How the data look like

In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from scipy.stats import poisson, expon, norm
```

In [2]:
```
df = pd.read_csv('aerofit_treadmill.csv')
df.head()
```

Out[2]:

	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

In [3]:
```
df.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    object
 3   Education      180 non-null    int64 
 4   MaritalStatus  180 non-null    object
 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: int64(6), object(3)
memory usage: 12.8+ KB
```

In [4]:
```
df.shape
```

Out[4]:
```
(180, 9)
```

In [6]:
```
df.ndim
```

Out[6]:
```
2
```

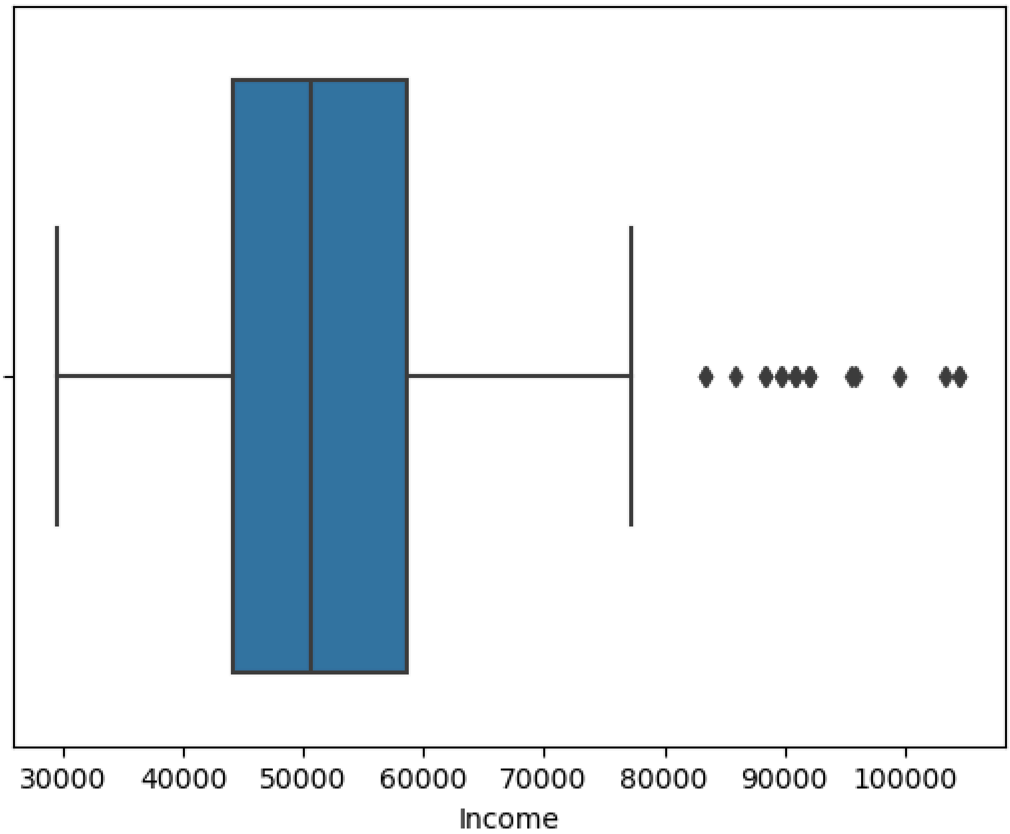
In [7]:
```
df.isnull().sum()
```

Out[7]:
```
Product          0
Age              0
Gender           0
Education        0
MaritalStatus    0
Usage            0
Fitness          0
Income           0
Miles            0
dtype: int64
```

Finding the Outliers

Income column

In [8]:
```
sns.boxplot(data = df, x = 'Income')
plt.show()
```



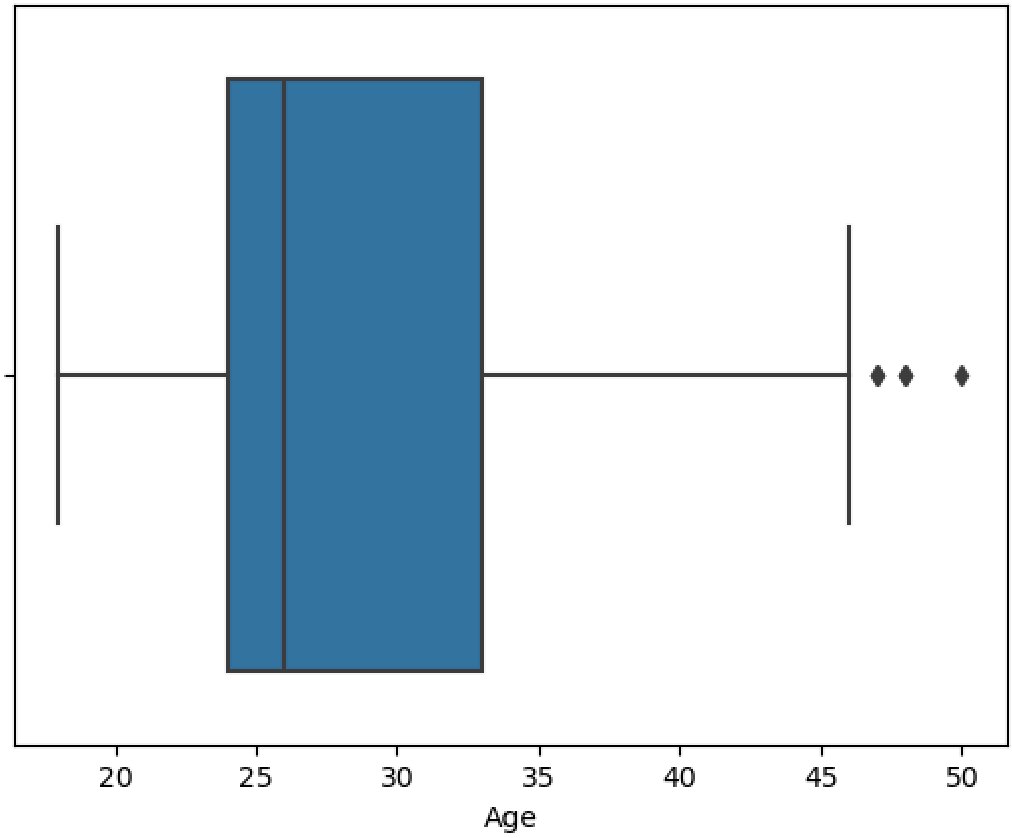
In [9]:
```
q1 = df['Income'].quantile(0.25)
q3 = df['Income'].quantile(0.75)
IQR = q3 - q1
df[(df['Income'] < (q1 - 1.5*IQR)) | (df['Income'] > (q3 + 1.5*IQR))]
```

Out[9]:

	Product	Age	Gender	Education	MaritalStatus	Usage	Fitness	Income	Miles
159	KP781	27	Male	16	Partnered	4	5	83416	160
160	KP781	27	Male	18	Single	4	3	88396	100
161	KP781	27	Male	21	Partnered	4	4	90886	100
162	KP781	28	Female	18	Partnered	6	5	92131	180
164	KP781	28	Male	18	Single	6	5	88396	150
166	KP781	29	Male	14	Partnered	7	5	85906	300
167	KP781	30	Female	16	Partnered	6	5	90886	280
168	KP781	30	Male	18	Partnered	5	4	103336	160
169	KP781	30	Male	18	Partnered	5	5	99601	150
170	KP781	31	Male	16	Partnered	6	5	89641	260
171	KP781	33	Female	18	Partnered	4	5	95866	200
172	KP781	34	Male	16	Single	5	5	92131	150
173	KP781	35	Male	16	Partnered	4	5	92131	360
174	KP781	38	Male	18	Partnered	5	5	104581	150
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

For age column

In [10]:
```
sns.boxplot(data = df, x = 'Age')
plt.show()
```



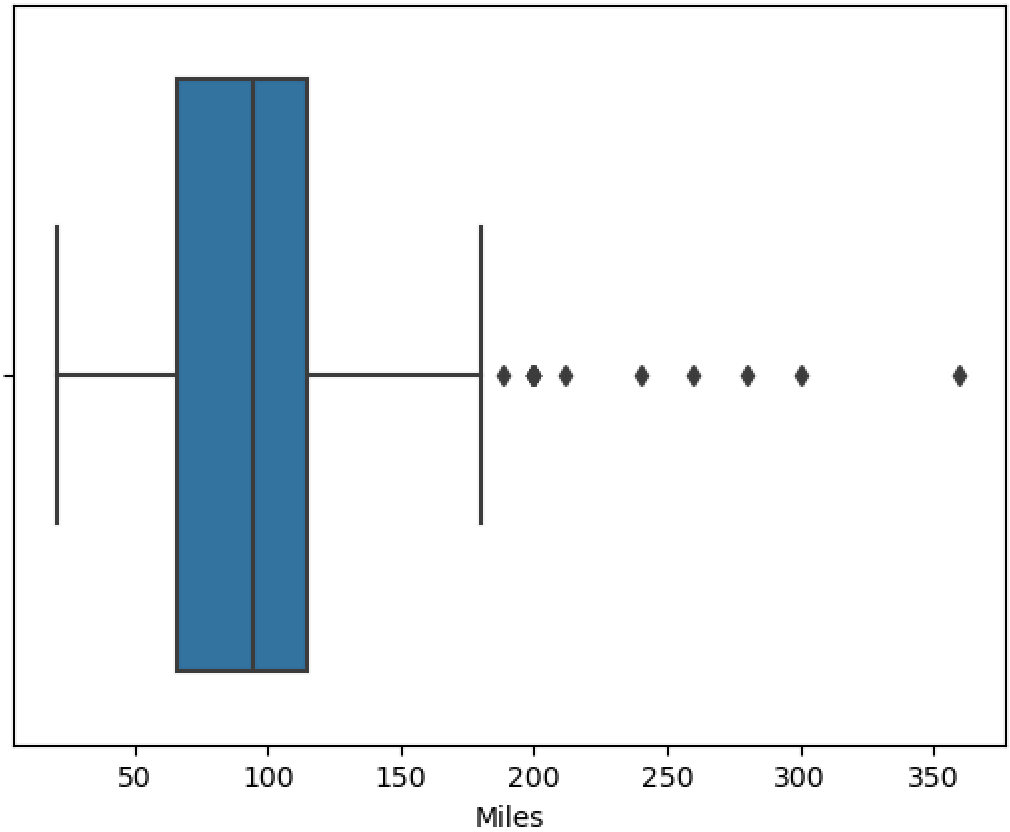
In [11]:
```
q1 = df['Age'].quantile(0.25)
q3 = df['Age'].quantile(0.75)
IQR = q3 - q1
df[(df['Age'] < (q1 - 1.5*IQR)) | (df['Age'] > (q3 + 1.5*IQR))]
```

Out[11]:

	Product	Age	Gender	Education	MaritalStatus	Usage	Fitness	Income	Miles
78	KP281	47	Male	16	Partnered	4	3	56850	94
79	KP281	50	Female	16	Partnered	3	3	64809	66
139	KP481	48	Male	16	Partnered	2	3	57987	64
178	KP781	47	Male	18	Partnered	4	5	104581	120
179	KP781	48	Male	18	Partnered	4	5	95508	180

For Miles Column

In [12]:
```
sns.boxplot(data = df, x = 'Miles')
plt.show()
```



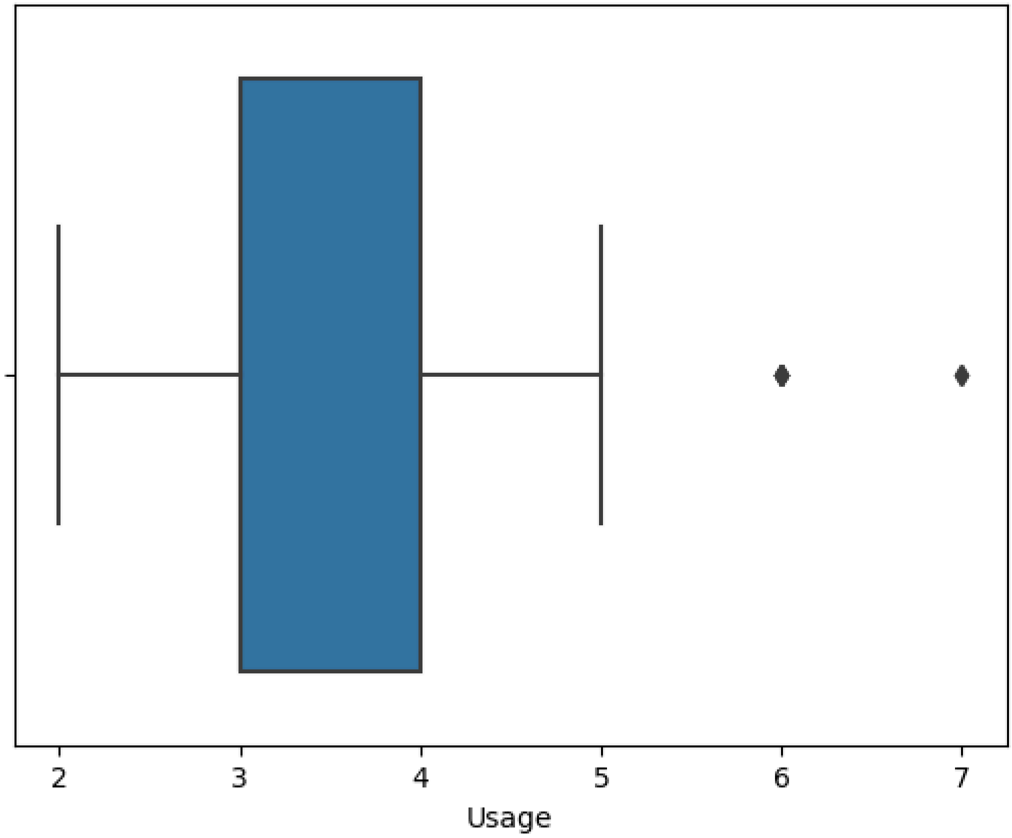
In [13]:
```
q1 = df['Miles'].quantile(0.25)
q3 = df['Miles'].quantile(0.75)
IQR = q3 - q1
df[(df['Miles'] < (q1 - 1.5*IQR)) | (df['Miles'] > (q3 + 1.5*IQR))]
```

Out[13]:

	Product	Age	Gender	Education	MaritalStatus	Usage	Fitness	Income	Miles
23	KP281	24	Female	16	Partnered	5	5	44343	188
84	KP481	21	Female	14	Partnered	5	4	34110	212
142	KP781	22	Male	18	Single	4	5	48556	200
148	KP781	24	Female	16	Single	5	5	52291	200
152	KP781	25	Female	18	Partnered	5	5	61006	200
155	KP781	25	Male	18	Partnered	6	5	75946	240
166	KP781	29	Male	14	Partnered	7	5	85906	300
167	KP781	30	Female	16	Partnered	6	5	90886	280
170	KP781	31	Male	16	Partnered	6	5	89641	260
171	KP781	33	Female	18	Partnered	4	5	95866	200
173	KP781	35	Male	16	Partnered	4	5	92131	360
175	KP781	40	Male	21	Single	6	5	83416	200
176	KP781	42	Male	18	Single	5	4	89641	200

For Usage column

In [14]:
```
sns.boxplot(data = df, x = 'Usage')
plt.show()
```



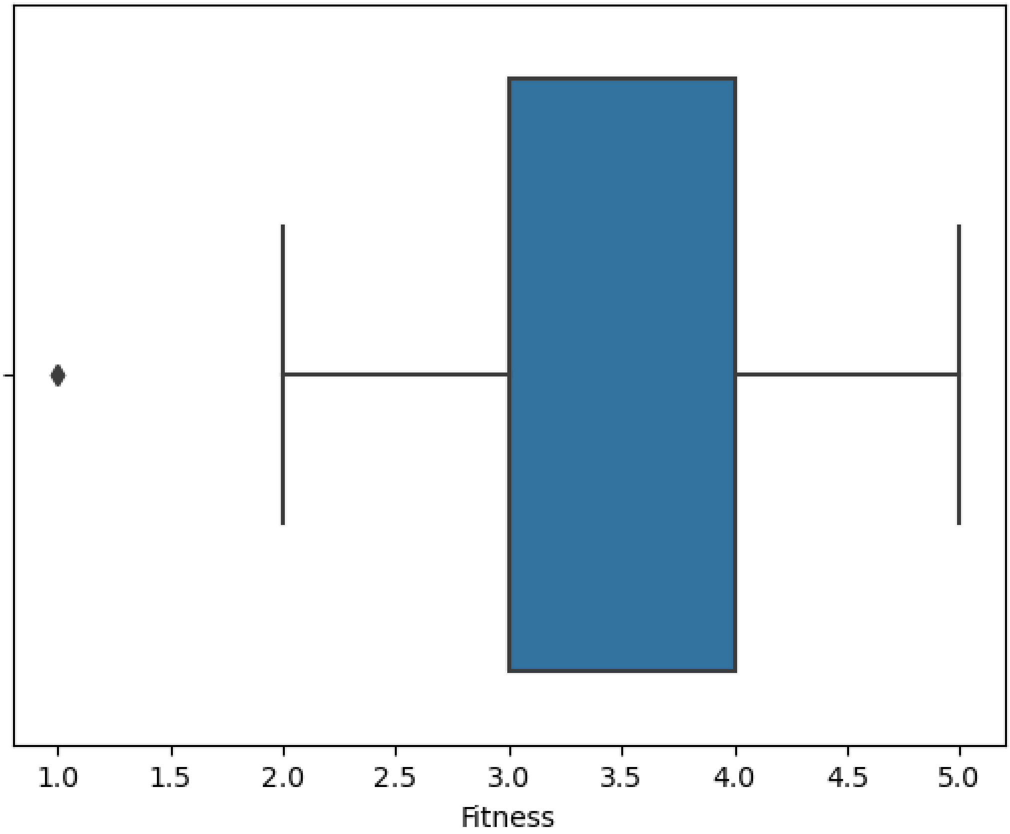
In [15]:
```
q1 = df['Usage'].quantile(0.25)
q3 = df['Usage'].quantile(0.75)
IQR = q3 - q1
df[(df['Usage'] < (q1 - 1.5*IQR)) | (df['Usage'] > (q3 + 1.5*IQR))]
```

Out[15]:

	Product	Age	Gender	Education	MaritalStatus	Usage	Fitness	Income	Miles
154	KP781	25	Male	18	Partnered	6	4	70966	180
155	KP781	25	Male	18	Partnered	6	5	75946	240
162	KP781	28	Female	18	Partnered	6	5	92131	180
163	KP781	28	Male	18	Partnered	7	5	77191	180
164	KP781	28	Male	18	Single	6	5	88396	150
166	KP781	29	Male	14	Partnered	7	5	85906	300
167	KP781	30	Female	16	Partnered	6	5	90886	280
170	KP781	31	Male	16	Partnered	6	5	89641	260
175	KP781	40	Male	21	Single	6	5	83416	200

For Fitness column

In [16]:
```
sns.boxplot(data = df, x = 'Fitness')
plt.show()
```



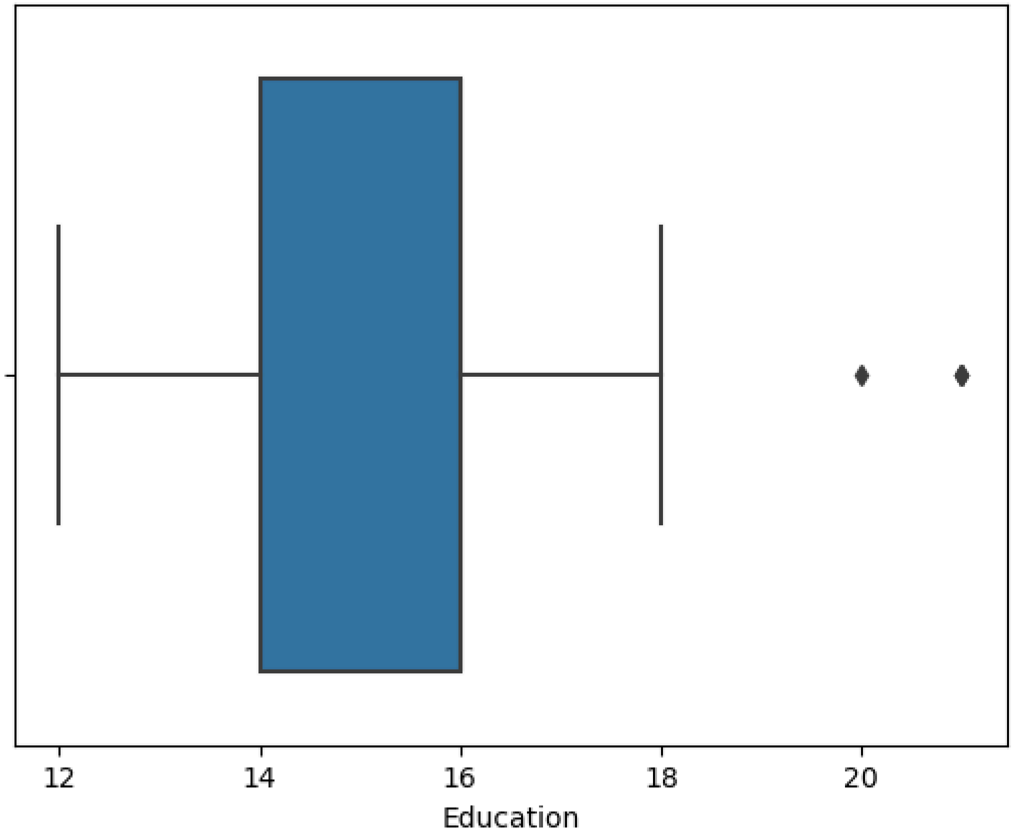
In [17]:
```
q1 = df['Fitness'].quantile(0.25)
q3 = df['Fitness'].quantile(0.75)
IQR = q3 - q1
df[(df['Fitness'] < (q1 - 1.5*IQR)) | (df['Fitness'] > (q3 + 1.5*IQR))]
```

Out[17]:

	Product	Age	Gender	Education	MaritalStatus	Usage	Fitness	Income	Miles
14	KP281	23	Male	16	Partnered	3	1	38658	47
117	KP481	31	Female	18	Single	2	1	65220	21

For Education column

In [18]:
```
sns.boxplot(data = df, x = 'Education')
plt.show()
```



In [19]:
```
q1 = df['Education'].quantile(0.25)
q3 = df['Education'].quantile(0.75)
IQR = q3 - q1
df[(df['Education'] < (q1 - 1.5*IQR)) | (df['Education'] > (q3 + 1.5*IQR))]
```

Out[19]:

	Product	Age	Gender	Education	MaritalStatus	Usage	Fitness	Income	Miles
156	KP781	25	Male	20	Partnered	4	5	74701	170
157	KP781	26	Female	21	Single	4	3	69721	100
161	KP781	27	Male	21	Partnered	4	4	90886	100
175	KP781	40	Male	21	Single	6	5	83416	200

Clipping the Data

In [20]:
```
minn = np.percentile(df['Income'], 5)
maxx = np.percentile(df['Income'], 95)
df['Income'] = np.clip(df['Income'], minn, maxx)
```

In [21]:
```
minn1 = np.percentile(df['Age'], 5)
maxx1 = np.percentile(df['Age'], 95)
df['Age'] = np.clip(df['Age'], minn1, maxx1)
```

In [22]:
```
minn2 = np.percentile(df['Education'], 5)
maxx2 = np.percentile(df['Education'], 95)
df['Education'] = np.clip(df['Education'], minn2, maxx2)
```

In [23]:
```
minn3 = np.percentile(df['Fitness'], 5)
maxx3 = np.percentile(df['Fitness'], 95)
df['Fitness'] = np.clip(df['Fitness'], minn3, maxx3)
```

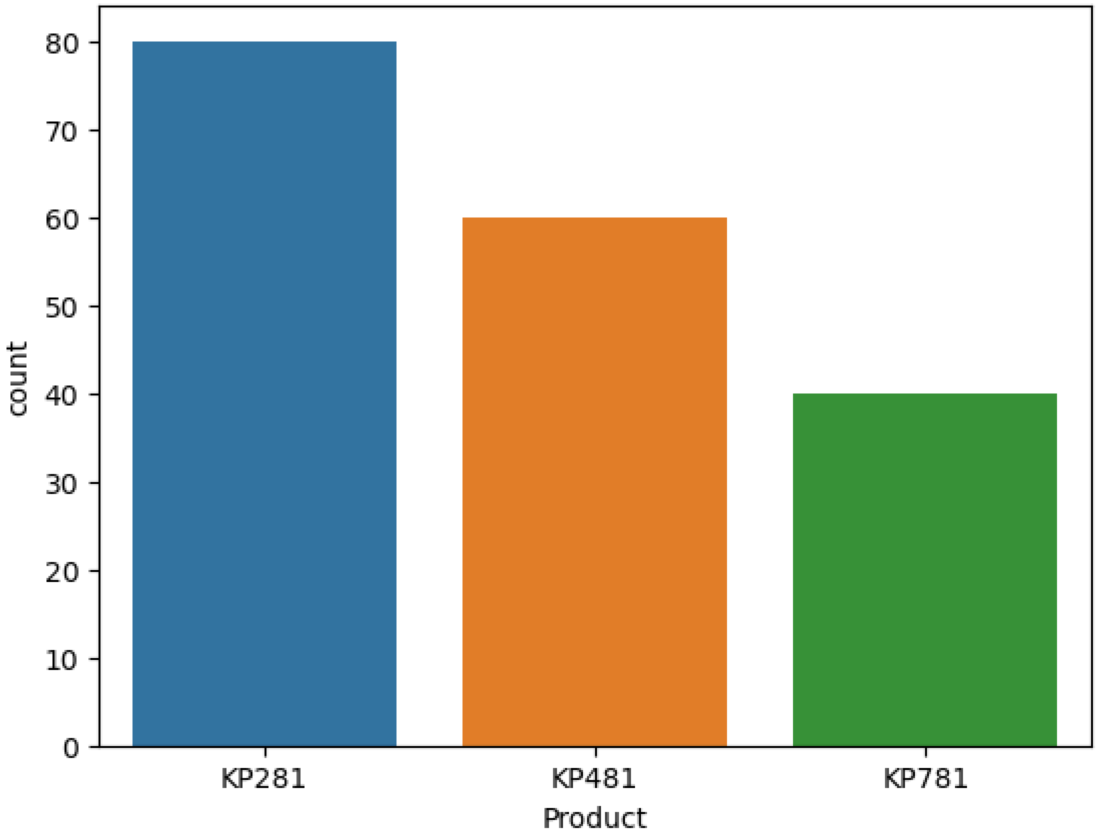
In [24]:
```
minn4 = np.percentile(df['Miles'], 5)
maxx4 = np.percentile(df['Miles'], 95)
df['Miles'] = np.clip(df['Miles'], minn4, maxx4)
```

In [25]:
```
minn5 = np.percentile(df['Usage'], 5)
maxx5 = np.percentile(df['Usage'], 95)
df['Usage'] = np.clip(df['Usage'], minn5, maxx5)
```

Univariate Analysis

In [65]:
```
sns.countplot(data = df, x = 'Product')
```

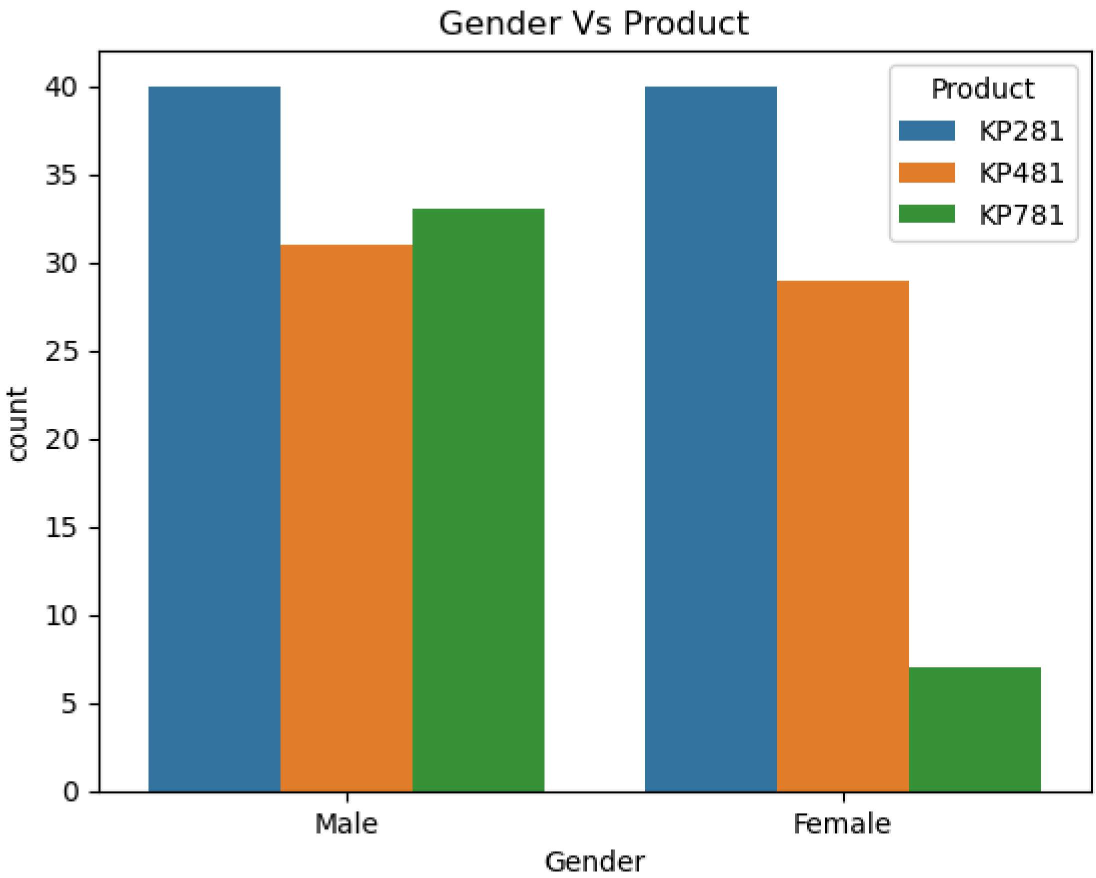
Out[65]: <Axes: xlabel='Product', ylabel='count'>



Bivariate Analysis

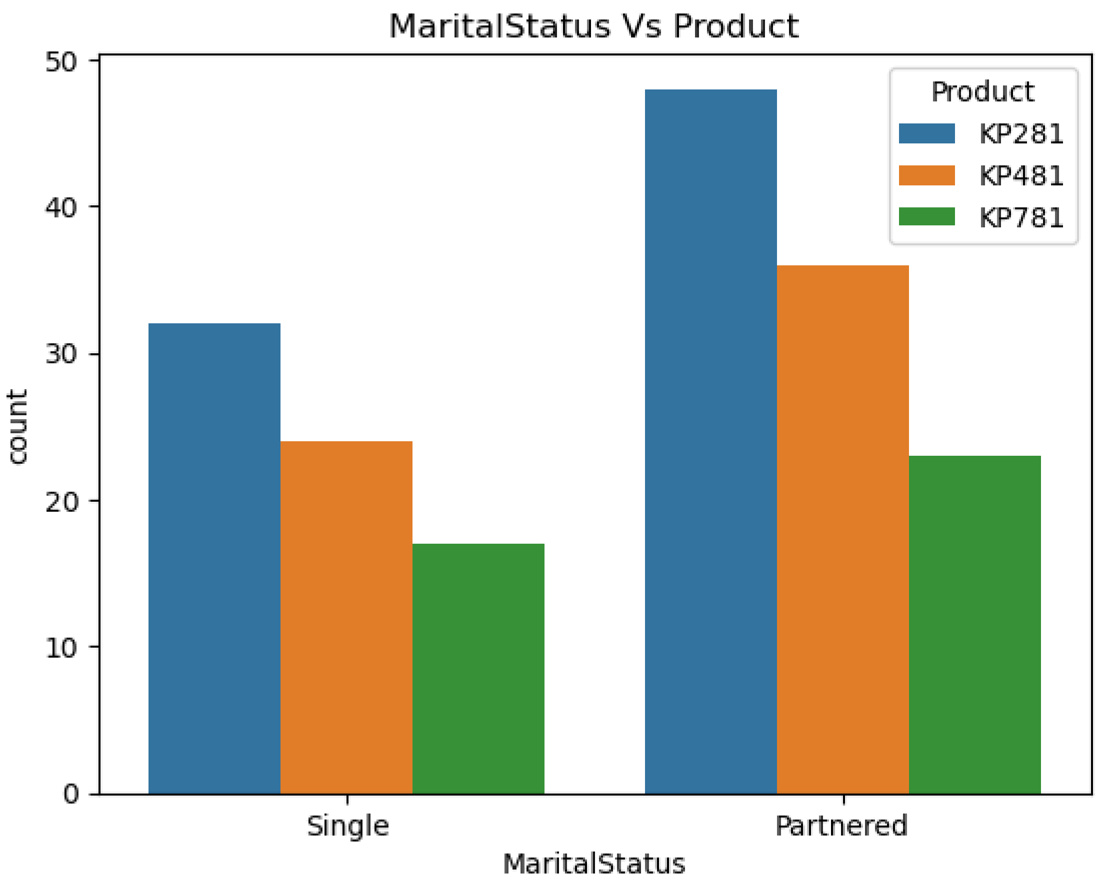
In [26]:
```
sns.countplot(data = df, x = 'Gender', hue = 'Product')
plt.title('Gender Vs Product')
plt.show
```

Out[26]:
```
<function matplotlib.pyplot.show(close=None, block=None)>
```



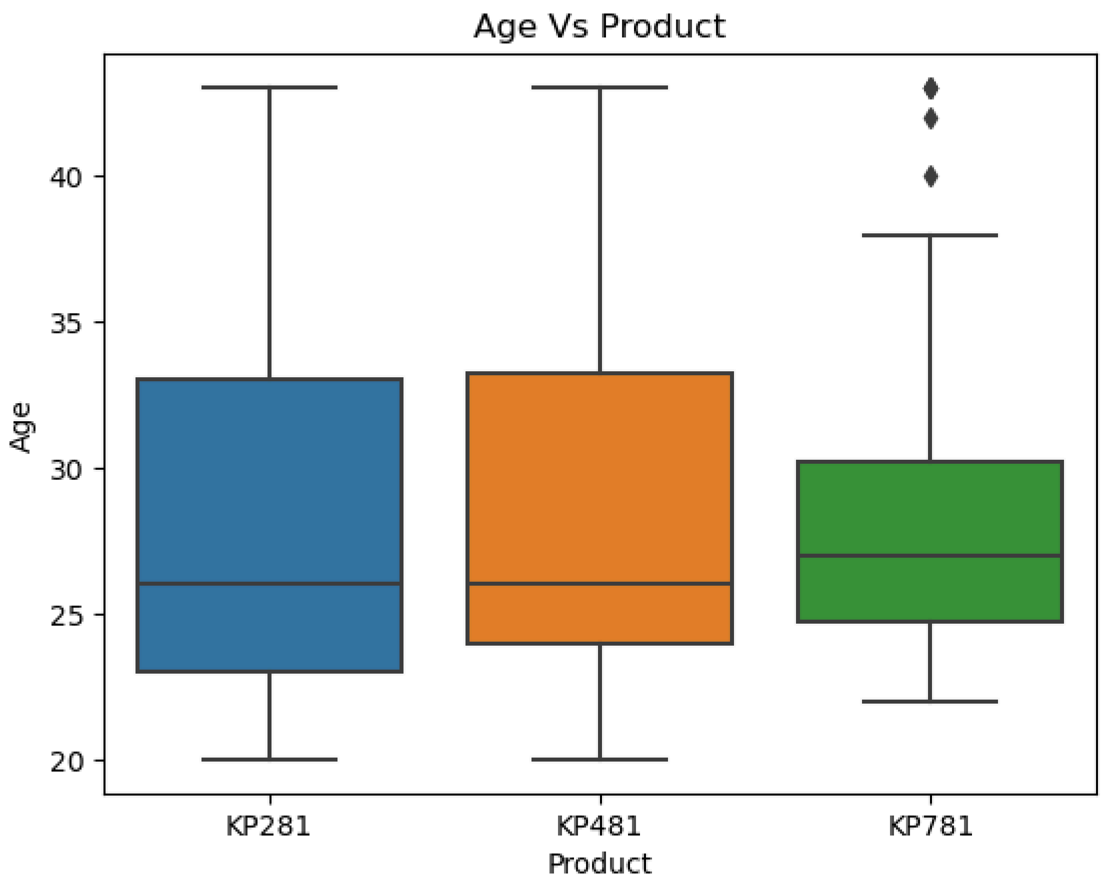
In [27]:
```
sns.countplot(data = df, x = 'MaritalStatus', hue = 'Product')
plt.title('MaritalStatus Vs Product')
plt.show
```

Out[27]: <function matplotlib.pyplot.show(close=None, block=None)>



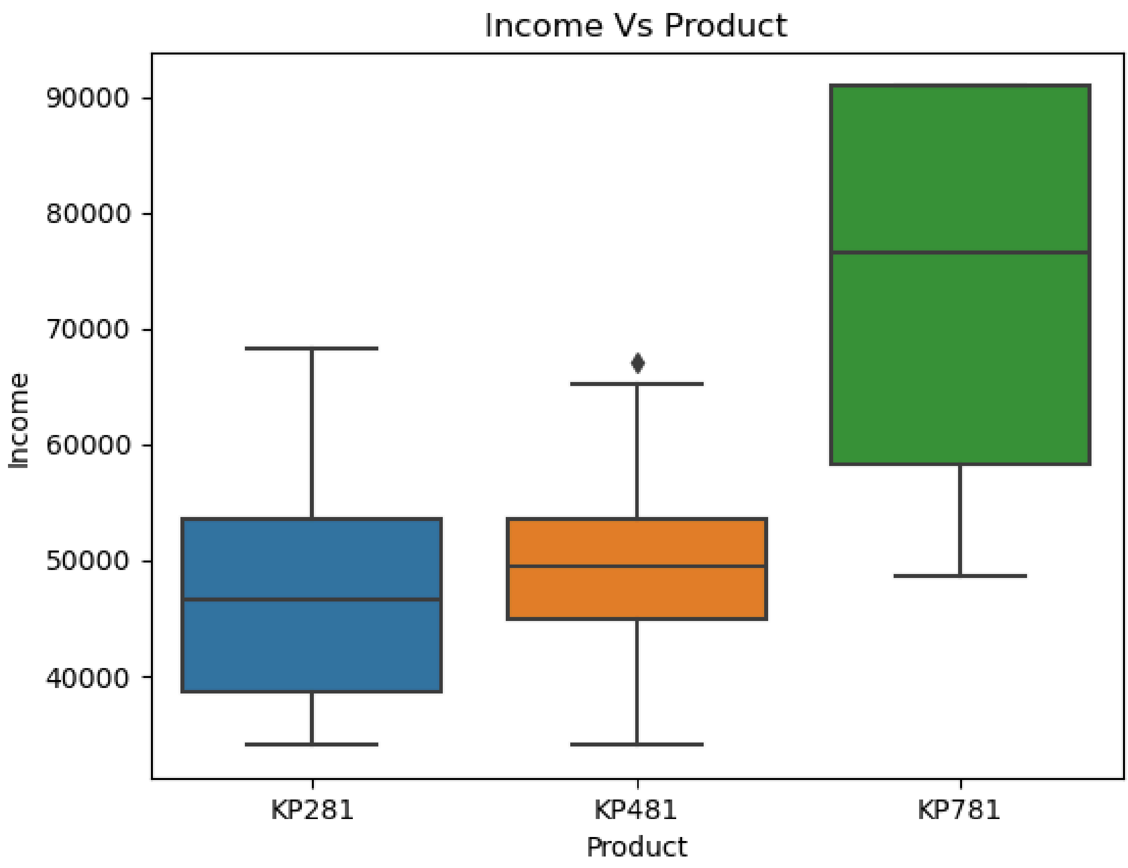
In [28]:
```
sns.boxplot(data = df, x = 'Product', y = 'Age')
plt.title('Age Vs Product')
plt.show
```

Out[28]: `<function matplotlib.pyplot.show(close=None, block=None)>`



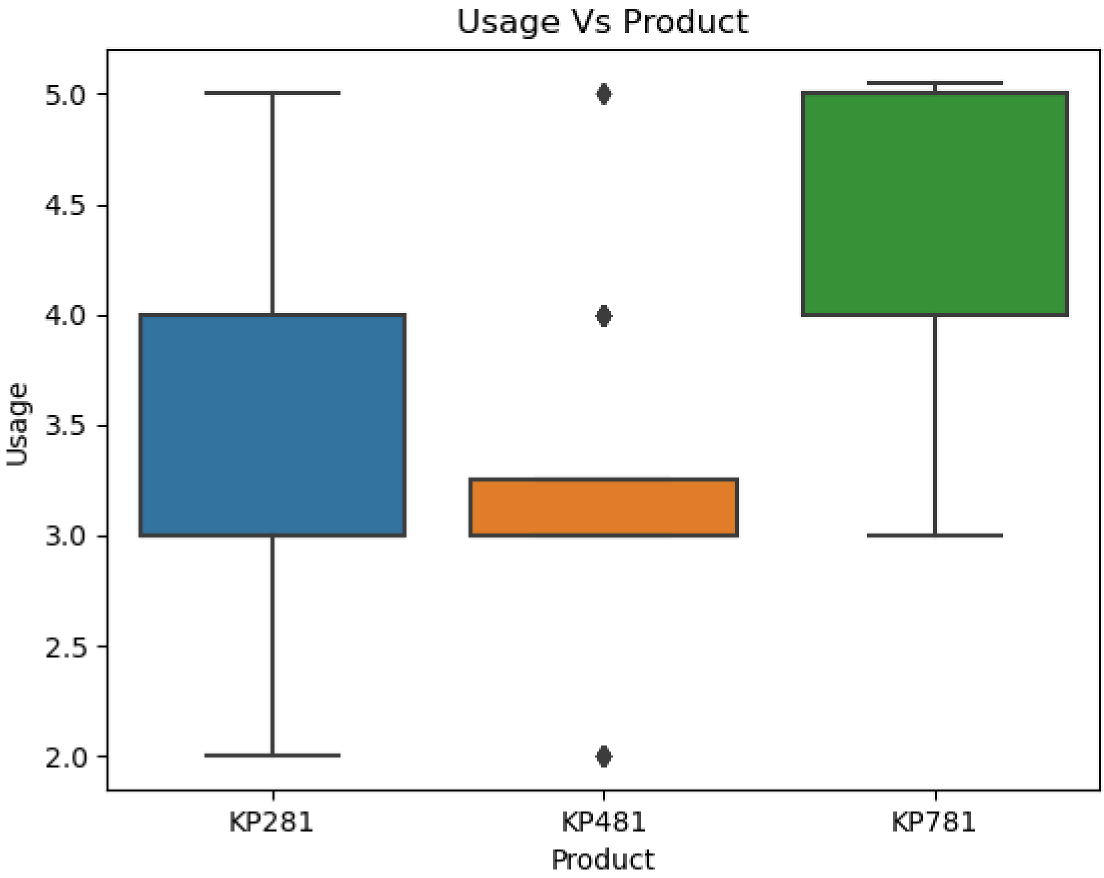
In [29]:
```
sns.boxplot(data = df, x = 'Product', y = 'Income')
plt.title('Income Vs Product')
plt.show
```

Out[29]: <function matplotlib.pyplot.show(close=None, block=None)>



In [30]:
```
sns.boxplot(data = df, x = 'Product', y = 'Usage')
plt.title('Usage Vs Product')
plt.show
```

Out[30]: <function matplotlib.pyplot.show(close=None, block=None)>



Representing the Probability

In [31]:
```
df.head()
```

Out[31]:

	Product	Age	Gender	Education	MaritalStatus	Usage	Fitness	Income	Miles
0	KP281	20.0	Male	14.0	Single	3.0	4.0	34053.15	112.0
1	KP281	20.0	Male	15.0	Single	2.0	3.0	34053.15	75.0
2	KP281	20.0	Female	14.0	Partnered	4.0	3.0	34053.15	66.0
3	KP281	20.0	Male	14.0	Single	3.0	3.0	34053.15	85.0
4	KP281	20.0	Male	14.0	Partnered	4.0	2.0	35247.00	47.0

In [32]:
```
crosstab1 = pd.crosstab(index = df['Product'], columns = 'count', normalize
= True)
crosstab1
```

Out[32]:

col_0	count
Product	
KP281	0.444444
KP481	0.333333
KP781	0.222222

Products and Gender

In [33]:
```
pd.crosstab(index = df['Gender'], columns = df['Product'], margins = True,
normalize = True)
```

Out[33]:

Product	KP281	KP481	KP781	All
Gender				
Female	0.222222	0.161111	0.038889	0.422222
Male	0.222222	0.172222	0.183333	0.577778
All	0.444444	0.333333	0.222222	1.000000

Product and MartialStatus

In [34]:
```
pd.crosstab(index = df['MaritalStatus'], columns = df['Product'], margins =
True, normalize = True)
```

Out[34]:

Product	KP281	KP481	KP781	All
MaritalStatus				
Partnered	0.266667	0.200000	0.127778	0.594444
Single	0.177778	0.133333	0.094444	0.405556
All	0.444444	0.333333	0.222222	1.000000

Conditional Probability

In [35]:
```
pd.crosstab(index = df['Gender'], columns = df['Product'], margins = True, normalize = True)
```

Out[35]:

Product	KP281	KP481	KP781	All
Gender				
Female	0.222222	0.161111	0.038889	0.422222
Male	0.222222	0.172222	0.183333	0.577778
All	0.444444	0.333333	0.222222	1.000000

- P(using KP281 I Female) = 0.22
- P(using KP481 I Female) = 0.16
- P(using KP781 I Female) = 0.03
- P(using KP281 I Male) = 0.22
- P(using KP482 I Male) = 0.17
- P(using KP781 I Male) = 0.18

In [36]:
```
pd.crosstab(index = df['MaritalStatus'], columns = df['Product'], margins = True, normalize = True)
```

Out[36]:

Product	KP281	KP481	KP781	All
MaritalStatus				
Partnered	0.266667	0.200000	0.127778	0.594444
Single	0.177778	0.133333	0.094444	0.405556
All	0.444444	0.333333	0.222222	1.000000

- P(using KP281 I Partnered) = 0.26
- P(using KP481 I Partnered) = 0.2
- P(using KP781 I Partnered) = 0.12
- P(using KP241 I Single) = 0.17
- P(using KP481 I Single) = 0.13
- P(using KP781 I Single) = 0.09

Correlation

In [38]:
```
df.head()
```

Out[38]:

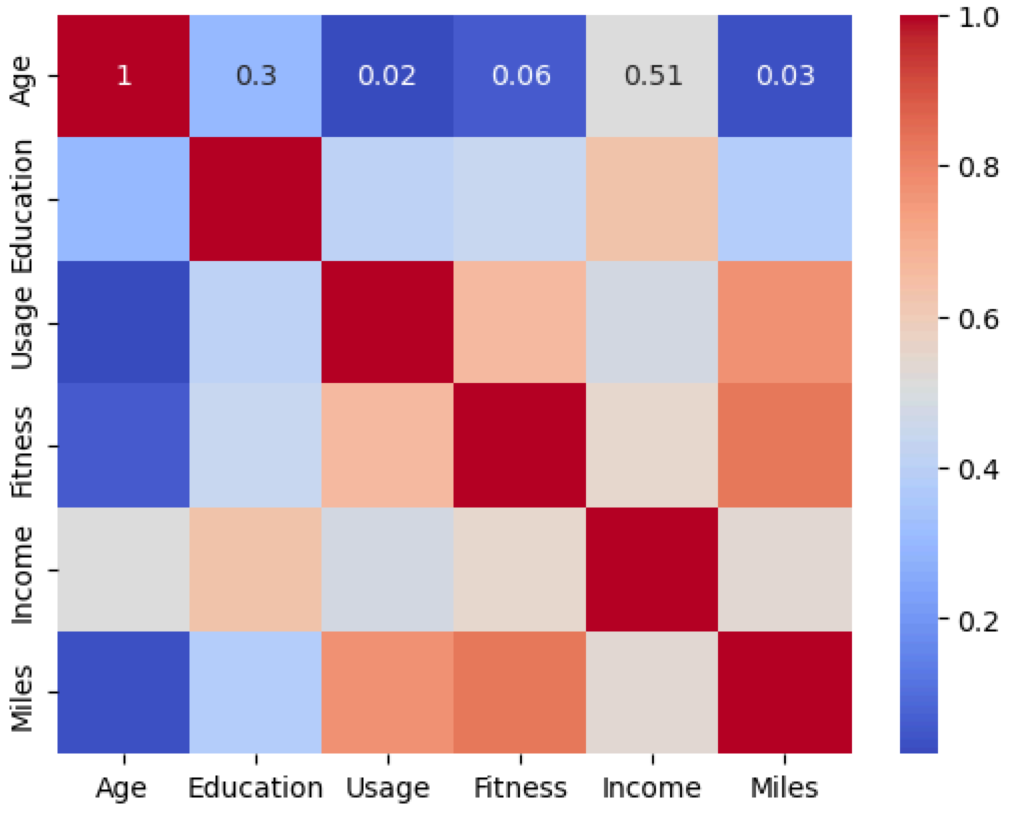
	Product	Age	Gender	Education	MaritalStatus	Usage	Fitness	Income	Miles
0	KP281	20.0	Male	14.0	Single	3.0	4.0	34053.15	112.0
1	KP281	20.0	Male	15.0	Single	2.0	3.0	34053.15	75.0
2	KP281	20.0	Female	14.0	Partnered	4.0	3.0	34053.15	66.0
3	KP281	20.0	Male	14.0	Single	3.0	3.0	34053.15	85.0
4	KP281	20.0	Male	14.0	Partnered	4.0	2.0	35247.00	47.0

In [48]:
```
cor1 = df.corr()
cor1
```

Out[48]:

	Age	Education	Usage	Fitness	Income	Miles
Age	1.000000	0.301971	0.015394	0.057361	0.514362	0.029636
Education	0.301971	1.000000	0.413600	0.441082	0.628597	0.377294
Usage	0.015394	0.413600	1.000000	0.661978	0.481608	0.771030
Fitness	0.057361	0.441082	0.661978	1.000000	0.546998	0.826307
Income	0.514362	0.628597	0.481608	0.546998	1.000000	0.537297
Miles	0.029636	0.377294	0.771030	0.826307	0.537297	1.000000

In [55]:
```
sns.heatmap(cor1.round(2), annot = True, cmap = 'coolwarm')
plt.show()
```



Customer Profiling

KP281

- Age: 23 to 33
- Income: 38000 to 54000
- Usage: 3 to 4 times a week
- Marital Status: Partnered are more likely to use KP281
- Gender: Both Male and female are equally using KP281

KP481

- Age: 24 to 34
- Income: 45000 to 55000
- Usage: 3 to 3.5 times a week
- Marital Status: Partnered are more likely to use KP481
- Gender: Male are more likely to use KP481 as compared to Female

KP781

- Age: 24 to 29
- Income: 60000 to 90000
- Usage: 4 to 5 times a week
- Marital Status: Partnered are more likely to use KP781
- Gender: The usage of KP781 is significantly higher among males compared to females, with 18% of males purchasing the product compared to only 3% of females.

Analysis

- The majority of treadmill users fall within the age range of 23 to 35.
- KP281 is the most commonly purchased treadmill model, with 80% of buyers opting for it, followed by KP481 at 60%, and KP781 with only a 35% share.
- Across all three treadmill models, males make up the predominant buyer demographic.
- Treadmill purchasing tendencies correlate with income levels, with lower income individuals tending to opt for lower-tier treadmill models.

Recommendations

- In the income bracket of 38000 to 54000, both demographics show a preference for KP281, resulting in lower sales of KP481.
- Enhancements in functionality or additional features could be incorporated into KP481.
- Offering special discounts targeted towards females could effectively stimulate sales within this demographic.
- Implementing targeted advertising campaigns aimed specifically at females would likely result in increased sales within this demographic.