Business Problem

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. The team decides to investigate whether there are differences across the product with respect to customer characteristics.

Perform descriptive analytics to create a customer profile for each AeroFit treadmill product by developing appropriate tables and charts. For each AeroFit treadmill product, construct two-way contingency tables and compute all conditional and marginal probabilities along with their insights/impact on the business.

Dataset

The company collected the data on individuals who purchased a treadmill from the AeroFit stores during the prior three months. The dataset has the following features:

Product Purchased: KP281, KP481, or KP781

Age: In years

Gender: Male/Female

Education: In years

MaritalStatus: Single or partnered

Usage: The average number of times the customer plans to use the treadmill each week . Income: Annual income (in $)

Fitness: Self-rated fitness on a 1-to-5 scale, where 1 is the poor shape and 5 is the excellent shape.

Miles: The average number of miles the customer expects to walk/run each week

Product Portfolio:

The KP281 is an entry-level treadmill that sells for $1,500.

The KP481 is for mid-level runners that sell for $1,750.

The KP781 treadmill is having advanced features that sell for $2,500.

In [ ]:

In [ ]:

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

1.Defining Problem Statement and Analysing basic metrics.

Observations on shape of data, data types of all the attributes, conversion of categorical attributes to 'category' (If required), statistical summary

In [2]:
```
Aerofit=pd.read_csv("https://d2beiqkhq929f0.cloudfront.net/public_assets/assets/000/001/125/original/aerofit_treadmill.csv")
Aerofit
```

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
...	...	...	...	...	...	...	...	...	...
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

In [53]:
```
# Shape
Aerofit.shape
```

Out[53]: (180, 9)

In [55]:
```
# DataTypes of all Attributes
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 [31]:
```
Aerofit.describe()   # only taking float and integer Data type
```

Out[31]:

	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

In [29]:
```
Aerofit.describe(include="all")   # taking all Data types
```

Out[29]:

	Product	Age	Gender	Education	MaritalStatus	Usage	Fitness	Income	Miles
count	180	180.000000	180	180.000000	180	180.000000	180.000000	180.000000	180.000000
unique	3	NaN	2	NaN	2	NaN	NaN	NaN	NaN
top	KP281	NaN	Male	NaN	Partnered	NaN	NaN	NaN	NaN
freq	80	NaN	104	NaN	107	NaN	NaN	NaN	NaN
mean	NaN	28.788889	NaN	15.572222	NaN	3.455556	3.311111	53719.577778	103.194444
std	NaN	6.943498	NaN	1.617055	NaN	1.084797	0.958869	16506.684226	51.863605
min	NaN	18.000000	NaN	12.000000	NaN	2.000000	1.000000	29562.000000	21.000000
25%	NaN	24.000000	NaN	14.000000	NaN	3.000000	3.000000	44058.750000	66.000000
50%	NaN	26.000000	NaN	16.000000	NaN	3.000000	3.000000	50596.500000	94.000000
75%	NaN	33.000000	NaN	16.000000	NaN	4.000000	4.000000	58668.000000	114.750000
max	NaN	50.000000	NaN	21.000000	NaN	7.000000	5.000000	104581.000000	360.000000

In [ ]:
```
```

2. Non-Graphical Analysis: Value counts and unique attributes

In [24]:
```
print("Number of Unique Products - ",Aerofit["Product"].nunique())
Aerofit["Product"].value_counts().to_frame()
```

```
Number of Unique Products -  3
```

Out[24]:

	Product
KP281	80
KP481	60
KP781	40

In [25]:
```
print("Number of Unique Marital Status - ",Aerofit["MaritalStatus"].nunique())
Aerofit["MaritalStatus"].value_counts().to_frame()
```

```
Number of Unique Marital Status -  2
```

Out[25]:

	MaritalStatus
Partnered	107
Single	73

In [15]:
```
Aerofit["Gender"].value_counts().to_frame()
```

Out[15]:

	Gender
Male	104
Female	76

In [27]:
```
print("Number of Unique Age - ",Aerofit["Age"].nunique())
Aerofit["Age"].value_counts().to_frame()
```

```
Number of Unique Age -  32
```

Out[27]:

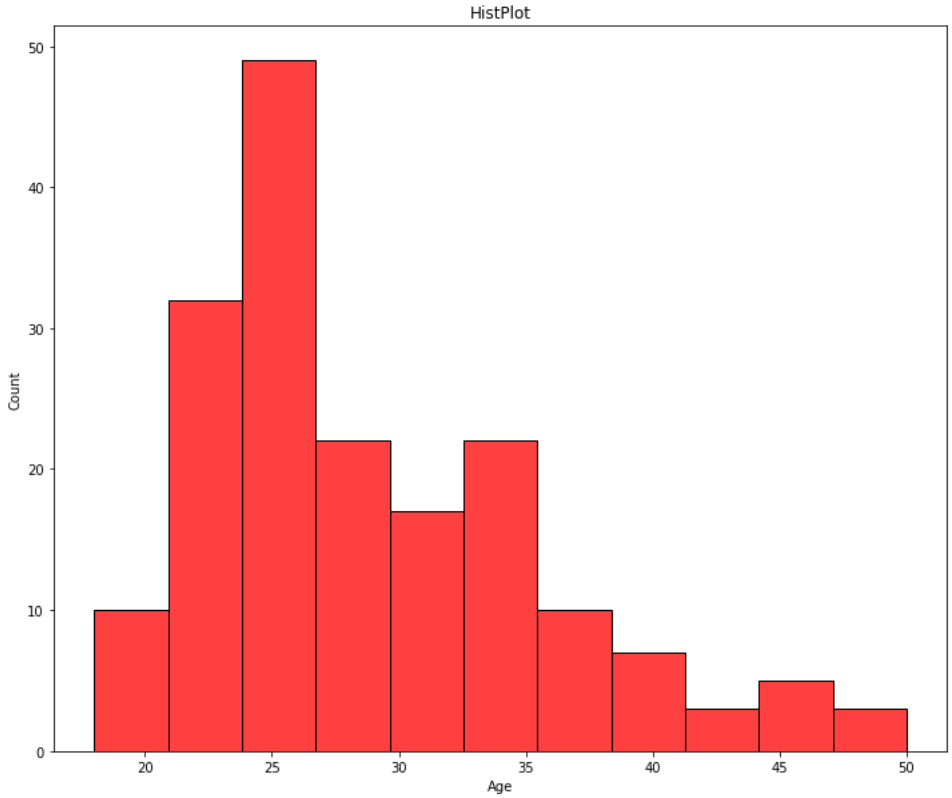
	Age
25	25
23	18
24	12
26	12
28	9
35	8
33	8
30	7
38	7
21	7
22	7
27	7
31	6
34	6
29	6
20	5
40	5
32	4
19	4
48	2
37	2
45	2
47	2
46	1
50	1
18	1
44	1
43	1
41	1
39	1
36	1
42	1

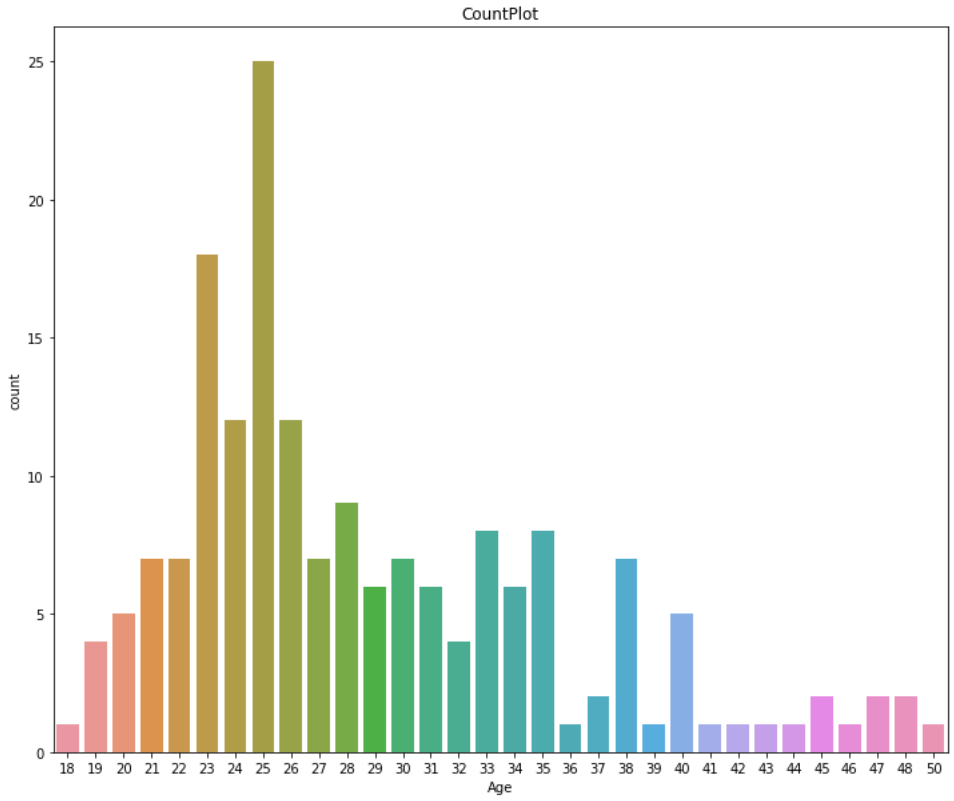
3. Visual Analysis - Univariate & Bivariate

3.1 For continuous variable(s): Distplot, countplot, histogram for univariate analysis

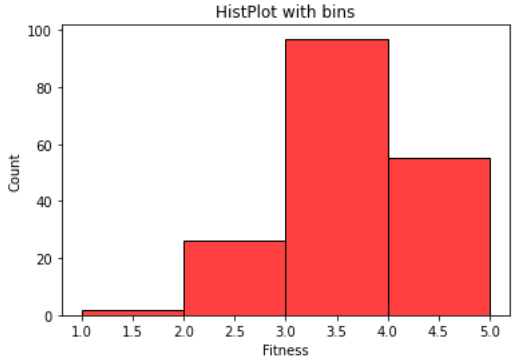
In [ ]:
```
countplot- all numerical
```

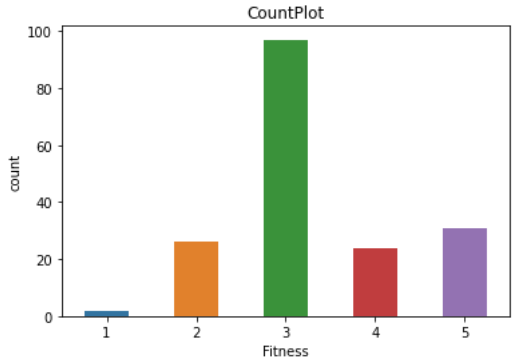
In [53]:
```
#Age
plt.figure(figsize=(12,10))
sns.histplot(x=Aerofit["Age"],color="red")
plt.title("HistPlot")
plt.show()

plt.figure(figsize=(12,10))
sns.countplot(x=Aerofit["Age"])
plt.title("CountPlot")
plt.show()
```



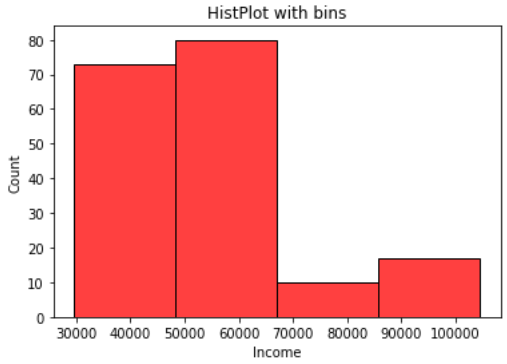


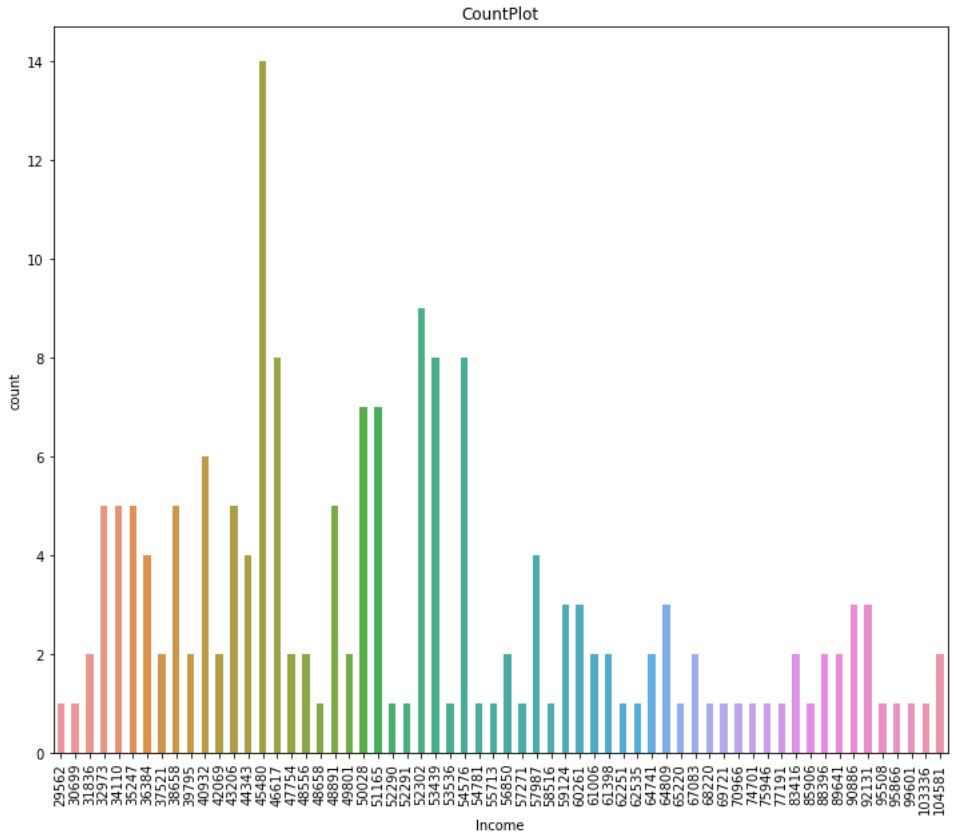
In [77]:
```
# Fitness

sns.histplot(x=Aerofit["Fitness"],color="red",bins=4)
plt.title("HistPlot with bins")
plt.show()

sns.countplot(x=Aerofit["Fitness"],width=0.5)
plt.title("CountPlot")
plt.show()
```



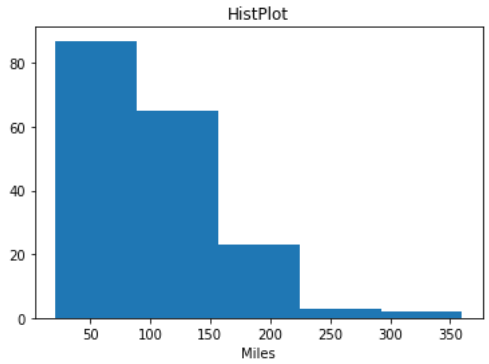


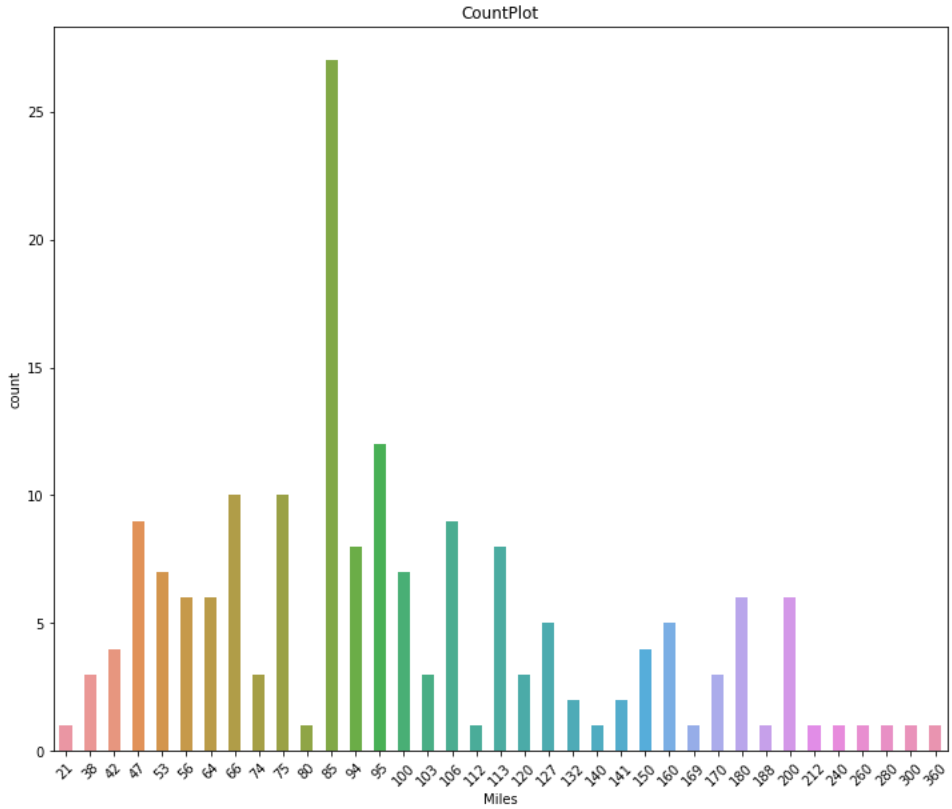
In [87]:
```
# Income
sns.histplot(x=Aerofit["Income"],color="red",bins=4)
plt.title("HistPlot with bins")
plt.show()

plt.figure(figsize=(12,10))
sns.countplot(x=Aerofit["Income"],width=0.5)
plt.title("CountPlot")
plt.xticks(rotation=90)
plt.show()
```





In [95]:
```
# Miles
# Fitness

plt.hist(x=Aerofit["Miles"],bins=5)
plt.title("HistPlot")
plt.xlabel("Miles")
plt.show()

plt.figure(figsize=(12,10))
sns.countplot(x=Aerofit["Miles"],width=0.5)
plt.title("CountPlot")
plt.xticks(rotation=45)
plt.show()
```





3.2 For categorical variable(s): Boxplot

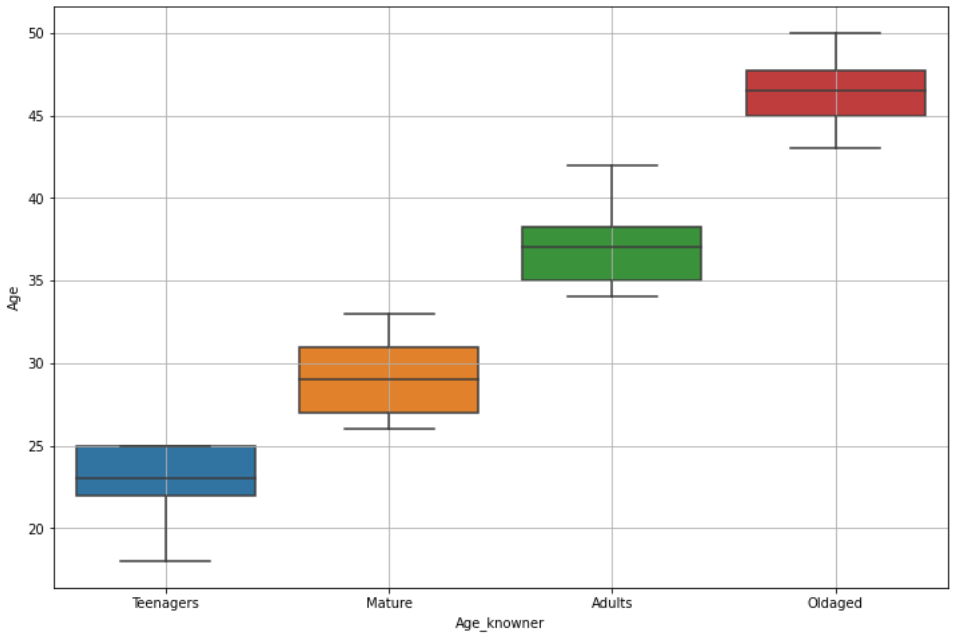
In [3]:
```
# Modifying Data On the basis of AGE
values=[17,25,33,42,55]
Groups=['Teenagers','Mature','Adults','Oldaged']
Aerofit["Age_knowner"]=pd.cut(Aerofit["Age"],labels=Groups,bins=values)
Aerofit
```

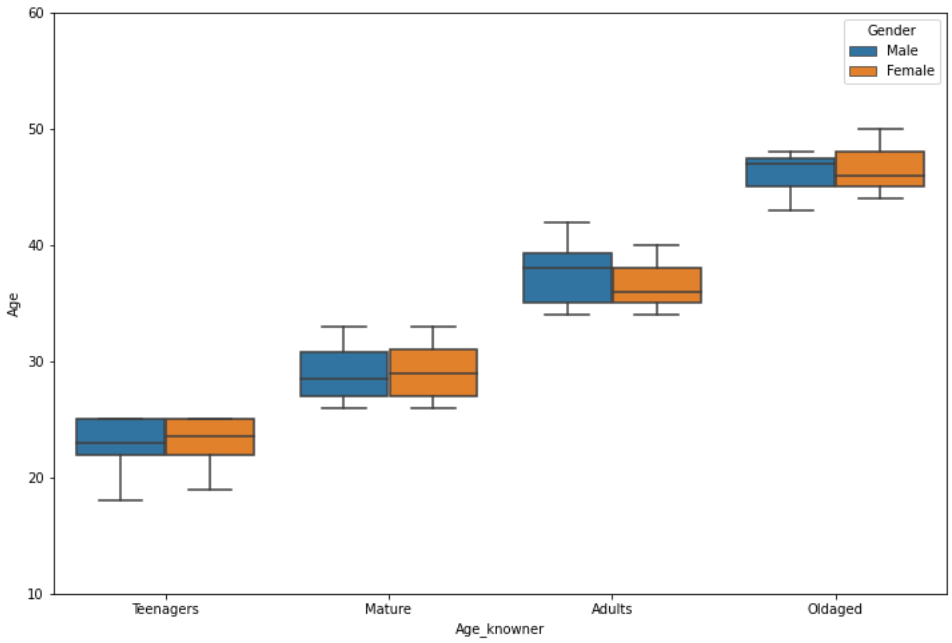
Out[3]:

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

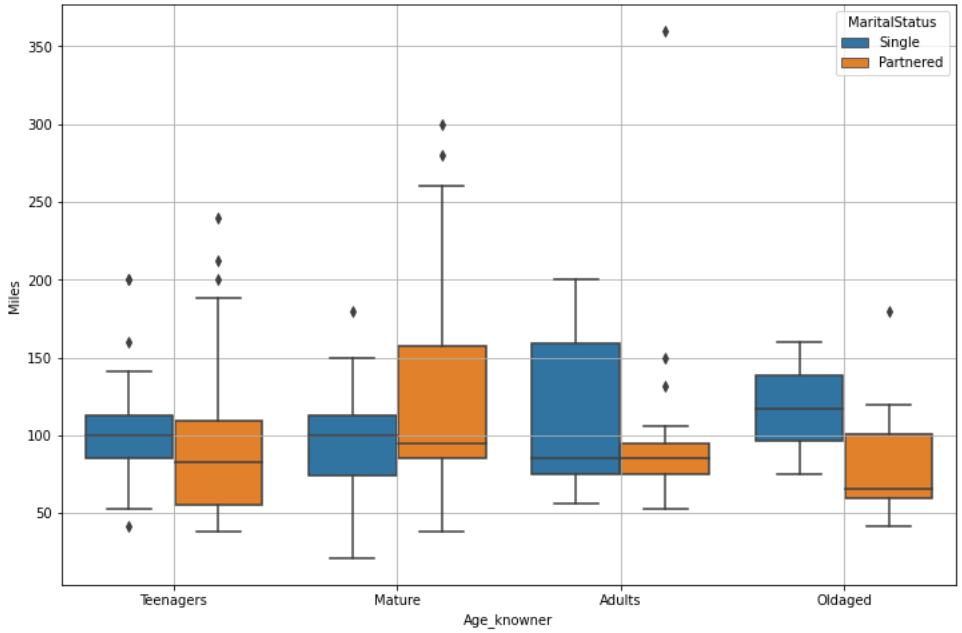
180 rows × 10 columns

In [24]:
```
# BoxPlot on Age_Knowner

#Bivariate Analysis
plt.figure(figsize=(12,8))
sns.boxplot(data=Aerofit,x="Age_knowner",y="Age")
plt.grid()
plt.show()

# Tri-Variate
plt.figure(figsize=(12,8))
sns.boxplot(data=Aerofit,x="Age_knowner",y="Age",hue="Gender")
plt.ylim(bottom=10,top=60)
plt.show()
```

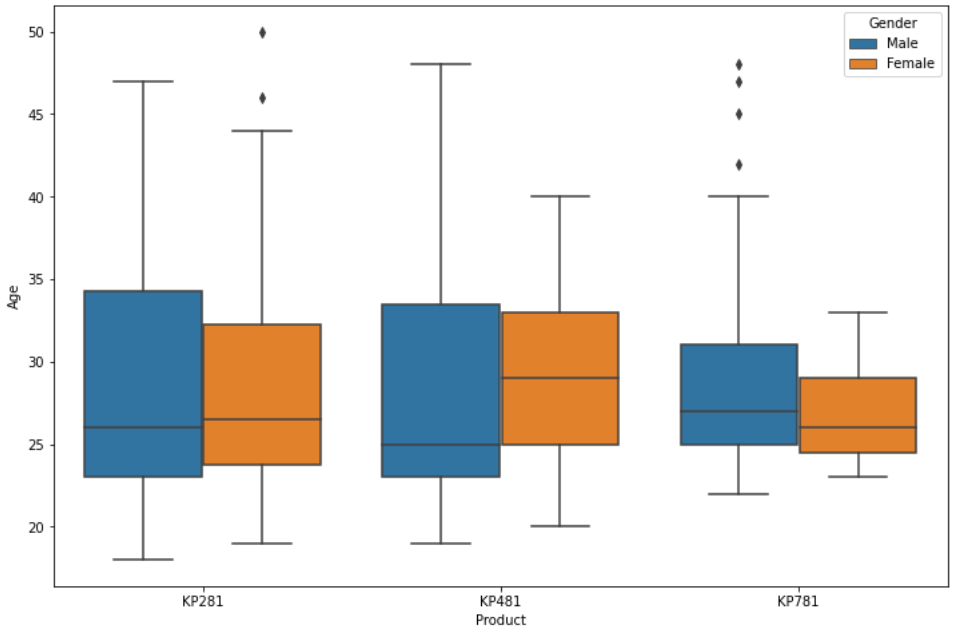




In [26]:
```
# Marital Status

plt.figure(figsize=(12,8))
sns.boxplot(data=Aerofit,x="Age_knowner",y="Miles",hue="MaritalStatus")
plt.grid()
plt.show()
```

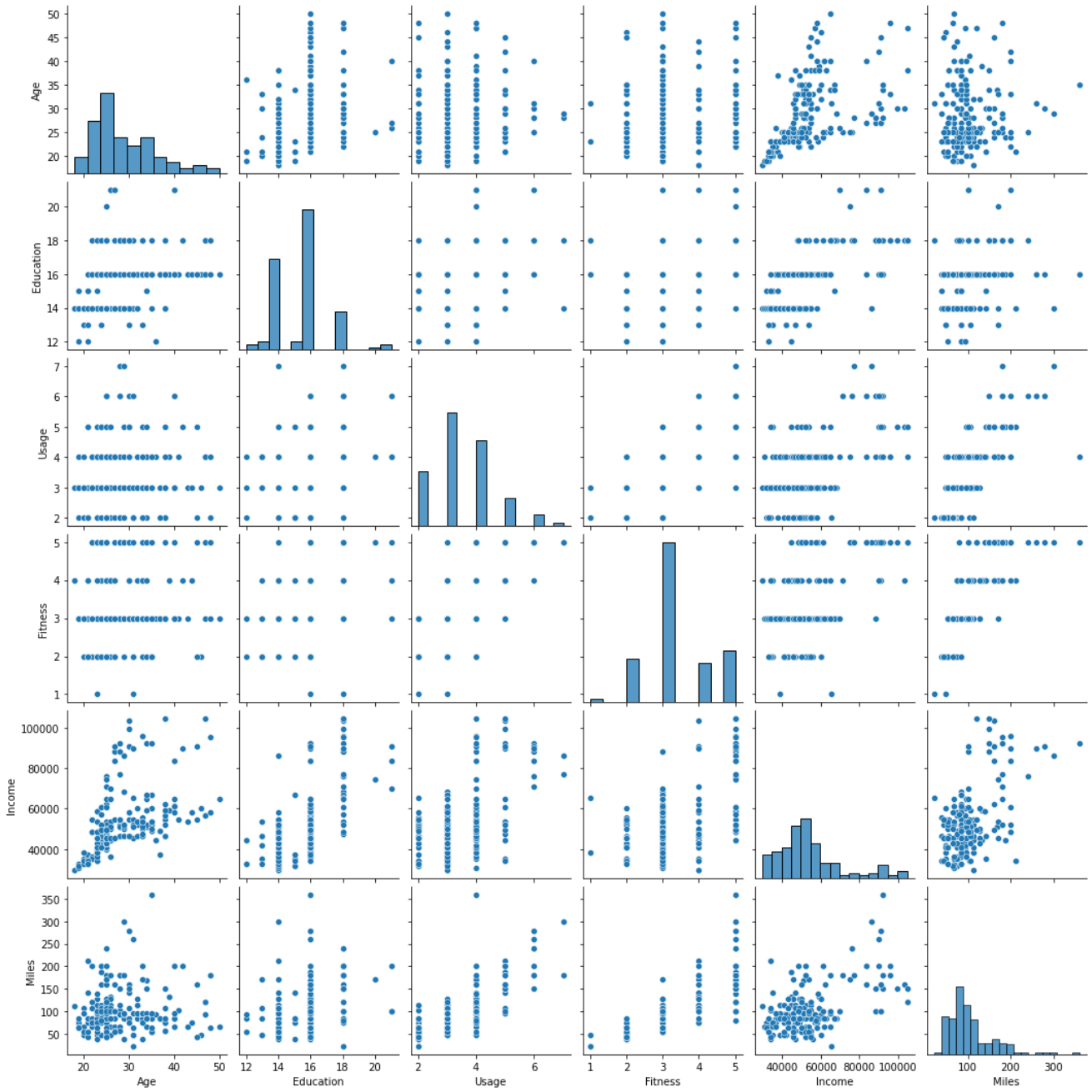


In [27]:
```
# Product

plt.figure(figsize=(12,8))
sns.boxplot(data=Aerofit,x="Product",y="Age",hue="Gender")
plt.show()
```



3.3 For correlation: Heatmaps, Pairplots

In [9]:
```
sns.pairplot(Aerofit)
plt.show()
```

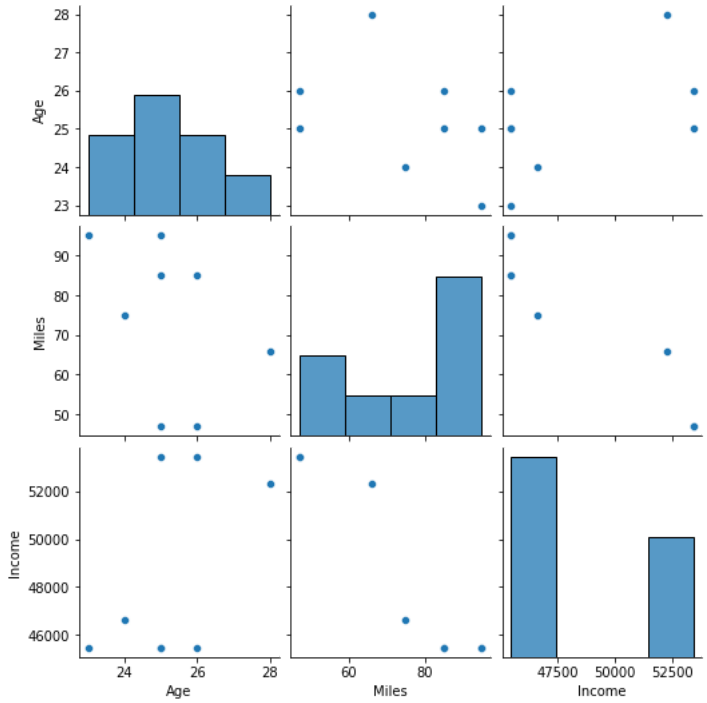


In [39]:
```
# Top 5 Data

Top_5_Age=Aerofit["Age"].value_counts().index[:5]
Top_5_Income=Aerofit["Income"].value_counts().index[:5]
Top_5_Miles=Aerofit["Miles"].value_counts().index[:5]

Top_5_data_based_on_Age_Income_Miles=Aerofit[(Aerofit["Age"].isin(Top_5_Age)) & (Aerofit["Income"].isin(Top_5_Income)) & (Aerofit
Top_5_data_based_on_Age_Income_Miles
```

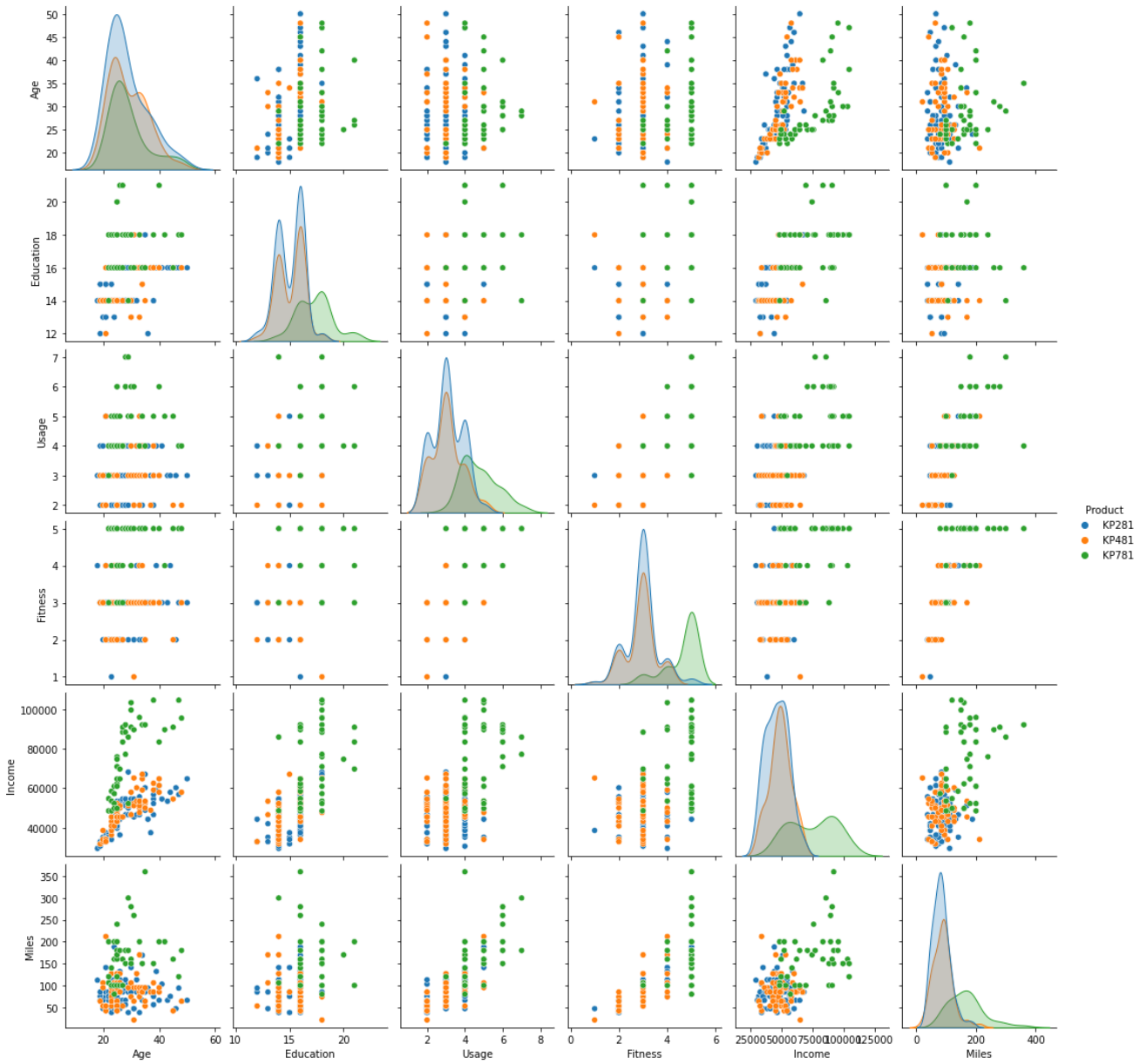
Out[39]:

	Product	Age	Gender	Education	MaritalStatus	Usage	Fitness	Income	Miles
26	KP281	24	Female	16	Single	4	3	46617	75
29	KP281	25	Female	14	Partnered	2	2	53439	47
36	KP281	26	Male	16	Partnered	2	2	53439	47
45	KP281	28	Female	16	Partnered	2	3	52302	66
89	KP481	23	Female	16	Single	3	3	45480	95
97	KP481	25	Female	14	Partnered	2	3	45480	85
101	KP481	25	Male	14	Single	3	3	45480	95
108	KP481	26	Female	16	Partnered	4	3	45480	85

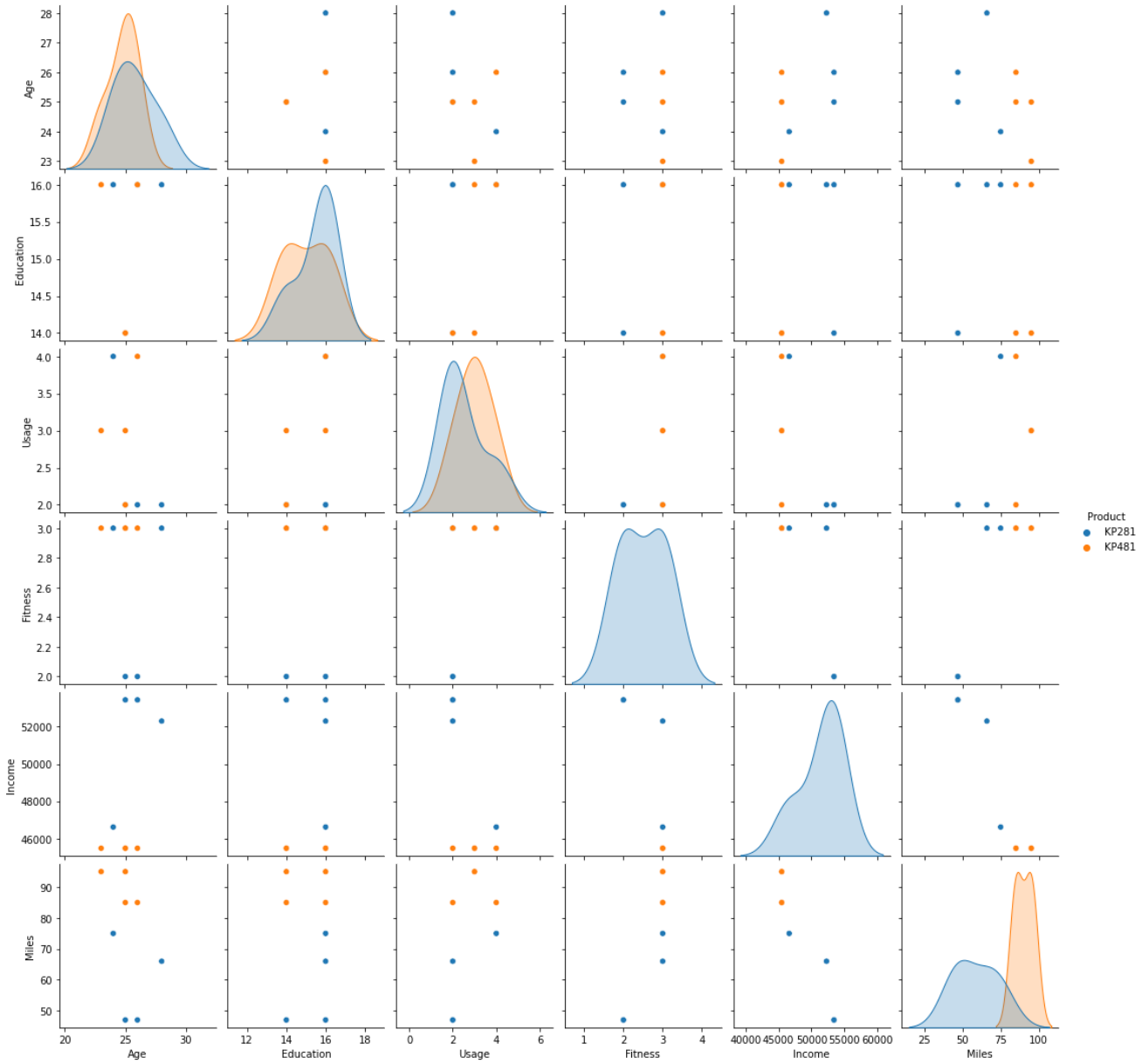
In [40]:
```
sns.pairplot(data=Top_5_data_based_on_Age_Income_Miles[["Age","Miles","Income","Product"]])
plt.show()
```



In [37]:
```
sns.pairplot(data=Aerofit,hue="Product")
plt.show()
```



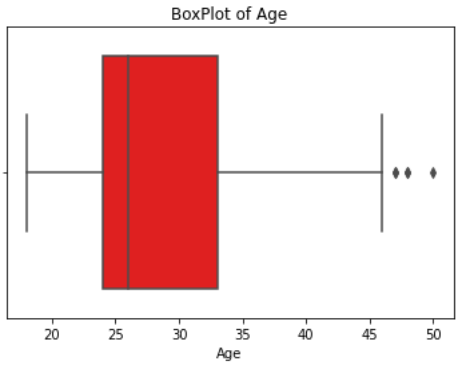
In [41]:
```
sns.pairplot(data=Top_5_data_based_on_Age_Income_Miles,hue="Product")
plt.show()
```



4. Missing Value & Outlier Detection

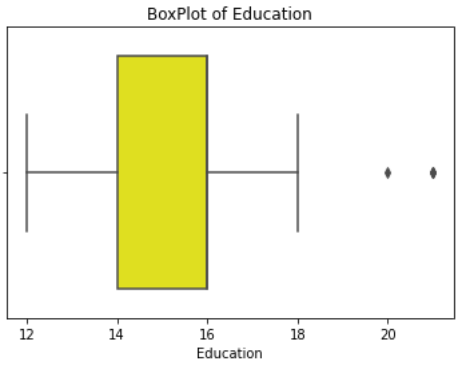
In [145]:
```
# Age - BoxPlot
Age_25=np.percentile(Aerofit["Age"],25)
Age_75=np.percentile(Aerofit["Age"],75)
IQR=Age_75-Age_25
Lower=max(Age_25-(1.5*IQR),0)
Upper=Age_75+(1.5*IQR)

print("People of Age less than ",Lower," and people of age greater than ",Upper,"are outlier")

sns.boxplot(x=Aerofit["Age"],color="red")
plt.title("BoxPlot of Age")
plt.show()
```

```
People of Age less than  10.5  and people of age greater than  46.5 are outlier
```



In [142]:
```
# Education

Education_25=np.percentile(Aerofit["Education"],25)
Education_75=np.percentile(Aerofit["Education"],75)
IQR=Education_75-Education_25
Lower=max(Education_25-(1.5*IQR),0)
Upper=Education_75+(1.5*IQR)

print("People of Education less than ",Lower," and people of Education greater than ",Upper,"are outlier")

sns.boxplot(x=Aerofit["Education"],color="yellow")
plt.title("BoxPlot of Education")
plt.show()
```

```
People of Education less than  11.0  and people of Education greater than  19.0 are outlier
```



In [149]:
```
# to delete rows having missing values
Aerofit.dropna()
```

Out[149]:

	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

In [148]:
```
print("the above dropna shows there are no missing values in complete data as shape of original data and after drop is same")
```

```
the above dropna shows there are no missing values in complete data as shape of original data and after drop is same
```

In [ ]:
```

```

5. Business Insights based on Non-Graphical and Visual Analysis

5.1 Comments on the range of attributes

In [109]:
```
Aerofit.describe()
```

Out[109]:

	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

In [108]:
```
# Age
a1=Aerofit["Age"].unique()
a2=Aerofit["Age"].nunique()
print("Unique Value of Age : ")
print(a1)
print("*************************")
print("Total Unique Age : ")
print(a2)
print("*************************")
print("From Aerofit.describe()")
print("minimum age : 18")
print("maximum age : 50")
print("-------------------------------------------------------------------------")
# Education
a1=Aerofit["Education"].unique()
a2=Aerofit["Education"].nunique()
print("Unique Value of Education : ")
print(a1)
print("*************************")
print("Total Unique Education : ")
print(a2)
print("*************************")
print("From Aerofit.describe()")
print("minimum Education : 12")
print("maximum Education : 21")
print("-------------------------------------------------------------------------")
# Income
a1=Aerofit["Income"].unique()
a2=Aerofit["Income"].nunique()
print("Unique Value of Income : ")
print(a1)
print("*************************")
print("Total Unique Income : ")
print(a2)
print("*************************")
print("From Aerofit.describe()")
print("minimum Income : 29562")
print("maximum Income : 104581")
```

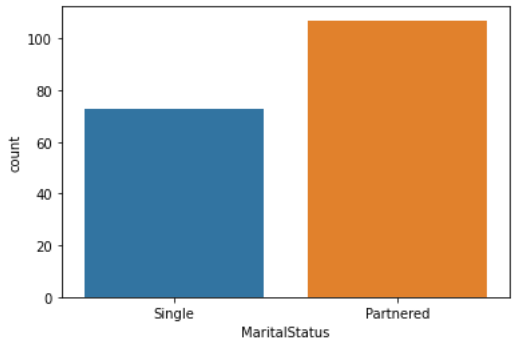
```
Unique Value of Age :
[18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41
 43 44 46 47 50 45 48 42]
*************************
Total Unique Age :
32
*************************
From Aerofit.describe()
minimum age : 18
maximum age : 50
-------------------------------------------------------------------------
Unique Value of Education :
[14 15 12 13 16 18 20 21]
*************************
Total Unique Education :
8
*************************
From Aerofit.describe()
minimum Education : 12
maximum Education : 21
-------------------------------------------------------------------------
Unique Value of Income :
[ 29562  31836  30699  32973  35247  37521  36384  38658  40932  34110
  39795  42069  44343  45480  46617  48891  53439  43206  52302  51165
  50028  54576  68220  55713  60261  67083  56850  59124  61398  57987
  64809  47754  65220  62535  48658  54781  48556  58516  53536  61006
  57271  52291  49801  62251  64741  70966  75946  74701  69721  83416
  88396  90886  92131  77191  52290  85906 103336  99601  89641  95866
 104581  95508]
*************************
Total Unique Income :
62
*************************
From Aerofit.describe()
minimum Income : 29562
maximum Income : 104581
```

5.2 Comments on the distribution of the variables and relationship between them

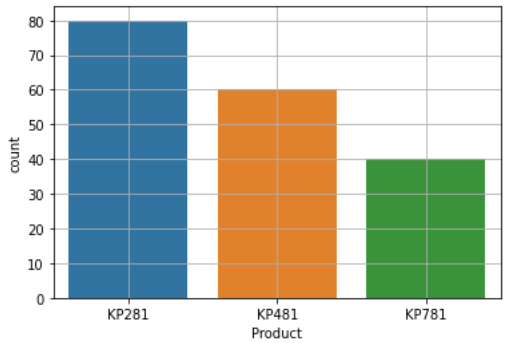
5.3 Comments for each univariate and bivariate plot

In [119]:
```
# Martial Status
x1=Aerofit["MaritalStatus"].value_counts()
print(x1)
sns.countplot(x=Aerofit["MaritalStatus"])
plt.show()
print("We Observed that Partnered status People mostly purchased a treadmill from the AeroFit stores during the prior three month

# Product
x2=Aerofit["Product"].value_counts()
print(x2)
sns.countplot(x=Aerofit["Product"])
plt.grid()
plt.show()
print("Product KP281 is highly purchase treadmil by peoples")

# Gender
x3=Aerofit["Gender"].value_counts()
print(x3)
sns.countplot(x=Aerofit["Gender"])
plt.show()
print("Males Gender is more consious to their healths")
```

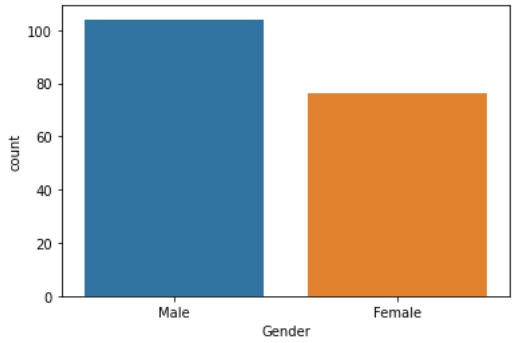
```
Partnered    107
Single        73
Name: MaritalStatus, dtype: int64
```




```
We Observed that Partnered status People mostly purchased a treadmill from the AeroFit stores during the prior three months
KP281    80
KP481    60
KP781    40
Name: Product, dtype: int64
```

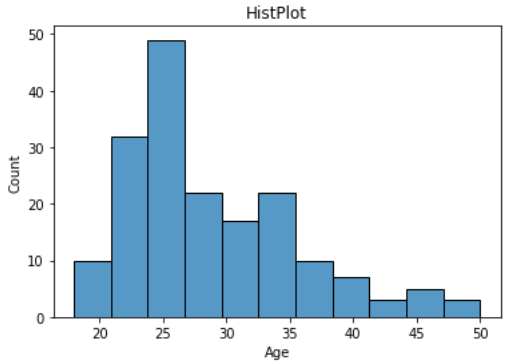



```
Product KP281 is highly purchase treadmil by peoples
Male      104
Female     76
Name: Gender, dtype: int64
```



Males Gender is more consious to their healths

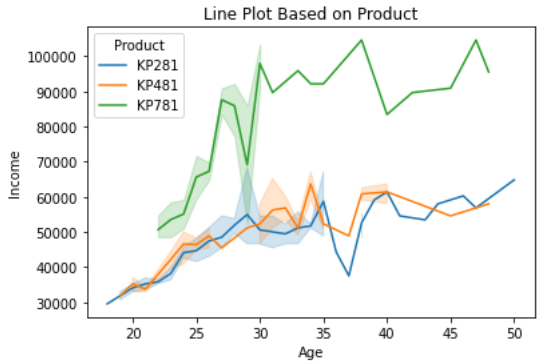
In [132]:
```
# GRAPHICAL ANALYSIS

sns.histplot(x=Aerofit["Age"])
plt.title("HistPlot")
plt.show()
print("We notice that age group of 25 people are more use of aerofit product")
```



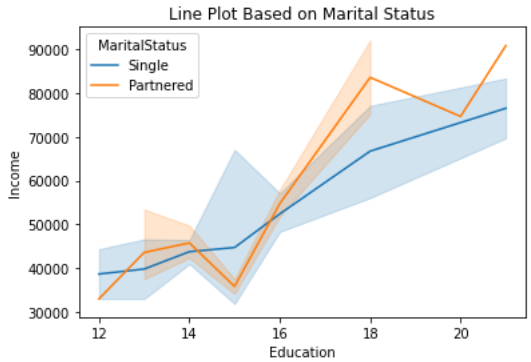
We notice that age group of 25 people are more use of aerofit product

In [128]:

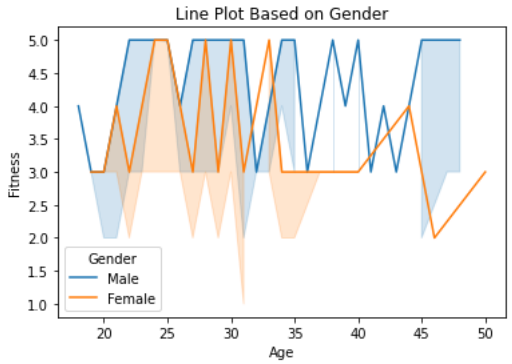
```
LYSIS
ta=Aerofit,x="Age",y="Income",hue="Product")
 Plot Based on Product")

oduct is mostly used by all age groups and it is also noticable that High income people use this mostly this product and it is al

ta=Aerofit,x="Education",y="Income",hue="MaritalStatus")
 Plot Based on Marital Status")

d people and single people both are educated but incomes of partnered peoples are more")

ta=Aerofit,x="Age",y="Fitness",hue="Gender",estimator=np.max)
 Plot Based on Gender")

der is constantly more consious to their health whereas females are too but they are not constant, they  are fluctating over age
----------------------------------------------------------")


 Analysis
it.shape[0]
it[Aerofit["Product"]=='KP281'].shape[0]
it[Aerofit["Product"]=='KP481'].shape[0]
it[Aerofit["Product"]=='KP781'].shape[0]

KP281/total_len
KP481/total_len
KP781/total_len

ity of use KP281 - ",Prob_KP281)
ity of use KP481 - ",Prob_KP481)
ity of use KP781 - ",Prob_KP781)
```



KP781 product is mostly used by all age groups and it is also noticable that High income people use this mostly this product an
d it is also notiocable that KP281 is highly Purchase but people with low income purchase this mostly



Partnered people and single people both are educated but incomes of partnered peoples are more

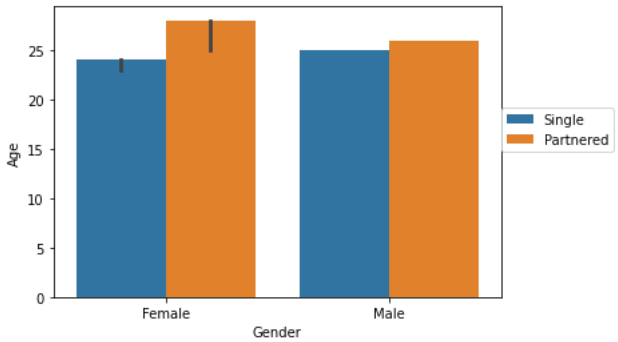



```
Male gender is constantly more consious to their health whereas females are too but they are not constant, they  are fluctating
over age
------------------------------------------------------------------
Probability of use KP281 -  0.4444444444444444
Probability of use KP481 -  0.3333333333333333
Probability of use KP781 -  0.2222222222222222
```

In [130]:
```
# Non-Graphical Analysis

Top_3_Age=Aerofit["Age"].value_counts().index[:3]
Top_3_Income=Aerofit["Income"].value_counts().index[:3]
Top_3_Miles=Aerofit["Miles"].value_counts().index[:3]

print("Top_3_Age_People more use Aerofit Product : ",Top_3_Age)
print("Top_3_Income_People : ",Top_3_Income)
print("Top_3_Miles_runned by People on Treadmil : ",Top_3_Miles)
```

```
Top_3_Age_People more use Aerofit Product :  Int64Index([25, 23, 24], dtype='int64')
Top_3_Income_People :  Int64Index([45480, 52302, 46617], dtype='int64')
Top_3_Miles_runned by People on Treadmil :  Int64Index([85, 95, 66], dtype='int64')
```

In [131]:
```
# Graphical analysis on top data
sns.barplot(data=Top_5_data_based_on_Age_Income_Miles,x="Gender",y="Age",hue="MaritalStatus",estimator=np.max)
plt.legend(loc=(1,0.5))
plt.show()

y1=Top_5_data_based_on_Age_Income_Miles["Gender"].value_counts()
y2=Top_5_data_based_on_Age_Income_Miles["MaritalStatus"].value_counts()

print("Total Genders in top 5 : ")
print(y1)
print("*****************************************")
print("Marital Status in top 5 : ")
print(y2)
```




```
Total Genders in top 5 :
Female    6
Male      2
Name: Gender, dtype: int64
*****************************************
Marital Status in top 5 :
Partnered    5
Single       3
Name: MaritalStatus, dtype: int64
```

6. Recommendations - Actionable items for business. No technical jargon. No complications. Simple action items that everyone can understand

Products

The KP281 is an entry-level treadmill that sells for $1,500.

The KP481 is for mid-level runners that sell for $1,750.

The KP781 treadmill is having advanced features that sell for $2,500.

1.As we see People muchy more buys KP281 which is having least cost in all three products , but company should decrease cost of KP781 Product as we have seen people having high incomes are more likely interested in buying it and people of low income more focus on KP281,KP481.

2.Company should more focus on Single marital status and female gender peoples as we have seen both of these category people are less aware of aerofit products.

3.Company should promote more awareness of health and their equipments in people of age group betwwen 35-50 years people.

4.Company should make females more attractive about gyming and physical health as we see females are attentive toward aerofit product but they are not consistent.

5.Peoples running more than 200 miles are very few , so company should promote peoples more awareness toward running and should offer them discount coupons if they run more than 200 miles.

6.Peoles of income between 30K-67K are more using Aerofit Equipments , So Company should have some few high range Products with more facility to high incomes peoples i.e. income>67K.

7.Mostly people are targeted toward 3 Fitness band , Company should every month held prize distribution to people have only 5 fitness band so that more people will exercise and due to it people will start promoting Aerofit Products.

8.As worked on this Aerofit Data , Viewed one common thing that Every People who use product have given values to evey columns rather than missing it which is good for company.

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