In [1]:

```python
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
warnings.filterwarnings('ignore')
```

In [2]:

```python
od=pd.read_csv('C:\\Users\\HP\\Documents\\Data Science\\Python\\E-Commerce_
```

In [3]:

```python
od
```

Out[3]:

	Customer ID	Order ID	Product	Units Sold	Date	Revenue	Cost
0	3	266868	Chocolate Chip	292	2/1/2020	1460.0	584.00
1	3	140794	Chocolate Chip	974	2/1/2020	4870.0	1948.00
2	3	684759	Chocolate Chip	2,518	6/1/2020	12590.0	5036.00
3	4	640447	Chocolate Chip	1,006	6/1/2020	5030.0	2012.00
4	2	898637	Chocolate Chip	367	7/1/2020	1835.0	734.00
...	...	...	...	...	...	...	...
695	3	853295	White Chocolate Macadamia Nut	2,826	5/1/2020	16956.0	7771.50
696	2	253981	White Chocolate Macadamia Nut	663	9/1/2020	3978.0	1823.25
697	4	208456	White Chocolate Macadamia Nut	2,574	11/1/2019	15444.0	7078.50
698	4	727940	White Chocolate Macadamia Nut	2,438	12/1/2019	14628.0	6704.50
699	4	414628	White Chocolate Macadamia Nut	914	12/1/2020	5484.0	2513.50

700 rows × 7 columns

In [4]:

```python
od.columns
```

Out[4]:

```
Index(['Customer ID', 'Order ID', 'Product', 'Units Sold', 'Date', 'Revenu
e',
       'Cost'],
      dtype='object')
```

In [5]:

```python
od.shape
```

Out[5]:

```
(700, 7)
```

In [6]:
```
od.dtypes
```

Out[6]:
```
Customer ID      int64
Order ID         int64
Product         object
Units Sold      object
Date            object
Revenue        float64
Cost           float64
dtype: object
```

In [7]:
```
od.duplicated()
```

Out[7]:
```
0      False
1      False
2      False
3      False
4      False
       ...  
695    False
696    False
697    False
698    False
699    False
Length: 700, dtype: bool
```

In [8]:
```
od.isnull().sum()
```

Out[8]:
```
Customer ID    0
Order ID       0
Product        0
Units Sold     0
Date           0
Revenue        0
Cost           0
dtype: int64
```

In [9]:
```
od['Units Sold']=od['Units Sold'].str.replace(',', '').astype(float)
```

In [10]:
```
od.head()
```

Out[10]:

	Customer ID	Order ID	Product	Units Sold	Date	Revenue	Cost
0	3	266868	Chocolate Chip	292.0	2/1/2020	1460.0	584.0
1	3	140794	Chocolate Chip	974.0	2/1/2020	4870.0	1948.0
2	3	684759	Chocolate Chip	2518.0	6/1/2020	12590.0	5036.0
3	4	640447	Chocolate Chip	1006.0	6/1/2020	5030.0	2012.0
4	2	898637	Chocolate Chip	367.0	7/1/2020	1835.0	734.0

In [11]:

```
#Removing outliers based on the IQR method for numeric columns
numeric_cols=['Customer ID', 'Order ID', 'Product', 'Units Sold', 'Date', '
       'Cost']
```

In [12]:

```
Q1 = od[numeric_cols].quantile(0.25)
Q3 = od[numeric_cols].quantile(0.75)
IQR= Q3-Q1
```

In [13]:

```
Q1
```

Out[13]:

```
Customer ID         2.000
Order ID       296211.500
Units Sold        905.000
Revenue          2854.000
Cost             1234.375
Name: 0.25, dtype: float64
```

In [14]:

```
Q3
```

Out[14]:

```
Customer ID         4.00
Order ID       710704.25
Units Sold       2229.50
Revenue          9580.00
Cost             3925.70
Name: 0.75, dtype: float64
```

In [15]:

```
IQR
```

Out[15]:

```
Customer ID         2.000
Order ID       414492.750
Units Sold       1324.500
Revenue          6726.000
Cost             2691.325
dtype: float64
```

In [16]:

```
#Defining a threshold to identify outliers
threshold=1.5
```

In [17]:

```
outlier_mask=((od[numeric_cols]<(Q1 - threshold*IQR)) | (od[numeric_cols]>(
```

In [18]:

```
outlier_mask.iloc[:20]
```

Out[18]:

```
0     False
1     False
2     False
3     False
4     False
5     False
6     False
7     False
8     False
9     False
10    False
11    False
12    False
13    False
14    False
15     True
16    False
17    False
18    False
19     True
dtype: bool
```

In [19]:

```
od_cleaned=od[~outlier_mask]
```

In [20]:

```
od_cleaned.shape
```

Out[20]:

```
(688, 7)
```

In [21]:

```
od.head()
```

Out[21]:

	Customer ID	Order ID	Product	Units Sold	Date	Revenue	Cost
0	3	266868	Chocolate Chip	292.0	2/1/2020	1460.0	584.0
1	3	140794	Chocolate Chip	974.0	2/1/2020	4870.0	1948.0
2	3	684759	Chocolate Chip	2518.0	6/1/2020	12590.0	5036.0
3	4	640447	Chocolate Chip	1006.0	6/1/2020	5030.0	2012.0
4	2	898637	Chocolate Chip	367.0	7/1/2020	1835.0	734.0

In [22]:

```
#To group the data by the "product" column
product_group = od.groupby('Product')
```

In [23]:

```
product_summary = product_group.agg({
    'Units Sold' : 'sum',
    'Revenue': 'sum',
    'Cost': 'sum'})
```

In [24]:

```
product_summary
```

Out[24]:

Product	Units Sold	Revenue	Cost
Chocolate Chip	338243.0	1691197.5	676479.000
Fortune Cookie	154201.0	154198.0	77099.000
Oatmeal Raisin	155318.0	776575.0	341693.000
Snickerdoodle	146849.0	587384.0	220269.000
Sugar	168787.0	506349.0	210978.750
White Chocolate Macadamia Nut	162426.0	974547.0	446667.375

In [25]:

```
#To calculate profit margin in percentage
product_summary['Profit Margin'] = ((product_summary['Revenue'] - product_s
```

In [26]:

```
product_summary['Profit Margin']
```

Out[26]:

```
Product
Chocolate Chip                   60.000000
Fortune Cookie                   50.000000
Oatmeal Raisin                   56.000000
Snickerdoodle                    62.500000
Sugar                            58.333333
White Chocolate Macadamia Nut    54.166667
Name: Profit Margin, dtype: float64
```

In [27]:

```
#Sorting the products by revenue and units sold to find the best sellers
best_sellers_by_revenue = product_summary.sort_values(by='Revenue', ascendi
best_sellers_by_units_sold = product_summary.sort_values(by='Units Sold', a
```

In [28]:

```
best_sellers_by_revenue
```

Out[28]:

Product	Units Sold	Revenue	Cost	Profit Margin
Chocolate Chip	338243.0	1691197.5	676479.000	60.000000
White Chocolate Macadamia Nut	162426.0	974547.0	446667.375	54.166667
Oatmeal Raisin	155318.0	776575.0	341693.000	56.000000
Snickerdoodle	146849.0	587384.0	220269.000	62.500000
Sugar	168787.0	506349.0	210978.750	58.333333
Fortune Cookie	154201.0	154198.0	77099.000	50.000000

In [29]:

```
best_sellers_by_units_sold
```

Out[29]:

	Units Sold	Revenue	Cost	Profit Margin
Product				
Chocolate Chip	338243.0	1691197.5	676479.000	60.000000
Sugar	168787.0	506349.0	210978.750	58.333333
White Chocolate Macadamia Nut	162426.0	974547.0	446667.375	54.166667
Oatmeal Raisin	155318.0	776575.0	341693.000	56.000000
Fortune Cookie	154201.0	154198.0	77099.000	50.000000
Snickerdoodle	146849.0	587384.0	220269.000	62.500000

In [30]:

```
od
```

Out[30]:

	Customer ID	Order ID	Product	Units Sold	Date	Revenue	Cost
0	3	266868	Chocolate Chip	292.0	2/1/2020	1460.0	584.00
1	3	140794	Chocolate Chip	974.0	2/1/2020	4870.0	1948.00
2	3	684759	Chocolate Chip	2518.0	6/1/2020	12590.0	5036.00
3	4	640447	Chocolate Chip	1006.0	6/1/2020	5030.0	2012.00
4	2	898637	Chocolate Chip	367.0	7/1/2020	1835.0	734.00
...	...	...	...	...	...	...	...
695	3	853295	White Chocolate Macadamia Nut	2826.0	5/1/2020	16956.0	7771.50
696	2	253981	White Chocolate Macadamia Nut	663.0	9/1/2020	3978.0	1823.25
697	4	208456	White Chocolate Macadamia Nut	2574.0	11/1/2019	15444.0	7078.50
698	4	727940	White Chocolate Macadamia Nut	2438.0	12/1/2019	14628.0	6704.50
699	4	414628	White Chocolate Macadamia Nut	914.0	12/1/2020	5484.0	2513.50

700 rows × 7 columns

In [31]:

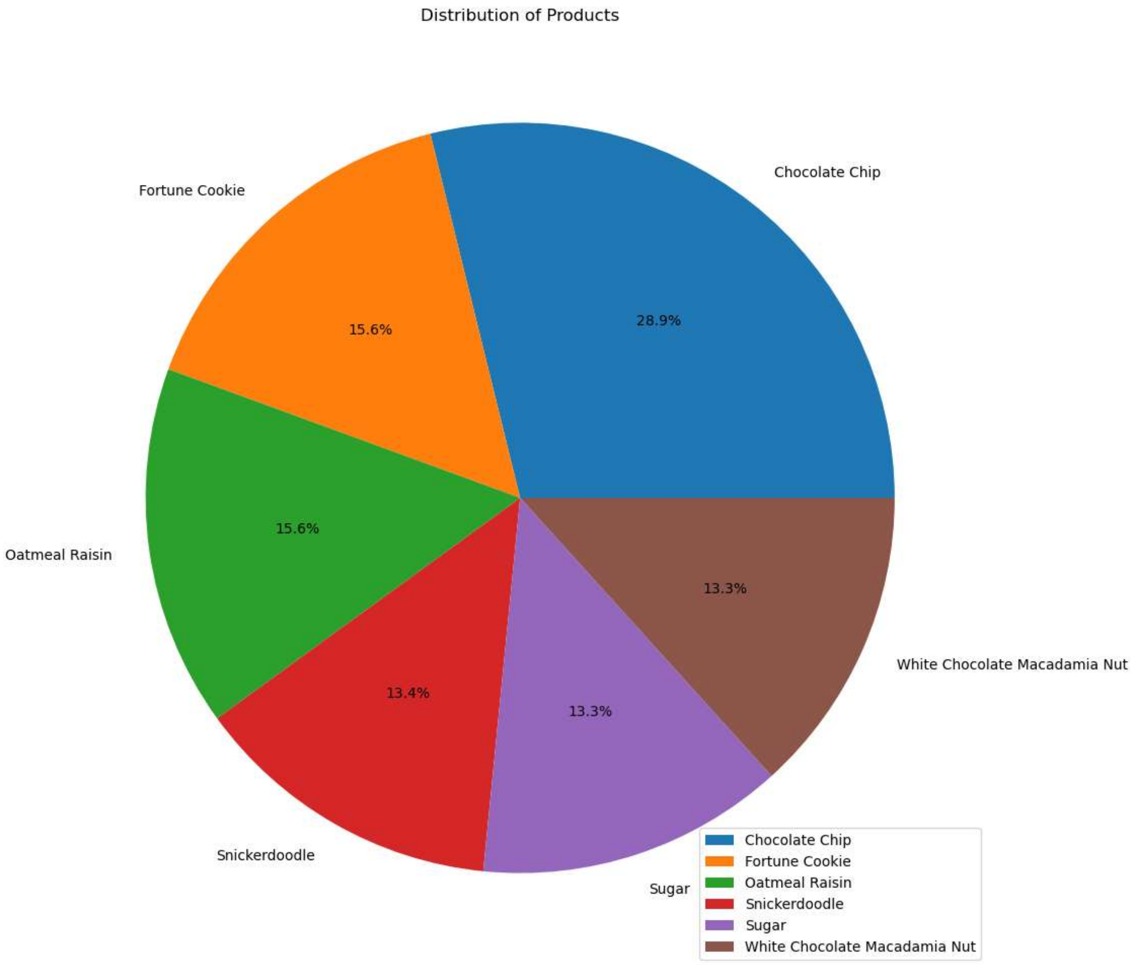
```
od['Product'].unique()
```

Out[31]:

```
array(['Chocolate Chip', 'Fortune Cookie', 'Oatmeal Raisin',
       'Snickerdoodle', 'Sugar', 'White Chocolate Macadamia Nut'],
      dtype=object)
```

```
In [32]:  #Explorative Data Analysis Using Matplotlib - Pie Chart
          plt.figure(figsize=(12,12))
          plt.pie(od['Product'].value_counts(), labels=['Chocolate Chip', 'Fortune Co
                 'Snickerdoodle', 'Sugar', 'White Chocolate Macadamia Nut'], autopct=
          plt.title('Distribution of Products')
          plt.legend(loc='lower right')

          plt.show()
```

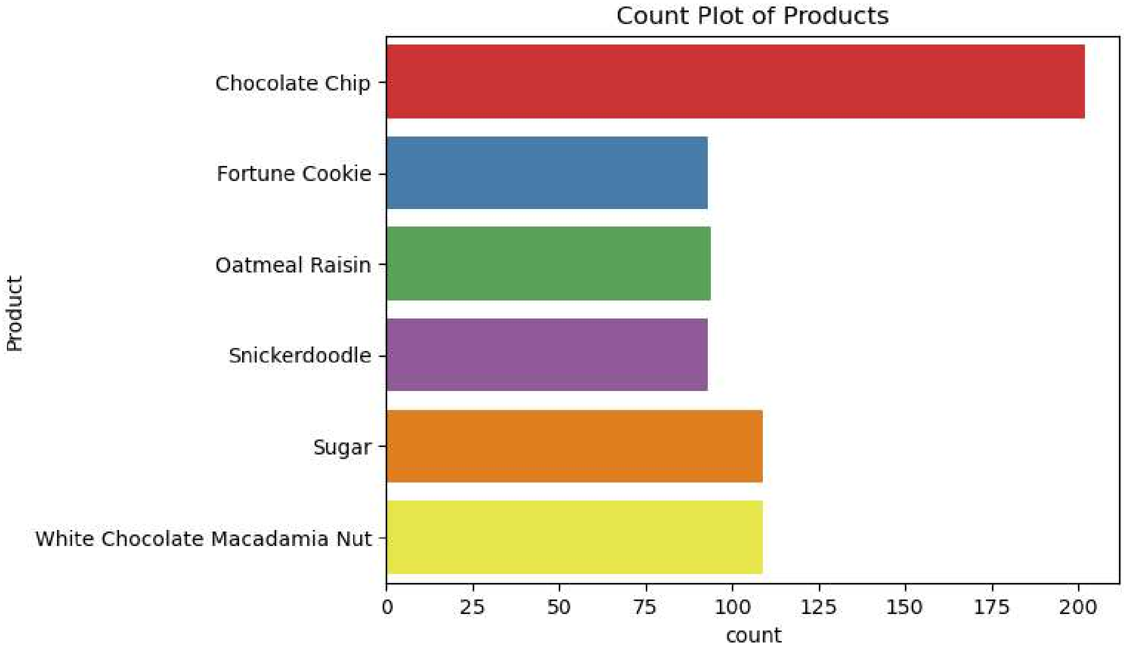


In [33]:

```
#Count Plot using Seaborn
sns.countplot(od,y='Product',palette="Set1" )
plt.title('Count Plot of Products')
```

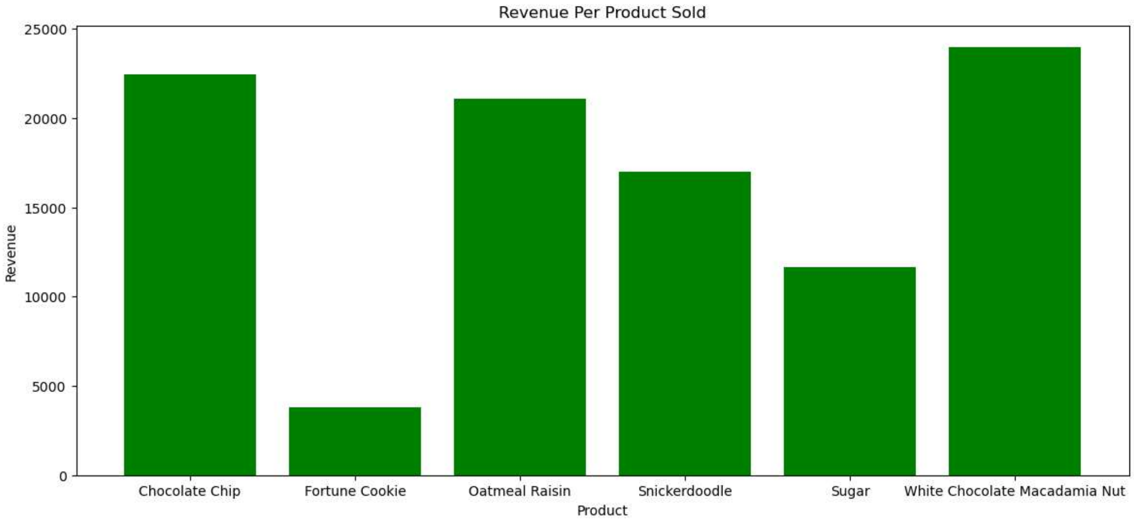
Out[33]:

```
Text(0.5, 1.0, 'Count Plot of Products')
```



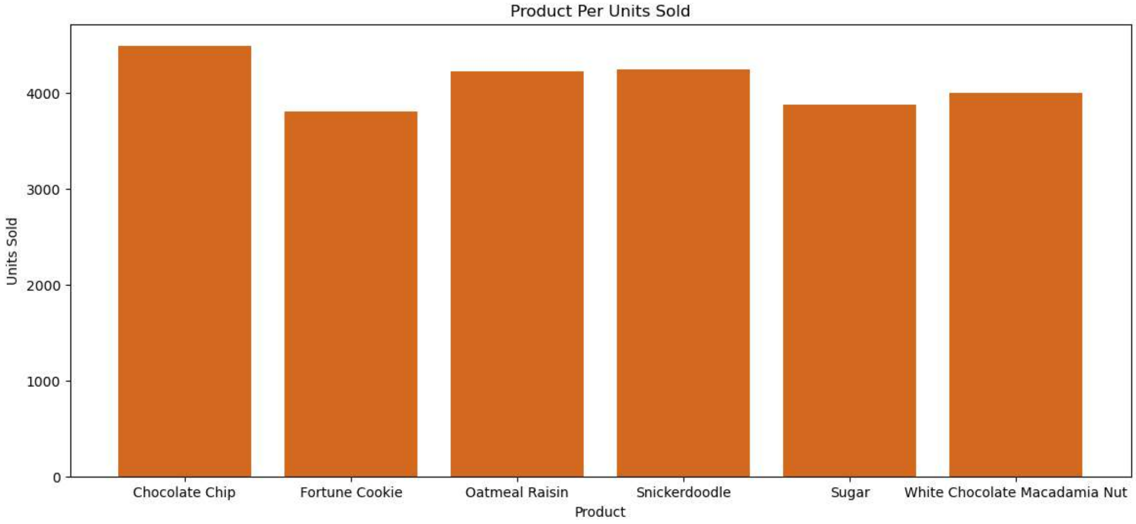
In [34]:

```
#Bar chart
plt.figure(figsize=(14,6))
plt.bar(od['Product'],od['Revenue'],color='green')
plt.xlabel('Product')
plt.ylabel('Revenue')
plt.title('Revenue Per Product Sold')
plt.show()
```



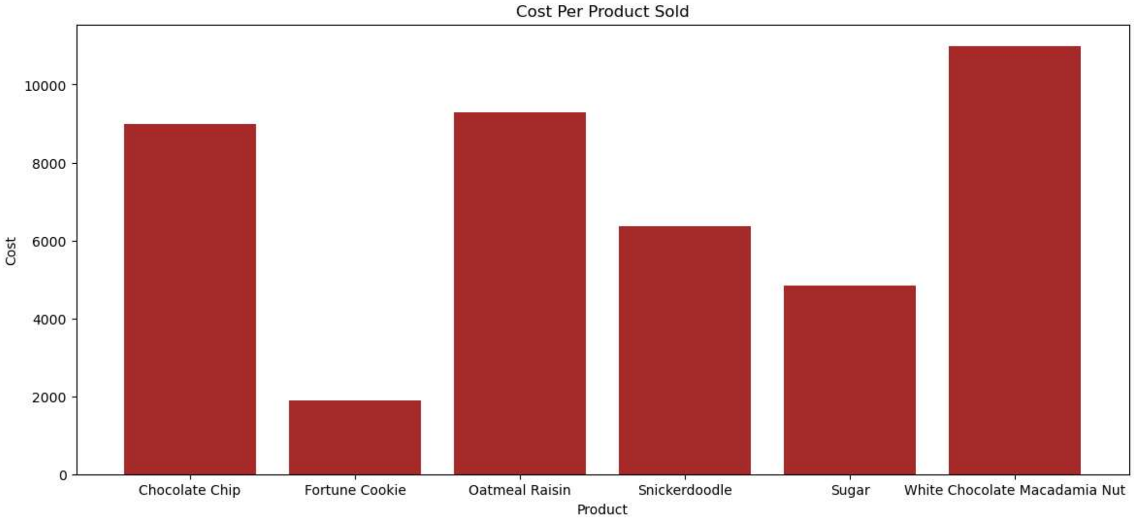
In [35]:

```
#Bar chart
plt.figure(figsize=(14,6))
plt.bar(od['Product'],od['Units Sold'],color='chocolate')
plt.xlabel('Product')
plt.ylabel('Units Sold')
plt.title('Product Per Units Sold')
plt.show()
```



In [36]:

```
#Bar chart
plt.figure(figsize=(14,6))
plt.bar(od['Product'],od['Cost'],color='brown')
plt.xlabel('Product')
plt.ylabel('Cost')
plt.title('Cost Per Product Sold')
plt.show()
```


Cost Per Product Sold
Cost
Chocolate Chip
Fortune Cookie
Oatmeal Raisin
Snickerdoodle
Sugar
White Chocolate Macadamia Nut
Product