Worksheet 1

Please go to https://www.kaggle.com/fedesoriano/heart-failure-prediction (https://www.kaggle.com/fedesoriano/heart-failure-prediction) and download the data set. Your task is to perform EDA on the dataset. Use “book1.ipynb” as a resource; remember, Google is your friend. Produce a Jupyter Notebook in which you complete the following tasks.

Assign the data to a dataframe.
(a) use .head() to see the first few rows. Did you need to use index_col = 0?
(b) What variable types are present in the dataframe? (Hint, use .dtypes) Are there any missing values?

In [1]:

```python
import pandas as pd
df = pd.read_csv('./heart.csv')
df.head()
# I did not have to use index_col = 0
df.dtypes
# we have objects, int64, float64
df.info()
# we have no missing values
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 918 entries, 0 to 917
Data columns (total 12 columns):
 #   Column          Non-Null Count  Dtype  
---  ------          --------------  -----  
 0   Age             918 non-null    int64  
 1   Sex             918 non-null    object 
 2   ChestPainType   918 non-null    object 
 3   RestingBP       918 non-null    int64  
 4   Cholesterol     918 non-null    int64  
 5   FastingBS       918 non-null    int64  
 6   RestingECG      918 non-null    object 
 7   MaxHR           918 non-null    int64  
 8   ExerciseAngina  918 non-null    object 
 9   Oldpeak         918 non-null    float64
 10  ST_Slope        918 non-null    object 
 11  HeartDisease    918 non-null    int64  
dtypes: float64(1), int64(6), object(5)
memory usage: 86.2+ KB
```

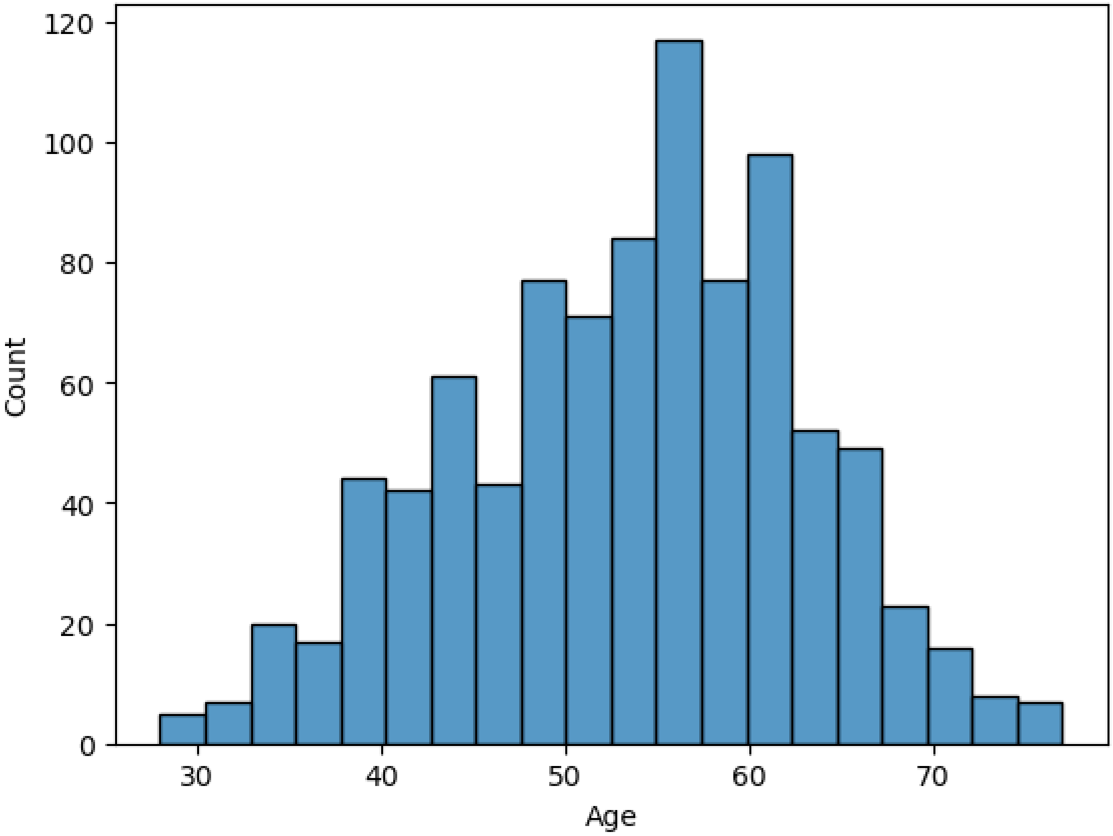
Plot a histogram of the ages of the patients.

In [2]:

```
import seaborn as sns
sns.histplot(df['Age'], bins = 20)
```

Out[2]:

```
<Axes: xlabel='Age', ylabel='Count'>
```



Patient gender:

(a) Use .value_counts() to determine number of males and females.

(b) Calculate percentages of males and females

In [3]:

```
print(df['Sex'].value_counts())
# 725M, 193F, thus 918 total
male_p = (725/918) * 100
female_p = (193/918) * 100
print (male_p)
print (female_p)
```

```
Sex
M    725
F    193
Name: count, dtype: int64
78.9760348583878
21.0239651416122
```

Use .describe() to get a summary of the dataframe.

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

Out[4]:

	Age	RestingBP	Cholesterol	FastingBS	MaxHR	Oldpeak	HeartDisease
count	918.000000	918.000000	918.000000	918.000000	918.000000	918.000000	918.000000
mean	53.510893	132.396514	198.799564	0.233115	136.809368	0.887364	0.553377
std	9.432617	18.514154	109.384145	0.423046	25.460334	1.066570	0.497414
min	28.000000	0.000000	0.000000	0.000000	60.000000	-2.600000	0.000000
25%	47.000000	120.000000	173.250000	0.000000	120.000000	0.000000	0.000000
50%	54.000000	130.000000	223.000000	0.000000	138.000000	0.600000	1.000000
75%	60.000000	140.000000	267.000000	0.000000	156.000000	1.500000	1.000000
max	77.000000	200.000000	603.000000	1.000000	202.000000	6.200000	1.000000

Count the number of patients for each `ChestPainType`

In [5]:
```
df.groupby('ChestPainType').ChestPainType.count()
```

Out[5]:
```
ChestPainType
ASY    496
ATA    173
NAP    203
TA      46
Name: ChestPainType, dtype: int64
```

How many patients have exercise induced angina?

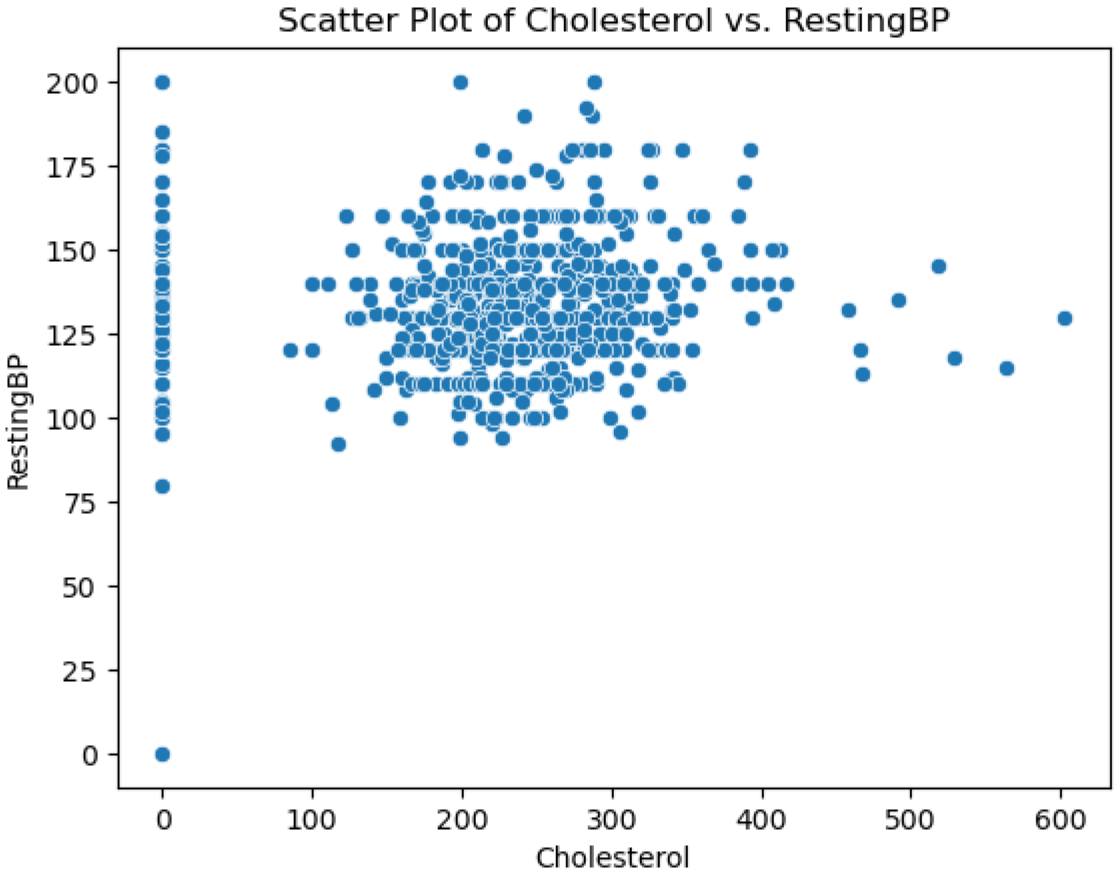
In [6]:
```
df['ExerciseAngina'].value_counts()
# thus, 371 have exercise induced angina
```

Out[6]:
```
ExerciseAngina
N    547
Y    371
Name: count, dtype: int64
```

Get a scatter plot of cholesterol vs. resting blood pressure.

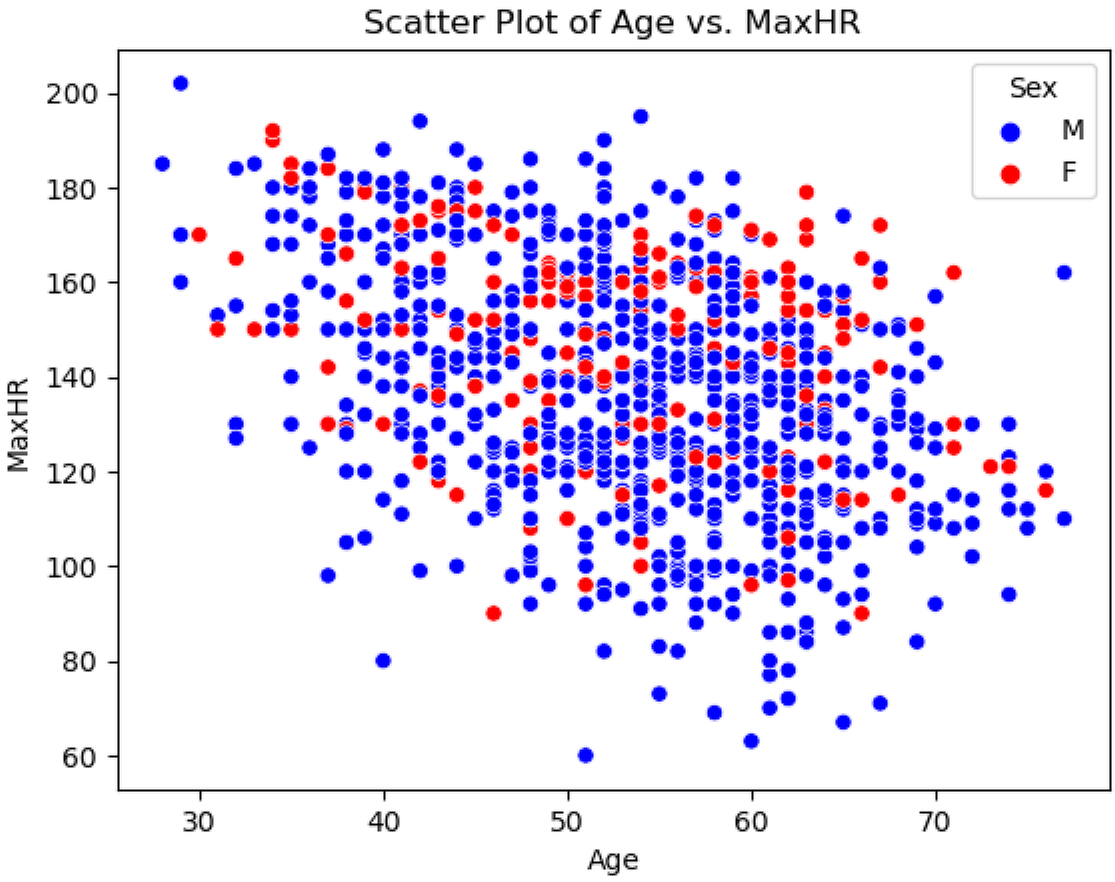
In [7]:

```
import matplotlib.pyplot as plt
sns.scatterplot(x='Cholesterol', y='RestingBP', data=df)
plt.xlabel('Cholesterol')
plt.ylabel('RestingBP')
plt.title('Scatter Plot of Cholesterol vs. RestingBP')
plt.show()
```



Get a scatter plot of `age` vs. `MaxHR` . Give a red dot for female, a blue dot for male, and an ‘o’ (hollow circle) if no age is given in that row.

In [8]:
```
sns.scatterplot(x='Age', y='MaxHR', hue='Sex', style='Sex', data=df, mar
sns.scatterplot(x='Age', y='MaxHR', data=df[df['Age'].isna()], marker='o
plt.xlabel('Age')
plt.ylabel('MaxHR')
plt.title('Scatter Plot of Age vs. MaxHR')
plt.show()
```



What is the average age of male patients? What is the average age of female patients?

In [9]:
```
df.groupby('Sex').Age.mean()
# average male age is roughly 54
# average female age is rougly 52.5
```

Out[9]:
```
Sex
F    52.492228
M    53.782069
Name: Age, dtype: float64
```

For each age:
(a) Count the number of males.
(b) Count the number of females.

In [10]:

```
df.groupby(['Age', 'Sex']).size().unstack(fill_value=0)
# above line counts both males and females in same df
```

Out[10]:

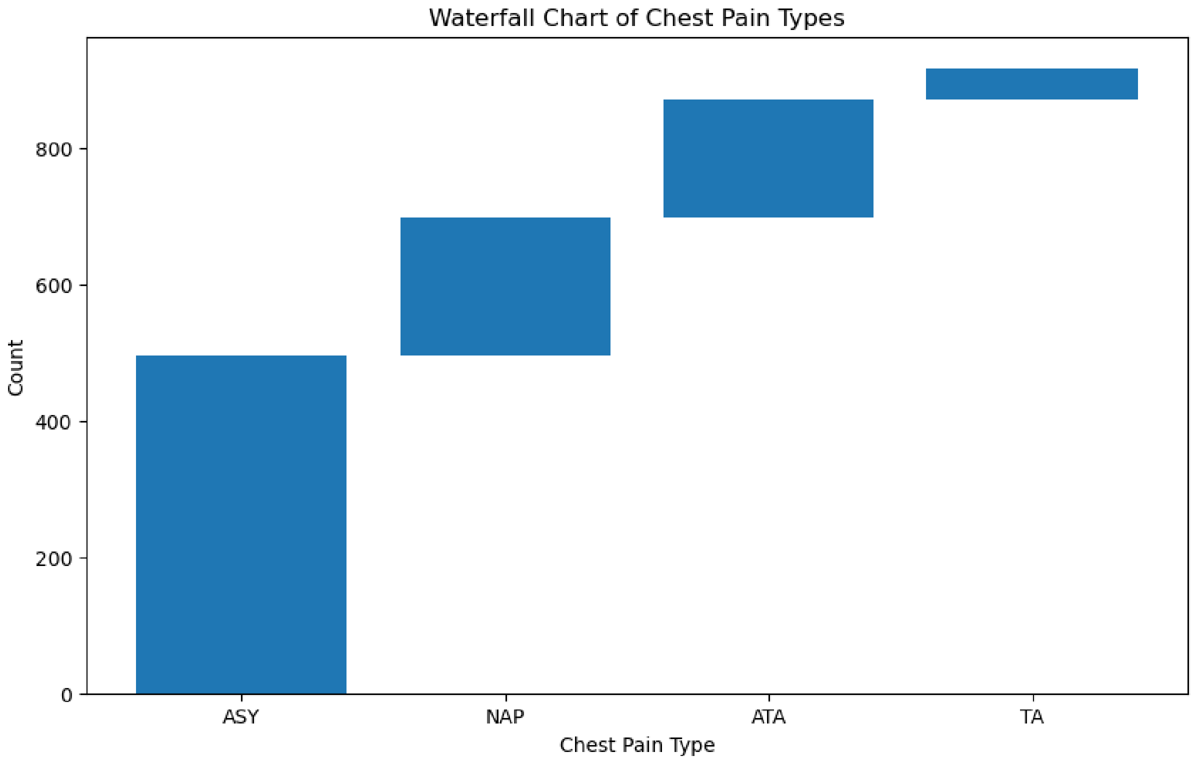
Sex	F	M
Age		
28	0	1
29	0	3
30	1	0
31	1	1
32	1	4
33	1	1
34	2	5
35	3	8
36	0	6
37	4	7
38	3	13
39	3	12
40	1	12
41	7	17
42	3	15
43	9	15
44	3	16
45	6	12
46	4	20
47	4	15
48	9	22
49	6	15
50	7	18
51	11	24
52	5	31
53	6	27
54	15	36
55	7	34
56	5	33
57	6	32
58	7	35
59	3	32
60	5	27

Sex	F	M
Age		
61	4	27
62	10	25
63	6	24
64	6	16
65	4	17
66	4	9
67	3	12
68	1	9
69	1	12
70	0	7
71	3	2
72	0	4
73	1	0
74	1	6
75	0	3
76	1	1
77	0	2

Get a waterfall graph of `ChestPainType` (like the last figure in W1-L3.ipynb.ipynb).

In [11]:

```
chest_pain_counts = df['ChestPainType'].value_counts()
cum = chest_pain_counts.cumsum()
cum_shift = cum.shift(fill_value=0)
fig, ax = plt.subplots(figsize=(10, 6))
ax.bar(chest_pain_counts.index, chest_pain_counts, bottom=cum_shift)
ax.set_xlabel('Chest Pain Type')
ax.set_ylabel('Count')
ax.set_title('Waterfall Chart of Chest Pain Types')
plt.show()
```



Extra credit: Produce an informative visualization of Age and ChestPainType, distinguishing between male and female patients.