Assignment 3

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21BCE1440

Perform the below Tasks to complete the Assignment:-

Clustering the data and performing classification algorithms

1. Download the dataset: Dataset

2. Load the dataset into the tool.

3. Perform Below Visualizations.

- Univariate Analysis
- Bi- Variate Analysis
- Multi-Variate Analysis

4. Perform descriptive statistics on the dataset.

5. Check for Missing values and deal with them.

6. Find the outliers and replace them outliers

7.Check the correlation of independent variables with the target

8. Check for Categorical columns and perform encoding.

9. Split the data into dependent and independent variables.

10. Scaling the data

11. Split the data into training and testing

12.check the training and testing data shape.

In [1]:

```
#importing required libraries
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
from matplotlib import rcParams
```

Task 1 and 2: Dataset was Downloaded and then loaded

link of dataset: https://drive.google.com/file/d/1AvRp8hOK-O76WIFvPj_rk10fAZbt8nWH/view (https://drive.google.com/file/d/1AvRp8hOK-O76WIFvPj_rk10fAZbt8nWH/view)

In [2]:

```
df=pd.read_csv("C:/Users/Charvi Upreti/Desktop/Assignments/Assignment 3/penguins_siz
```

Basic information

In [3]:

```
df.head().T
```

Out[3]:

	0	1	2	3	4
species	Adelie	Adelie	Adelie	Adelie	Adelie
island	Torgersen	Torgersen	Torgersen	Torgersen	Torgersen
culmen_length_mm	39.1	39.5	40.3	NaN	36.7
culmen_depth_mm	18.7	17.4	18.0	NaN	19.3
flipper_length_mm	181.0	186.0	195.0	NaN	193.0
body_mass_g	3750.0	3800.0	3250.0	NaN	3450.0
sex	MALE	FEMALE	FEMALE	NaN	FEMALE

In [4]:

```
1 df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 344 entries, 0 to 343
Data columns (total 7 columns):
 #   Column             Non-Null Count  Dtype  
---  ------             --------------  -----  
 0   species            344 non-null    object 
 1   island             344 non-null    object 
 2   culmen_length_mm   342 non-null    float64
 3   culmen_depth_mm    342 non-null    float64
 4   flipper_length_mm  342 non-null    float64
 5   body_mass_g        342 non-null    float64
 6   sex                334 non-null    object 
dtypes: float64(4), object(3)
memory usage: 18.9+ KB
```

In [5]:

```
1 df['species'].value_counts()
```

Out[5]:

```
Adelie       152
Gentoo       124
Chinstrap     68
Name: species, dtype: int64
```

Task 3: Visualizations on initial dataset:-

**Visualizations are continued after dealing with missing values

In [6]:

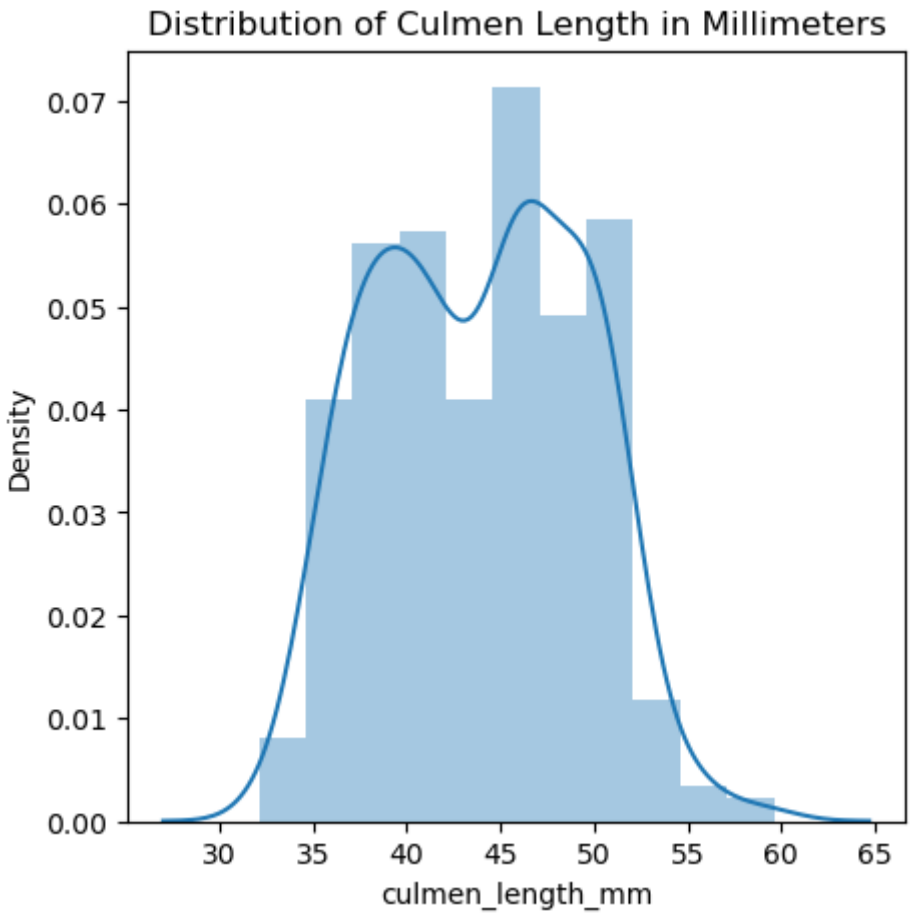
```
1 rcParams['figure.figsize']=5,5
```

Univariate Analysis

In [7]:

```
#distribution of culmen_length
sns.distplot(df.culmen_length_mm)
plt.title('Distribution of Culmen Length in Millimeters')
plt.show()
```

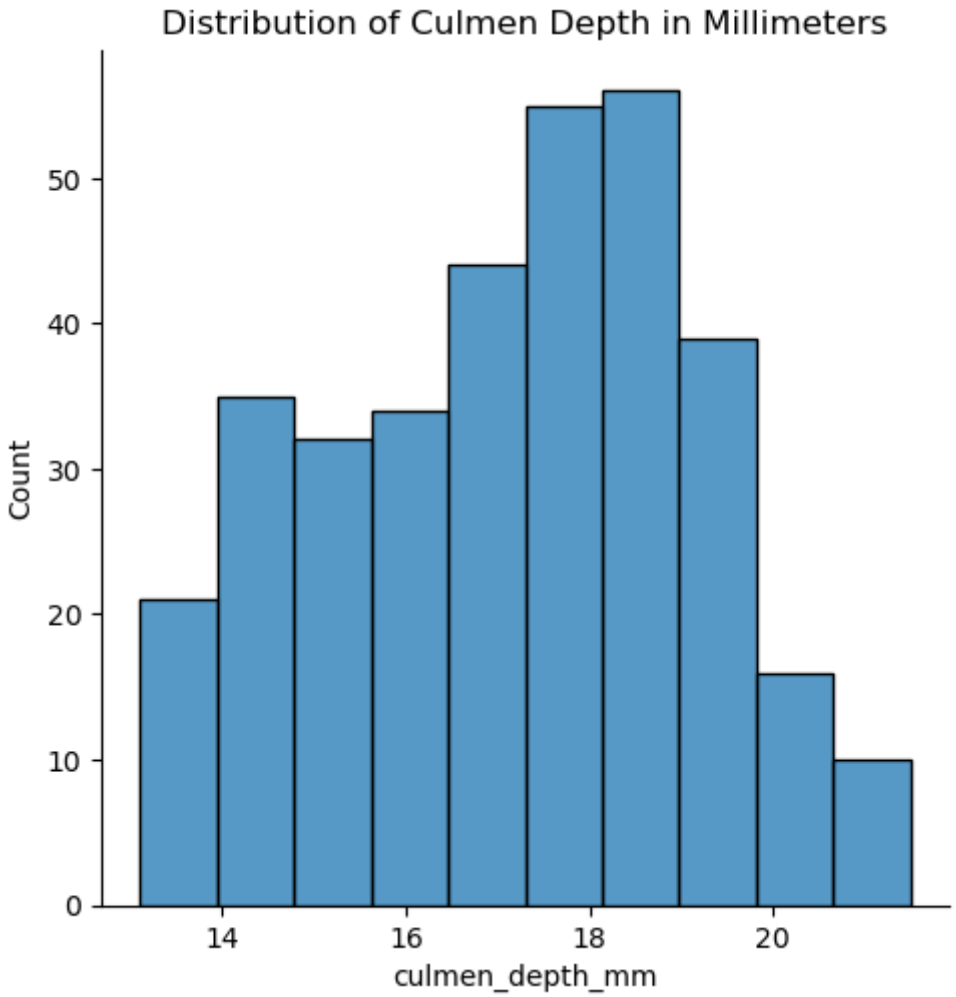
```
C:\Users\Charvi Upreti\AppData\Local\Temp\ipykernel_25624\2265130548.py:2:
UserWarning:

`distplot` is a deprecated function and will be removed in seaborn v0.14.
0.

Please adapt your code to use either `displot` (a figure-level function wi
th
similar flexibility) or `histplot` (an axes-level function for histogram
s).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751 (https://
gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751)

  sns.distplot(df.culmen_length_mm)
```



In [8]:

```
#distribution of culmen_depth
sns.displot(df.culmen_depth_mm)
plt.title('Distribution of Culmen Depth in Millimeters')
plt.show()
```

```
C:\Users\Charvi Upreti\anaconda3\lib\site-packages\seaborn\axisgrid.py:11
8: UserWarning: The figure layout has changed to tight
  self._figure.tight_layout(*args, **kwargs)
```



In [9]:

```
df['flipper_length_mm'].nunique()
```

Out[9]:

```
55
```

In [10]:

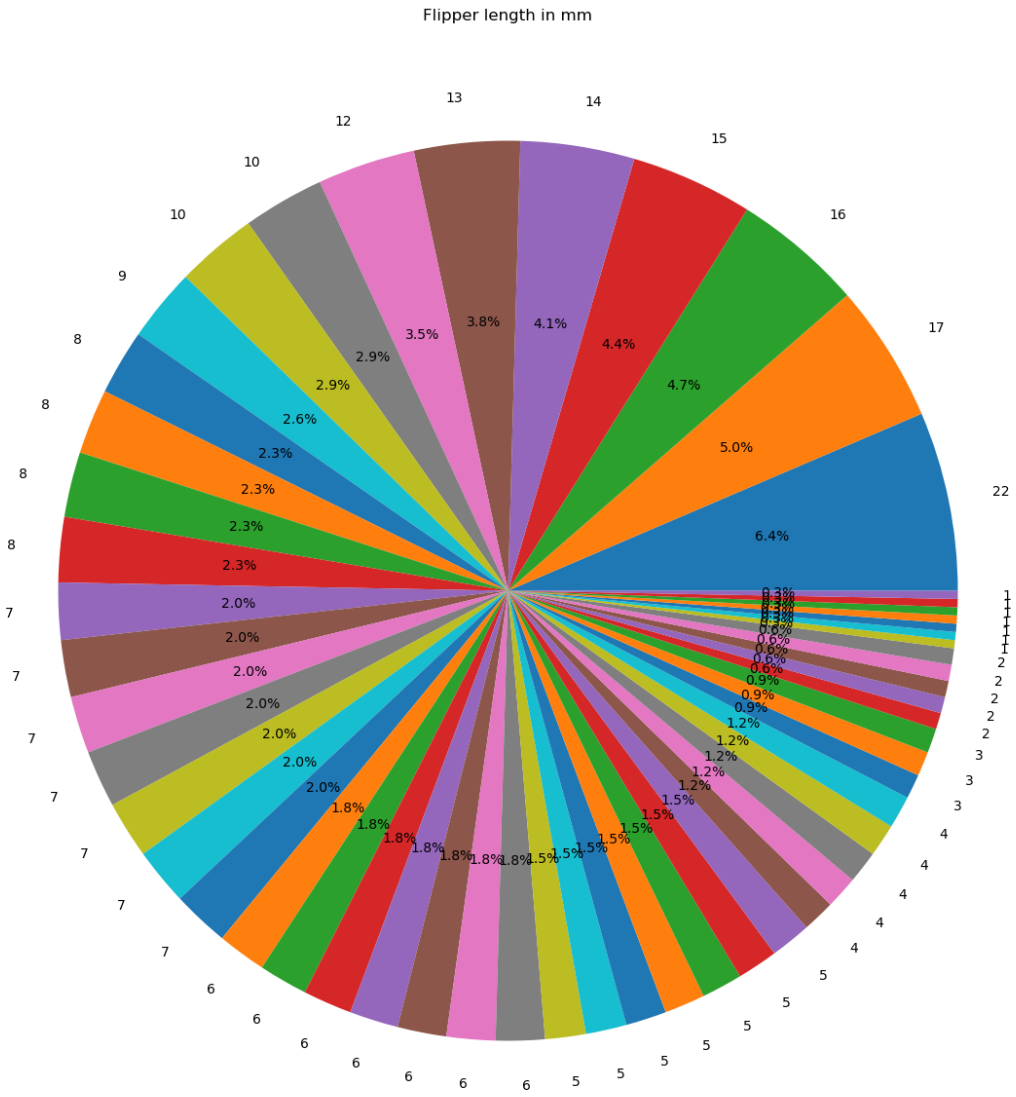
```
list1=list(df['flipper_length_mm'].value_counts())
```

In [11]:

```
rcParams['figure.figsize']=15,15
```

In [12]:

```
1 plt.pie(df.flipper_length_mm.value_counts(),labels = list1,autopct ='%1.1f%%',)
2 plt.title('Flipper length in mm')
3 plt.show()
```

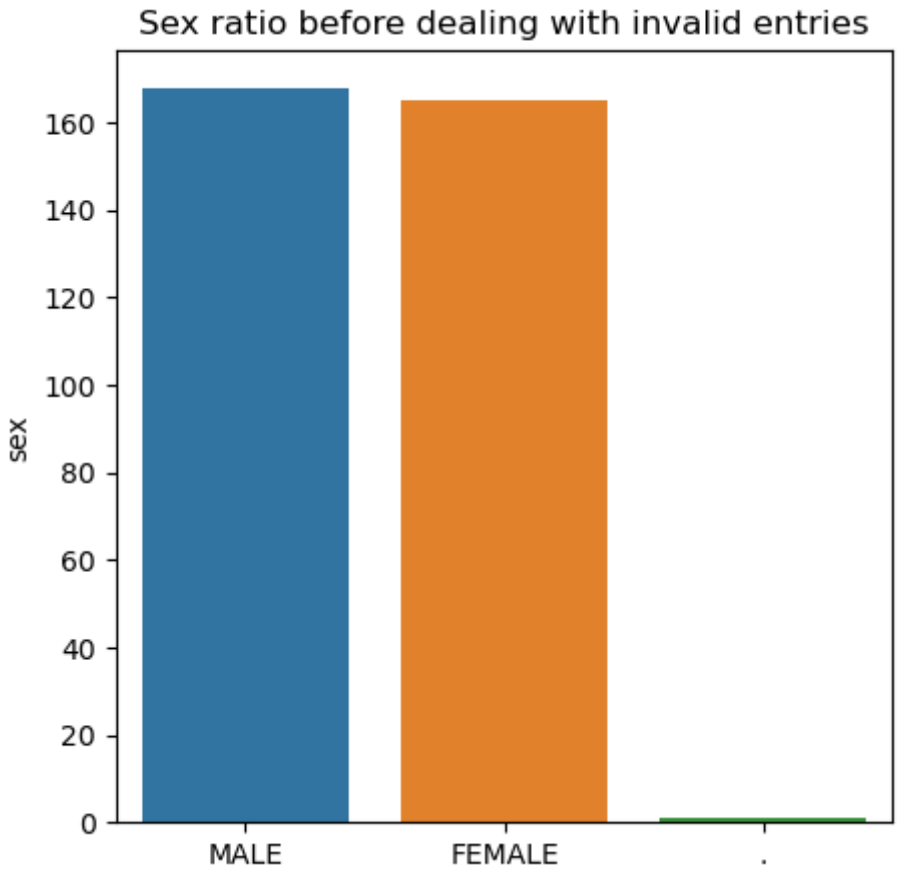


In [13]:

```
1 rcParams['figure.figsize']=5,5
```

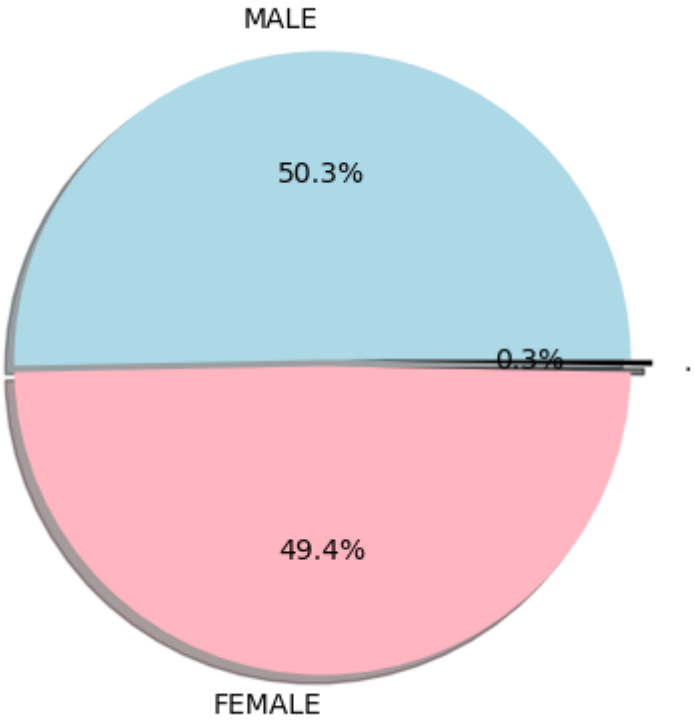
In [14]:

```
sns.barplot(x =df.sex.value_counts().index,y =df.sex.value_counts())
plt.title('Sex ratio before dealing with invalid entries')
# Done again after dealing with them later.
plt.show()
```



In [15]:

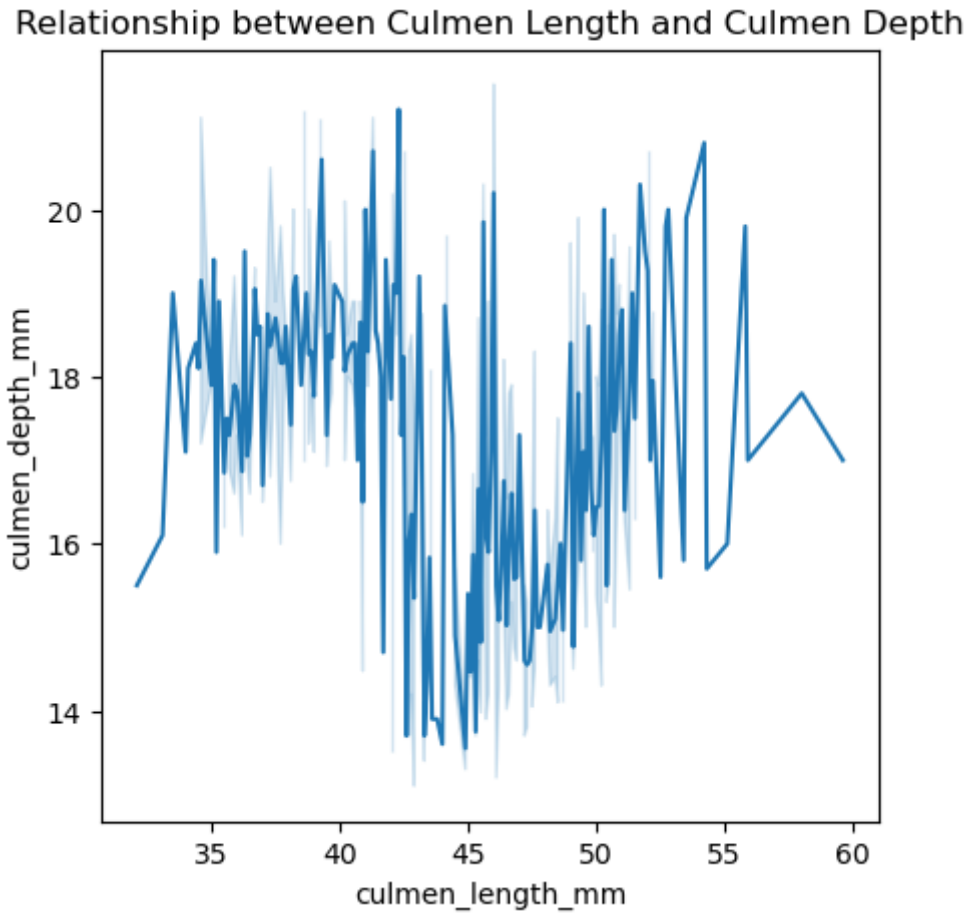
```
counts = df['sex'].value_counts()
plt.figure()
plt.pie(counts, [0,0.02,0.07],shadow=True,labels=counts.index, autopct='%1.1f%%',col
plt.show()
```



Bi - Variate Analysis

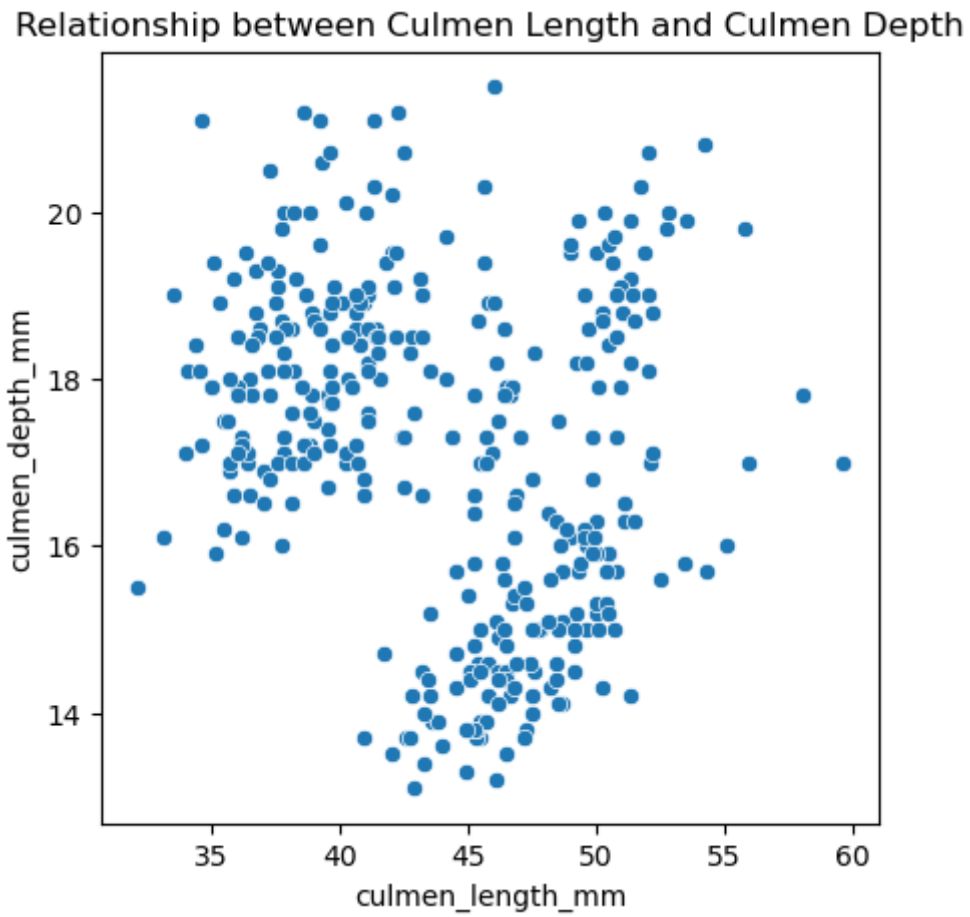
In [16]:

```
1 sns.lineplot(x = df.culmen_length_mm,y=df.culmen_depth_mm)
2 plt.title('Relationship between Culmen Length and Culmen Depth')
3 plt.show()
```



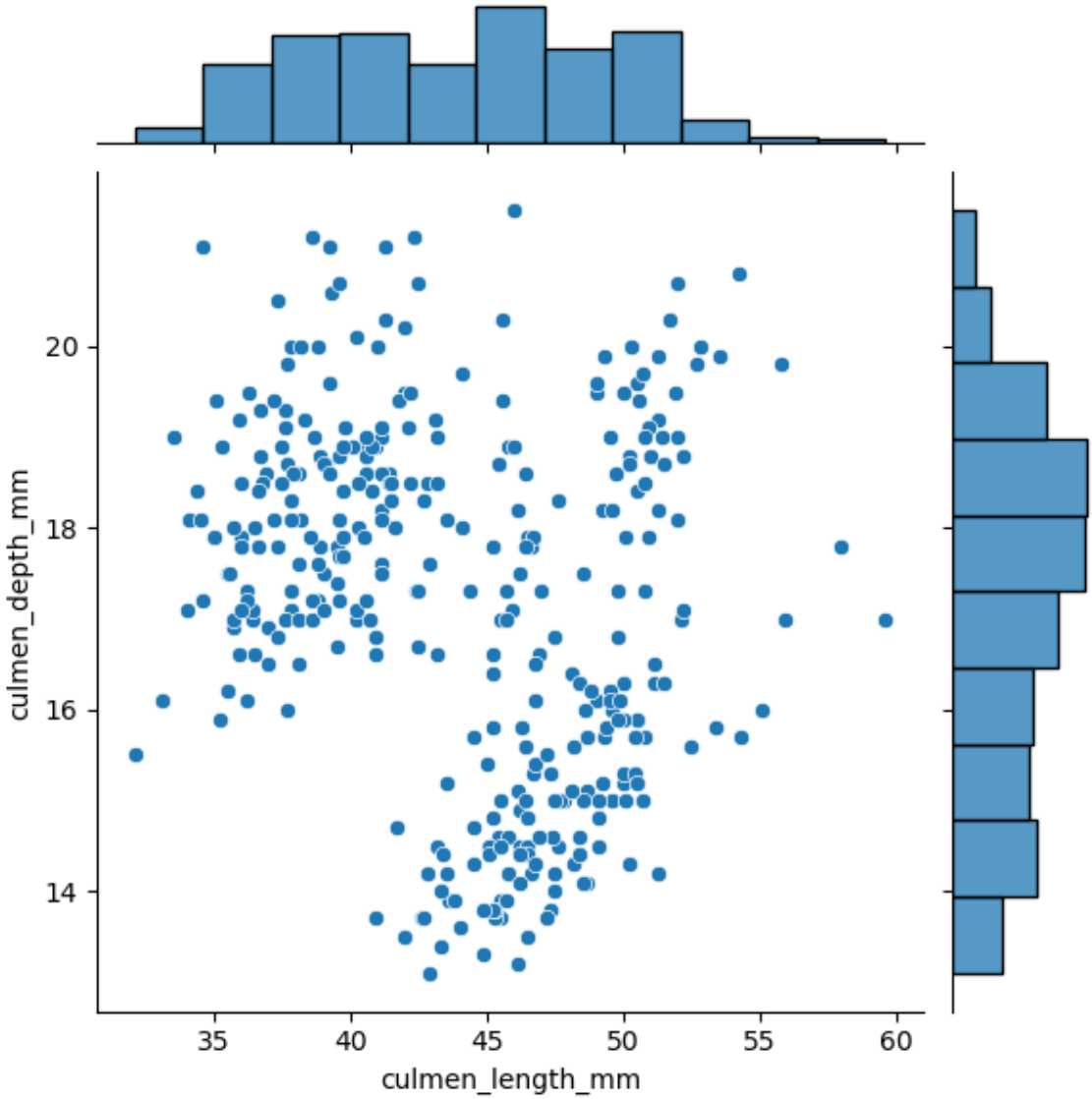
In [17]:

```
sns.scatterplot(x = df.culmen_length_mm,y=df.culmen_depth_mm)
plt.title('Relationship between Culmen Length and Culmen Depth')
plt.show()
```



In [18]:

```
1 sns.jointplot(x = df.culmen_length_mm,y=df.culmen_depth_mm)
2 plt.show()
```

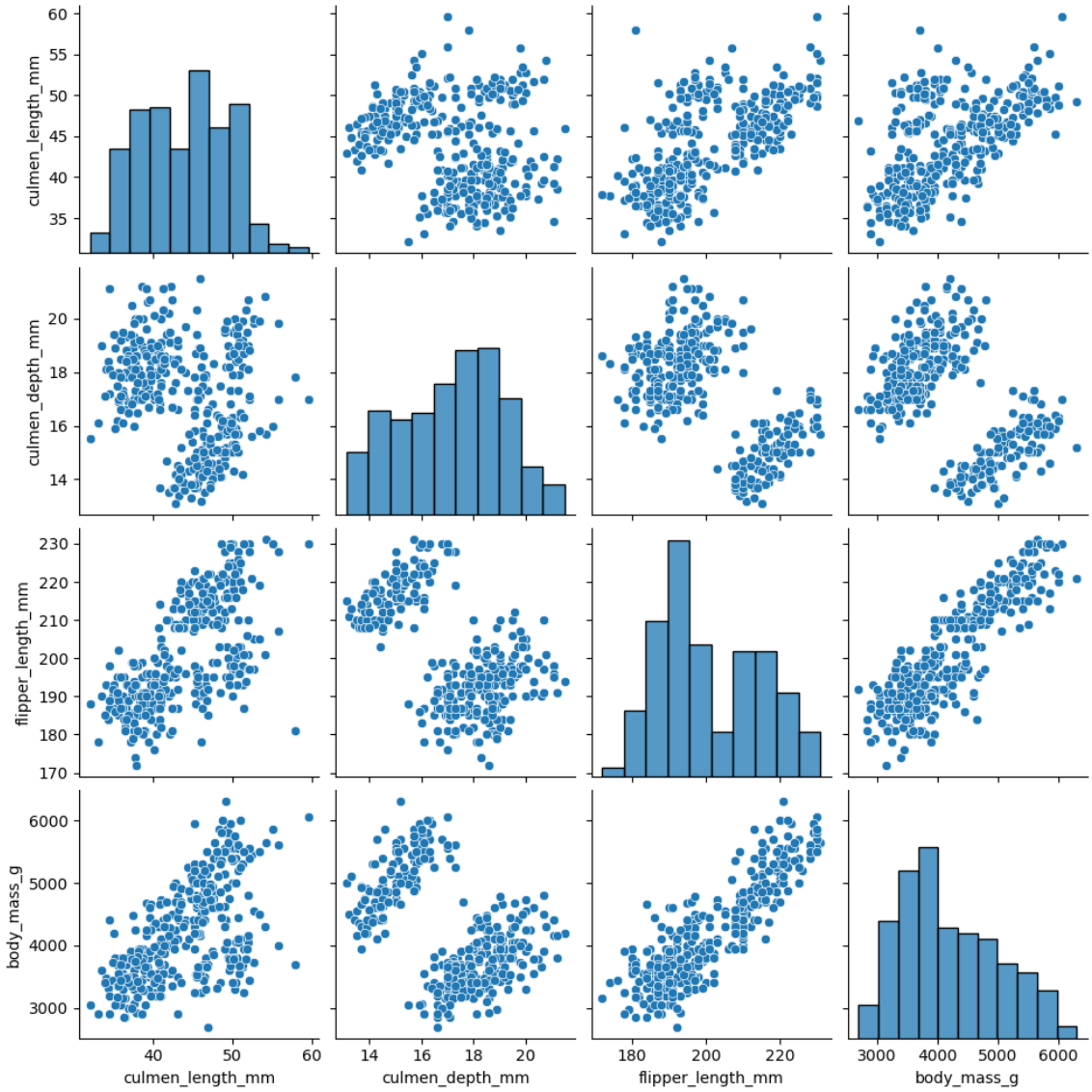


Multi-Variate Analysis

In [19]:

```
1  sns.pairplot(df)
2  plt.show()
```

```
C:\Users\Charvi Upreti\anaconda3\lib\site-packages\seaborn\axisgrid.py:11
8: UserWarning: The figure layout has changed to tight
  self._figure.tight_layout(*args, **kwargs)
```

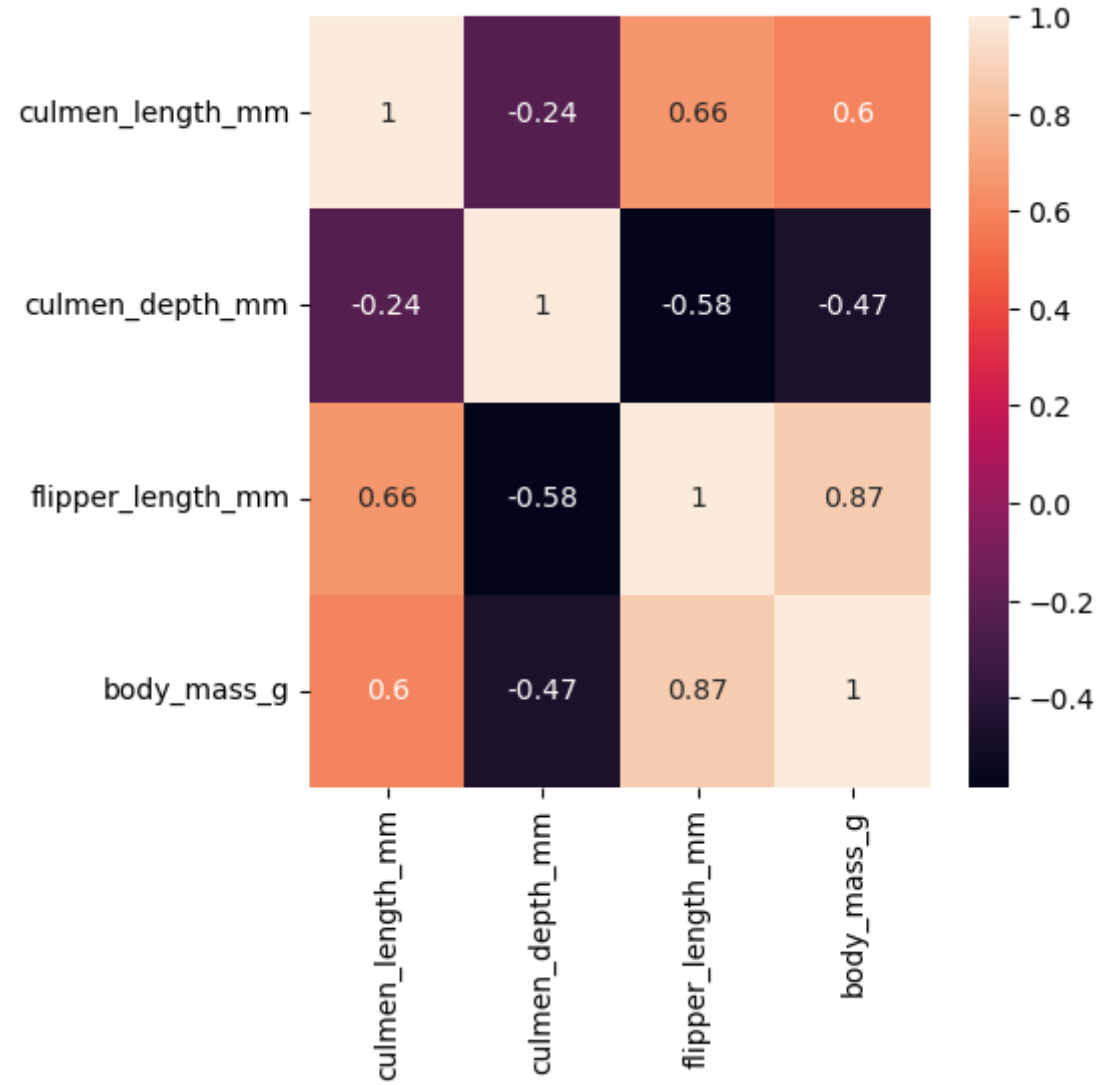


In [20]:

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

Out[20]:

<Axes: >



Task 4: Descriptive statistice on the dataset

In [21]:

```
1 df.describe()
```

Out[21]:

	culmen_length_mm	culmen_depth_mm	flipper_length_mm	body_mass_g
count	342.000000	342.000000	342.000000	342.000000
mean	43.921930	17.151170	200.915205	4201.754386
std	5.459584	1.974793	14.061714	801.954536
min	32.100000	13.100000	172.000000	2700.000000
25%	39.225000	15.600000	190.000000	3550.000000
50%	44.450000	17.300000	197.000000	4050.000000
75%	48.500000	18.700000	213.000000	4750.000000
max	59.600000	21.500000	231.000000	6300.000000

Task 5: Checking missing values and dealing with them

In [22]:

```
1 df.isnull().sum()
```

Out[22]:

```
species               0
island                0
culmen_length_mm      2
culmen_depth_mm       2
flipper_length_mm     2
body_mass_g           2
sex                  10
dtype: int64
```

In [23]:

```
1 df.sex.value_counts()
```

Out[23]:

```
MALE      168
FEMALE    165
.           1
Name: sex, dtype: int64
```

In [24]:

```
1 df['sex'] = df['sex'].replace(".", df['sex'].mode()[0])
```

In [25]:

```
1 df.sex.value_counts()
```

Out[25]:

```
MALE      169
FEMALE    165
Name: sex, dtype: int64
```

In [26]:

```
1 df['sex'] = df['sex'].fillna(df['sex'].mode()[0])
```

In [27]:

```
1 df.sex.value_counts()
```

Out[27]:

```
MALE      179
FEMALE    165
Name: sex, dtype: int64
```

In [28]:

```
1 df=df.fillna(df.median())
```

```
C:\Users\Charvi Upreti\AppData\Local\Temp\ipykernel_25624\308181716.py:1:
FutureWarning: Dropping of nuisance columns in DataFrame reductions (with
'numeric_only=None') is deprecated; in a future version this will raise Ty
peError.  Select only valid columns before calling the reduction.
  df=df.fillna(df.median())
```

In [29]:

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

Out[29]:

```
species              0
island               0
culmen_length_mm     0
culmen_depth_mm      0
flipper_length_mm    0
body_mass_g          0
sex                  0
dtype: int64
```

In [30]:

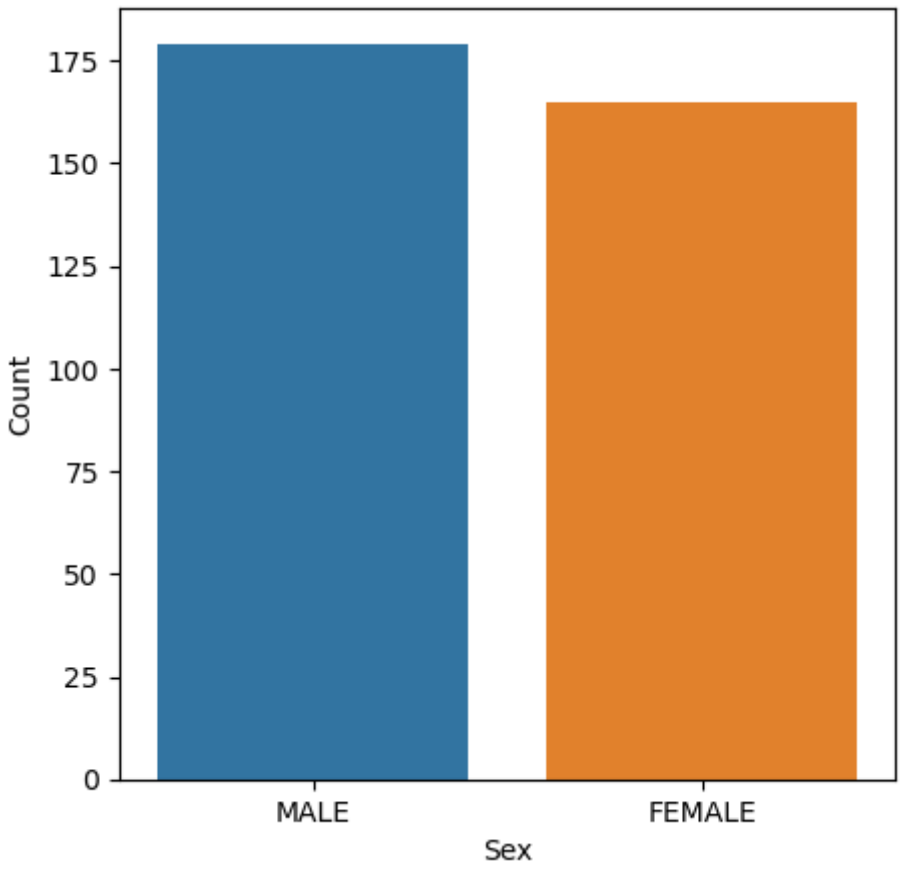
```
1  df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 344 entries, 0 to 343
Data columns (total 7 columns):
 #   Column             Non-Null Count  Dtype  
---  ------             --------------  -----  
 0   species            344 non-null    object 
 1   island             344 non-null    object 
 2   culmen_length_mm   344 non-null    float64
 3   culmen_depth_mm    344 non-null    float64
 4   flipper_length_mm  344 non-null    float64
 5   body_mass_g        344 non-null    float64
 6   sex                344 non-null    object 
dtypes: float64(4), object(3)
memory usage: 18.9+ KB
```

Task 3 (Continued): Some visualizations done after dealing with missing / invalid values

In [31]:

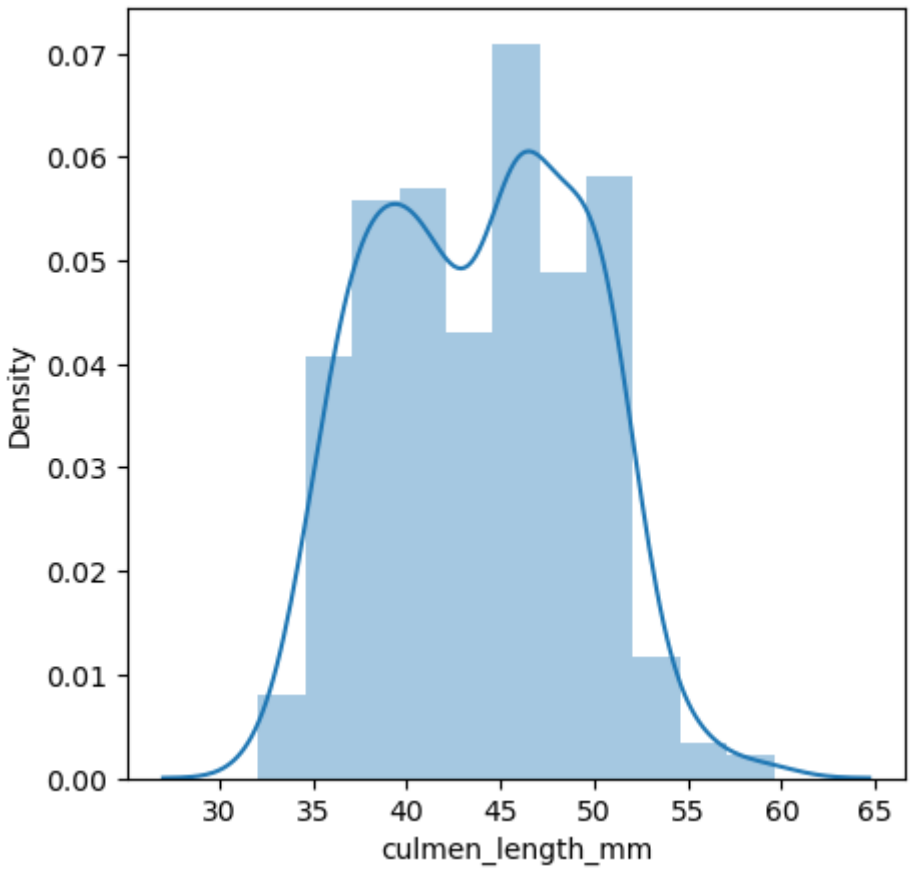
```
1  sns.barplot(x =df.sex.value_counts().index,y =df.sex.value_counts())
2  # Done after dealing with invalid/missing entries.
3  plt.xlabel('Sex')
4  plt.ylabel('Count')
5  plt.show()
```



In [32]:

```
1 sns.distplot(df.culmen_length_mm)
2 plt.show()
```

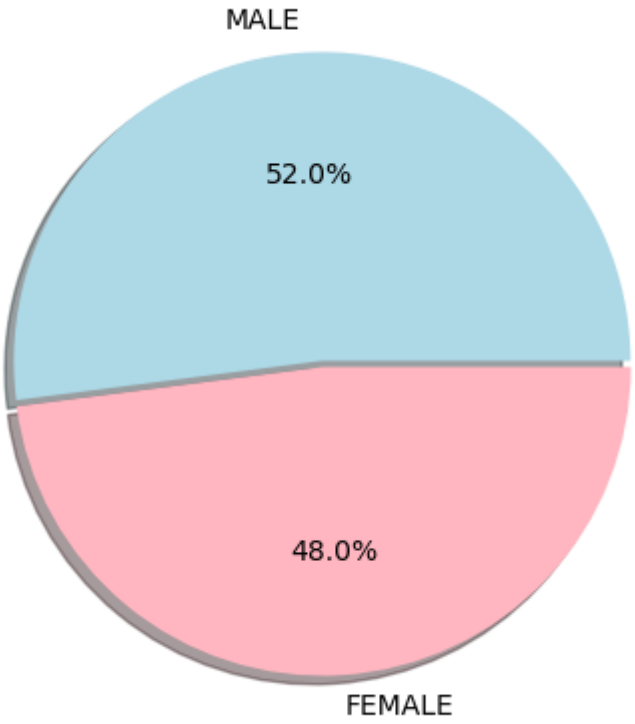
```
C:\Users\Charvi Upreti\AppData\Local\Temp\ipykernel_25624\1383932245.py:1:
UserWarning:

`distplot` is a deprecated function and will be removed in seaborn v0.14.
0.

Please adapt your code to use either `displot` (a figure-level function wi
th
similar flexibility) or `histplot` (an axes-level function for histogram
s).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751 (https://
gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751)

  sns.distplot(df.culmen_length_mm)
```



Univariate

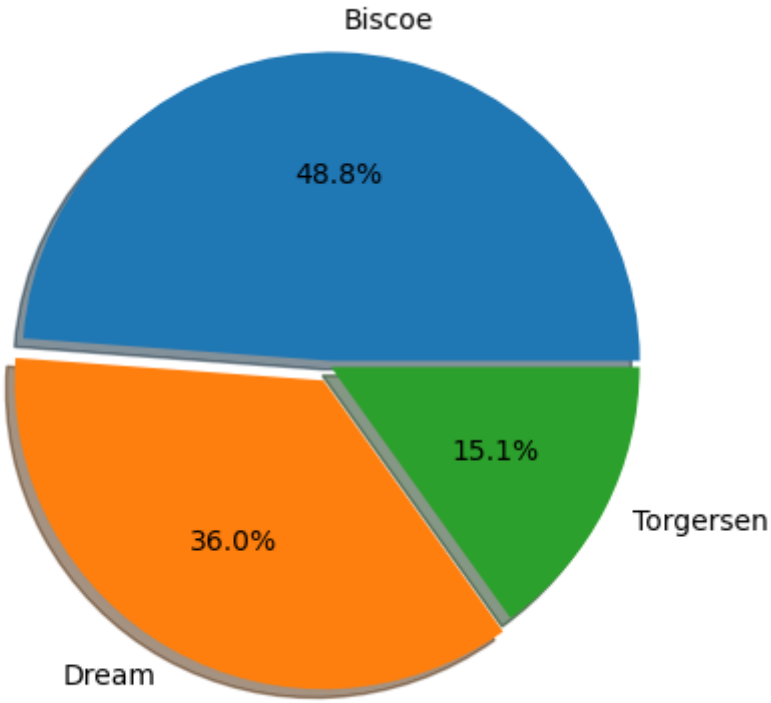
In [33]:

```
counts = df['sex'].value_counts()
plt.figure()
plt.pie(counts, [0.02,0],shadow=True,labels=counts.index, autopct='%1.1f%%',colors=[
plt.show()
```



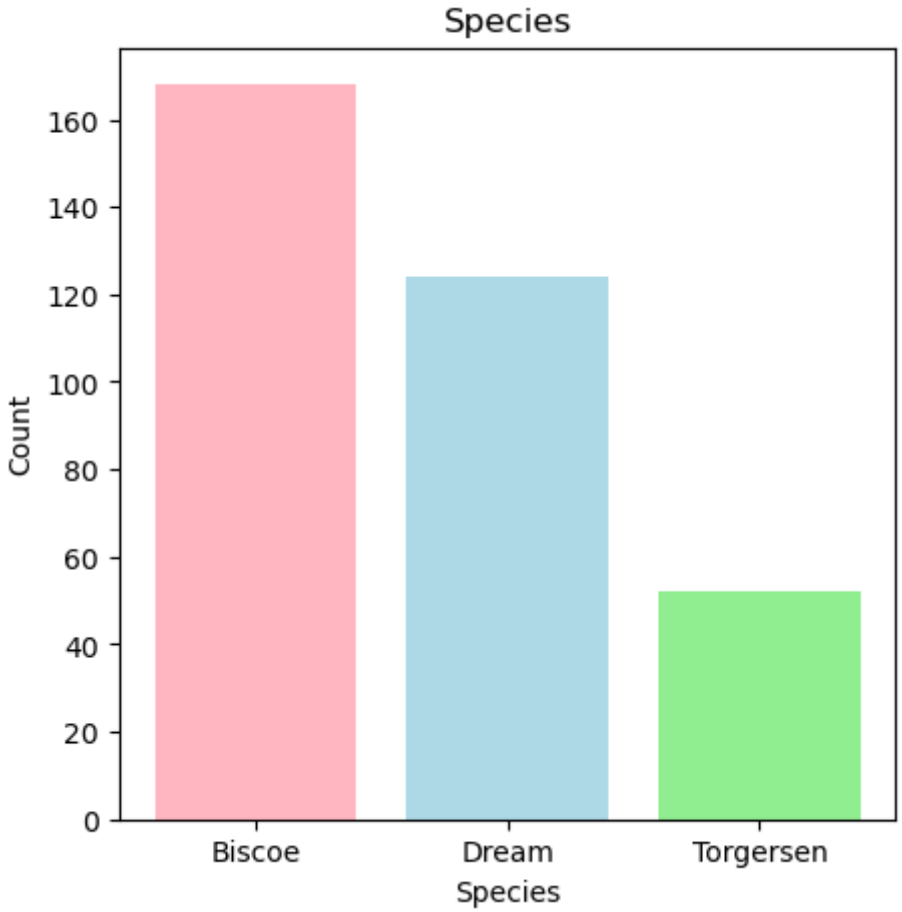
In [34]:

```
counts = df['island'].value_counts()
plt.figure()
plt.pie(counts, [0.02,0.05,0],shadow=True,labels=counts.index, autopct='%1.1f%%')
plt.show()
```



In [35]:

```
plt.bar(counts.index, counts, color=['lightpink', 'lightblue', 'lightgreen'])
plt.xlabel('Species')
plt.ylabel('Count')
plt.title('Species')
plt.show()
```



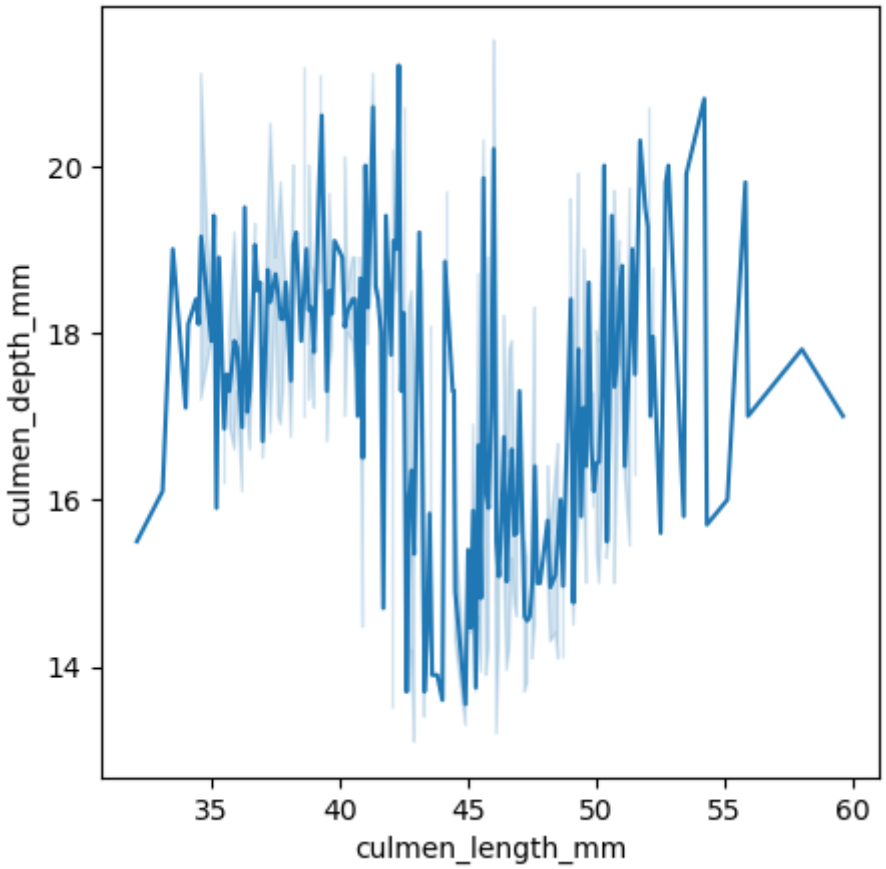
Bi - Variate Analysis

In [36]:

```
1 sns.lineplot(x = df.culmen_length_mm,y=df.culmen_depth_mm)
```

Out[36]:

```
<Axes: xlabel='culmen_length_mm', ylabel='culmen_depth_mm'>
```

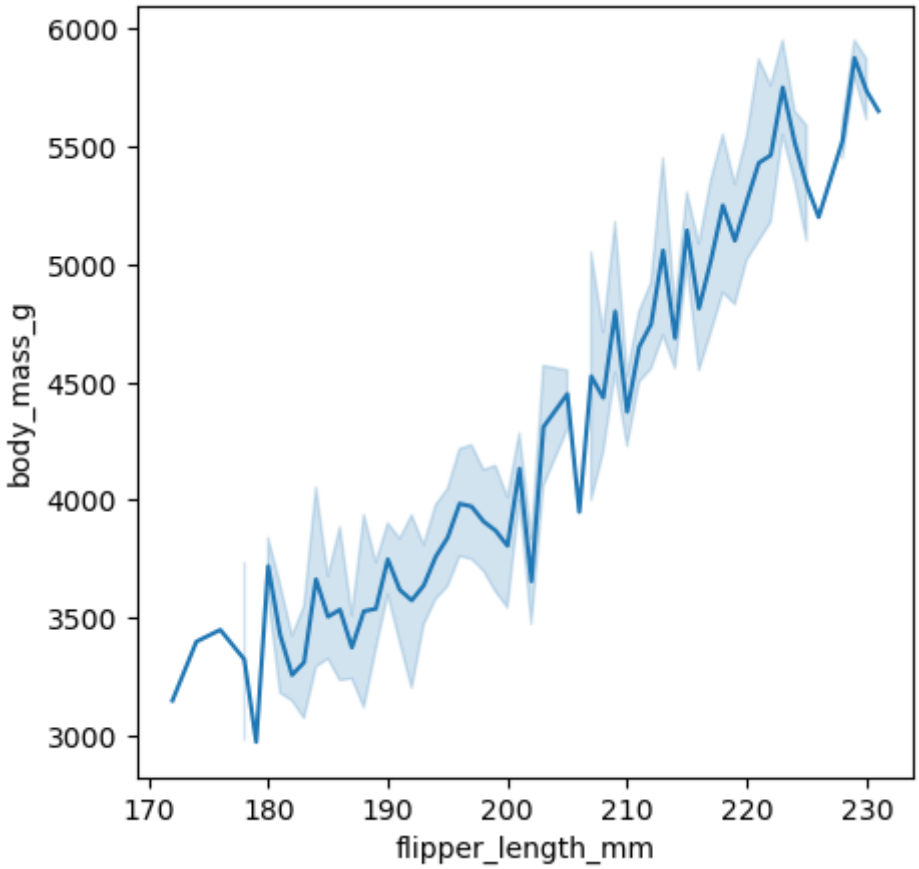


In [37]:

```
1 sns.lineplot(x = df.flipper_length_mm,y=df.body_mass_g)
```

Out[37]:

<Axes: xlabel='flipper_length_mm', ylabel='body_mass_g'>

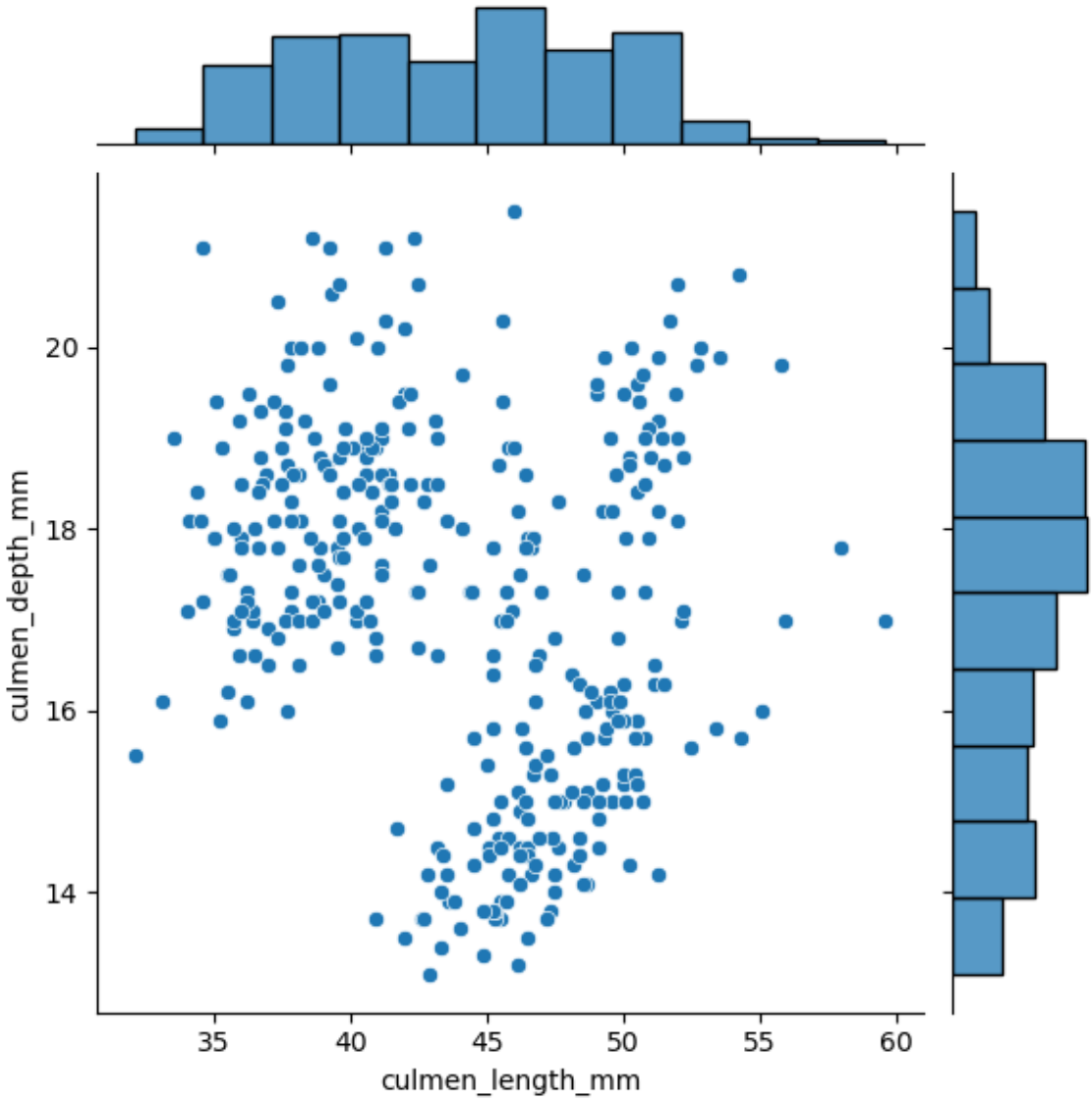


In [38]:

```
1 sns.jointplot(x = df.culmen_length_mm,y=df.culmen_depth_mm)
```

Out[38]:

```
<seaborn.axisgrid.JointGrid at 0x25f80359940>
```



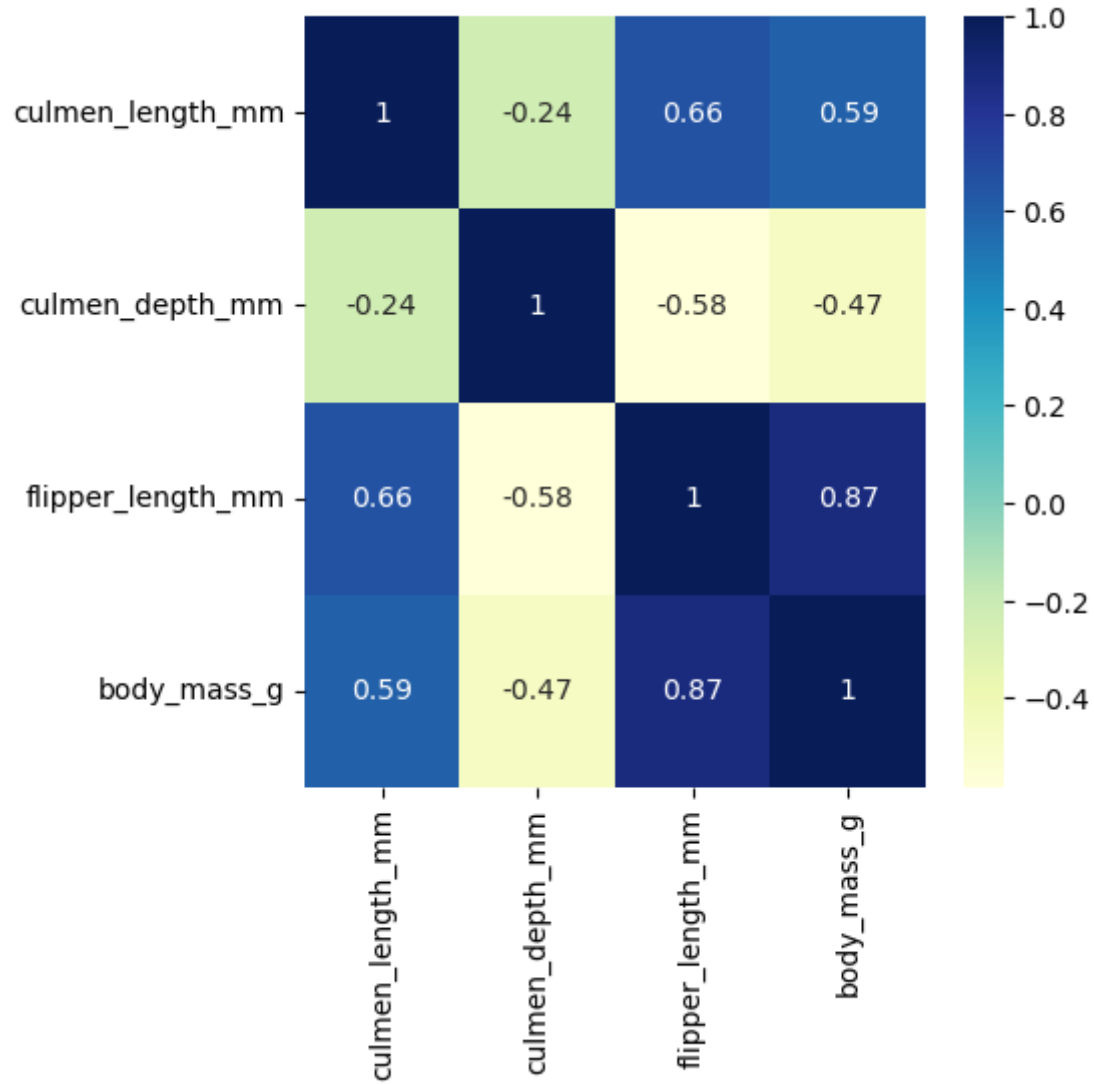
Multi-Variate Analysis

In [39]:

```
1 sns.heatmap(df.corr(),annot=True,cmap="YlGnBu")
```

Out[39]:

<Axes: >



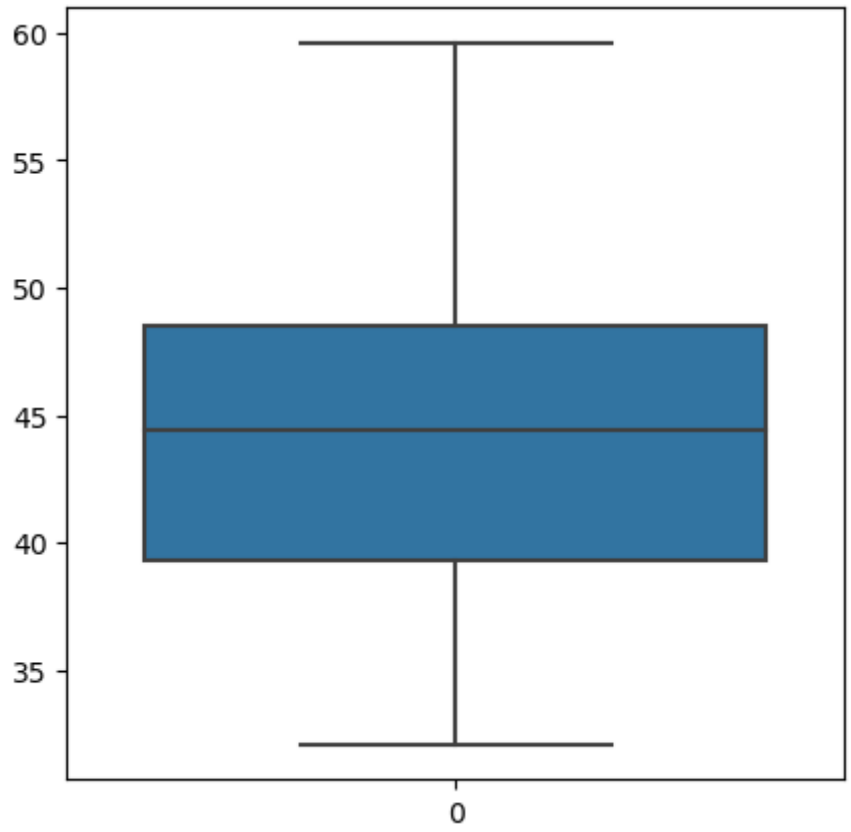
Task 6: Finding and replacing outliers

In [40]:

```
sns.boxplot(df.culmen_length_mm)
#### seems like no outliers
```

Out[40]:

<Axes: >

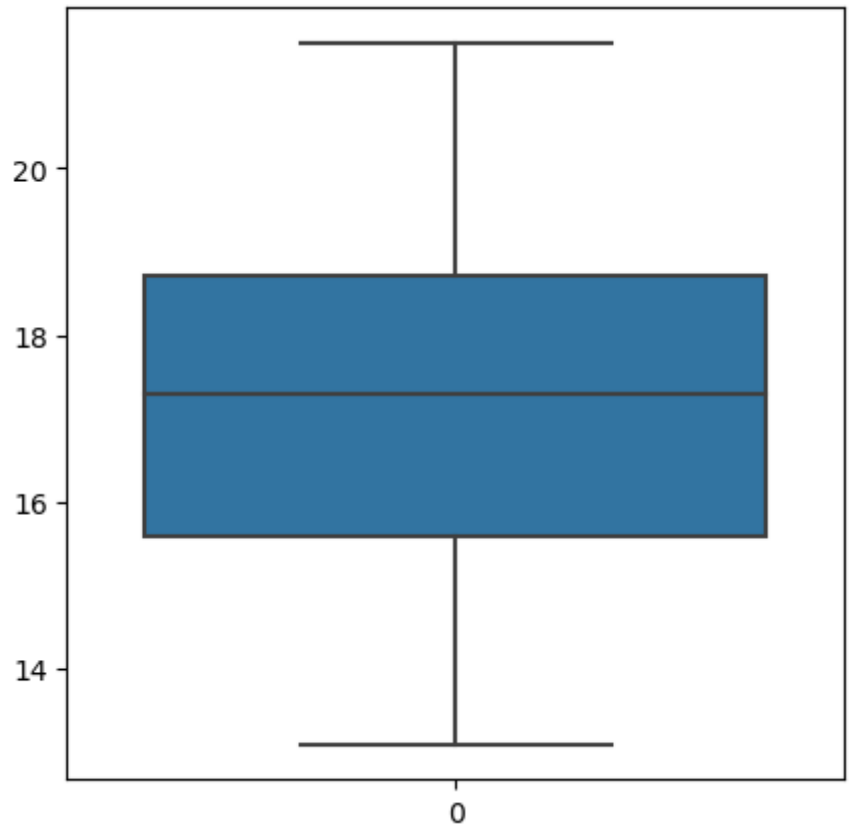


In [41]:

```
sns.boxplot(df.culmen_depth_mm)
#### seems like no outliers
```

Out[41]:

<Axes: >

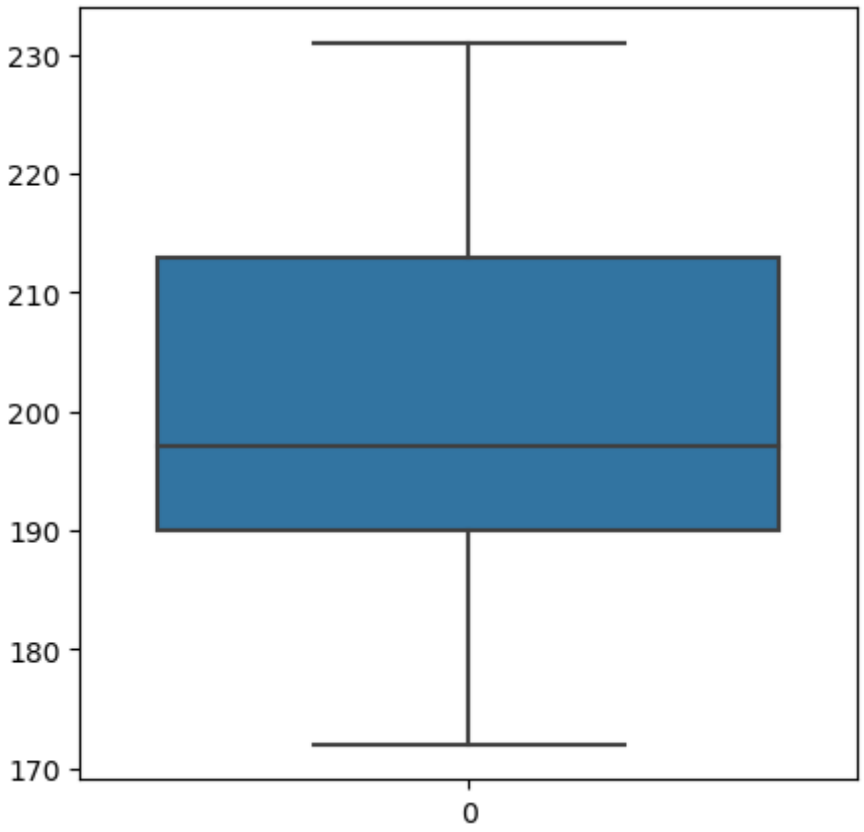


In [42]:

```
sns.boxplot(df.flipper_length_mm)
#### seems like no outliers
```

Out[42]:

<Axes: >

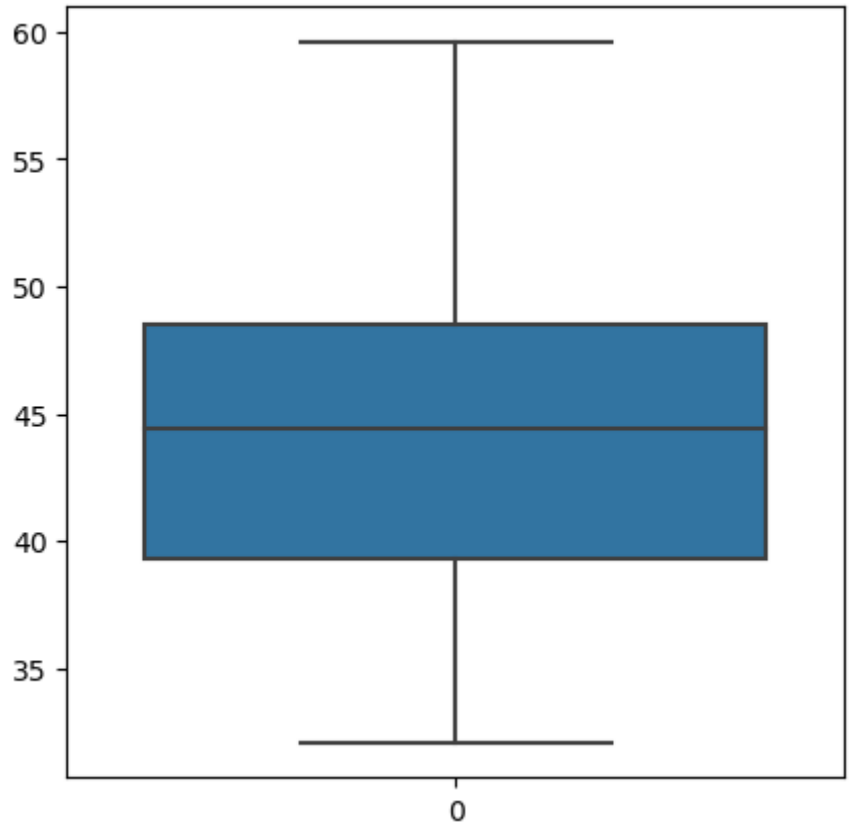


Outliers not present, but trying removal on culmen_length_mm by replacement with median

In [43]:

```
q1 = df.culmen_length_mm.quantile(0.25)
q3 = df.culmen_length_mm.quantile(0.75)
print("Before: ")
print(q1)
print(q3)
IQR = q3-q1
upper_limit = q3+1.5*IQR
df['culmen_length_mm'] = np.where(df['culmen_length_mm']>upper_limit,30,df['culmen_l
sns.boxplot(df['culmen_length_mm'])
plt.show()
q1 = df.culmen_length_mm.quantile(0.25) #Q1
q3 = df.culmen_length_mm.quantile(0.75) #Q3
print("After: ")
print(q1)
print(q3)
print("No change as no outliers present.")
```

```
Before:
39.275
48.5
```




```
After:
39.275
48.5
No change as no outliers present.
```

Task 8: Checking for categorical columns and performing encoding.

In [44]:

```
1 df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 344 entries, 0 to 343
Data columns (total 7 columns):
 #   Column             Non-Null Count  Dtype  
---  ------             --------------  -----  
 0   species            344 non-null    object 
 1   island             344 non-null    object 
 2   culmen_length_mm   344 non-null    float64
 3   culmen_depth_mm    344 non-null    float64
 4   flipper_length_mm  344 non-null    float64
 5   body_mass_g        344 non-null    float64
 6   sex                344 non-null    object 
dtypes: float64(4), object(3)
memory usage: 18.9+ KB
```

In [45]:

```
1 from sklearn.preprocessing import LabelEncoder
2 le=LabelEncoder()
3 df['island']=le.fit_transform(df['island'])
4 df['sex']=le.fit_transform(df['sex'])
5 #Species is target variable hence we did not encode it
```

Task 7: Checking correlation of independent variables with the target

In [46]:

```
1 df.corr()
```

Out[46]:

	island	culmen_length_mm	culmen_depth_mm	flipper_length_mm	bo
island	1.000000	-0.351189	0.567701	-0.562957	
culmen_length_mm	-0.351189	1.000000	-0.235000	0.655858	
culmen_depth_mm	0.567701	-0.235000	1.000000	-0.583832	
flipper_length_mm	-0.562957	0.655858	-0.583832	1.000000	
body_mass_g	-0.558500	0.594925	-0.471942	0.871221	
sex	0.002893	0.322871	0.354791	0.241941	

To check correlation creating a label encoded copy.

In [47]:

```
df_copy = df.copy()
df_copy['species'] = le.fit_transform(df_copy['species'])
df_copy.corr().species.sort_values(ascending =False)
```

Out[47]:

```
species              1.000000
flipper_length_mm    0.850819
body_mass_g          0.747547
culmen_length_mm     0.728706
sex                  0.010240
island              -0.635659
culmen_depth_mm     -0.741282
Name: species, dtype: float64
```

Task 9: Spliting data to dependent and independent variables

In [48]:

```
Y=df['species']
Y
```

Out[48]:

```
0      Adelie
1      Adelie
2      Adelie
3      Adelie
4      Adelie
        ...
339    Gentoo
340    Gentoo
341    Gentoo
342    Gentoo
343    Gentoo
Name: species, Length: 344, dtype: object
```

In [49]:

```
X =df.drop(columns =['species'],axis =1)
X.head()
```

Out[49]:

	island	culmen_length_mm	culmen_depth_mm	flipper_length_mm	body_mass_g	sex
0	2	39.10	18.7	181.0	3750.0	1
1	2	39.50	17.4	186.0	3800.0	0
2	2	40.30	18.0	195.0	3250.0	0
3	2	44.45	17.3	197.0	4050.0	1
4	2	36.70	19.3	193.0	3450.0	0

Task 10: Scaling the data

In [50]:

```
from sklearn.preprocessing import MinMaxScaler
scale =MinMaxScaler()
X_scaled= pd.DataFrame(scale.fit_transform(X),columns =X.columns)
X_scaled.head()
```

Out[50]:

	island	culmen_length_mm	culmen_depth_mm	flipper_length_mm	body_mass_g	sex
0	1.0	0.254545	0.666667	0.152542	0.291667	1.0
1	1.0	0.269091	0.511905	0.237288	0.305556	0.0
2	1.0	0.298182	0.583333	0.389831	0.152778	0.0
3	1.0	0.449091	0.500000	0.423729	0.375000	1.0
4	1.0	0.167273	0.738095	0.355932	0.208333	0.0

Task 11:Split the data into training and testing

In [51]:

```
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_sta
```

Task 12:Check the training and testing data shape

In [52]:

```
print(X_train.shape)
print(Y_train.shape)
print(X_test.shape)
print(Y_test.shape)
```

```
(240, 6)
(240,)
(104, 6)
(104,)
```