```
import pandas as pd
from matplotlib import pyplot as plt
import seaborn as sns
```

```
data = pd.read_csv('/content/aerofit_treadmill.csv')
```

```
data
```

	Product	Age	Gender	Education	MaritalStatus	Usage	Fitness	Income	Miles
0	KP281	18	Male	14	Single	3	4	29562	112
1	KP281	19	Male	15	Single	2	3	31836	75
2	KP281	19	Female	14	Partnered	4	3	30699	66
3	KP281	19	Male	12	Single	3	3	32973	85
4	KP281	20	Male	13	Partnered	4	2	35247	47
...	...	...	...	...	...	...	...	...	...
175	KP781	40	Male	21	Single	6	5	83416	200
176	KP781	42	Male	18	Single	5	4	89641	200
177	KP781	45	Male	16	Single	5	5	90886	160
178	KP781	47	Male	18	Partnered	4	5	104581	120
179	KP781	48	Male	18	Partnered	4	5	95508	180

180 rows × 9 columns

Basic Analysis

```
data.shape
```

```
(180, 9)
```

```
data.dtypes
```

```
Product          object
Age               int64
Gender           object
Education         int64
MaritalStatus    object
Usage             int64
Fitness           int64
Income            int64
Miles             int64
dtype: object
```

```
#Convertion of categorical Attributes
data['Gender'] = data['Gender'].astype('category')
data['MaritalStatus'] = data['MaritalStatus'].astype('category')
```

```
data.dtypes
```

```
Product            object
Age                 int64
Gender           category
Education           int64
MaritalStatus    category
Usage               int64
Fitness             int64
Income              int64
Miles               int64
dtype: object
```

```
#Missing values
data.isnull().sum()
```

```
Product          0
Age              0
Gender           0
Education        0
MaritalStatus    0
Usage            0
Fitness          0
```

```
Income           0
Miles            0
dtype: int64
```

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 180 entries, 0 to 179
Data columns (total 9 columns):
 #   Column         Non-Null Count  Dtype
---  ------         --------------  -----
 0   Product        180 non-null    object
 1   Age            180 non-null    int64
 2   Gender         180 non-null    category
 3   Education      180 non-null    int64
 4   MaritalStatus  180 non-null    category
 5   Usage          180 non-null    int64
 6   Fitness        180 non-null    int64
 7   Income         180 non-null    int64
 8   Miles          180 non-null    int64
dtypes: category(2), int64(6), object(1)
memory usage: 10.6+ KB
```

```
#Statistical Summary
data.describe()
```

	Age	Education	Usage	Fitness	Income	Miles
count	180.000000	180.000000	180.000000	180.000000	180.000000	180.000000
mean	28.788889	15.572222	3.455556	3.311111	53719.577778	103.194444
std	6.943498	1.617055	1.084797	0.958869	16506.684226	51.863605
min	18.000000	12.000000	2.000000	1.000000	29562.000000	21.000000
25%	24.000000	14.000000	3.000000	3.000000	44058.750000	66.000000
50%	26.000000	16.000000	3.000000	3.000000	50596.500000	94.000000
75%	33.000000	16.000000	4.000000	4.000000	58668.000000	114.750000
max	50.000000	21.000000	7.000000	5.000000	104581.000000	360.000000

```
#Value count
data['Product'].value_counts()
```

```
KP281    80
KP481    60
KP781    40
Name: Product, dtype: int64
```

```
data['Age'].value_counts()
```

```
25    25
23    18
24    12
26    12
28     9
35     8
33     8
30     7
38     7
21     7
22     7
27     7
31     6
34     6
29     6
20     5
40     5
32     4
19     4
48     2
37     2
45     2
47     2
46     1
50     1
18     1
44     1
43     1
41     1
39     1
36     1
42     1
Name: Age, dtype: int64
```

```
data['MaritalStatus'].value_counts()
```

```
Partnered    107
Single        73
Name: MaritalStatus, dtype: int64
```

```
#Unique Value
data['Age'].unique()
```

```
array([18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34,
       35, 36, 37, 38, 39, 40, 41, 43, 44, 46, 47, 50, 45, 48, 42])
```

```
data['Education'].unique()
```

```
array([14, 15, 12, 13, 16, 18, 20, 21])
```

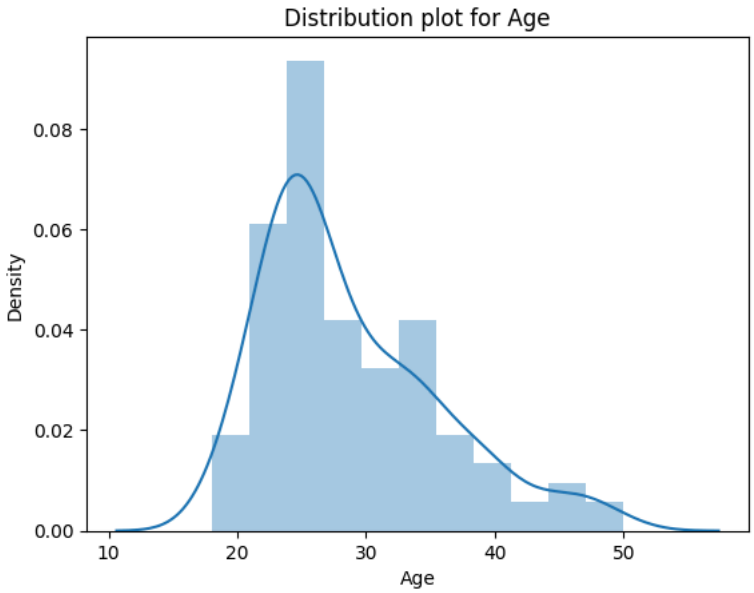
```
data['Fitness'].unique()
```

```
array([4, 3, 2, 1, 5])
```

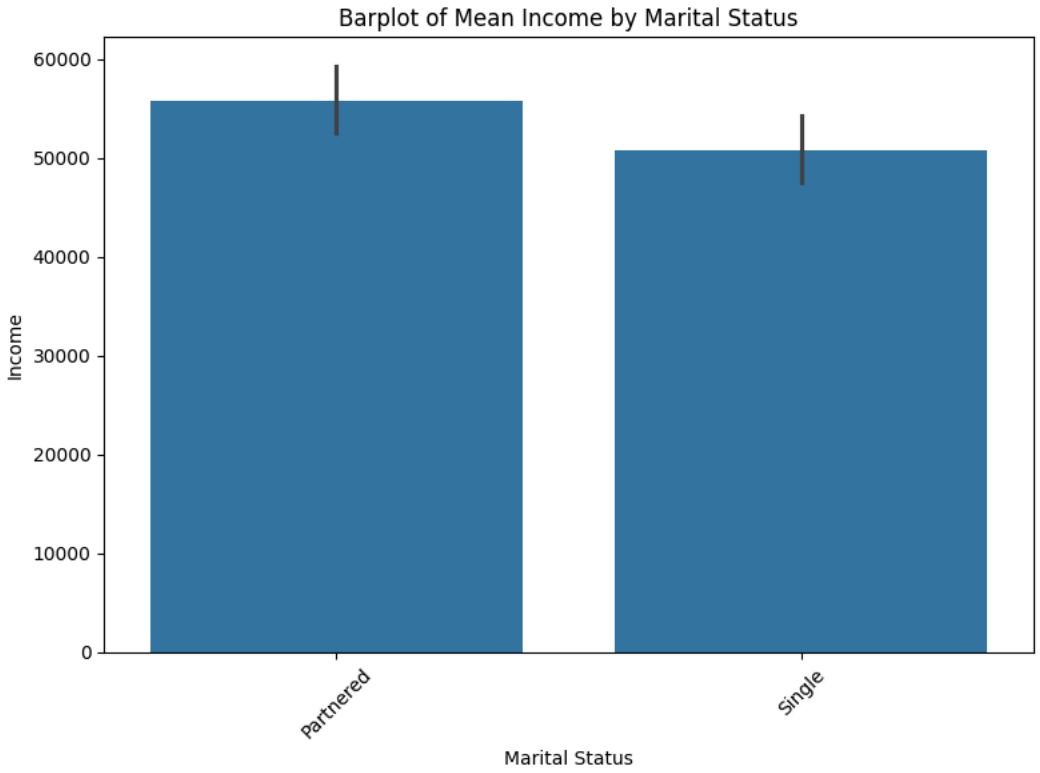
Visual Analysis

```
#Continuous Variable
sns.distplot(data['Age'] , kde = True )
plt.title('Distribution plot for Age')
```

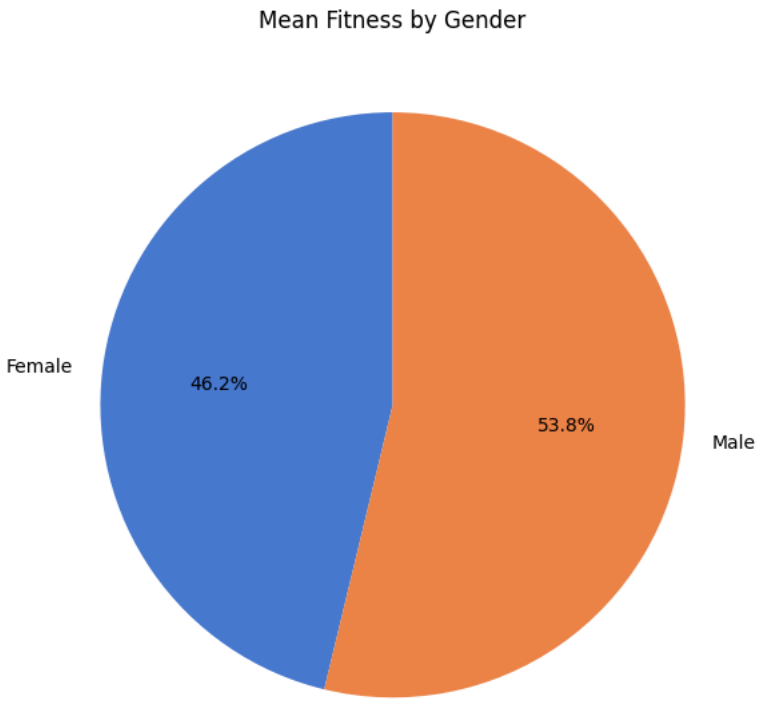
```
<ipython-input-19-ea25fbf59195>:2: UserWarning:

`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 with
similar flexibility) or `histplot` (an axes-level function for histograms).

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

  sns.distplot(data['Age'] , kde = True )
Text(0.5, 1.0, 'Distribution plot for Age')
```




```
#Disceret variable

plt.figure(figsize=(8, 6))
sns.barplot(x='MaritalStatus', y='Income', data=data)
plt.title('Barplot of Mean Income by Marital Status')
plt.xlabel('Marital Status')
plt.ylabel('Income')
plt.xticks(rotation=45)  # Rotate x-axis labels for better visibility
plt.tight_layout()
plt.show()
```




```
mean_fitness_by_gender = data.groupby('Gender')['Fitness'].mean()

plt.figure(figsize=(8, 6))
plt.pie(mean_fitness_by_gender, labels=mean_fitness_by_gender.index, autopct='%1.1f%%', startangle=90, colors=sns.color_palette('muted')
plt.title('Mean Fitness by Gender')
plt.tight_layout()
plt.show()
```

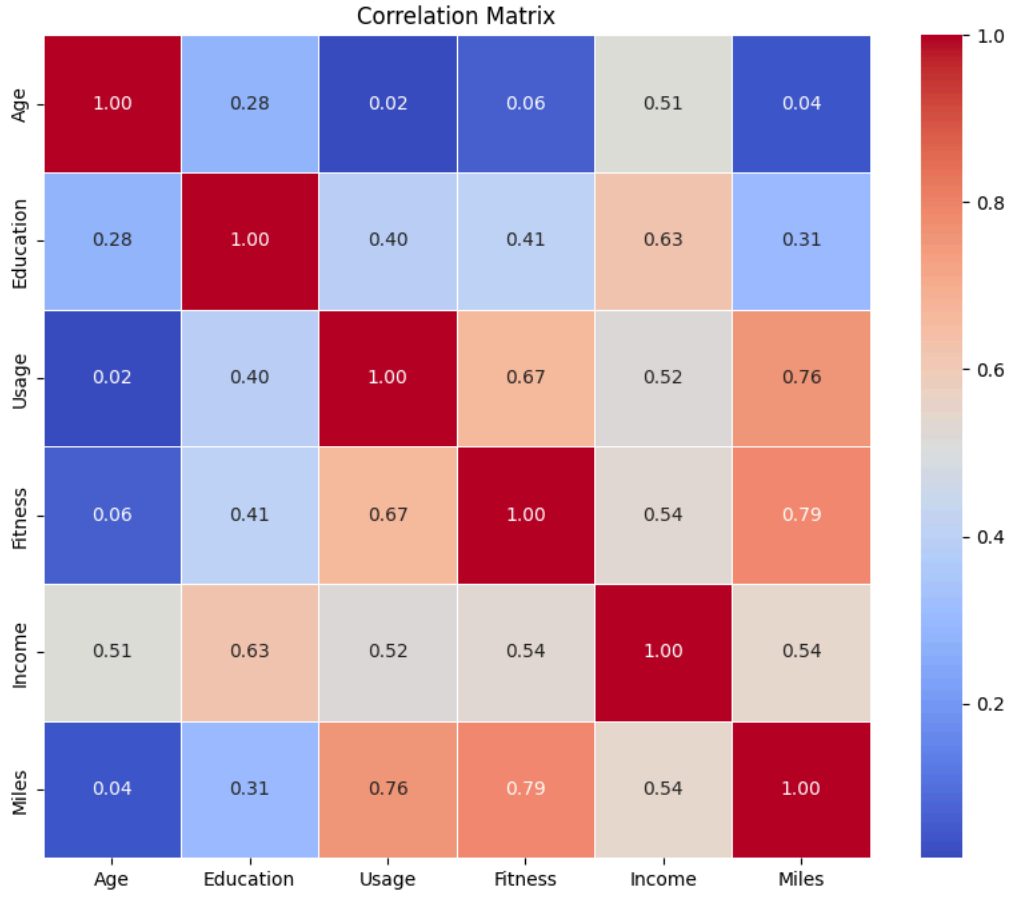



```
# Correlation Analysis

correlation = data.corr()
correlation
```

```
<ipython-input-22-1a65a135d714>:3: FutureWarning: The default value of numeric_only in DataFrame.corr is deprecated. In a future ver
  correlation = data.corr()
```

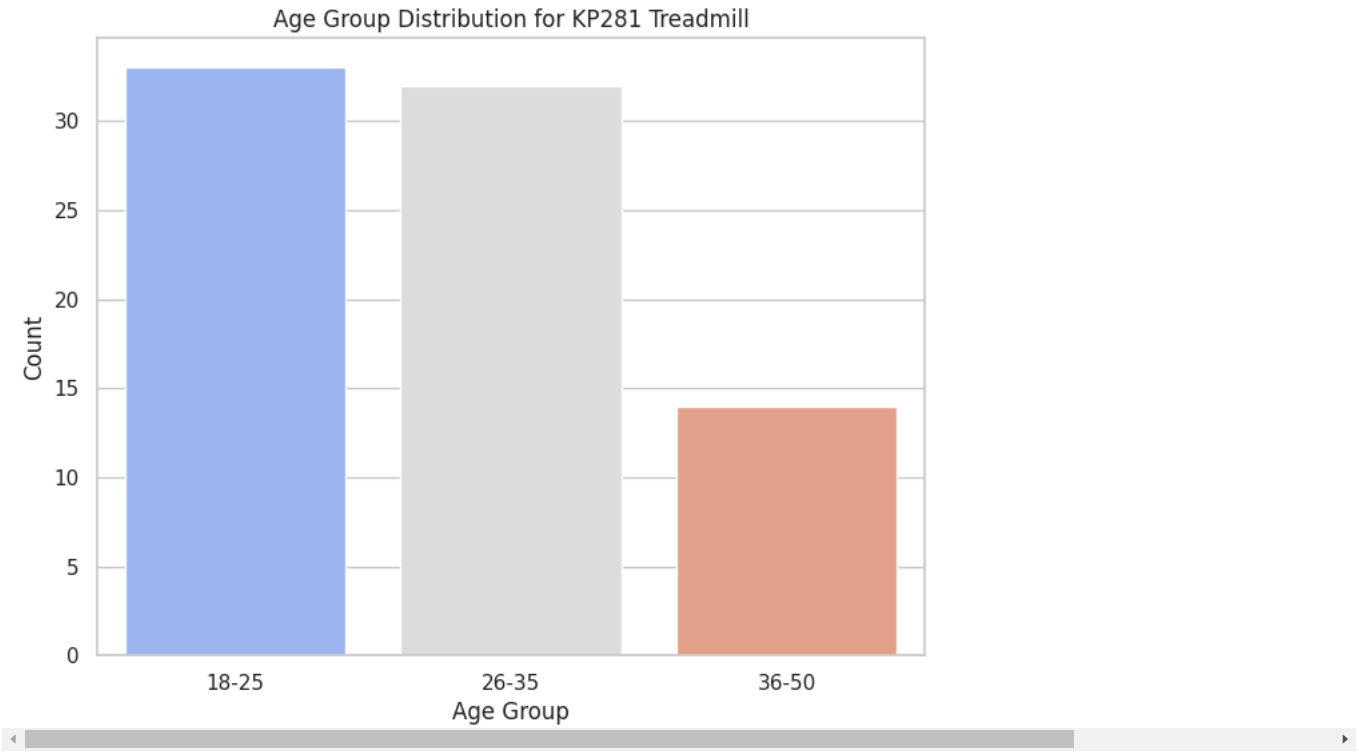
	Age	Education	Usage	Fitness	Income	Miles
Age	1.000000	0.280496	0.015064	0.061105	0.513414	0.036618
Education	0.280496	1.000000	0.395155	0.410581	0.625827	0.307284
Usage	0.015064	0.395155	1.000000	0.668606	0.519537	0.759130
Fitness	0.061105	0.410581	0.668606	1.000000	0.535005	0.785702
Income	0.513414	0.625827	0.519537	0.535005	1.000000	0.543473
Miles	0.036618	0.307284	0.759130	0.785702	0.543473	1.000000

```
#Heatmap

plt.figure(figsize=(10, 8))
sns.heatmap(correlation, annot= True, cmap = 'coolwarm' , fmt = '.2f' , linewidths=0.5)
plt.title('Correlation Matrix')
plt.show()
```




```
#Customer profiling

sns.set(style='whitegrid')
kp281_data = data[data['Product'] == 'KP281']

age_groups = pd.cut(kp281_data['Age'], bins=[18, 25, 35, 50], labels=['18-25', '26-35', '36-50'])
age_group_counts = age_groups.value_counts().sort_index()

plt.figure(figsize=(8, 6))
sns.barplot(x=age_group_counts.index, y=age_group_counts.values, palette='coolwarm')
plt.title('Age Group Distribution for KP281 Treadmill')
plt.xlabel('Age Group')
plt.ylabel('Count')
plt.show()
```

```
<ipython-input-37-7261d18f5730>:10: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to `hue` and set `le

  sns.barplot(x=age_group_counts.index, y=age_group_counts.values, palette='coolwarm')
```

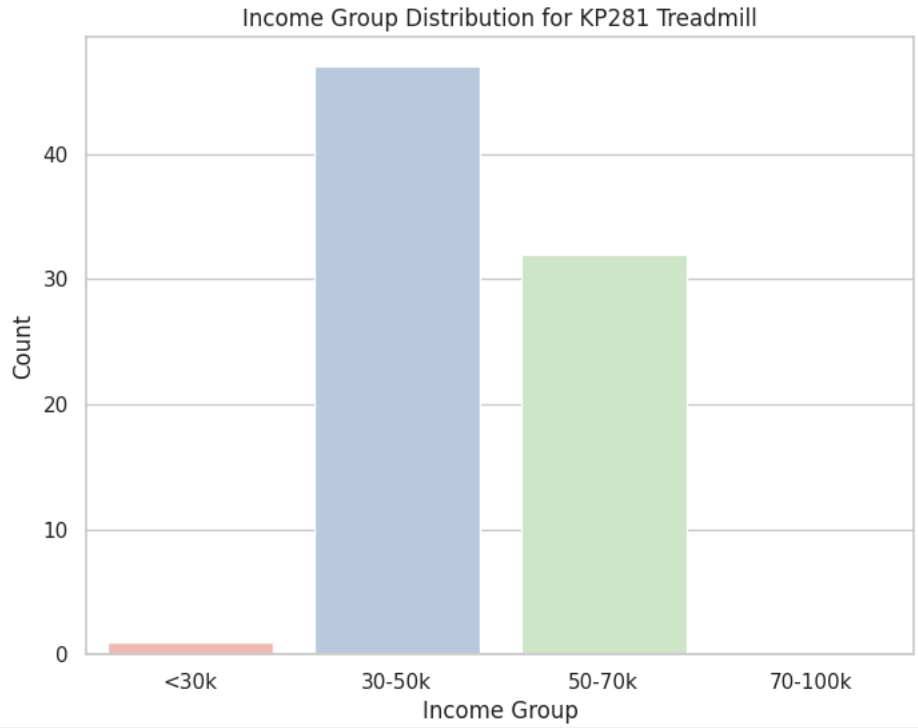



```
gender_counts = kp281_data['Gender'].value_counts()

# Plotting gender distribution
plt.figure(figsize=(8, 6))
sns.barplot(x=gender_counts.index, y=gender_counts.values, palette='Set2')
plt.title('Gender Distribution for KP281 Treadmill')
plt.xlabel('Gender')
plt.ylabel('Count')
plt.show()
```

```
<ipython-input-38-c7018787f702>:5: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to `hue` and set `le

  sns.barplot(x=gender_counts.index, y=gender_counts.values, palette='Set2')
```


```
# Customer profiling by income group
income_groups = pd.cut(kp281_data['Income'], bins=[0, 30000, 50000, 70000, 100000], labels=['<30k', '30-50k', '50-70k', '70-100k'])
income_group_counts = income_groups.value_counts().sort_index()

# Plotting income group distribution
plt.figure(figsize=(8, 6))
sns.barplot(x=income_group_counts.index, y=income_group_counts.values, palette='Pastel1')
plt.title('Income Group Distribution for KP281 Treadmill')
plt.xlabel('Income Group')
plt.ylabel('Count')
plt.show()
```

```
<ipython-input-39-67d5a9e22312>:7: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to `hue` and set `le

  sns.barplot(x=income_group_counts.index, y=income_group_counts.values, palette='Pastel1')
```

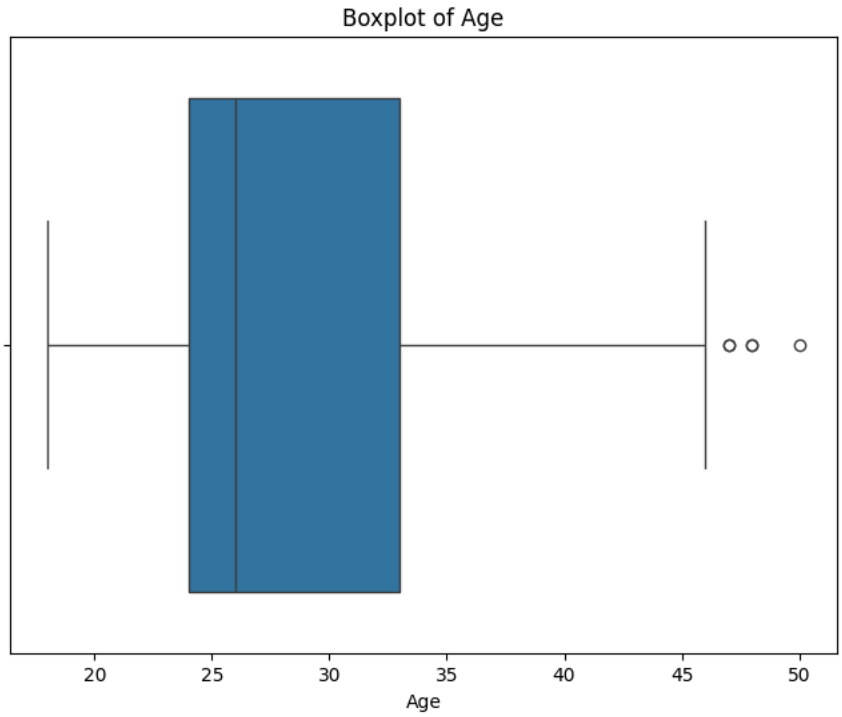


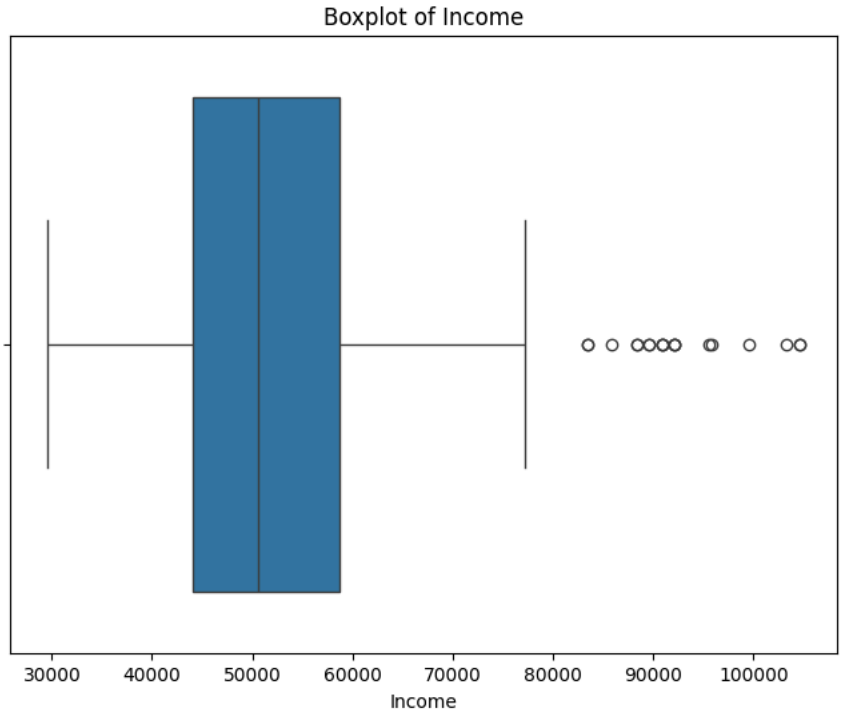
Missing Value & Outlier Detection

```
data.isnull().sum()
```

```
Product          0
Age              0
Gender           0
Education        0
MaritalStatus    0
Usage            0
Fitness          0
Income           0
Miles            0
dtype: int64
```

```
#Outlier
cols = ['Age' , 'Income' , 'Fitness' , 'Miles']
for c in cols:
  plt.figure(figsize=(8,6))
  sns.boxplot(x = c, data = data)
  plt.title(f'Boxplot of {c}')
  plt.show()
```





Boxplot of Fitness

```
#Marginal Probability (What percent of customers have purchased KP281, KP481, or KP781):

cross_tab = pd.crosstab(index=data['Product'], columns='count')

marginal_probabilities = cross_tab / cross_tab.sum() * 100

marginal_probabilities
```

col_0	count
Product	
KP281	44.444444
KP481	33.333333
KP781	22.222222

```
# Probability that the customer buys a product based on each column:
```