Aerofit Case Study: Project

Aerofit is a leading brand in the field of fitness equipment. The market research team at AeroFit wants to identify the characteristics of the target audience for each type of treadmill offered by the company, to provide a better recommendation of the treadmills to the new customers.

In [660]:

```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
import statsmodels
from scipy.special import comb
from scipy.stats import binom, norm, poisson
```

In [662]:

```
aerofit = pd.read_csv("C:/DSML Practice DataSet/aerofit_treadmill.txt")
aerofit.head()
```

Out[662]:

	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 [664]:

```
aerofit.shape
```

Out[664]:

```
(180, 9)
```

In [666]:

```
aerofit.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 [668]:

```
aerofit.isnull().sum().sum()
```

Out[668]:

```
0
```

In [670]:

```
aerofit.describe(include = 'all')
```

Out[670]:

	Product	Age	Gender	Education	MaritalStatus	Usage	Fitness	
count	180	180.000000	180	180.000000	180	180.000000	180.000000	
unique	3	NaN	2	NaN	2	NaN	NaN	
top	KP281	NaN	Male	NaN	Partnered	NaN	NaN	
freq	80	NaN	104	NaN	107	NaN	NaN	
mean	NaN	28.788889	NaN	15.572222	NaN	3.455556	3.311111	53
std	NaN	6.943498	NaN	1.617055	NaN	1.084797	0.958869	16
min	NaN	18.000000	NaN	12.000000	NaN	2.000000	1.000000	29
25%	NaN	24.000000	NaN	14.000000	NaN	3.000000	3.000000	44
50%	NaN	26.000000	NaN	16.000000	NaN	3.000000	3.000000	50
75%	NaN	33.000000	NaN	16.000000	NaN	4.000000	4.000000	58
max	NaN	50.000000	NaN	21.000000	NaN	7.000000	5.000000	104

Data Observation:

1. Aerofit Costomers' **Average age 28 years and Median age 26 years**

2. The customers have on average **16 years of education**
3. The customers are using treadmill **3 times a week on an average**
4. Average fitness rating is **3.3 out of 5**
5. Difference between the mean and median for columns **'Income' and 'Miles'** is huge which indicates there might be outliers.
6. **Min and Max Income** of the customers are **29562 USDD and 104581 USD** respectively
7. Min to Max range of miles walked/run is **21 to 360 per week**

EDA

In [729]:

```
aerofit.replace(to_replace={'Male': 'M', 'Female': 'F'}, inplace=True)
aerofit.head()
```

Out[729]:

	Product	Age	Gender	Education	MaritalStatus	Usage	Fitness	Income	Miles	Age_Gro
0	KP281	18	M	14	Single	3	4	29562	112	1st gro
1	KP281	19	M	15	Single	2	3	31836	75	1st gro
2	KP281	19	F	14	Partnered	4	3	30699	66	1st gro
3	KP281	19	M	12	Single	3	3	32973	85	1st gro
4	KP281	20	M	13	Partnered	4	2	35247	47	1st gro

In [676]:

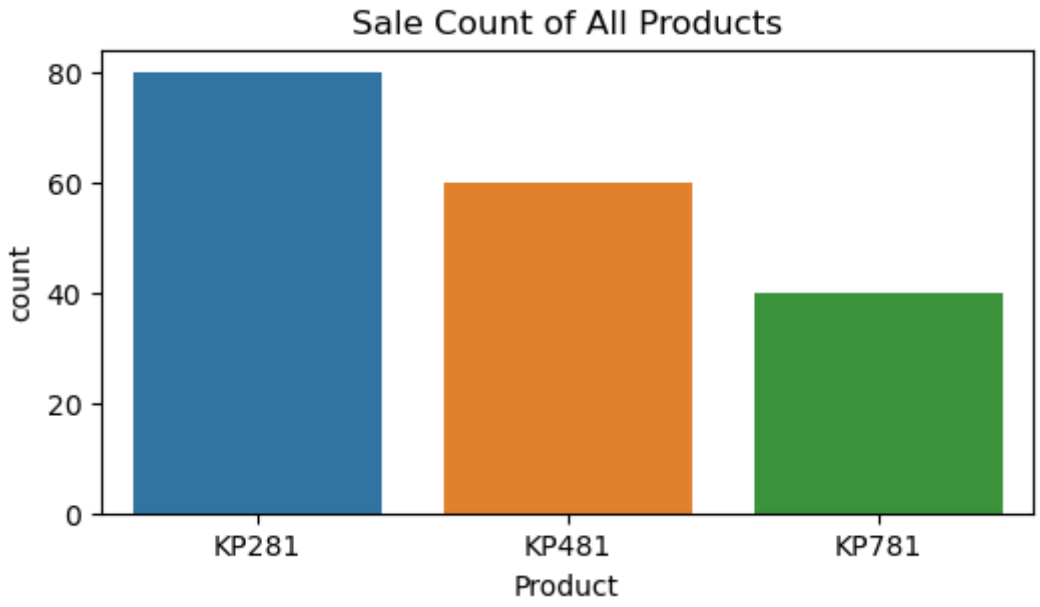
```
# Finding out the number of unique values
aerofit.nunique()
```

Out[676]:

```
Product          3
Age             32
Gender           2
Education        8
MaritalStatus    2
Usage            6
Fitness          5
Income          62
Miles           37
dtype: int64
```

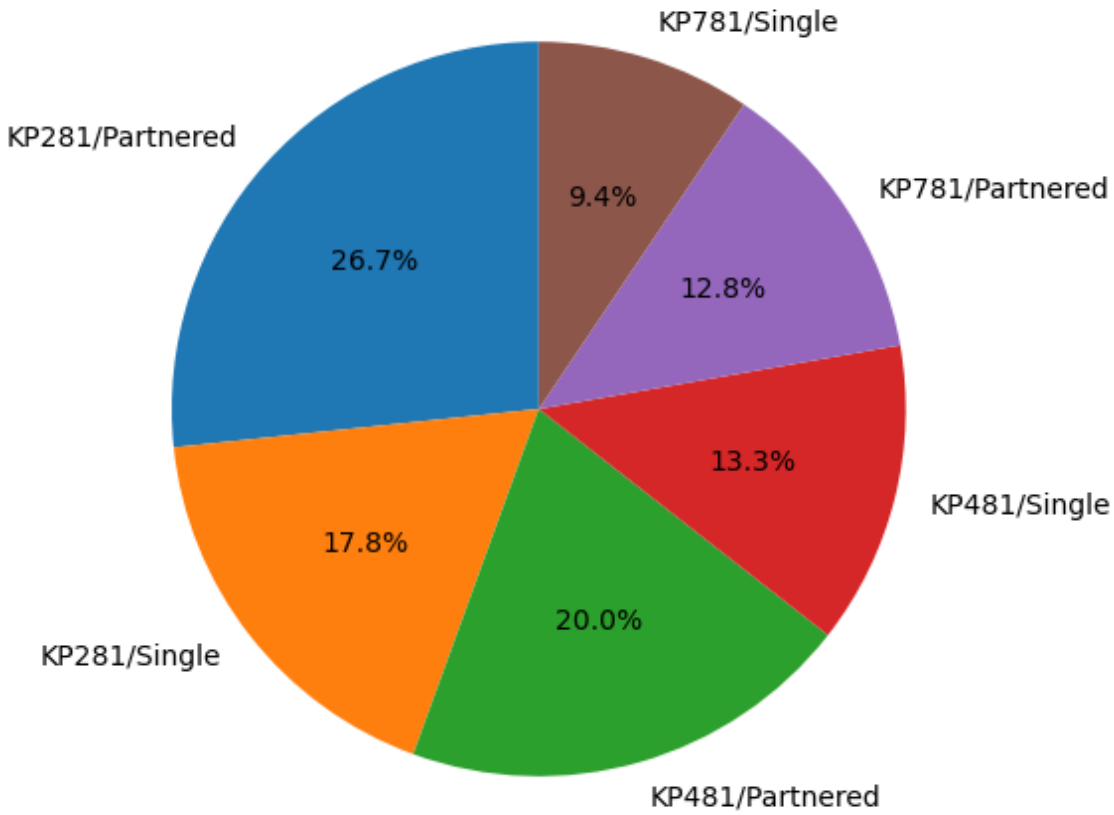
In [678]:

```
plt.figure(figsize=(6,3))
sns.countplot(x= "Product", data= aerofit)
plt.title('Sale Count of All Products')
plt.show()
```



In [680]:

```
product_and_marriage = aerofit.groupby(['Product', 'MaritalStatus']).size()
plt.figure(figsize=(6,6))
labels = ['KP281/Partnered', 'KP281/Single', 'KP481/Partnered',
          'KP481/Single', 'KP781/Partnered','KP781/Single']
plt.pie(product_and_marriage,labels=labels, startangle=90, autopct='%2.1f%%')
plt.show()
```



In [682]:

```
print(aerofit['Income'].median())
print(aerofit['Income'].mean())
```

```
50596.5
53719.57777777778
```

In [684]:

```
p_25 = np.percentile(aerofit['Income'], 25)
p_50 = np.percentile(aerofit['Income'], 50)
p_75 = np.percentile(aerofit['Income'], 75)
print(p_25, p_50, p_75)
```

```
44058.75 50596.5 58668.0
```

In [686]:

```
iqr = p_75-p_25
upper = p_75 +1.5*iqr
lower = p_25 -1.5*iqr
print(iqr, upper, lower)
```

```
14609.25 80581.875 22144.875
```

In [688]:

```
outlier = aerofit[aerofit['Income']>upper]
len(outlier)
```

Out[688]:

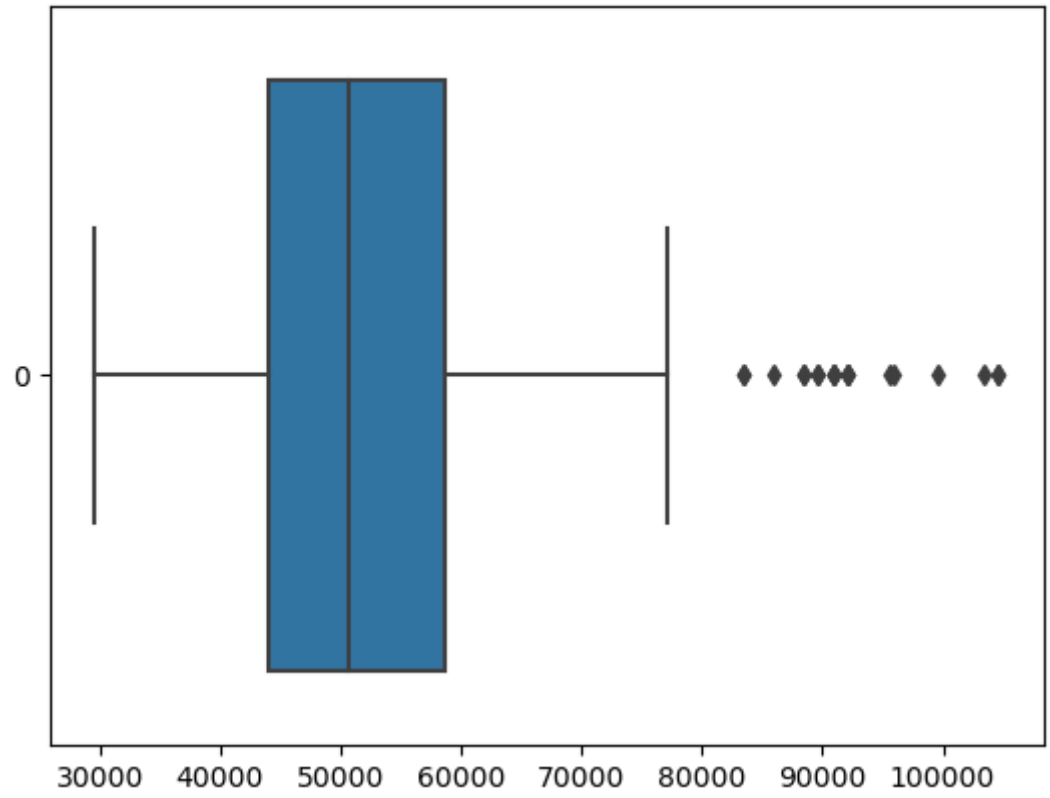
```
19
```

In [690]:

```
sns.boxplot(data=aerofit['Income'], orient='h')
```

Out[690]:

```
<AxesSubplot:>
```



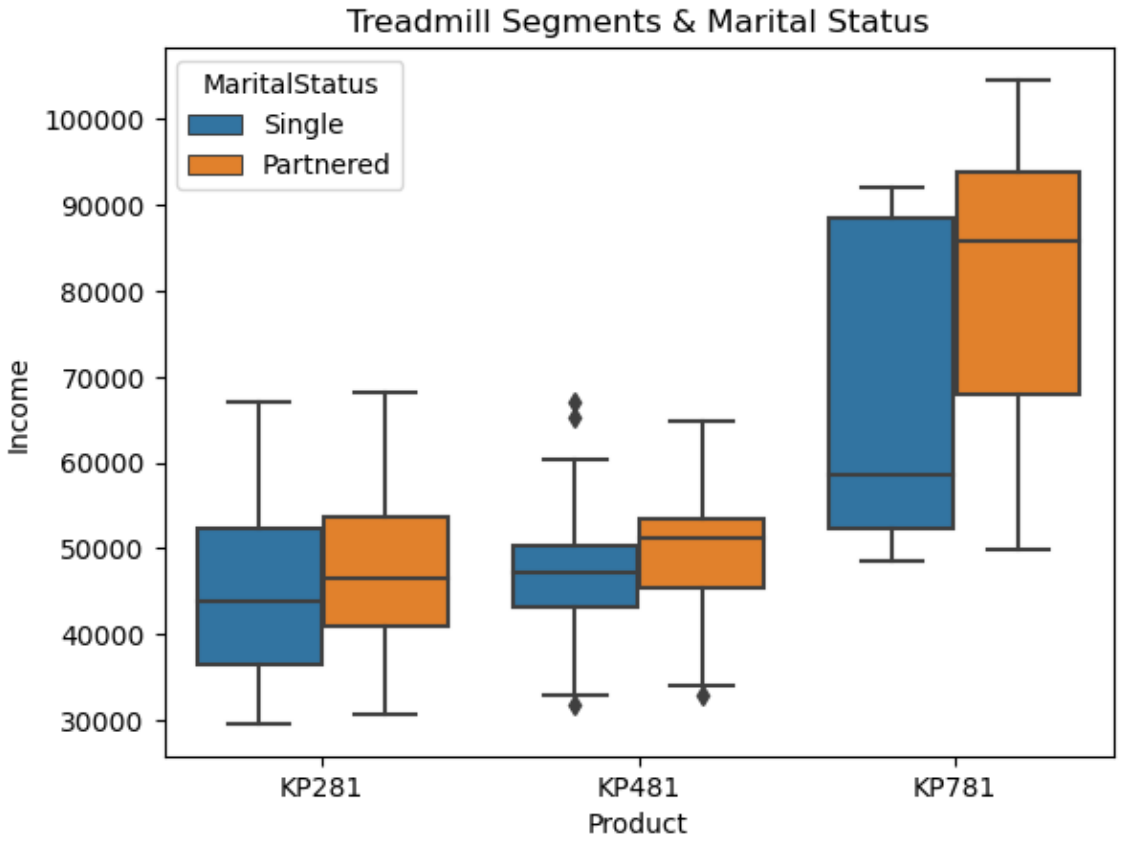
👆 There are so many outliers in the 'Income' column. High income people are potential customers to make a stronger client base

In [ ]:

```
```

In [692]:

```
sns.boxplot(data=aerofit, x="Product", y="Income", hue= 'MaritalStatus')
plt.title('Treadmill Segments & Marital Status')
plt.show()
```



👆 People who baught KP781, the income range for single is bigger than partnered custmers. Single people can afford to buy expensive treadmill even with less income than USD7000 per year but not less than USD50000.

In [ ]:

```
```

In [694]:

```
# Getting mean and median age of the people who baught high end product
Cx_of_KP781 = aerofit[aerofit['Product']=='KP781']
print(Cx_of_KP781['Age'].mean())
print(Cx_of_KP781['Age'].median())
```

```
29.1
27.0
```

In [696]:

```
p_25 = np.percentile(Cx_of_KP781['Age'], 25)
p_50 = np.percentile(Cx_of_KP781['Age'], 50)
p_75 = np.percentile(Cx_of_KP781['Age'], 75)
print(p_25, p_50, p_75)
```

```
24.75 27.0 30.25
```

In [698]:

```
iqr = p_75-p_25
upper = p_75 +1.5*iqr
lower = p_25 -1.5*iqr
print(iqr, upper, lower)
```

```
5.5 38.5 16.5
```

In [700]:

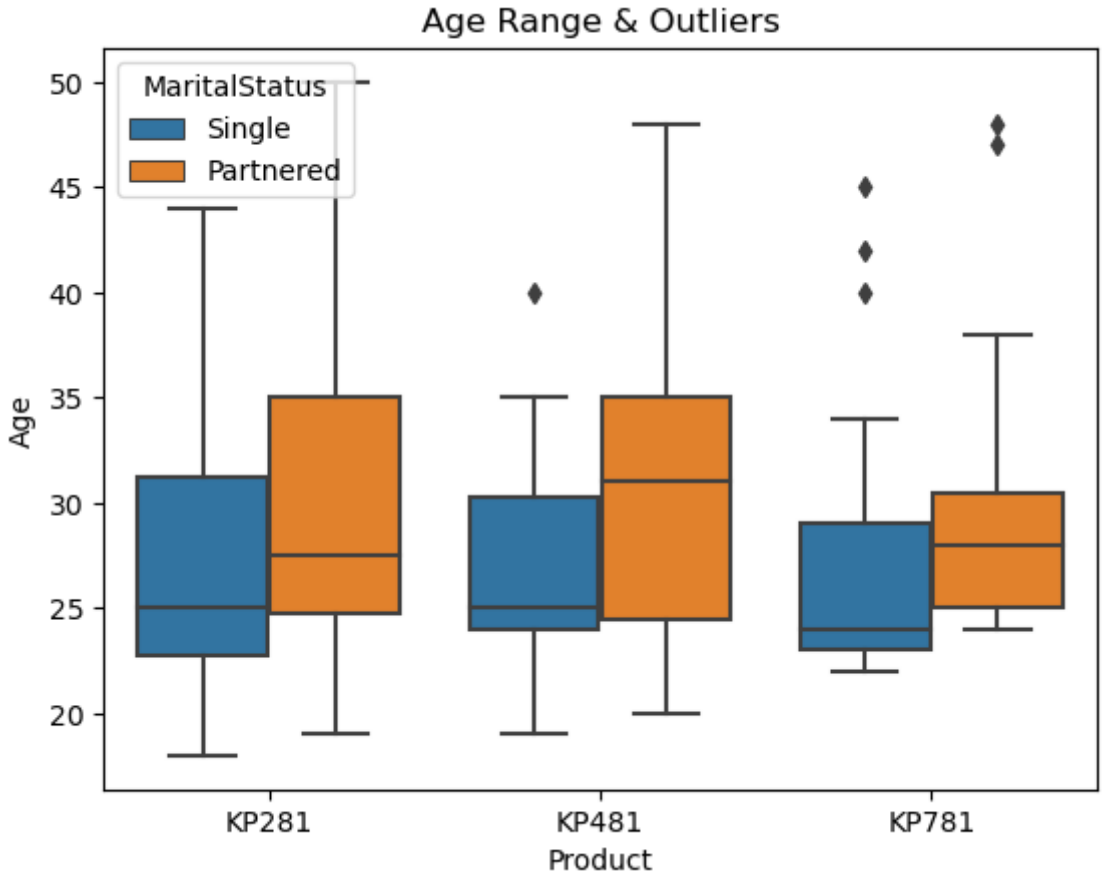
```
outlier_age = Cx_of_KP781[Cx_of_KP781['Age']>upper]
len(outlier_age)
```

Out[700]:

```
5
```

In [702]:

```
sns.boxplot(x=aerofit["Product"], y=aerofit["Age"], hue= aerofit['MaritalStatus'])
plt.title('Age Range & Outliers')
plt.show()
```



👆 Most of the cx of high end treadmill are young, aged b/w 22 and 38 years. However, there are outliers which shows that people more than 40 years old are also buying the expensive/high quality treadmill (as they have higher income than young people)

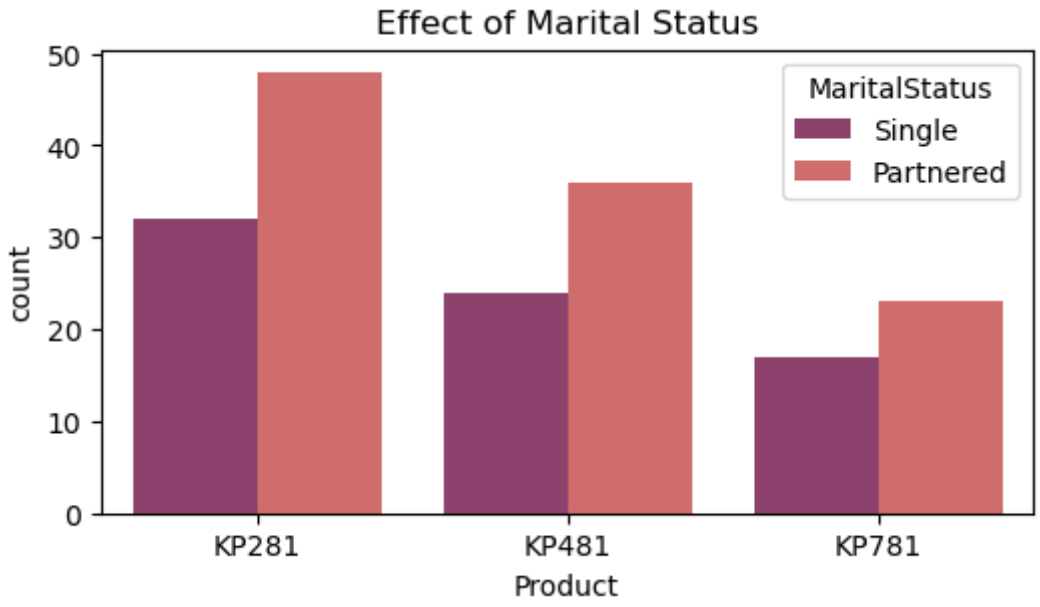
In [ ]:

```

```

In [704]:

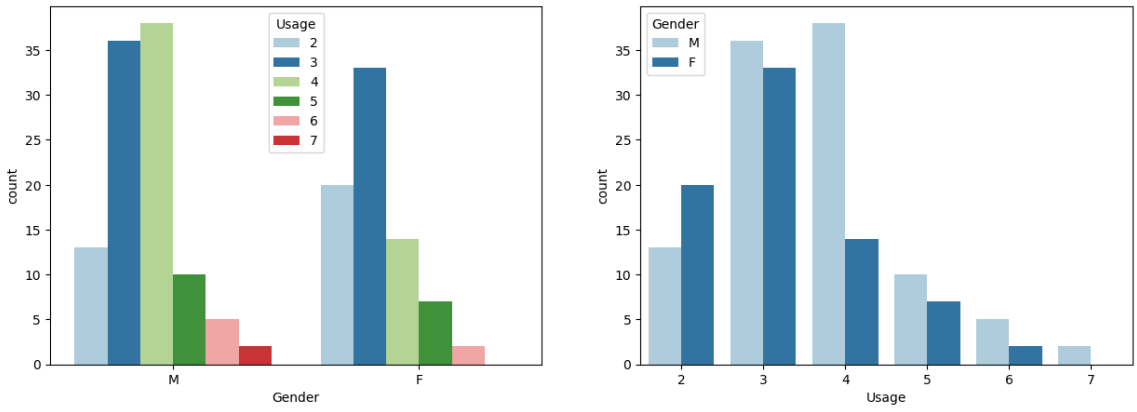
```
plt.figure(figsize=(6,3))
sns.countplot(x= "Product", data= aerofit, hue= 'MaritalStatus', palette= 'flare_r')
plt.title('Effect of Marital Status')
plt.show()
```



👆 The company has more partnered customer than single in all segments of treadmill

In [740]:

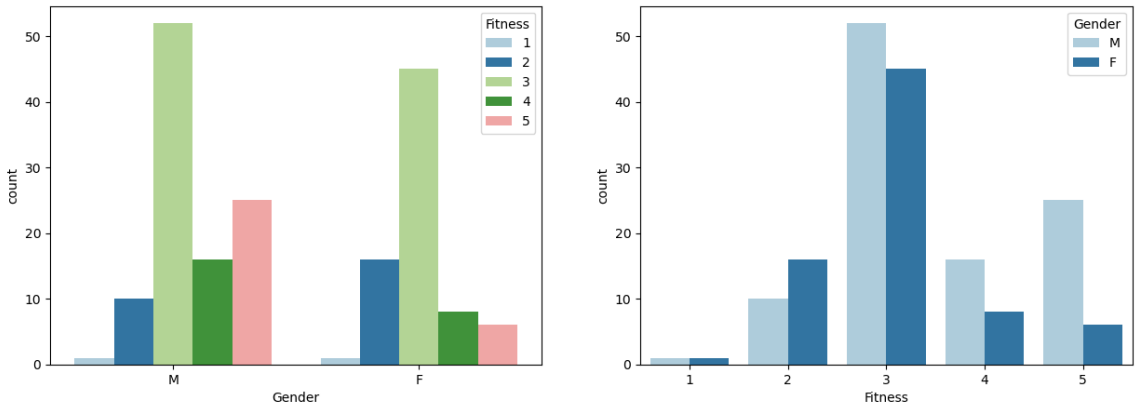
```
fig, axes = plt.subplots(1, 2, figsize=(15,5))
sns.countplot(data=aerofit, x='Gender', hue='Usage', ax=axes[0], palette='Paired')
sns.countplot(data=aerofit, x='Usage', hue='Gender', ax=axes[1], palette='Paired')
plt.show()
```



- Usage per week of males is higher than that of females.

In [741]:

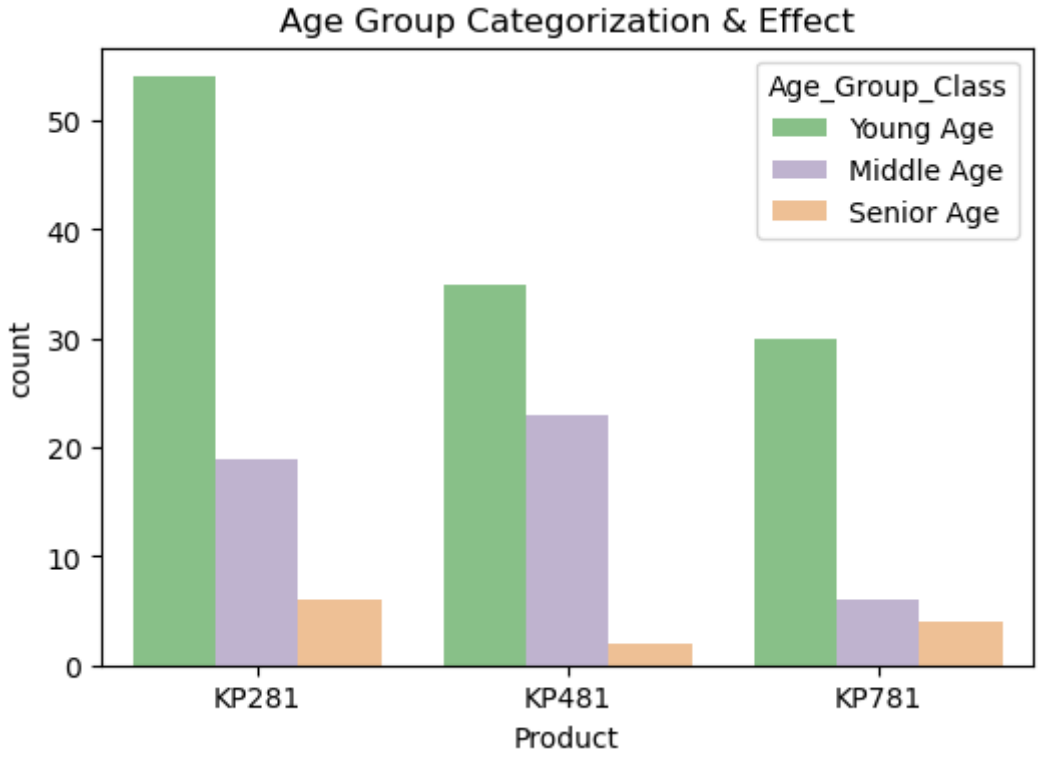
```
fig, axes = plt.subplots(1, 2, figsize=(15,5))
sns.countplot(data=aerofit, x='Gender', hue='Fitness', ax=axes[0], palette='Paired')
sns.countplot(data=aerofit, x='Fitness', hue='Gender', ax=axes[1], palette='Paired')
plt.show()
```



- Males have mostly rated themselves higher on fitness level

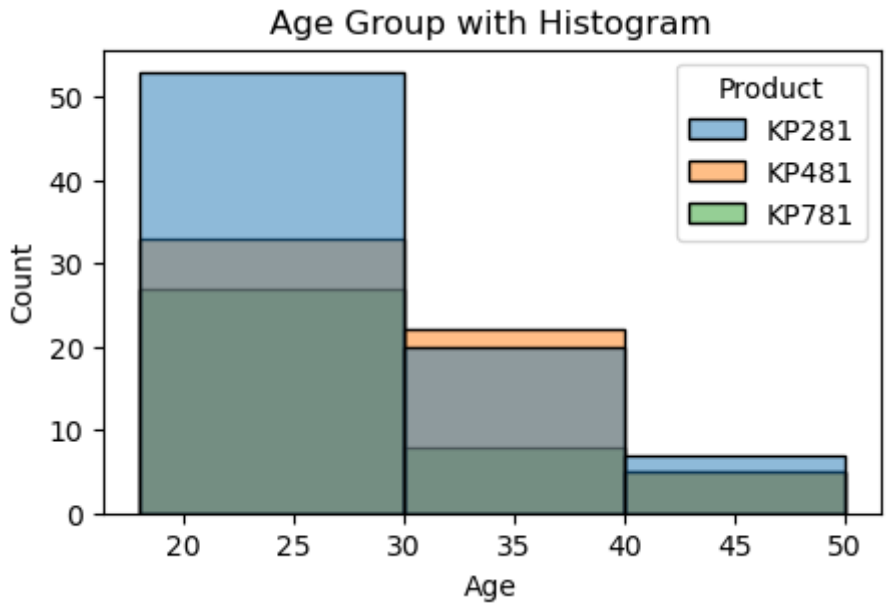
In [731]:

```
bins = [18, 30, 40, 51]
labels = ['Young Age', 'Middle Age', 'Senior Age']
aerofit['Age_Group_Class'] = pd.cut(aerofit['Age'],
                                    bins = bins, labels = labels)
plt.figure(figsize=(6,4))
sns.countplot(x= "Product", data= aerofit, hue= 'Age_Group_Class', palette= 'Accent')
plt.title('Age Group Categorization & Effect')
plt.show()
```



In [708]:

```
plt.figure(figsize=(5,3))
sns.histplot(x = 'Age', data = aerofit, bins = [18,30,40,50], hue='Product')
plt.title('Age Group with Histogram')
plt.show()
```



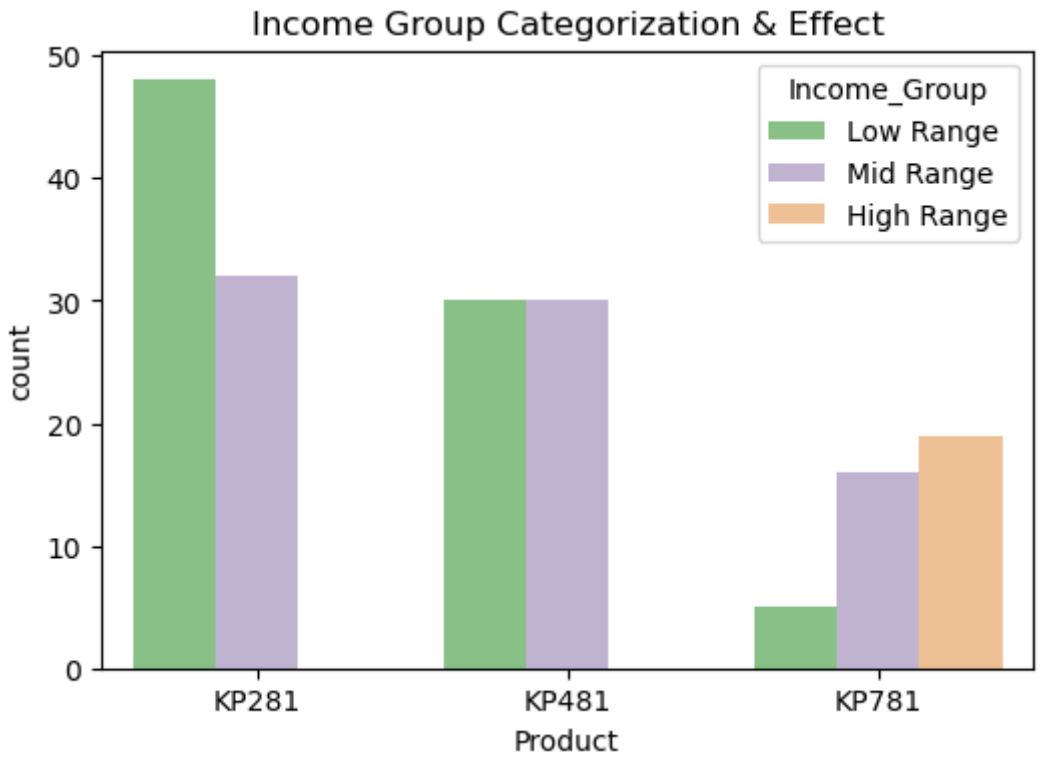
👆 All 3 treadmills have the most customers in Young age group(18-30) and least customers in Senior age group(40-50)

In [ ]:

In [709]:

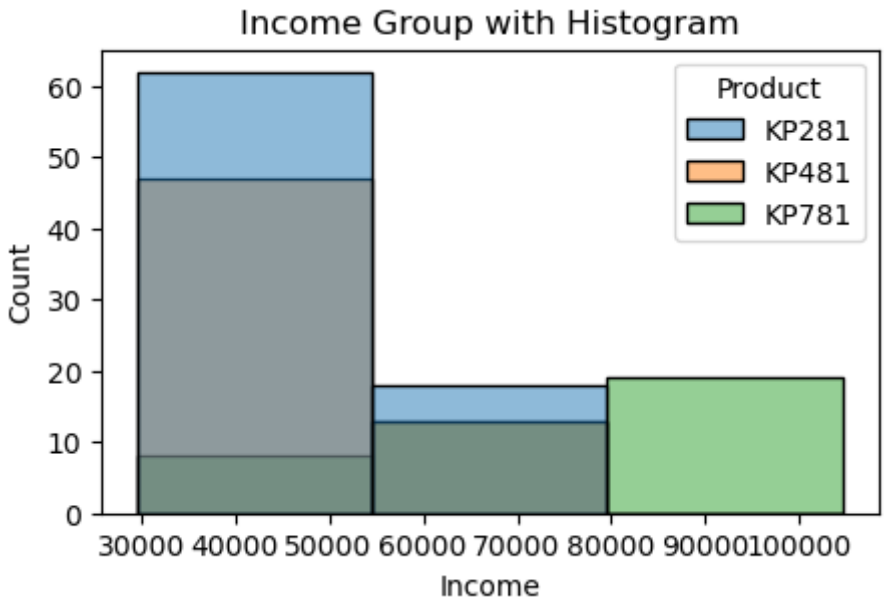
```
def income(x):
    if x>=29000 and x<=50000:
        return 'Low Range'
    elif x>=50001 and x<=80000:
        return 'Mid Range'
    else:
        return 'High Range'
aerofit['Income_Group']= aerofit['Income'].apply(income)

plt.figure(figsize=(6,4))
sns.countplot(x= "Product", data= aerofit, hue= 'Income_Group', palette= 'Accent')
plt.title('Income Group Categorization & Effect')
plt.show()
```



In [710]:

```
plt.figure(figsize=(5,3))
sns.histplot(x = 'Income', data = aerofit, bins = 3, hue='Product')
plt.title('Income Group with Histogram')
plt.show()
```



👆 High Range Income people are not buying KP481 and KP281

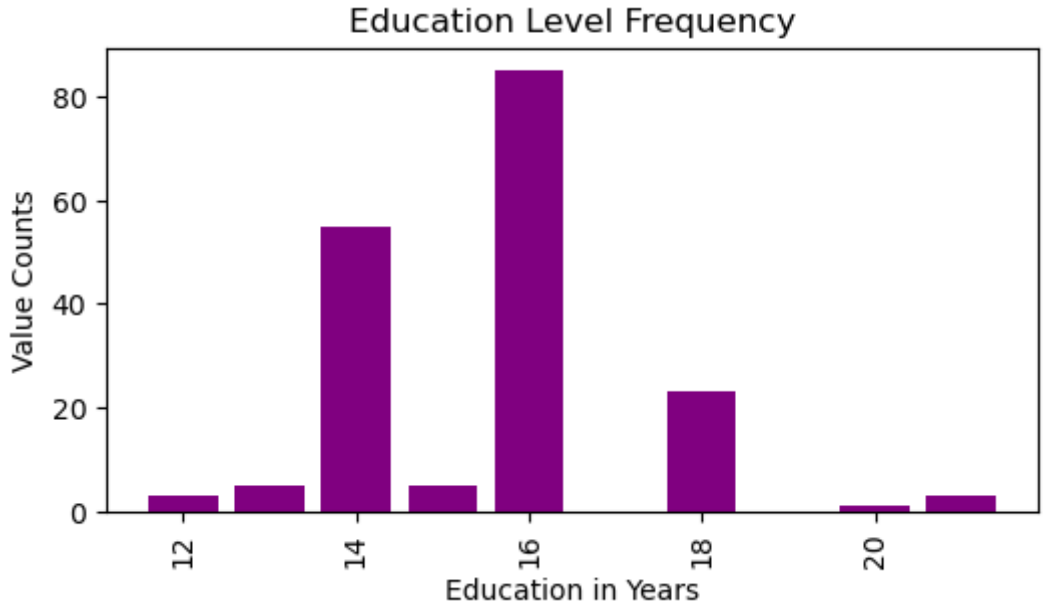
In [ ]:

```

```

In [711]:

```
cat_count = aerofit['Education'].value_counts()
x = cat_count.index
y = cat_count
plt.figure(figsize=(6,3))
plt.bar(x, y, width=0.8, color='purple')
plt.xlabel('Education in Years')
plt.ylabel('Value Counts')
plt.title('Education Level Frequency')
plt.xticks(rotation=90)
plt.show()
```

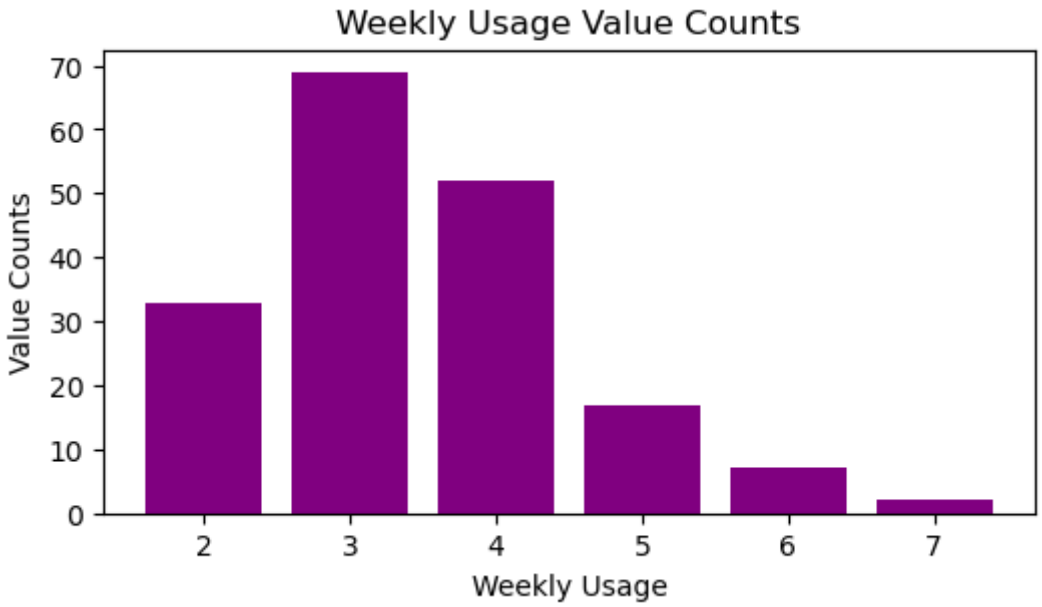


👆Education level of 14,16 and 18 years are the most common among Aerofit's consumer

In [ ]:

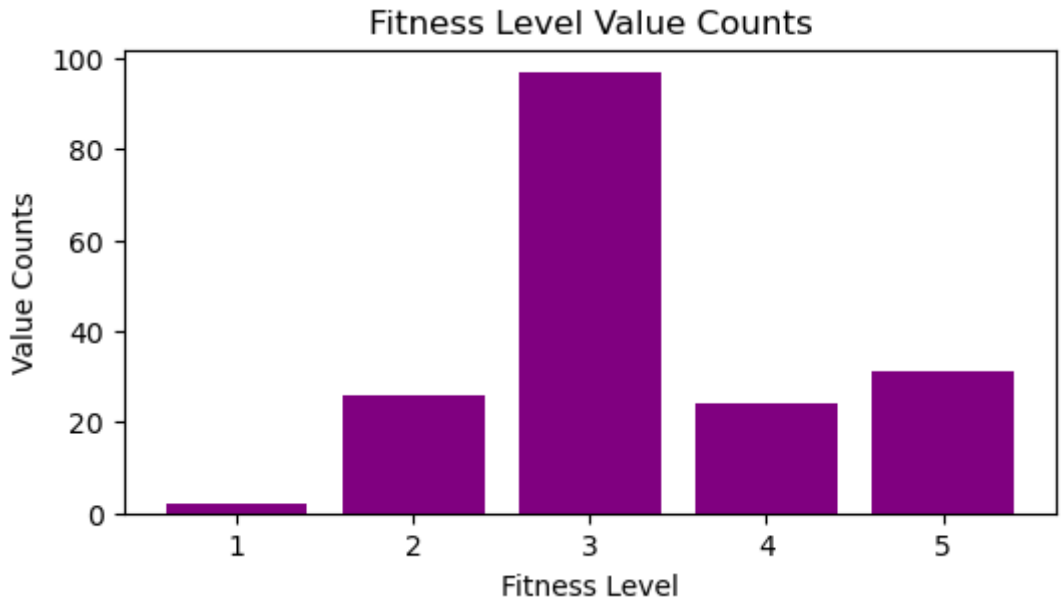
In [734]:

```
usage_count = aerofit['Usage'].value_counts()
x = usage_count.index
y = usage_count
plt.figure(figsize=(6,3))
plt.bar(x, y, width=0.8, color='purple')
plt.xlabel('Weekly Usage')
plt.ylabel('Value Counts')
plt.title('Weekly Usage Value Counts')
plt.show()
```



In [736]:

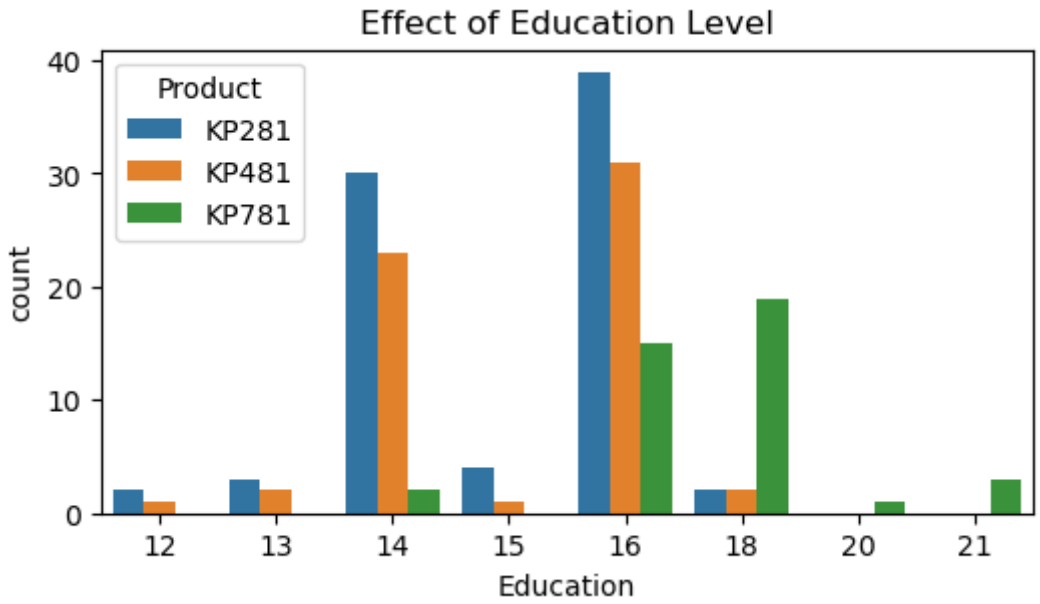
```
usage_count = aerofit['Fitness'].value_counts()
x = usage_count.index
y = usage_count
plt.figure(figsize=(6,3))
plt.bar(x, y, width=0.8, color='purple')
plt.xlabel('Fitness Level')
plt.ylabel('Value Counts')
plt.title('Fitness Level Value Counts')
plt.show()
```



In [ ]:

In [713]:

```
plt.figure(figsize=(6,3))
sns.countplot(x= "Education", data= aerofit, hue= 'Product')
plt.title('Effect of Education Level')
plt.show()
```

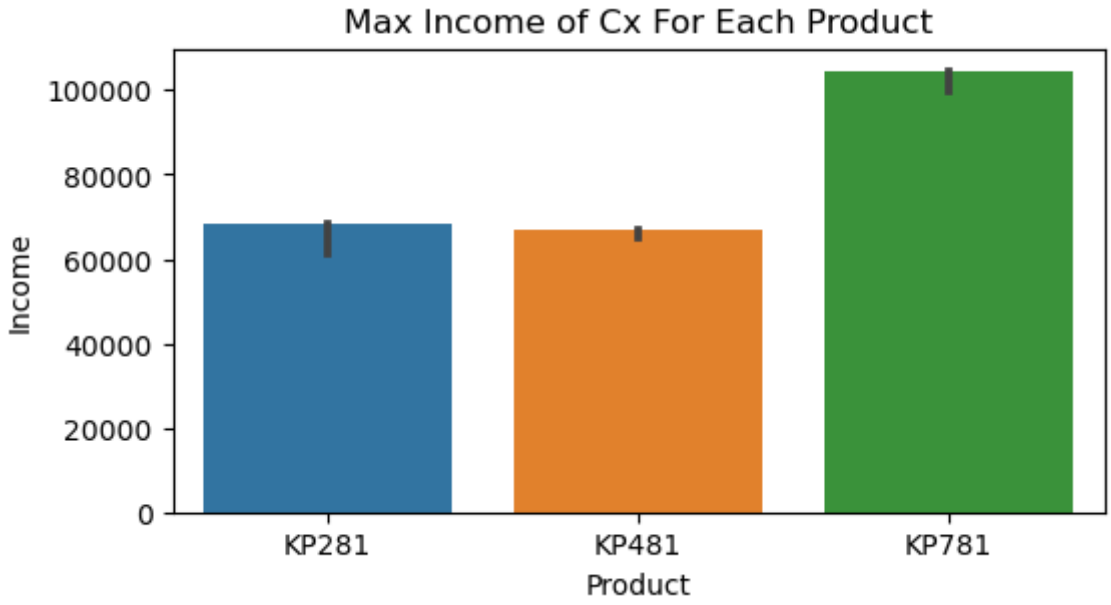


👆 Education level also has an effect on the products purchased. 14 to 18 years(mid range) have bought the most.

In [ ]:

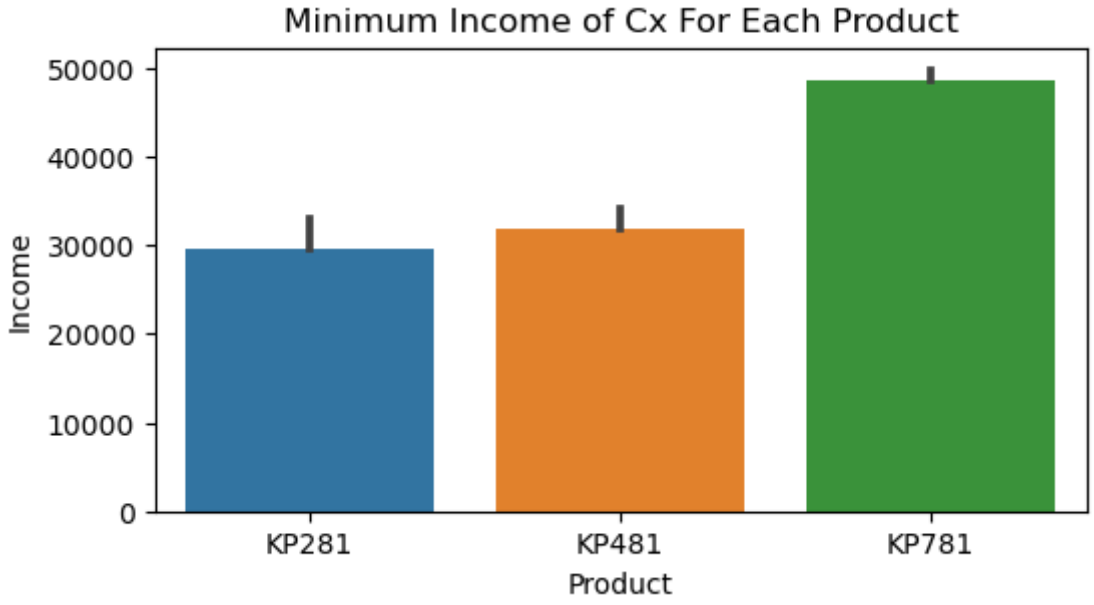
In [714]:

```
plt.figure(figsize=(6,3))
sns.barplot(data=aerofit,
            x='Product',
            y='Income',
            estimator=np.max)
plt.title('Max Income of Cx For Each Product')
plt.show()
```



In [715]:

```
plt.figure(figsize=(6,3))
sns.barplot(data=aerofit,
            x='Product',
            y='Income',
            estimator=np.min)
plt.title('Minimum Income of Cx For Each Product')
plt.show()
```



In [ ]:

```
```

Condiational & Marginal Probabilities

In [716]:

```
total = len(aerofit)
per_KP281 = round(len(no_KP281)/total, 2)
per_KP481 = round(len(no_KP481)/total, 2)
per_KP781 = round(len(no_KP781)/total, 2)
print(per_KP281, per_KP481, per_KP781)
```

```
0.44 0.33 0.22
```

In [ ]:

```
```

In [717]:

```
pd.crosstab(index= aerofit['Gender'], columns=aerofit['Product'], margins= True)
```

Out[717]:

Product	KP281	KP481	KP781	All
Gender				
F	40	29	7	76
M	40	31	33	104
All	80	60	40	180

In [718]:

```
pd.crosstab(index= aerofit['Gender'],
            columns=aerofit['Product'], margins= True, normalize=True)*100
```

Out[718]:

Product	KP281	KP481	KP781	All
Gender				
F	22.222222	16.111111	3.888889	42.222222
M	22.222222	17.222222	18.333333	57.777778
All	44.444444	33.333333	22.222222	100.000000

In [719]:

```
pd.crosstab(index= aerofit['Gender'],
            columns=aerofit['Product'], margins= True, normalize='columns')*100
```

Out[719]:

Product	KP281	KP481	KP781	All
Gender				
F	50.0	48.333333	17.5	42.222222
M	50.0	51.666667	82.5	57.777778

In [720]:

```
total_no_high_end_treadmill = aerofit[aerofit['Product']=='KP781']
no_male_buying_highend_treadmill = aerofit[(aerofit['Product']=='KP781') & (aerofit['Gen
Prob_male_buying_highend_treadmill = len(no_male_buying_highend_treadmill) / len(total_n
Prob_male_buying_highend_treadmill
```

Out[720]:

```
0.825
```

In [721]:

```
pd.crosstab(index= aerofit['Gender'],
            columns=aerofit['Product'], margins= True, normalize='index')*100
```

Out[721]:

Product	KP281	KP481	KP781
Gender			
F	52.631579	38.157895	9.210526
M	38.461538	29.807692	31.730769
All	44.444444	33.333333	22.222222

In [722]:

```
aerofit.groupby(['Gender', 'Product'])['Income'].mean().unstack()
```

Out[722]:

Product	KP281	KP481	KP781
Gender			
F	46020.075	49336.448276	73633.857143
M	46815.975	48634.258065	75825.030303

Male and Female have almost equal probability for buying the lower and mid range treadmil. However, the high end treadmill is baught way more by males than females. Hence it changes the entire figure of buying the treadmill by Male and Female customers.

👆 Probability of Male customers buying the high end treadmill = 0.825

In [723]:

```
pd.crosstab(index= aerofit['Gender'], columns=aerofit['MaritalStatus'], margins= True)
```

Out[723]:

MaritalStatus	Partnered	Single	All
Gender			
F	46	30	76
M	61	43	104
All	107	73	180

Overall, parnered people have baught more treadmills than singles

In [728]:

```
pd.crosstab(index= aerofit['Gender'], columns=aerofit['MaritalStatus'],
            margins= True, normalize='columns')*100
```

Out[728]:

MaritalStatus	Partnered	Single	All
Gender			
F	42.990654	41.09589	42.222222
M	57.009346	58.90411	57.777778

In [724]:

```
no_partnered_cx = aerofit[aerofit['MaritalStatus']=='Partnered']
no_male_among_partnered_cx = aerofit[(aerofit['MaritalStatus']=='Partnered') &(aerofit['
no_female_among_partnered_cx = aerofit[(aerofit['MaritalStatus']=='Partnered') &(aerofit
Prob_male_partnered_cx = len(no_male_among_partnered_cx) / len(no_partnered_cx)
Prob_female_partnered_cx = len(no_female_among_partnered_cx) / len(no_partnered_cx)
print(round(Prob_male_partnered_cx, 2))
print(round(Prob_female_partnered_cx, 2))
```

```
0.57
0.43
```

👆 Probability of Male customers among partnered = 0.57 and female among partnered = 0.43

In [725]:

```
no_single_cx = aerofit[aerofit['MaritalStatus']=='Single']
no_male_among_single_cx = aerofit[(aerofit['MaritalStatus']=='Single') &(aerofit['Gender
no_female_among_single_cx = aerofit[(aerofit['MaritalStatus']=='Single') &(aerofit['Gend
Prob_male_single_cx = len(no_male_among_single_cx) / len(no_single_cx)
Prob_female_single_cx = len(no_female_among_single_cx) / len(no_single_cx)
print(round(Prob_male_single_cx, 2))
print(round(Prob_female_single_cx, 2))
```

```
0.59
0.41
```

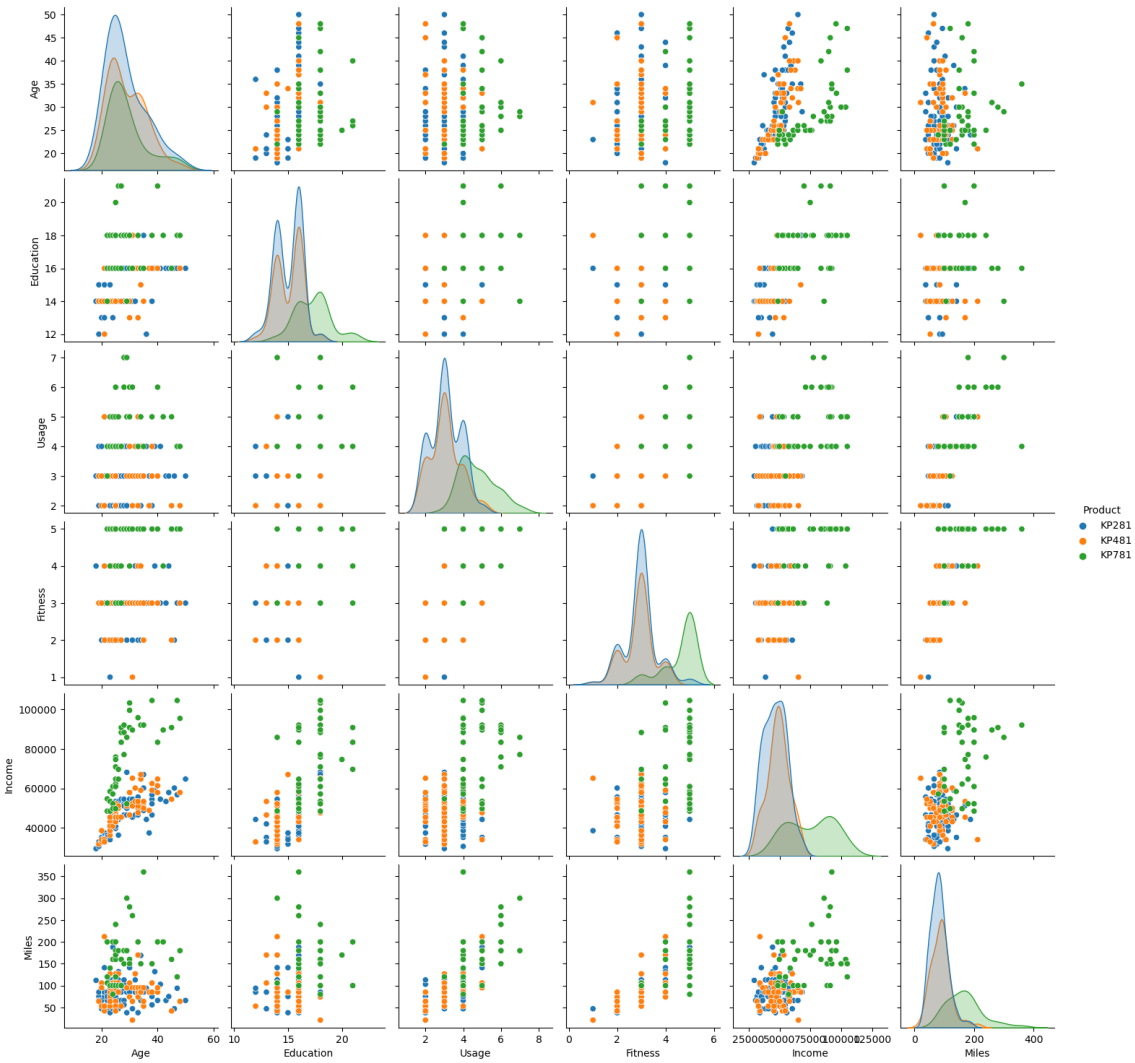
👆 Probability of Male among single = 0.59 and female among single = 0.41

In [ ]:

```
```

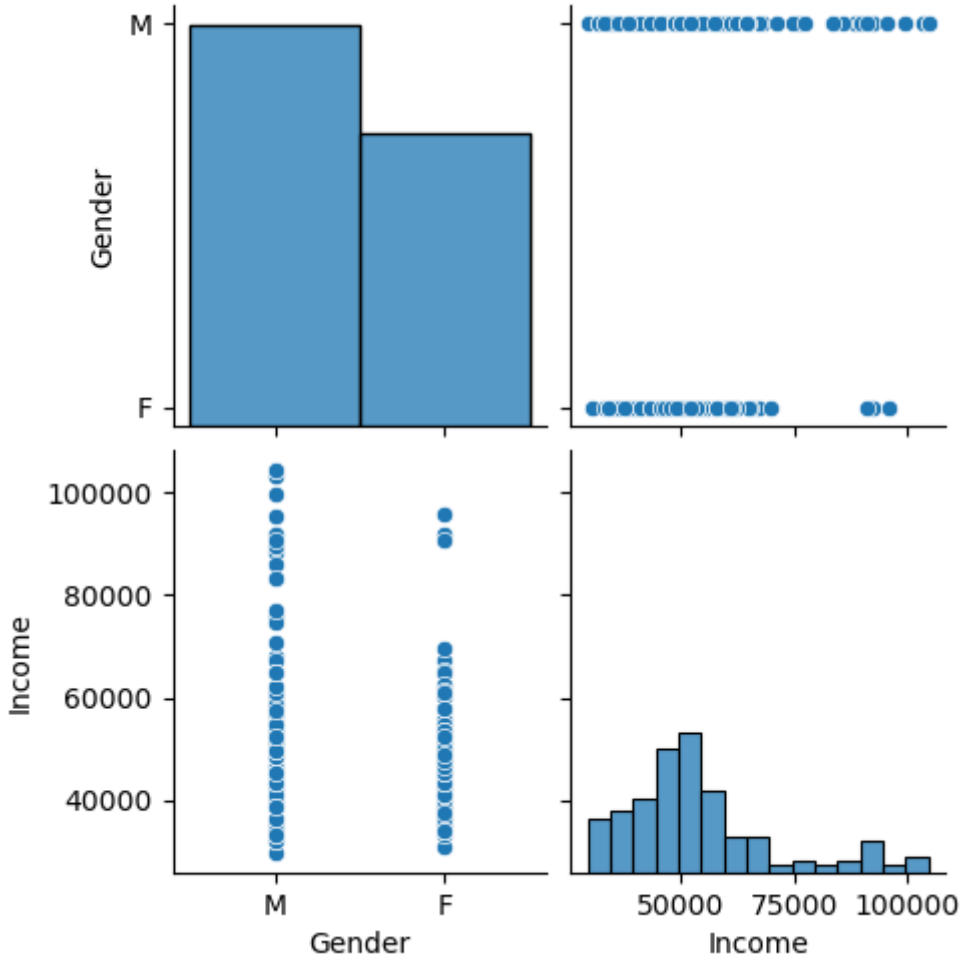
In [501]:

```
sns.pairplot(aerofit, hue='Product')
plt.show()
```



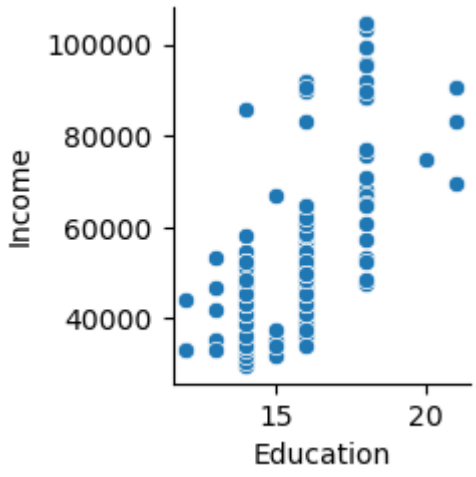
In [453]:

```
sns.pairplot(aerofit, vars=['Gender', 'Income'])
plt.show()
```



In [456]:

```
sns.pairplot(aerofit, x_vars=['Education'], y_vars=['Income'])
plt.show()
```



In [242]:

```
aerofit.corr()
```

Out[242]:

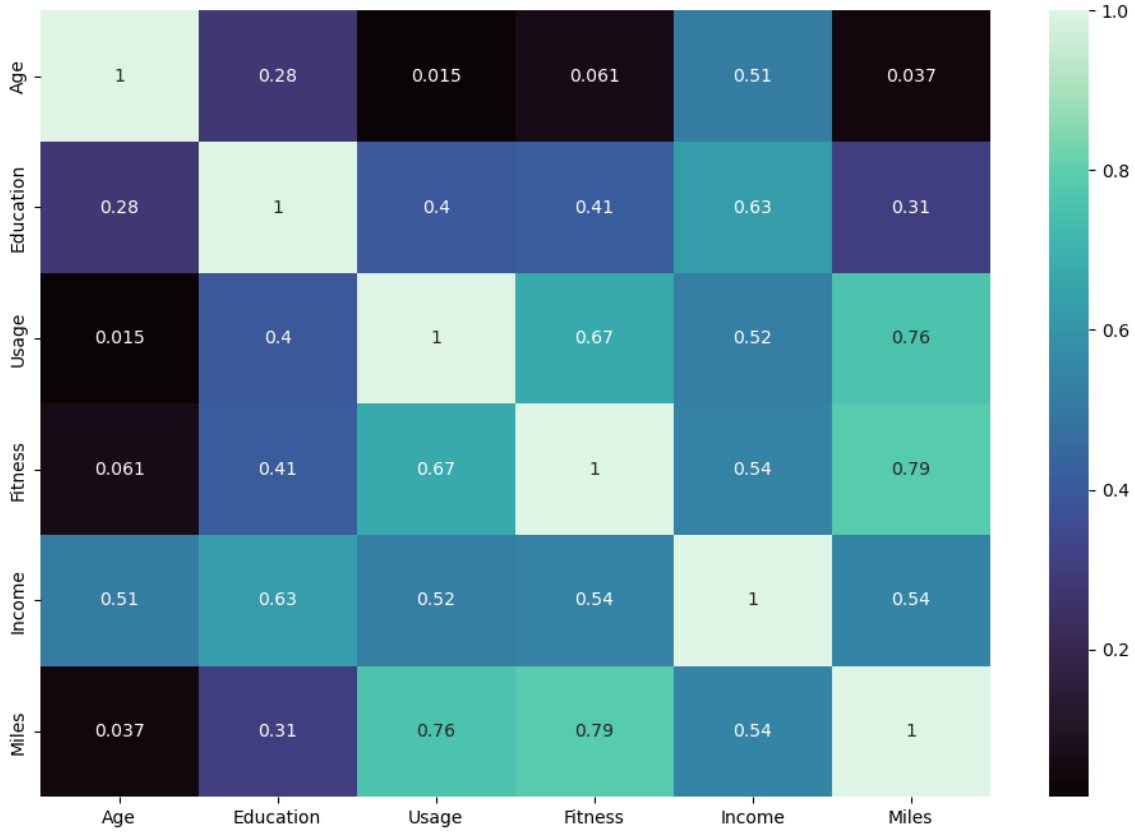
	Age	Education	Usage	Fitness	Income	Miles
Age	1.000000	0.280496	0.015064	0.061105	0.513414	0.036618
Education	0.280496	1.000000	0.395155	0.410581	0.625827	0.307284
Usage	0.015064	0.395155	1.000000	0.668606	0.519537	0.759130
Fitness	0.061105	0.410581	0.668606	1.000000	0.535005	0.785702
Income	0.513414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

In [628]:

```
plt.figure(figsize=(12,8))
sns.heatmap(aerofit.corr(), annot=True, cmap='mako')
```

Out[628]:

<AxesSubplot:>



👆 Correlation between different factors can be noticed above in the pairplot & Heat map.

High Correlation b/w= 'Education & Income', 'Usage & Fitness', 'Miles & Fitness', 'Miles & Usage'

In [ ]:

Summary

- Average age of customer 28.
- KP281 Product has highest contribution , having 44% records in the data.
- There are more Male customers (57.8%) than Female customers (42.2%).
- Data shows 59.4% Partnered customers.
- Most of the customers with Low and middel income buy Model KP281 and KP481.
- Customers buying treadmill before the age of 20 and after 40 are very less.

Recommendations:

1. The most affordable product among all is the best selling and most common among the 'Low Range' income people. The Company can utilize this as an opportunity of mass production for cost management or increased margin.
2. The company should target the single people with 'Mid Range' income with more lucrative offers and discounts in order to generate more revenue by selling more of the most expensive product.
3. Although most of the buyers are middle aged, but as shown by the outliers, it is not a hinderance. The company can focus on people more than 40 years as well as they are the people with good income.
4. Couple discount or a combo offer of treadmill with another fitness equipment for married people can be thought over.
5. Youngsters are focused on their fitness, they can afford to spend some money on it. The company can target them with all 3 products for all income group and education level.
6. Higher Education = More health awareness & Good Income as well. The company can directly market its products to the more Educated people with a little less worry about their Income and Age.
7. Men are buying the most when it comes o the most expensive, good quality treadmill. They prefer quality over money. Hence the company should focus more on showcasing good features and quality to them on digital marketing platforms.

In [ ]:

In [ ]: