whole weight'
plt.scatter(x = df[var], y = df['age'])
plt.grid(True)

df.drop(df[(df['Whole weight'] >= 2.5) &
          (df['age'] < 25)].index, inplace = True)
df.drop(df[(df['Whole weight']<2.5) & (
df['age'] > 25)].index, inplace = True)
```



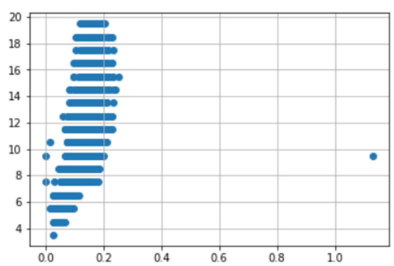
In [ ]:

```
var = 'Diameter'
plt.scatter(x = df[var], y = df['age'])
plt.grid(True)

df.drop(df[(df['Diameter'] <0.1) &
          (df['age'] < 5)].index, inplace = True)
df.drop(df[(df['Diameter']<0.6) & (
df['age'] > 25)].index, inplace = True)
df.drop(df[(df['Diameter']>=0.6) & (
df['age'] < 25)].index, inplace = True)
```



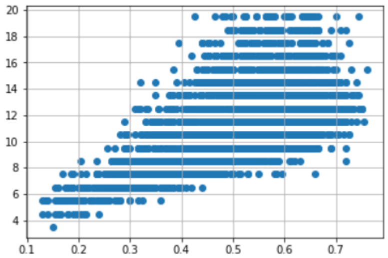
In [ ]:

```
var = 'Height'
plt.scatter(x = df[var], y = df['age'])
plt.grid(True)
df.drop(df[(df['Height'] > 0.4) &
          (df['age'] < 15)].index, inplace = True)
df.drop(df[(df['Height']<0.4) & (
df['age'] > 25)].index, inplace = True)
```



In [ ]:

```
var = 'Length'
plt.scatter(x = df[var], y = df['age'])
plt.grid(True)

df.drop(df[(df['Length'] <0.1) &
          (df['age'] < 5)].index, inplace = True)
df.drop(df[(df['Length']<0.8) & (
df['age'] > 25)].index, inplace = True)
df.drop(df[(df['Length']>=0.8) & (
df['age'] < 25)].index, inplace = True)
```



7. Categorical columns

In [ ]:
```
numerical_features = df.select_dtypes(include = [np.number]).columns
categorical_features = df.select_dtypes(include = [np.object]).columns
```

In [19]:
```
numerical_features
```

Out[19]:
```
Index(['Length', 'Diameter', 'Height', 'Whole weight', 'Shucked weight',
       'Viscera weight', 'Shell weight', 'age', 'Sex_F', 'Sex_I', 'Sex_M'],
      dtype='object')
```

In [20]:
```
categorical_features
```

Out[20]:
```
Index([], dtype='object')
```

ENCODING

In [21]:
```
from sklearn.preprocessing import LabelEncoder
le=LabelEncoder()
print(df.Length.value_counts())
```

```
0.575    93
0.625    91
0.580    89
0.550    89
0.620    83
         ..
0.220     2
0.150     1
0.755     1
0.135     1
0.760     1
Name: Length, Length: 126, dtype: int64
```

8. Split the dependent and independent variables

In [22]:
```
x=df.iloc[:,:5]
x
```

Out[22]:

	Length	Diameter	Height	Whole weight	Shucked weight
0	0.455	0.365	0.095	0.5140	0.2245
1	0.350	0.265	0.090	0.2255	0.0995
2	0.530	0.420	0.135	0.6770	0.2565
3	0.440	0.365	0.125	0.5160	0.2155
4	0.330	0.255	0.080	0.2050	0.0895
...	...	...	...	...	...
4172	0.565	0.450	0.165	0.8870	0.3700
4173	0.590	0.440	0.135	0.9660	0.4390
4174	0.600	0.475	0.205	1.1760	0.5255
4175	0.625	0.485	0.150	1.0945	0.5310
4176	0.710	0.555	0.195	1.9485	0.9455

3995 rows × 5 columns

In [23]:
```
y=df.iloc[:,5:]
y
```

Out[23]:

	Viscera weight	Shell weight	age	Sex_F	Sex_I	Sex_M
0	0.1010	0.1500	16.5	0	0	1
1	0.0485	0.0700	8.5	0	0	1
2	0.1415	0.2100	10.5	1	0	0
3	0.1140	0.1550	11.5	0	0	1
4	0.0395	0.0550	8.5	0	1	0
...	...	...	...	...	...	...
4172	0.2390	0.2490	12.5	1	0	0
4173	0.2145	0.2605	11.5	0	0	1
4174	0.2875	0.3080	10.5	0	0	1
4175	0.2610	0.2960	11.5	1	0	0
4176	0.3765	0.4950	13.5	0	0	1

3995 rows × 6 columns

9. Feature Scaling

In [26]:
```
from sklearn.preprocessing import StandardScaler
ss=StandardScaler()
x_train=ss.fit_transform(x_train)
```

In [ ]:
```
mlrpred=mlr.predict(x_test[0:9])
```

In [ ]:
```
mlrpred
```

10. Train , Test , Split

In [25]:
```
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)
```

11. Model building

In [ ]:
```
from sklearn.linear_model import LinearRegression
mlr=LinearRegression()
mlr.fit(x_train,y_train)
```

12 & 13. Train and Test the model

In [ ]:
```
x_test[0:5]
```

In [ ]:
```
y_test[0:5]
```

14. Measure the performance using metrics

In [ ]:
```
from sklearn.metrics import r2_score
r2_score(mlr.predict(x_test),y_test)
```