In [1]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.metrics import accuracy_score
from sklearn.preprocessing import LabelEncoder
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.naive_bayes import GaussianNB
from sklearn.ensemble import RandomForestClassifier
import warnings
warnings.simplefilter("ignore")
```

In [2]:

```
dataset = pd.read_csv("Heart_Disease_Prediction.csv")
```

In [3]:

```
dataset.head()
```

Out[3]:

	Age	Sex	Chest pain type	BP	Cholesterol	FBS over 120	EKG results	Max HR	Exercise angina	ST depression	Slope of ST	Number of vessels fluro	Th
0	70	1	4	130	322	0	2	109	0	2.4	2	3	
1	67	0	3	115	564	0	2	160	0	1.6	2	0	
2	57	1	2	124	261	0	0	141	0	0.3	1	0	
3	64	1	4	128	263	0	0	105	1	0.2	2	1	
4	74	0	2	120	269	0	2	121	1	0.2	1	1	

In [4]:

```
dataset.shape
```

Out[4]:

```
(270, 14)
```

In [5]:

```
dataset.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 270 entries, 0 to 269
Data columns (total 14 columns):
 #   Column                   Non-Null Count  Dtype  
---  ------                   --------------  -----  
 0   Age                      270 non-null    int64  
 1   Sex                      270 non-null    int64  
 2   Chest pain type          270 non-null    int64  
 3   BP                       270 non-null    int64  
 4   Cholesterol              270 non-null    int64  
 5   FBS over 120             270 non-null    int64  
 6   EKG results              270 non-null    int64  
 7   Max HR                   270 non-null    int64  
 8   Exercise angina          270 non-null    int64  
 9   ST depression            270 non-null    float64
 10  Slope of ST              270 non-null    int64  
 11  Number of vessels fluro  270 non-null    int64  
 12  Thallium                 270 non-null    int64  
 13  Heart Disease            270 non-null    object
dtypes: float64(1), int64(12), object(1)
memory usage: 29.7+ KB
```

In [6]:

```
dataset.describe()
```

Out[6]:

	Age	Sex	Chest pain type	BP	Cholesterol	FBS over 120	EKG results	Max H
count	270.000000	270.000000	270.000000	270.000000	270.000000	270.000000	270.000000	270.0000
mean	54.433333	0.677778	3.174074	131.344444	249.659259	0.148148	1.022222	149.6777
std	9.109067	0.468195	0.950090	17.861608	51.686237	0.355906	0.997891	23.1657
min	29.000000	0.000000	1.000000	94.000000	126.000000	0.000000	0.000000	71.0000
25%	48.000000	0.000000	3.000000	120.000000	213.000000	0.000000	0.000000	133.0000
50%	55.000000	1.000000	3.000000	130.000000	245.000000	0.000000	2.000000	153.5000
75%	61.000000	1.000000	4.000000	140.000000	280.000000	0.000000	2.000000	166.0000
max	77.000000	1.000000	4.000000	200.000000	564.000000	1.000000	2.000000	202.0000

In [7]:

```
dataset.isnull().sum()
```

Out[7]:

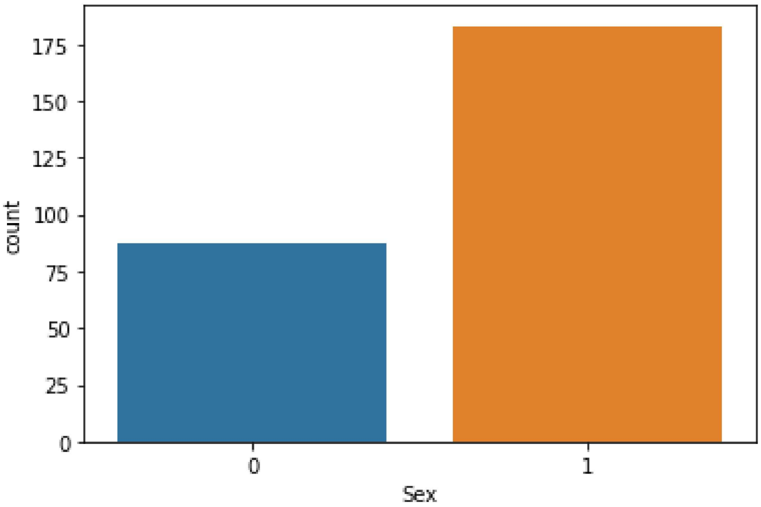
```
Age                        0
Sex                        0
Chest pain type            0
BP                         0
Cholesterol                0
FBS over 120               0
EKG results                0
Max HR                     0
Exercise angina            0
ST depression              0
Slope of ST                0
Number of vessels fluro    0
Thallium                   0
Heart Disease              0
dtype: int64
```

In [8]:

```
sns.countplot(x="Sex",data=dataset)
```

Out[8]:

```
<AxesSubplot:xlabel='Sex', ylabel='count'>
```



In [9]:

```
dataset.columns
```

Out[9]:

```
Index(['Age', 'Sex', 'Chest pain type', 'BP', 'Cholesterol', 'FBS over 120',
       'EKG results', 'Max HR', 'Exercise angina', 'ST depression',
       'Slope of ST', 'Number of vessels fluro', 'Thallium', 'Heart Disease'],
      dtype='object')
```

In [10]:

```
dataset["Heart Disease"] = LabelEncoder().fit_transform(dataset["Heart Disease"])
```

In [11]:

```
dataset.head()
```

Out[11]:

	Age	Sex	Chest pain type	BP	Cholesterol	FBS over 120	EKG results	Max HR	Exercise angina	ST depression	Slope of ST	Number of vessels fluro	Th
0	70	1	4	130	322	0	2	109	0	2.4	2	3	
1	67	0	3	115	564	0	2	160	0	1.6	2	0	
2	57	1	2	124	261	0	0	141	0	0.3	1	0	
3	64	1	4	128	263	0	0	105	1	0.2	2	1	
4	74	0	2	120	269	0	2	121	1	0.2	1	1	

Heart Disease 1 -----> Present

Heart Disease 0 -----> Absent

In [12]:

```
X = dataset.drop(columns="Heart Disease",axis=1)
Y = dataset["Heart Disease"]
```

In [13]:

```
X.head()
```

Out[13]:

	Age	Sex	Chest pain type	BP	Cholesterol	FBS over 120	EKG results	Max HR	Exercise angina	ST depression	Slope of ST	Number of vessels fluro	Th
0	70	1	4	130	322	0	2	109	0	2.4	2	3	

	Age	Sex	Chest pain type	BP	Cholesterol	FBS over 120	EKG results	Max HR	Exercise angina	ST depression	Slope of ST	Number of vessels fluro	Th
1	67	0	3	115	564	0	2	160	0	1.6	2	0	
2	57	1	2	124	261	0	0	141	0	0.3	1	0	
3	64	1	4	128	263	0	0	105	1	0.2	2	1	
4	74	0	2	120	269	0	2	121	1	0.2	1	1	

In [14]:

```
Y.head()
```

Out[14]:

```
0    1
1    0
2    1
3    0
4    0
Name: Heart Disease, dtype: int32
```

In [40]:

```
X_train,X_test,Y_train,Y_test = train_test_split(X,Y,test_size=0.2,random_state=0)
```

In [41]:

```
X_train.head()
```

Out[41]:

	Age	Sex	Chest pain type	BP	Cholesterol	FBS over 120	EKG results	Max HR	Exercise angina	ST depression	Slope of ST	Number of vessels fluro	.
5	65	1	4	120	177	0	0	140	0	0.4	1	0	
22	43	1	4	115	303	0	0	181	0	1.2	2	0	
196	58	0	4	100	248	0	2	122	0	1.0	2	0	
110	55	0	4	180	327	0	1	117	1	3.4	2	0	
12	44	1	3	140	235	0	2	180	0	0.0	1	0	

In [42]:

```
X_test.head()
```

Out[42]:

	Age	Sex	Chest pain type	BP	Cholesterol	FBS over 120	EKG results	Max HR	Exercise angina	ST depression	Slope of ST	Number of vessels fluro	.
64	63	1	1	145	233	1	2	150	0	2.3	3	0	
135	46	0	3	142	177	0	2	160	1	1.4	3	0	
153	64	0	4	130	303	0	0	122	0	2.0	2	2	
189	70	1	3	160	269	0	0	112	1	2.9	2	1	
253	51	1	3	110	175	0	0	123	0	0.6	1	0	

In [43]:

```
Y_train.head()
```

Out[43]:

```
5      0
22     0
196    0
110    1
12     0
Name: Heart Disease, dtype: int32
```

In [44]:

```
Y_test.head()
```

Out[44]:

```
64     0
135    0
153    0
189    1
253    0
Name: Heart Disease, dtype: int32
```

In [45]:

```
X.shape,X_train.shape,X_test.shape
```

Out[45]:

```
((270, 13), (216, 13), (54, 13))
```

In [46]:

```
model = LogisticRegression()
```

In [47]:

```
model.fit(X_train, Y_train)
```

Out[47]:

```
▾ LogisticRegression
LogisticRegression()
```

In [48]:

```
X_train_prediction = model.predict(X_train)
X_train_accuracy = accuracy_score(X_train_prediction, Y_train)
```

In [49]:

```
X_train_accuracy
```

Out[49]:

```
0.8842592592592593
```

In [50]:

```
X_test_prediction = model.predict(X_test)
X_test_accuracy = accuracy_score(X_test_prediction, Y_test)
```

In [51]:

```
X_test_accuracy
```

Out[51]:

```
0.8333333333333334
```

In [52]:

```
model2 = GaussianNB()
```

In [53]:

```
model2.fit(X_train, Y_train)
```

Out[53]:

```
▾ GaussianNB

GaussianNB()
```

In [54]:

```
X_test_prediction2 = model2.predict(X_test)
X_test_accuracy2 = accuracy_score(X_test_prediction2, Y_test)
```

In [55]:

```
X_test_accuracy2
```

Out[55]:

```
0.7407407407407407
```

In [56]:

```
X_train_prediction2 = model2.predict(X_train)
X_train_accuracy2 = accuracy_score(X_train_prediction2, Y_train)
```

In [57]:

```
X_train_accuracy2
```

Out[57]:

```
0.8796296296296297
```

In [58]:

```
model3 = RandomForestClassifier()
```

In [59]:

```
model3.fit(X_train,Y_train)
```

Out[59]:

```
▾ RandomForestClassifier

RandomForestClassifier()
```

In [60]:

```
X_train_prediction3 = model3.predict(X_train)
X_train_accuracy3 = accuracy_score(X_train_prediction3, Y_train)
```

In [61]:

```
X_train_accuracy3
```

Out[61]:

```
1.0
```

In [62]:

```
X_test_prediction3 = model3.predict(X_test)
X_test_accuracy3 = accuracy_score(X_test_prediction3, Y_test)
```

In [63]:

```
X_test_accuracy3
```

Out[63]:

```
0.8148148148148148
```

In [66]:

```
input_data = (32,0,0,120,150,0,0,10,0,2,0,2,2)
input_data_as_numpy_array = np.asarray(input_data)

input_data_reshaped = input_data_as_numpy_array.reshape(1,-1)

prediction = model.predict(input_data_reshaped)
prediction
```

```
if prediction[0]==0:
    print("The person does not have heart disease")
else:
    print("The person have heart disease")
```

```
The person have heart disease
```

In [ ]: