# 4)Implement any 2 Classification techniques using any data analytics tool.

In [8]:
```
import pandas as pd   # to load dataset
import matplotlib.pyplot as plt
import seaborn as sns
import pylab as pl
from sklearn.model_selection import train_test_split   # for splitting dataset
from sklearn.preprocessing import MinMaxScaler  # for scaling
from sklearn.linear_model import LogisticRegression   # machine learning lib/model, #
from sklearn.tree import DecisionTreeClassifier  # get accuracy by Decision Tree class
from sklearn.neighbors import KNeighborsClassifier  # get accuracy by KNN classifier
from sklearn.naive_bayes import GaussianNB # get accuracy by GNB classifier
```

In [9]:
```
df=pd.read_csv('fruit_data.csv')
```

In [10]:
```
df.shape
```

Out[10]:
```
(59, 7)
```

In [11]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 59 entries, 0 to 58
Data columns (total 7 columns):
 #   Column         Non-Null Count  Dtype  
---  ------         --------------  -----  
 0   fruit_label    59 non-null     int64  
 1   fruit_name     59 non-null     object 
 2   fruit_subtype  59 non-null     object 
 3   mass           59 non-null     int64  
 4   width          59 non-null     float64
 5   height         59 non-null     float64
 6   color_score    59 non-null     float64
dtypes: float64(3), int64(2), object(2)
memory usage: 3.4+ KB
```

In [12]:
```
df.describe()
```

Out[12]:

| | fruit_label | mass | width | height | color_score |
|---|---|---|---|---|---|
| **count** | 59.000000 | 59.000000 | 59.000000 | 59.000000 | 59.000000 |
| **mean** | 2.542373 | 163.118644 | 7.105085 | 7.693220 | 0.762881 |
| **std** | 1.208048 | 55.018832 | 0.816938 | 1.361017 | 0.076857 |
| **min** | 1.000000 | 76.000000 | 5.800000 | 4.000000 | 0.550000 |
| **25%** | 1.000000 | 140.000000 | 6.600000 | 7.200000 | 0.720000 |
| **50%** | 3.000000 | 158.000000 | 7.200000 | 7.600000 | 0.750000 |
| **75%** | 4.000000 | 177.000000 | 7.500000 | 8.200000 | 0.810000 |
| **max** | 4.000000 | 362.000000 | 9.600000 | 10.500000 | 0.930000 |

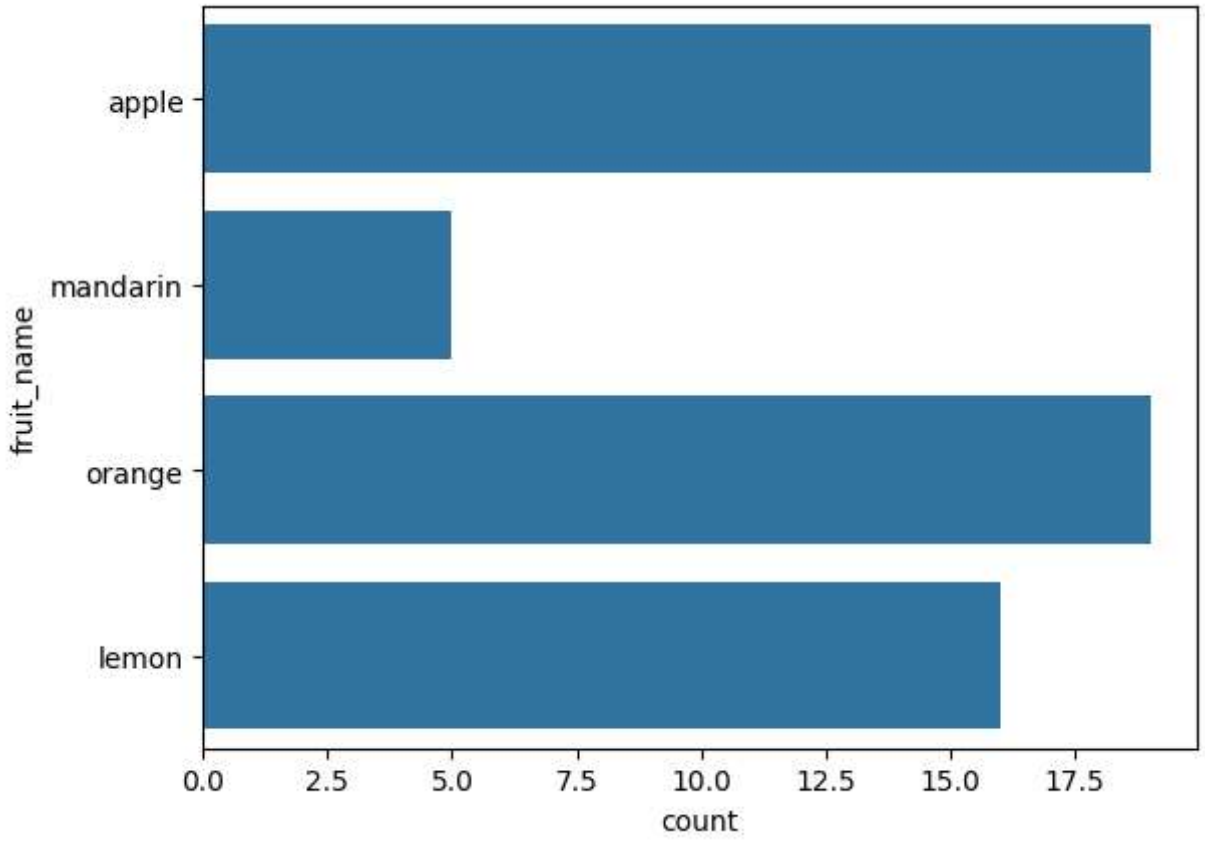
In [13]:
```
print(df['fruit_name'].unique()) # unique fruits name
```

```
['apple' 'mandarin' 'orange' 'lemon']
```

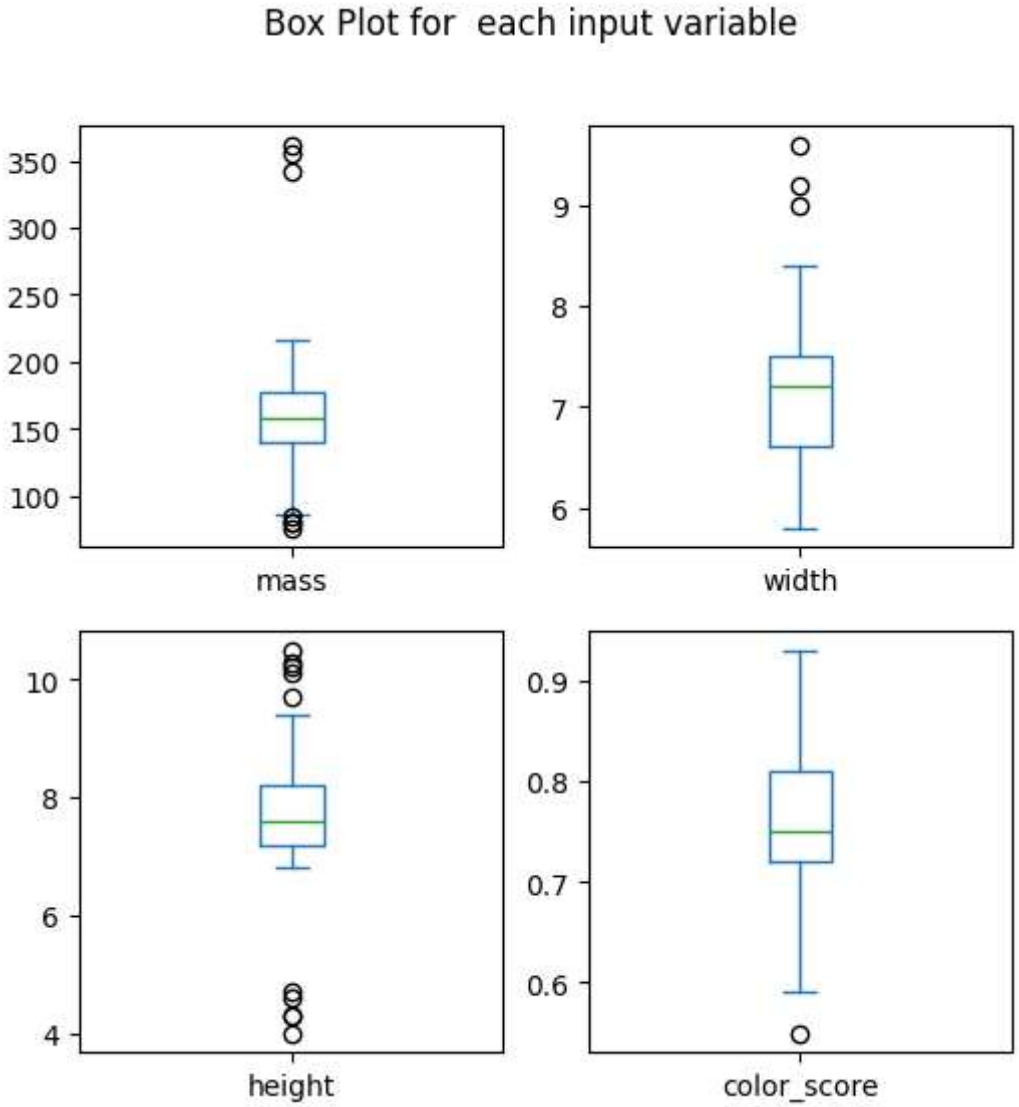
In [14]:
```
print(df['fruit_subtype'].unique()) # unique fruit subtype
```

```
['granny_smith' 'mandarin' 'braeburn' 'golden_delicious' 'cripps_pink'
 'spanish_jumbo' 'selected_seconds' 'turkey_navel' 'spanish_belsan'
 'unknown']
```

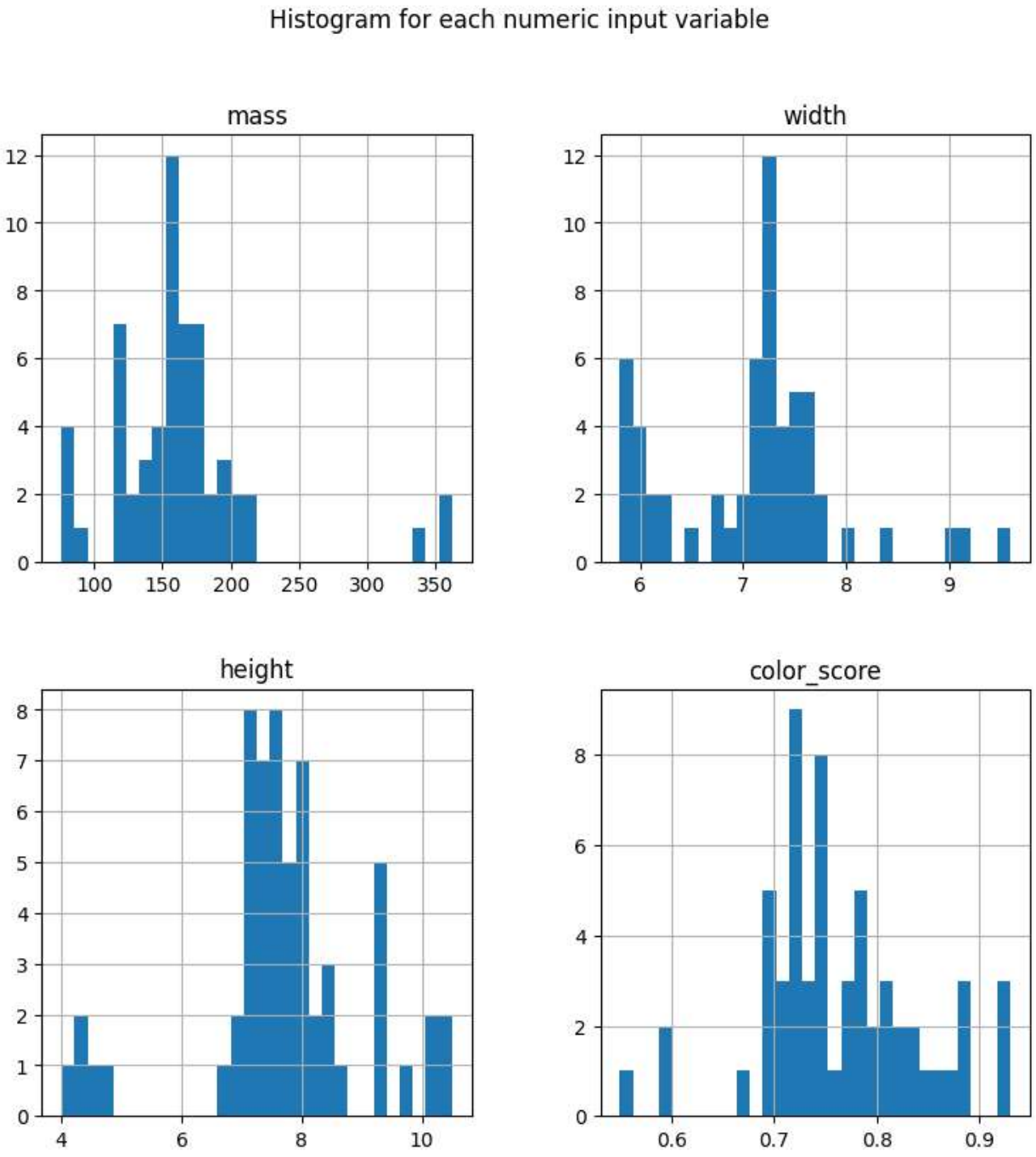
In [15]:
```
sns.countplot(df['fruit_name'],label='Count') # count plot
plt.show()
```




In [16]:
```
df.drop('fruit_label',axis=1).plot(kind='box', subplots=True, layout=(2,2), sharex=Fal
plt.savefig('fruits_box')
plt.show()
```



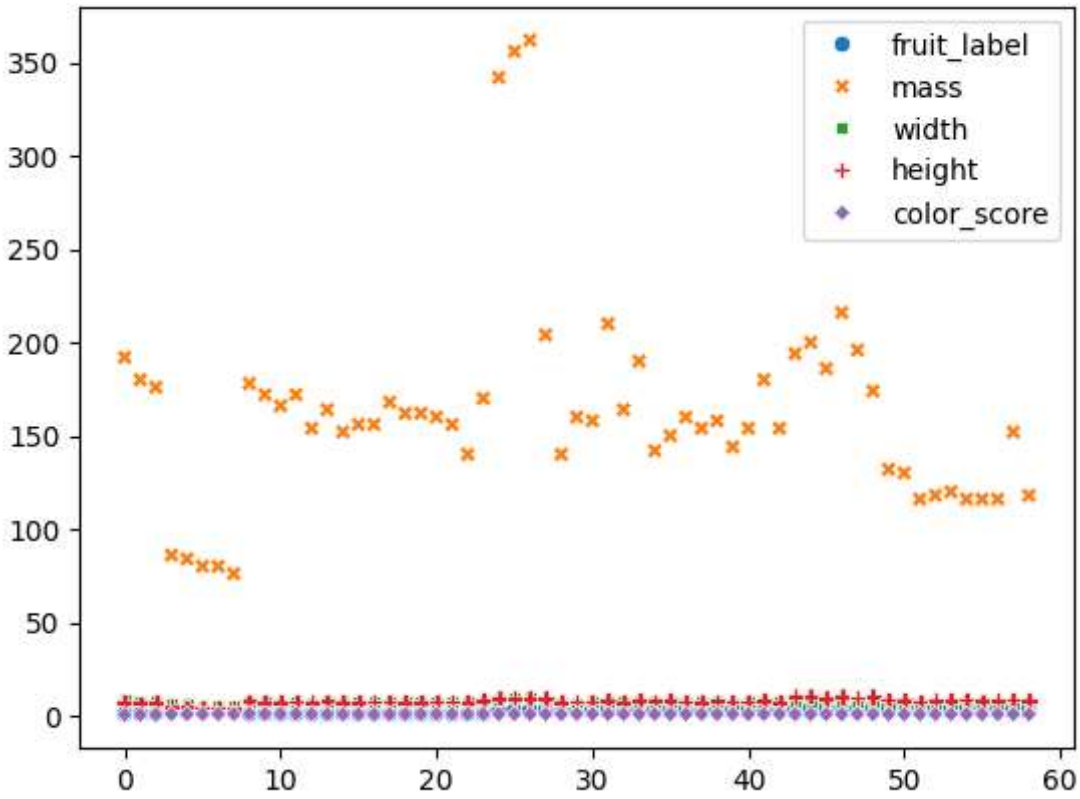

In [17]:
```
import pylab as pl

df.drop('fruit_label', axis=1).hist(bins=30, figsize=(9,9))
pl.suptitle("Histogram for each numeric input variable")
plt.savefig('fruits_hist')
```




In [18]:
```
plt.show()
```

In [19]:
```
#scaterplot
sns.scatterplot(data=df)
```

Out[19]:
```
<Axes: >
```




In [20]:
```
#preparing data with scaling
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import MinMaxScaler

feature_names = ['mass', 'width', 'height', 'color_score']
x=df[feature_names]
y=df['fruit_label']

x_train, x_test, y_train, y_test = train_test_split(x,y, random_state=0)

print(x_train[:3]) # to check output

scaler = MinMaxScaler()
x_train=scaler.fit_transform(x_train)
x_test= scaler.transform(x_test)

print("\nAfter scaling\n")
print(x_train[:3]) # to check output
```

```
    mass  width  height  color_score
42   154    7.2     7.2         0.82
48   174    7.3    10.1         0.72
7     76    5.8     4.0         0.81

After scaling

[[0.27857143 0.41176471 0.49230769 0.72972973]
 [0.35       0.44117647 0.93846154 0.45945946]
 [0.         0.         0.         0.7027027 ]]
```

In [21]:
```
from sklearn.neighbors import KNeighborsClassifier

# KNN method
```

```
knn = KNeighborsClassifier()
knn.fit(x_train, y_train)

#print score of train data
print('Accuracy of KNN classifier on training set:{:.2f}'
     .format(knn.score(x_train, y_train)))

#print score of test data
print('Accuracy of KNN Classifier on test set:{:.2f}'
     .format(knn.score(x_test, y_test)))
```

```
Accuracy of KNN classifier on training set:0.95
Accuracy of KNN Classifier on test set:1.00
```

In [22]:
```
from sklearn.naive_bayes import GaussianNB

# Gaussian Naive bayes
gnb = GaussianNB()
gnb.fit(x_train, y_train)

#print score of train data
print('Accuracy of GNB classifier on training set:{:.2f}'
     .format(gnb.score(x_train, y_train)))

#print score of test data
print('Accuracy of GNB Classifier on test set:{:.2f}'
     .format(gnb.score(x_test, y_test)))
```

```
Accuracy of GNB classifier on training set:0.86
Accuracy of GNB Classifier on test set:0.67
```

In [ ]:
```

```