In [407]:
```
import numpy as np
import pandas as pd
import os
import matplotlib.pyplot as plt
import matplotlib
import seaborn as sns
%matplotlib inline
sns.set(color_codes=True) # adds a nice background to the graphs
```

In [3]:
```
import math
from scipy import stats
from scipy.stats import   ttest_1samp, ttest_ind
import scipy.stats as stats
import statsmodels.stats.api as sm
```

In [4]:
```
Wsale= pd.read_csv('Wholesale+Customers+Data.csv')
Wsale
```

Out[4]:

	Buyer/Spender	Channel	Region	Fresh	Milk	Grocery	Frozen	Detergents_Paper	Delica
0	1	Retail	Other	12669	9656	7561	214	2674	
1	2	Retail	Other	7057	9810	9568	1762	3293	
2	3	Retail	Other	6353	8808	7684	2405	3516	
3	4	Hotel	Other	13265	1196	4221	6404	507	
4	5	Retail	Other	22615	5410	7198	3915	1777	
...	...	...	...	...	...	...	...	...	
435	436	Hotel	Other	29703	12051	16027	13135	182	
436	437	Hotel	Other	39228	1431	764	4510	93	
437	438	Retail	Other	14531	15488	30243	437	14841	
438	439	Hotel	Other	10290	1981	2232	1038	168	
439	440	Hotel	Other	2787	1698	2510	65	477	

440 rows × 9 columns

In [8]:
```
Wsale.describe().T
```

Out[8]:

	count	mean	std	min	25%	50%	75%	max
Buyer/Spender	440.0	220.500000	127.161315	1.0	110.75	220.5	330.25	440.0
Fresh	440.0	12000.297727	12647.328865	3.0	3127.75	8504.0	16933.75	112151.0
Milk	440.0	5796.265909	7380.377175	55.0	1533.00	3627.0	7190.25	73498.0
Grocery	440.0	7951.277273	9503.162829	3.0	2153.00	4755.5	10655.75	92780.0
Frozen	440.0	3071.931818	4854.673333	25.0	742.25	1526.0	3554.25	60869.0
Detergents_Paper	440.0	2881.493182	4767.854448	3.0	256.75	816.5	3922.00	40827.0
Delicatessen	440.0	1524.870455	2820.105937	3.0	408.25	965.5	1820.25	47943.0

In [10]:
```
# 2
Wsale
```

Out[10]:

	Buyer/Spender	Channel	Region	Fresh	Milk	Grocery	Frozen	Detergents_Paper	Delica
0	1	Retail	Other	12669	9656	7561	214	2674	
1	2	Retail	Other	7057	9810	9568	1762	3293	
2	3	Retail	Other	6353	8808	7684	2405	3516	
3	4	Hotel	Other	13265	1196	4221	6404	507	
4	5	Retail	Other	22615	5410	7198	3915	1777	
...	...	...	...	...	...	...	...	...	
435	436	Hotel	Other	29703	12051	16027	13135	182	
436	437	Hotel	Other	39228	1431	764	4510	93	
437	438	Retail	Other	14531	15488	30243	437	14841	
438	439	Hotel	Other	10290	1981	2232	1038	168	
439	440	Hotel	Other	2787	1698	2510	65	477	

440 rows × 9 columns

In [23]:
```
#Create a column with sum of total sales across all the departments

Wsale['Total Sales']= Wsale['Fresh']+ Wsale['Milk']+Wsale['Grocery']+Wsale['Fr
ozen'] + Wsale['Detergents_Paper'] +Wsale['Delicatessen']
Wsale
```

Out[23]:

	Buyer/Spender	Channel	Region	Fresh	Milk	Grocery	Frozen	Detergents_Paper	Delica
0	1	Retail	Other	12669	9656	7561	214	2674	
1	2	Retail	Other	7057	9810	9568	1762	3293	
2	3	Retail	Other	6353	8808	7684	2405	3516	
3	4	Hotel	Other	13265	1196	4221	6404	507	
4	5	Retail	Other	22615	5410	7198	3915	1777	
...	...	...	...	...	...	...	...	...	
435	436	Hotel	Other	29703	12051	16027	13135	182	
436	437	Hotel	Other	39228	1431	764	4510	93	
437	438	Retail	Other	14531	15488	30243	437	14841	
438	439	Hotel	Other	10290	1981	2232	1038	168	
439	440	Hotel	Other	2787	1698	2510	65	477	

440 rows × 10 columns

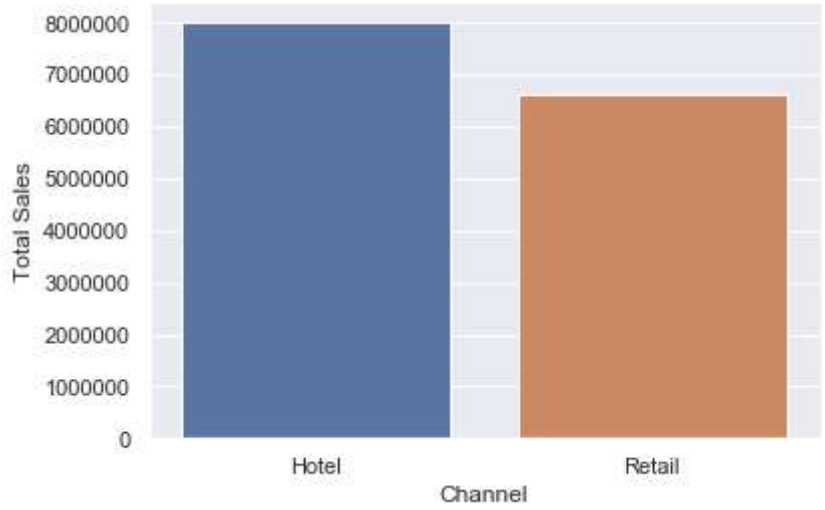
1.1

In [57]:
```
# Coding for Problem 1.1

#Create a column with sum of total sales across all the departments
Wsale['Total Sales']= Wsale['Fresh']+ Wsale['Milk']+Wsale['Grocery']+Wsale['Fr
ozen'] + Wsale['Detergents_Paper'] +Wsale['Delicatessen']

#Groupby Region to figure out the summation of Total sales per Region
WsaleReg = Wsale[['Region','Total Sales']].groupby('Region').sum()
WsaleReg.reset_index(inplace=True)

#Arrange the table in Ascending order
WsaleReg.sort_values(by='Total Sales', ascending= True)

#Figure ourt the Region with Max and min sales
MaxReg = WsaleReg[WsaleReg['Total Sales']==WsaleReg['Total Sales'].max()][['Re
gion','Total Sales']].set_index('Region')
MinReg = WsaleReg[WsaleReg['Total Sales']==WsaleReg['Total Sales'].min()][['Re
gion','Total Sales']].set_index('Region')
```

In [74]:
```
#Doing the same as above line for Chanel

#Groupby Channel to figure out the summation of Total sales per Region
WsaleChan = Wsale[['Channel','Total Sales']].groupby('Channel').sum()
WsaleChan.reset_index(inplace= True)
WsaleChan.sort_values(by='Total Sales', ascending= True)

#Arrange the table in Ascending order
WsaleChan.sort_values(by='Total Sales', ascending= True)

#Figure out the Channel with Max and min sales
MaxChan = WsaleChan[WsaleChan['Total Sales']==WsaleChan['Total Sales'].max()]
[['Channel','Total Sales']].set_index('Channel')
MinChan = WsaleChan[WsaleChan['Total Sales']==WsaleChan['Total Sales'].min()]
[['Channel','Total Sales']].set_index('Channel')
```

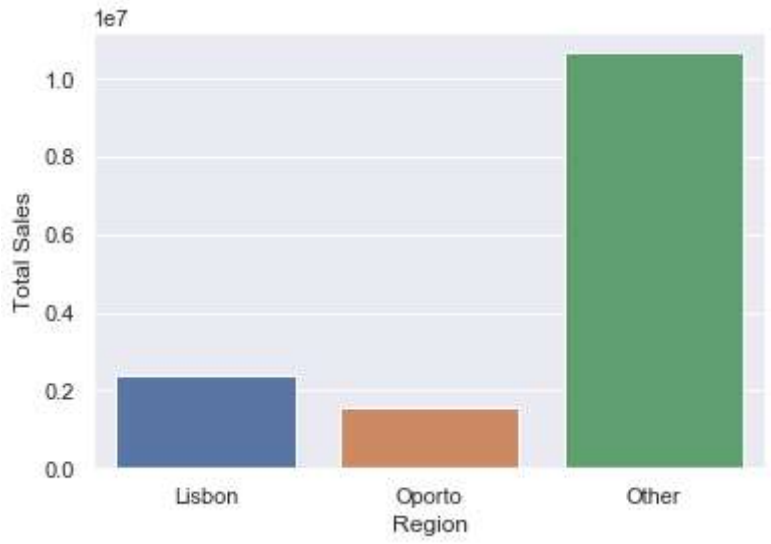
In [403]:
```
sns.barplot( WsaleChan['Channel'], WsaleChan['Total Sales'])
```

Out[403]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x20124eabec8>
```



In [404]:
```
sns.barplot( WsaleReg['Region'], WsaleReg['Total Sales'])
```

Out[404]: <matplotlib.axes._subplots.AxesSubplot at 0x20124eda9c8>



In [73]:
```
#Answer to the Ques 1.1

print('The Region and Channel which seems to spend maximum are:','\n','\n', Ma
xReg , '\n','\n', MaxChan)
```

```
The Region and Channel which seems to spend maximum are:

         Total Sales
Region
Other      10677599

          Total Sales
Channel
Hotel        7999569
```

In [72]:
```
print('The Region and Channel which seems to spend minimum are:','\n','\n', Mi
nReg , '\n','\n', MinChan)
```

```
The Region and Channel which seems to spend minimum are:

         Total Sales
Region
Oporto      1555088

          Total Sales
Channel
Retail       6619931
```

In [382]:
```
MaxReg.to_csv('Maximum Region.csv')
MinReg.to_csv('Minimum Region.csv')
MaxChan.to_csv('Max Channel.csv')
MinChan.to_csv('Min Channel.csv')
```

In [ ]:

1.2

In [383]:
```
Wdescribe = Wsale.describe().T. round()
```

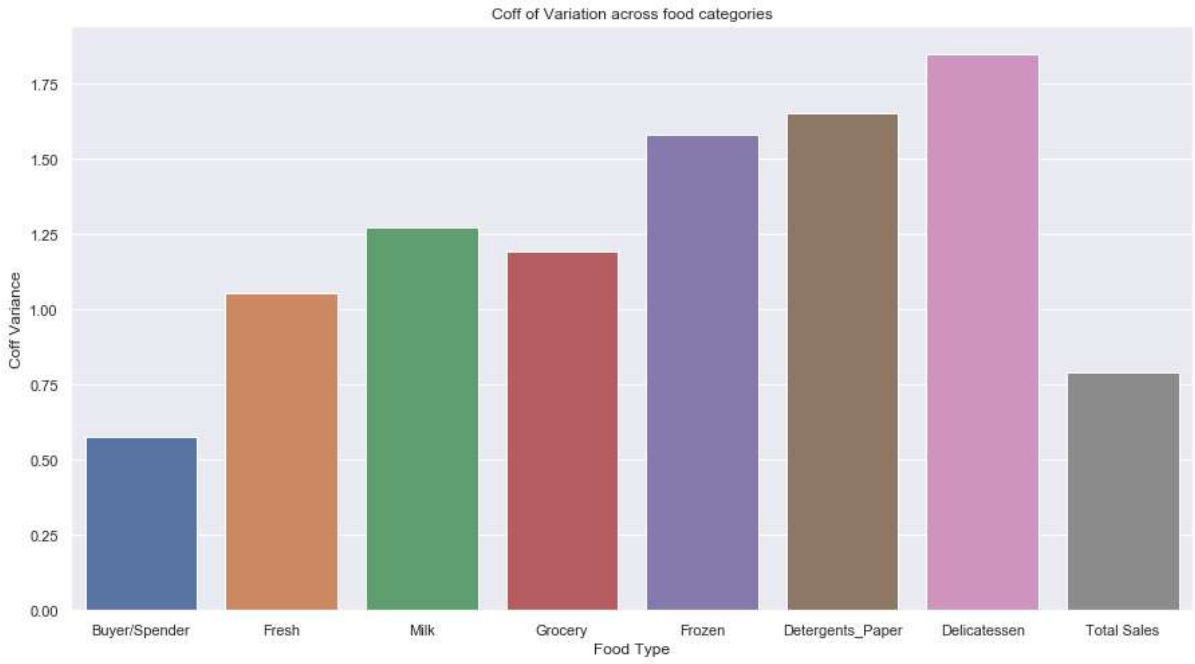
In [387]:
```
#Create a new Column to Measure the Coff of Variance for each food item
Wdescribe['Coff Variance']= Wdescribe['std']/Wdescribe['mean']

Wdescribe
```

Out[387]:

	count	mean	std	min	25%	50%	75%	max	Coff Variance
Buyer/Spender	440.0	220.0	127.0	1.0	111.0	220.0	330.0	440.0	0.577273
Fresh	440.0	12000.0	12647.0	3.0	3128.0	8504.0	16934.0	112151.0	1.053917
Milk	440.0	5796.0	7380.0	55.0	1533.0	3627.0	7190.0	73498.0	1.273292
Grocery	440.0	7951.0	9503.0	3.0	2153.0	4756.0	10656.0	92780.0	1.195196
Frozen	440.0	3072.0	4855.0	25.0	742.0	1526.0	3554.0	60869.0	1.580404
Detergents_Paper	440.0	2881.0	4768.0	3.0	257.0	816.0	3922.0	40827.0	1.654981
Delicatessen	440.0	1525.0	2820.0	3.0	408.0	966.0	1820.0	47943.0	1.849180
Total Sales	440.0	33226.0	26356.0	904.0	17449.0	27492.0	41308.0	199891.0	0.793234

In [394]:
```
#Reset Index to create Food categories as Columns

Wdescribe1 = Wdescribe.reset_index()
Wdescribe1['Food Type']= Wdescribe1['index']

#Plot a bar plot against the Coff of Variation to access the variability in di
fferent food categories
print('\n')
print('No! the 6 food categories do not show similar behaviour across Regions
 and Channels')

plt.figure(figsize=(15,8))
plt.title('Coff of Variation across food categories')
sns.barplot( Wdescribe1['Food Type'] ,Wdescribe1['Coff Variance'])
plt.show()
plt.savefig('Similarityin food type.jpg', dpi=300)
```

```
No! the 6 food categories do not show similar behaviour across Regions and Ch
annels
```




```
<Figure size 432x288 with 0 Axes>
```

In [ ]:

1.3

In [396]:
```
# 1.3- On the basis of the descriptive measure of variability, which item show
s the most inconsistent behaviour?
#Which items shows the least inconsistent behaviour?


#Remove unnecessary rows from Wdescribe

Wdescribe.drop(index = 'Buyer/Spender', inplace= True)
Wdescribe.drop(index = 'Total Sales', inplace= True)

Wdescribe
```

Out[396]:

	count	mean	std	min	25%	50%	75%	max	Coff Variance
Fresh	440.0	12000.0	12647.0	3.0	3128.0	8504.0	16934.0	112151.0	1.053917
Milk	440.0	5796.0	7380.0	55.0	1533.0	3627.0	7190.0	73498.0	1.273292
Grocery	440.0	7951.0	9503.0	3.0	2153.0	4756.0	10656.0	92780.0	1.195196
Frozen	440.0	3072.0	4855.0	25.0	742.0	1526.0	3554.0	60869.0	1.580404
Detergents_Paper	440.0	2881.0	4768.0	3.0	257.0	816.0	3922.0	40827.0	1.654981
Delicatessen	440.0	1525.0	2820.0	3.0	408.0	966.0	1820.0	47943.0	1.849180

In [152]:
```
#Create variables for Maximum and minimum Coff of Variance
Minconsistent = Wdescribe[Wdescribe['Coff Variance']==Wdescribe['Coff Varianc
e'].max()]['Coff Variance']
Linconsistent = Wdescribe[Wdescribe['Coff Variance']==Wdescribe['Coff Varianc
e'].min()]['Coff Variance']
```

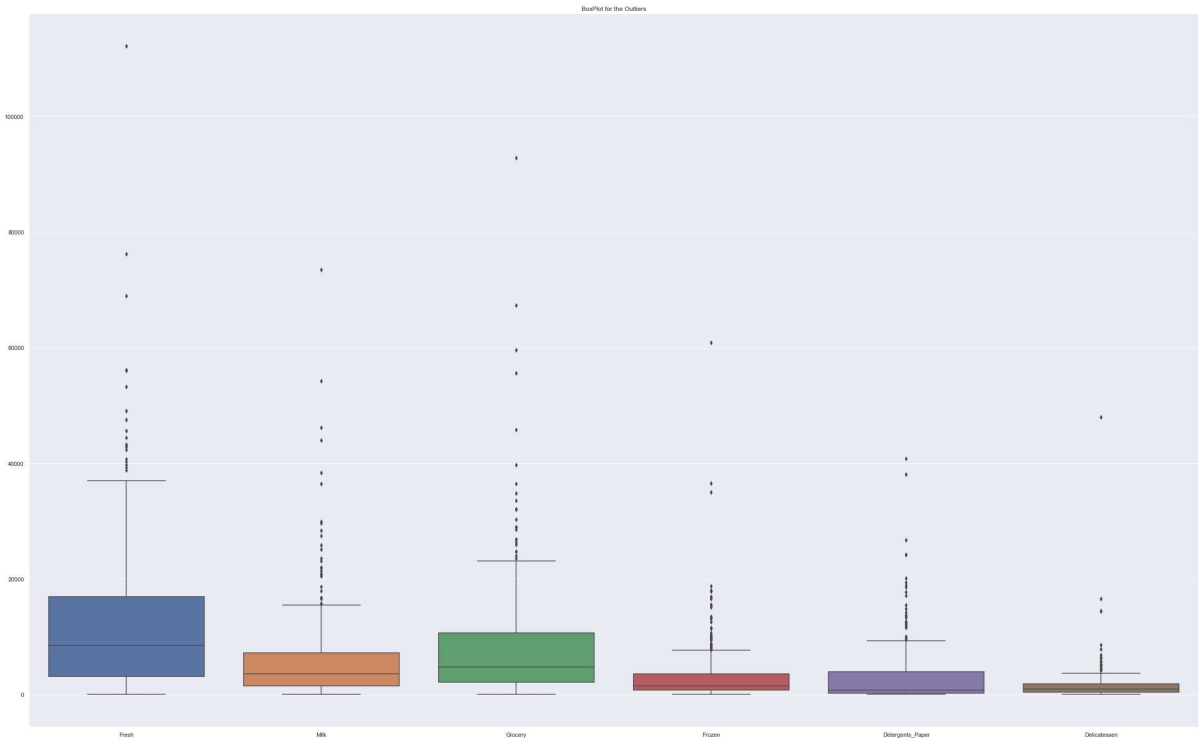
In [153]:
```
print('The Food category with most inconsistent behaviour:', '\n ', Minconsist
ent )
print('\n', '\n')
print('The Food category with least inconsistent behaviour:','\n',  Linconsist
ent)
```

```
The Food category with most inconsistent behaviour:
  Delicatessen    1.84918
Name: Coff Variance, dtype: float64



The Food category with least inconsistent behaviour:
 Fresh    1.053917
Name: Coff Variance, dtype: float64
```

In [395]:
```
Minconsistent.to_csv('Inconsistent.csv')
Linconsistent.to_csv('Consistent.csv')
```

1.4

In [408]:
```
Wboxplot = Wsale.drop(['Buyer/Spender','Total Sales'], axis =1)

Wboxplot

#Boxplot for the whole table of the food items :  Wboxplot
plt.figure(figsize=(40,25))
plt.title('BoxPlot for the Outliers')
sns.boxplot( data = Wboxplot )
plt.show()
plt.savefig('Boxplot.pdf')
```




```
<Figure size 432x288 with 0 Axes>
```

In [142]:
```
print('YES! There are outliers in the data')
```

```
YES! There are outliers in the data
```

In [ ]:
```

```

1.5

In [417]:
```
Wsale
```

Out[417]:

	Buyer/Spender	Channel	Region	Fresh	Milk	Grocery	Frozen	Detergents_Paper	Delica
0	1	Retail	Other	12669	9656	7561	214	2674	
1	2	Retail	Other	7057	9810	9568	1762	3293	
2	3	Retail	Other	6353	8808	7684	2405	3516	
3	4	Hotel	Other	13265	1196	4221	6404	507	
4	5	Retail	Other	22615	5410	7198	3915	1777	
...	...	...	...	...	...	...	...	...	
435	436	Hotel	Other	29703	12051	16027	13135	182	
436	437	Hotel	Other	39228	1431	764	4510	93	
437	438	Retail	Other	14531	15488	30243	437	14841	
438	439	Hotel	Other	10290	1981	2232	1038	168	
439	440	Hotel	Other	2787	1698	2510	65	477	

440 rows × 10 columns

In [421]:
```
WGroup = Wsale.groupby(['Region','Channel']).mean().round(2)
WGroup
```

Out[421]:

		Buyer/Spender	Fresh	Milk	Grocery	Frozen	Detergents_Paper	Delic
Region	**Channel**							
Lisbon	**Hotel**	237.73	12902.25	3870.20	4026.14	3127.32	950.53	
	Retail	226.06	5200.00	10784.00	18471.94	2584.11	8225.28	
Oporto	**Hotel**	321.00	11650.54	2304.25	4395.50	5745.04	482.71	
	Retail	311.11	7289.79	9190.79	16326.32	1540.58	8410.26	
Other	**Hotel**	227.58	13878.05	3486.98	3886.73	3656.90	786.68	
	Retail	152.44	9831.50	10981.01	15953.81	1513.20	6899.24	

In [424]:
```
WGroup.to_csv('Recom1.5.csv')
```

In [143]:
```
print(' For Recommendations, please refer to the Report submitted.')
```

```
 For Recommendations, please refer to the Report submitted.
```

In [ ]:
```

```

Question no 2

In [5]:
```
Survey = pd.read_csv('Survey.csv')
```

In [6]:
```
Survey
```

Out[6]:

	ID	Gender	Age	Class	Major	Grad Intention	GPA	Employment	Salary	Net
0	1	Female	20	Junior	Other	Yes	2.9	Full-Time	50.0	
1	2	Male	23	Senior	Management	Yes	3.6	Part-Time	25.0	
2	3	Male	21	Junior	Other	Yes	2.5	Part-Time	45.0	
3	4	Male	21	Junior	CIS	Yes	2.5	Full-Time	40.0	
4	5	Male	23	Senior	Other	Undecided	2.8	Unemployed	40.0	
...	...	...	...	...	...	...	...	...	...	
57	58	Female	21	Senior	International Business	No	2.4	Part-Time	40.0	
58	59	Female	20	Junior	CIS	No	2.9	Part-Time	40.0	
59	60	Female	20	Sophomore	CIS	No	2.5	Part-Time	55.0	
60	61	Female	23	Senior	Accounting	Yes	3.5	Part-Time	30.0	
61	62	Female	23	Senior	Economics/Finance	No	3.2	Part-Time	70.0	

62 rows × 14 columns

2.1

In [298]:
```
# 2.1.1- CrossTab of Gender and Major
majors = pd.crosstab(Survey['Gender'], Survey['Major'], margins= 'All')
majors
```

Out[298]:

Major	Accounting	CIS	Economics/Finance	International Business	Management	Other	Retailing/Market
Gender							
Female	3	3	7	4	4	3	
Male	4	1	4	2	6	4	
All	7	4	11	6	10	7	

In [300]:
```
#2.1.2 - Crosstab of Gender and Graduation Intention

grad_intention = pd.crosstab(Survey['Gender'], Survey['Grad Intention'],margin
s= 'All')
grad_intention
```

Out[300]:

Grad Intention	No	Undecided	Yes	All
Gender				
Female	9	13	11	33
Male	3	9	17	29
All	12	22	28	62

In [301]:
```
#2.1.3 - Crosstab of Gender and Employement Status

employment = pd.crosstab(Survey['Gender'], Survey['Employment'],margins= 'All'
)
employment
```

Out[301]:

Employment	Full-Time	Part-Time	Unemployed	All
Gender				
Female	3	24	6	33
Male	7	19	3	29
All	10	43	9	62

In [302]:
```
#2.1.4 - Crosstab of Gender and Laptop Preference

laptop = pd.crosstab(Survey['Gender'], Survey['Computer'],margins= 'All')
laptop
```

Out[302]:

Computer	Desktop	Laptop	Tablet	All
Gender				
Female	2	29	2	33
Male	3	26	0	29
All	5	55	2	62

2.2.1

In [247]:
```
#2.2.1

# Get seperate Value counts gender wise
a= Survey['Gender'].value_counts()

#Calculate the number of Males and Females
total_males = a['Male']
total_females = a['Female']

#Calculate the total no of the students
b =Survey['Gender'].count()

#Calculate the required probability
p_male =round(a['Male']/b,2)

print('The probability that a randomly selected student is a MALE is:', p_male
)
print('\n')
print('The probability that a randomly selected student is a FEMALE is:',(1- p
_male))
```

```
The probability that a randomly selected student is a MALE is: 0.47


The probability that a randomly selected student is a FEMALE is: 0.53
```

In [ ]:
```

```

2.2.2

In [270]:
```
majors
```

Out[270]:

Major	Accounting	CIS	Economics/Finance	International Business	Management	Other	Retailing/Market
Gender							
Female	3	3	7	4	4	3	
Male	4	1	4	2	6	4	
All	7	4	11	6	10	7	

In [281]:
```
#Conditional Probability of different Majors for Male students
male_major_cp = majors.iloc[1]/total_males

print('The CONDITIONAL PROBABILITY of different Majors for MALE students is as
follows:','\n','\n',male_major_cp.round(2))
```

```
The CONDITIONAL PROBABILITY of different Majors for MALE students is as follo
ws:

 Major
Accounting                0.14
CIS                       0.03
Economics/Finance         0.14
International Business    0.07
Management                0.21
Other                     0.14
Retailing/Marketing       0.17
Undecided                 0.10
All                       1.00
Name: Male, dtype: float64
```

In [241]:
```
#Conditional Probability of different Majors for Female students\
female_major_cp = majors.iloc[0]/total_females
print('The CONDITIONAL PROBABILITY of different Majors for FEMALE students is
 as follows:','\n','\n',female_major_cp.round(2))
```

```
The CONDITIONAL PROBABILITY of different Majors for FEMALE students is as fol
lows:

 Major
Accounting                0.09
CIS                       0.09
Economics/Finance         0.21
International Business    0.12
Management                0.12
Other                     0.09
Retailing/Marketing       0.27
Undecided                 0.00
Name: Female, dtype: float64
```

In [410]:
```
male_major_cp.to_csv('2.2.2Male.csv')
female_major_cp.to_csv('2.2.2Female.csv')
```

2.2.3

In [412]:
```
# prob_grad_male = prob(Male and Graduate)/ prob(Male)
prob_grad_male = (grad_intention['Yes'][1]/b) / p_male
print('The conditional probability of intent to graduate, given that the stude
nt is a male is: ',prob_grad_male.round(2))
```

```
The conditional probability of intent to graduate, given that the student is
a male is:  0.58
```

In [413]:
```
# prob_grad_female = prob(Female and Graduate)/ prob(Female)
prob_grad_female = (grad_intention['Yes'][0]/b) / (1-p_male)
print('The conditional probability of intent to graduate, given that the stude
nt is a male is:',prob_grad_female.round(2))
```

```
The conditional probability of intent to graduate, given that the student is
a male is: 0.33
```

2.2.4 : The Conditional Probability for Males and Females on the basis of Employement status

In [ ]:
```
```

In [286]:
```
#Conditional Probability of different Majors for Male students
male_emp_cp = employment.iloc[1]/employment['All'][1]

print('The CONDITIONAL PROBABILITY of different EmploymentStatus for MALE stud
ents is as follows:','\n','\n',male_emp_cp.round(2))
```

```
The CONDITIONAL PROBABILITY of different EmploymentStatus for MALE students i
s as follows:

 Employment
Full-Time     0.24
Part-Time     0.66
Unemployed    0.10
All           1.00
Name: Male, dtype: float64
```

In [288]:
```
#Conditional Probability of different Majors for Male students
female_emp_cp = employment.iloc[0]/employment['All'][0]

print('The CONDITIONAL PROBABILITY of different EmploymentStatus for FEMALE st
udents is as follows:','\n','\n',female_emp_cp.round(2))
```

```
The CONDITIONAL PROBABILITY of different EmploymentStatus for FEMALE students
is as follows:

 Employment
Full-Time     0.09
Part-Time     0.73
Unemployed    0.18
All           1.00
Name: Female, dtype: float64
```

In [416]:
```
male_emp_cp.to_csv('Male2.2.4.csv')
female_emp_cp.to_csv('Female2.2.4.csv')
```

2.2.5

Conditional probability of laptop preference among the male students as well as among the female students.

In [414]:
```
#Conditional Probability of Laptop for Male students
male_comp_cp = laptop['Laptop'][1]/laptop['All'][1]

print('The CONDITIONAL PROBABILITY of Laptop Preference for MALE students is:'
,male_comp_cp.round(2))
```

```
The CONDITIONAL PROBABILITY of Laptop Preference for MALE students is: 0.9
```

In [415]:
```
#Conditional Probability of different Laptop for FeMale students
female_comp_cp = laptop['Laptop'][0]/laptop['All'][0]

print('The CONDITIONAL PROBABILITY of different Laptop Status for FEMALE stude
nts is:',female_comp_cp.round(2))
```

```
The CONDITIONAL PROBABILITY of different Laptop Status for FEMALE students i
s: 0.88
```

2.3- In the Report

2.4

Note that there are three numerical (continuous) variables in the data set, Salary, Spending and Text Messages. For each of them comment whether they follow a normal distribution.

Write a note summarizing your conclusions. [Recall that symmetric histogram does not necessarily mean that the underlying distribution is symmetric]

In [ ]:
```
```

In [318]:
```
norm_dist = Survey[['Salary','Spending','Text Messages']]
norm_dist
```

Out[318]:

	Salary	Spending	Text Messages
0	50.0	350	200
1	25.0	360	50
2	45.0	600	200
3	40.0	600	250
4	40.0	500	100
...	...	...	...
57	40.0	1000	10
58	40.0	350	250
59	55.0	500	500
60	30.0	490	50
61	70.0	250	0

62 rows × 3 columns

In [367]:
```
# Testing for Shapiro Test
W, p = stats.shapiro(norm_dist['Salary'])
p
```

Out[367]: 0.028000956401228905

In [363]:
```
W, p = stats.shapiro(norm_dist['Spending'])
p
```

Out[363]: 1.6854661225806922e-05

In [364]:
```
W, p = stats.shapiro(norm_dist['Text Messages'])
p
```

Out[364]: 4.324040673964191e-06

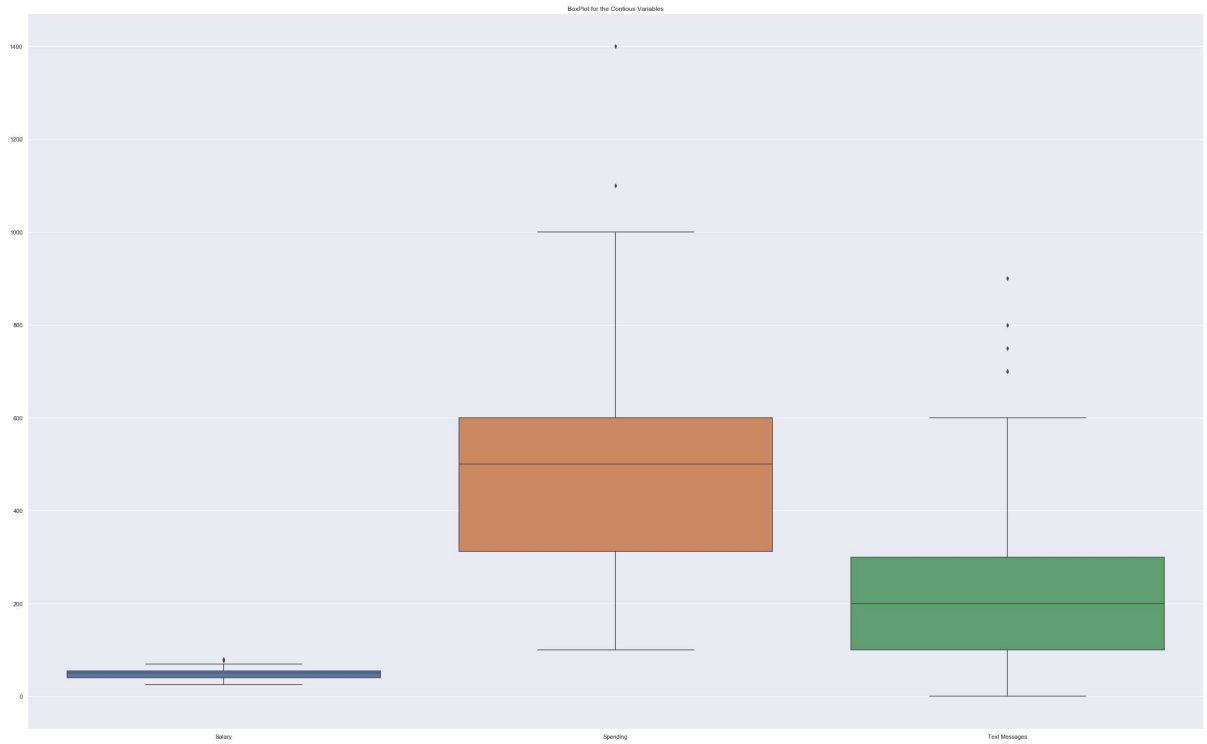
In [349]:
```
# Testing the Normality via comparing Mean and Median

summary = norm_dist.describe().T
print(summary)
print('\n')
print('The conclusions from Summarizing the data are as follows:','\n')
print('1. Salary and 2. Spending display more characteristics of normal distri
bution because their Median is very close to the Mean')
```

```
               count        mean         std    min    25%    50%    75%  \
Salary          62.0   48.548387   12.080912   25.0   40.0   50.0   55.0
Spending        62.0  482.016129  221.953805  100.0  312.5  500.0  600.0
Text Messages   62.0  246.209677  214.465950    0.0  100.0  200.0  300.0

                 max
Salary          80.0
Spending      1400.0
Text Messages  900.0


The conclusions from Summarizing the data are as follows:

1. Salary and 2. Spending display more characteristics of normal distribution
because their Median is very close to the Mean
```

In [338]:
```
print('The conclusions are as follows:')
print('1. Salary and 2. Spending display more characteristics of normal distri
bution because their Median is very close to the Mean.')
```

```
The conclusions are as follows:
1. Salary and 2. Spending display more characteristics of normal distribution
because their Median is very close to the Mean.
```

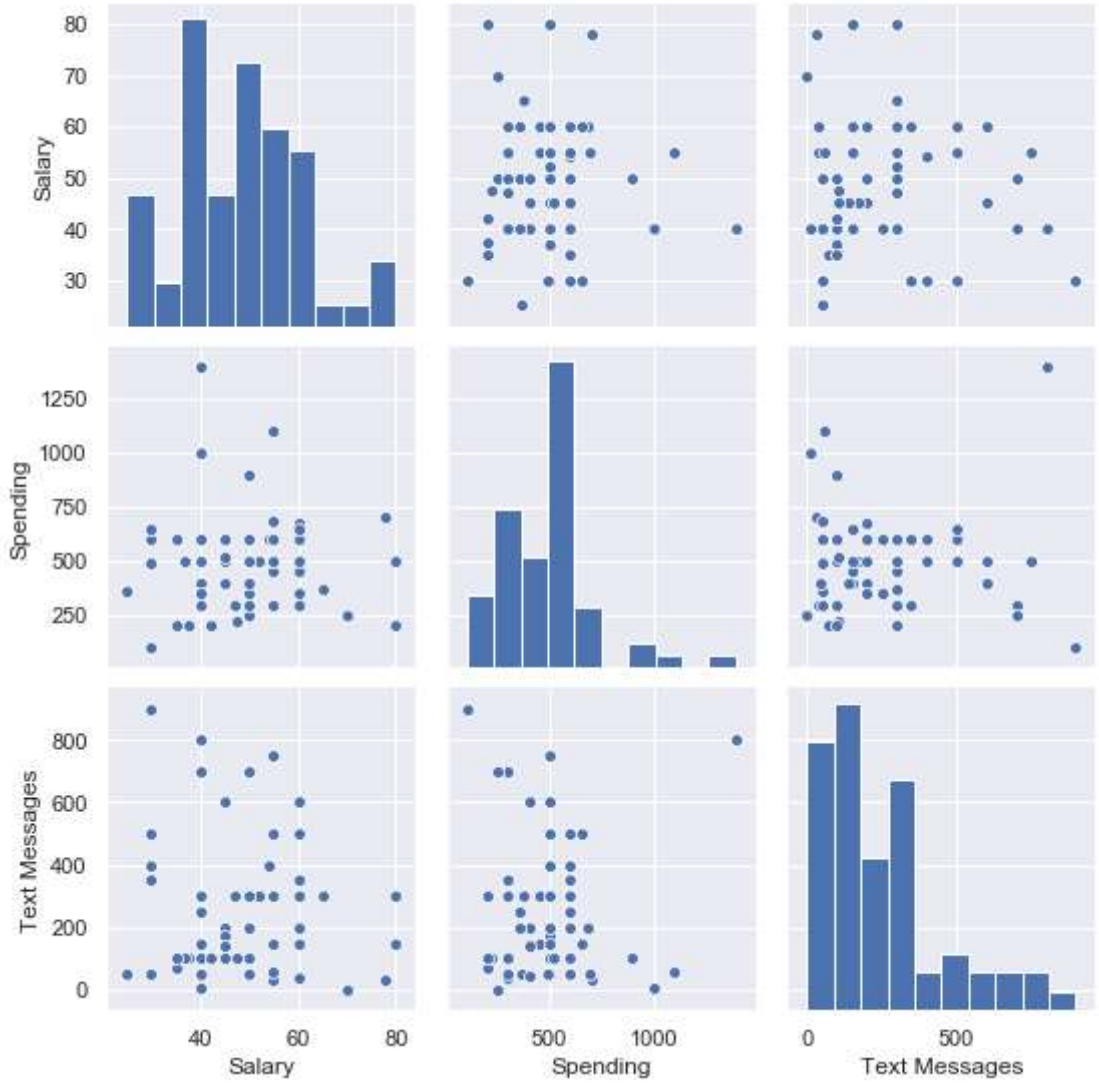
In [350]:
```
# Testing the normality by plotting a Box plot

plt.figure(figsize=(40,25))
plt.title('BoxPlot for the Contious Variables')
sns.boxplot( data = norm_dist )
plt.show()

print('The conclusions from BOXPLOT are as follows:')
print('1. Salary and 2. Spending display more characteristics of normal distri
bution because of the BOXPLOT being more uniform.')
```




```
The conclusions from BOXPLOT are as follows:
1. Salary and 2. Spending display more characteristics of normal distribution
because of the BOXPLOT being more uniform.
```

In [ ]:
```

```

In [346]:
```
sns.pairplot(norm_dist[['Salary', 'Spending', 'Text Messages']]);
```



In [ ]:
```

```

In [366]:
```
# Testing SKEWNESS
Skew_Sal = stats.skew(norm_dist['Salary'])
Skew_Sal
```

Out[366]: 0.5216766008645851

In [357]:
```
stats.skew(norm_dist['Spending'])
```

Out[357]: 1.5472850312929523

In [358]:
```
stats.skew(norm_dist['Text Messages'])
```

Out[358]: 1.2642446834439687

In [ ]:
```

```

3.1 : ABC Asphalt Shingles

In [368]:
```
shingles = pd.read_csv('A+&+B+shingles.csv')
```

In [370]:
```
shingles.head()
```

Out[370]:

	A	B
0	0.44	0.14
1	0.61	0.15
2	0.47	0.31
3	0.30	0.16
4	0.15	0.37

Hypothesis Formation

H0 => (Mean_A - Mean_B) = 0

Ha => (Mean_A - Mean_B) != 0

2 Sample test for A

In [ ]:
```

```

In [434]:
```
t_statistic, p_value = ttest_ind(shingles['A'], shingles['B'], nan_policy = 'omit')
```

In [435]:
```
t_statistic, p_value
```

Out[435]:
```
(1.2896282719661123, 0.2017496571835306)
```

In [437]:
```
if p_value <0.05: #Assuming alpha = 0.05
    print('We reject the null hypothesis')
else:
    print('We fail to reject the Null Hypothesis')
```

```
We fail to reject the Null Hypothesis
```

In [ ]:
```

```

In [ ]:
```

```

In [ ]:

In [ ]: