1.Importing Libraries

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

from sklearn.preprocessing import StandardScaler
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import confusion_matrix,accuracy_score

import seaborn as sns
```

2.Loading Data

In [2]:
```
data = pd.read_csv(r'C:\Users\G.SAI KRISHNA\Desktop\ML_Projects\ML_GFG\7.Logistic Regressio
data.head()
```

Out[2]:

	area	perimeter	compactness	length	width	asymmetry	length_kernel_groove	kernel
0	15.26	14.84	0.8710	5.763	3.312	2.221	5.220	0
1	14.88	14.57	0.8811	5.554	3.333	1.018	4.956	0
2	14.29	14.09	0.9050	5.291	3.337	2.699	4.825	0
3	13.84	13.94	0.8955	5.324	3.379	2.259	4.805	0
4	16.14	14.99	0.9034	5.658	3.562	1.355	5.175	0

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

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 210 entries, 0 to 209
Data columns (total 8 columns):
 #   Column                Non-Null Count  Dtype  
---  ------                --------------  -----  
 0   area                  210 non-null    float64
 1   perimeter             210 non-null    float64
 2   compactness           210 non-null    float64
 3   length                210 non-null    float64
 4   width                 210 non-null    float64
 5   asymmetry             210 non-null    float64
 6   length_kernel_groove  210 non-null    float64
 7   kernel                210 non-null    int64  
dtypes: float64(7), int64(1)
memory usage: 13.2 KB
```

In [4]:
```
data.describe()
```

Out[4]:

	area	perimeter	compactness	length	width	asymmetry	length_kernel_groove	ke
count	210.000000	210.000000	210.000000	210.000000	210.000000	210.000000	210.000000	210.00
mean	14.847524	14.559286	0.870999	5.628533	3.258605	3.700201	5.408071	1.00
std	2.909699	1.305959	0.023629	0.443063	0.377714	1.503557	0.491480	0.81
min	10.590000	12.410000	0.808100	4.899000	2.630000	0.765100	4.519000	0.00
25%	12.270000	13.450000	0.856900	5.262250	2.944000	2.561500	5.045000	0.00
50%	14.355000	14.320000	0.873450	5.523500	3.237000	3.599000	5.223000	1.00
75%	17.305000	15.715000	0.887775	5.979750	3.561750	4.768750	5.877000	2.00
max	21.180000	17.250000	0.918300	6.675000	4.033000	8.456000	6.550000	2.00

3.Data Splitting

In [5]:
```
x=data.drop(['kernel'],axis=1)
y=data['kernel']
```

In [6]:
```
x.head()
```

Out[6]:

	area	perimeter	compactness	length	width	asymmetry	length_kernel_groove
0	15.26	14.84	0.8710	5.763	3.312	2.221	5.220
1	14.88	14.57	0.8811	5.554	3.333	1.018	4.956
2	14.29	14.09	0.9050	5.291	3.337	2.699	4.825
3	13.84	13.94	0.8955	5.324	3.379	2.259	4.805
4	16.14	14.99	0.9034	5.658	3.562	1.355	5.175

In [7]:
```
y.head()
```

Out[7]:
```
0    0
1    0
2    0
3    0
4    0
Name: kernel, dtype: int64
```

4.Data Scaling

In [8]:
```
scaler_x = StandardScaler()
x = scaler_x.fit_transform(x)
x
```

Out[8]:
```
array([[ 1.42097769e-01,  2.15462437e-01,  6.06017918e-05, ...,
         1.41701823e-01, -9.86151745e-01, -3.83577423e-01],
       [ 1.11880257e-02,  8.22375713e-03,  4.28515270e-01, ...,
         1.97432229e-01, -1.78816620e+00, -9.22013487e-01],
       [-1.92066576e-01, -3.60200562e-01,  1.44238325e+00, ...,
         2.08047544e-01, -6.67479334e-01, -1.18919199e+00],
       ...,
       [-5.67570840e-01, -6.90247348e-01,  7.33948301e-01, ...,
        -7.06044846e-02,  3.07658816e+00, -7.18060432e-01],
       [-1.03608992e+00, -1.03564515e+00, -8.01701104e-01, ...,
        -1.12152071e+00, -6.81351965e-02, -7.42534799e-01],
       [-8.77620233e-01, -9.35863561e-01, -1.10234659e-01, ...,
        -7.55292327e-01,  1.29122264e+00, -7.03783718e-01]])
```

5.Training & Testing Data

In [9]:
```
x_train,x_test,y_train,y_test = train_test_split(x,y,test_size=0.3,random_state=0)
```

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

Out[10]:
```
(147, 7)
```

In [11]:
```
x_test.shape
```

Out[11]:
```
(63, 7)
```

In [12]:
```
y_train.shape
```

Out[12]:
```
(147,)
```

In [13]:
```
y_test.shape
```

Out[13]:
```
(63,)
```

6.Logistic Regression Classification

Training the Model

In [14]:
```
classifier = LogisticRegression()

classifier.fit(x_train,y_train)
```

Out[14]:
```
LogisticRegression()
```

Predicting Test Values

In [15]:
```
y_pred = classifier.predict(x_test)

y_pred
```

Out[15]:
```
array([0, 1, 0, 0, 2, 1, 1, 1, 1, 2, 0, 2, 0, 2, 1, 1, 2, 0, 0, 0, 2, 0,
       0, 0, 1, 1, 1, 0, 2, 2, 1, 2, 1, 1, 2, 2, 2, 1, 0, 0, 2, 0, 1, 2,
       0, 1, 1, 0, 0, 1, 0, 1, 2, 2, 1, 0, 1, 1, 1, 1, 2, 1, 1],
      dtype=int64)
```

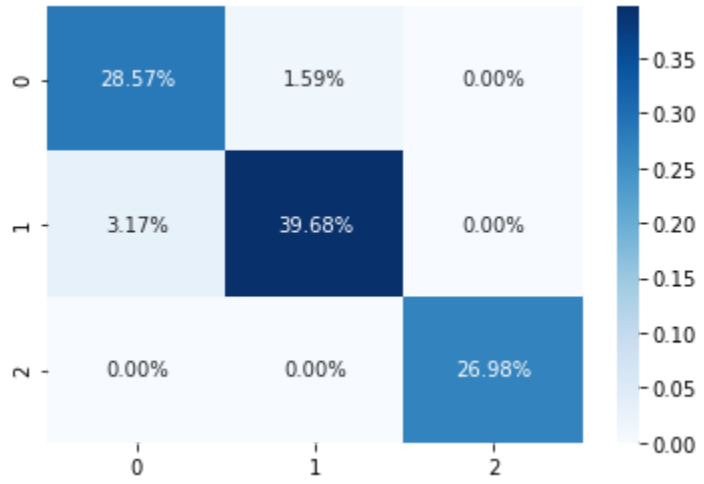
Visualizing Model Performance

In [16]:
```
cm = confusion_matrix(y_test,y_pred)
cm
```

Out[16]:
```
array([[18,  1,  0],
       [ 2, 25,  0],
       [ 0,  0, 17]], dtype=int64)
```

In [17]:
```
sns.heatmap(cm/np.sum(cm), annot=True,fmt='.2%', cmap='Blues')
```

Out[17]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x294037fcb20>
```



In [18]:
```
print("Accuracy : "+str(accuracy_score(y_test,y_pred)*100)+"%")
```

```
Accuracy : 95.23809523809523%
```

/