Objects manipulation and utilisation (46 marks)

• Sufficient workbook manipulation: At least two workbooks for the source data sets, at least one workbook for the derived data sets, at least one workbook for the report, and one workbook for the programme code and Userform. Sufficiently utilized object variables, references, properties, and methods. (0-5)

• Sufficient worksheet manipulation: Sufficiently utilized object variables, references, properties, and methods. (0-4)

• Sufficient data manipulation: Generate at least one new data set in a new workbook by applying non-trivial manipulation on the source data sets. (0-8)

• Create at least two non-Pivot tables for character variables in the report workbook. At least one table includes summary statistics of a numeric variable for each level of the character variable. All elements of the tables, such as data range, variables, statistics, etc., must be appropriately coded in the application. (0-4)

• Create at least one non-Pivot frequency table for a numeric variable in the report workbook. All elements of the tables, such as data range, variables, statistics, etc., must be appropriately coded in the application. (0-3)

• Create at least two types of non-Pivot charts in the report workbook. All features of the charts, such as data range, type of chart, labels, etc. of the charts must be appropriately coded in the application. (0-4)

• Utilise OptionButton control. (0-2)

• Utilise CheckBox control. (0-2)

• Utilise RefEdit control. (0-1)

• Utilise ScrollBar or SpinButton controls. (0-2)

• Utilise ComboBox control. (0-3)

• Utilise Frame control. (0-2)

• Utilise ListBox control. (0-4)

• Utilise MultiPage control. (0-2)

Problem Description and background
CWC drinking shop is a shop is a shop selling drink like tea, coffee. It also sells ice cream. It has three branches in Hong Kong Island, Kowloon and New Territories respectively.

1. Member discount: Provide discounts to members based on their spending and the holiday. The source dataset includes two workbooks: **workbook_salesrecord** and **workbook_memberInformation**, which have the common column **Member ID**. The sales record gives the spending of members, and member information gives information such as salaries, marital status, and birthdays in the month. Customers who accumulate spending above a certain amount can receive a percentage discount. Customers can also receive a 10% discount if they purchase items during their own birthday month. Additionally, customers who are married can receive a 10% discount if they buy drinks between February 10 and February 14 to celebrate Valentine's Day. Discounts can be used together by multiplying them. Memberships are usually upgraded at the end of the month, as sales reports for members are generated monthly. To achieve this objective, two workbooks need to be generated: **Workbook_salesreport** and **Workbook_Membership&discount**. The latter will summarize the number of members in each tier and the discount given.

	Accumulated Spending	Discount
Basic	$100	1%
Advanced	$250	5%
Platinum	$400	10%
Birthday	N/A	8%
Valentine's day(in 10-Feb to 14-Feb)	N/A	12%

2. Weekly sales report: Generate a sales report as a new workbook by extracting data from the **workbook_salesrecord**. This report will be generated at the end of each week to help the marketing department identify which products have the potential to generate more profit for the company.

3. Monthly sales report: Generate a sales report as a new workbook by extracting data from the **workbook_salesrecord**. This report will be generated at the end of each month and will include the weekly sales report. The purpose of this report is to provide a comprehensive overview of sales trends over time.

Type of Product

Espresso	Price	Cost
Decaf Espresso	$32.50	$15.20

Caffe Latte	$25.00	$12.20
Caffe Mocha	$30.30	$13.00
Regular Espresso	$22.00	$14.20

Coffee	Price	Cost
Amaretto	$15.20	$8.50
Decaf Irish Cream	$35.30	$28.00
Columbian	$20.00	$15.00

Herbal Tea	Price	Cost
Lemon	$18.50	$5.50
Chamomile	$21.00	$14.00
Mint	$18.32	$8.90

Tea	Price	Cost
Green Tea	17.50	7.00
Earl Grey	22.00	14.00
Darjeeling	25.00	15.00

Data source description

The workbook_MemberInformation have following column.
Member ID, Gender, Age, Salary, Martial Status, Living District and Birthday in Month

Pic 1:

Member ID	gender	Age	Salary	Martial Status	Living District	Birthday
HK001	Female	19	38018	TRUE	Hong Kong Island	January
HK002	Female	21	18939	TRUE	Hong Kong Island	December
HK003	Male	24	34875	FALSE	Hong Kong Island	February
HK004	Male	34	29816	TRUE	Hong Kong Island	April
HK005	Female	38	25537	FALSE	Hong Kong Island	March
HK006	Male	43	29459	FALSE	Hong Kong Island	June
HK007	Male	29	35524	FALSE	Hong Kong Island	May
HK008	Male	20	39699	TRUE	Hong Kong Island	July
HK009	Male	41	19429	TRUE	Hong Kong Island	January
HK010	Female	26	44693	TRUE	Hong Kong Island	April
HK011	Female	28	26965	FALSE	Hong Kong Island	December
HK012	Male	43	19452	TRUE	Hong Kong Island	August
HK013	Female	24	24089	TRUE	Hong Kong Island	June
HK014	Female	38	35038	FALSE	Hong Kong Island	July
HK015	Female	18	40486	TRUE	Hong Kong Island	January
HK016	Female	43	42789	TRUE	Hong Kong Island	June
HK017	Male	22	30073	TRUE	Hong Kong Island	February
HK018	Male	33	21420	TRUE	Hong Kong Island	August

The Workbook_salesrecord have following columns.
Member ID, Order Date, Product Name, Product Category, Quantity, Price Per Unit, Total sales, Total revenue by member ID
Pic 2:

Member ID	Order Date	Product Name	Product Category	Quantity	Price Per Unit	Total sales	Total revenue by Member ID
HK015	31-Jan-2023	Decaf Espresso	Espresso	4	32.50	130	
HK018	22-Jan-2023	Amaretto	Coffee	4	15.20	60.8	
HK020	22-Jan-2023	Chamomile	Herbal Tea	1	21.00	21	197.5
HK007	22-Jan-2023	Columbian	Coffee	2	20.00	40	
HK021	22-Jan-2023	Columbian	Coffee	4	20.00	80	
HK030	22-Jan-2023	Columbian	Coffee	5	20.00	100	355
HK004	28-Jan-2023	Decaf Espresso	Espresso	4	32.50	130	
HK010	26-Jan-2023	Decaf Espresso	Espresso	5	32.50	162.5	325
HK011	25-Jan-2023	Decaf Espresso	Espresso	1	32.50	32.5	
HK015	25-Jan-2023	Decaf Irish Cream	Coffee	2	35.30	70.6	
HK031	25-Jan-2023	Green Tea	Tea	1	17.50	17.5	
HK014	23-Jan-2023	Green Tea	Tea	3	17.50	52.5	52.5
HK012	28-Jan-2023	Lemon	Herbal Tea	2	18.50	37	
HK012	23-Jan-2023	Lemon	Herbal Tea	1	18.50	18.5	160.5
HK028	23-Jan-2023	Lemon	Herbal Tea	1	18.50	18.5	260.9
HK020	22-Jan-2023	Lemon	Herbal Tea	5	18.50	92.5	
HK015	22-Jan-2023	Mint	Herbal Tea	4	18.32	73.28	
HK016	21-Jan-2023	Chamomile	Herbal Tea	3	21.00	63	191
HK016	21-Jan-2023	Columbian	Coffee	2	20.00	40	
HK016	20-Jan-2023	Earl Grey	Tea	4	22.00	88	
HK032	20-Jan-2023	Green Tea	Tea	1	17.50	17.5	213.7
HK021	19-Jan-2023	Lemon	Herbal Tea	2	18.50	37	
HK008	18-Jan-2023	Darjeeling	Tea	5	25.00	125	
HK025	18-Feb-2023	Lemon	Herbal Tea	4	18.50	74	166.5
HK028	17-Jan-2023	Caffe Mocha	Espresso	4	30.30	121.2	
HK011	17-Jan-2023	Decaf Espresso	Espresso	5	32.50	162.5	195

Pic 2 shows the sales record in Hong Kong Island. There are three worksheets which represent different region in this workbook. The member ID will be NTXXX (New Territories), HKXXX(Hong Kong Island) and KLXXX(Kowloon). （Add case to other region）

Report generated

1) Membership and Discount workbook (Workbook_Membership&discount)
The officer needs to update the membership and discount workbook monthly to ensure giving correct discount to the customers.

In this workbook, Officer needs to enter the column of Member ID, total amount spending, Birthday discount received, Valentine's Day discount received, Membership level, Amount spent, Amount of discount received.

Member ID	total amount spending	Birthday discount received	Valentine's Day discount received	Membership level	Amount spended	Discount received
NT001	298.82	FALSE	FALSE	Advanced	180	9
NT002	240	TRUE	TRUE	Advanced	20	4.6176
NT003	205	FALSE	FALSE	Basic	52.5	2.625
NT004	235.6	FALSE	FALSE	Basic	0	0
NT005	333.3	FALSE	FALSE	Advanced	0	0

For example, the NT002 is having total spending of 240 which is extract for workbook_salesrecord in February. He had birthday in February and married. The valentine's Day discount is depended on Marital status. He spent $20 at the 13-Feb. He can received discount of (20-20*0.92*0.88*0.95)=4.6176 in March.

In this workbook report, total amount spending need to be extract from the workbook_salesrecord first. Then birthday discount and Valentine's Day discount need to be extracted from the workbook_MemberInformation because the birthday month and Marital status is the key of determining the discount is true or false.

2) Sales report workbook (Workbook_salesreport)
The first need to be done is weekly report worksheets, the weekly sales report have two parts, the first part is reporting the weekly unit sales of different region.

Pic3:

Weekly sales report on 22/1-28/1								
New Territories	Unit sales		Kowloon		Hong Kong Island		Total sales	
Product			Product		Product		Product	
Expresso			Expresso		Expresso		Expresso	
Decaf Espresso	9		Decaf Espresso	0	Decaf Espresso	10	Decaf Espresso	9
Caffe Latte	0		Caffe Latte	0	Caffe Latte	0	Caffe Latte	0
Caffe Mocha	6		Caffe Mocha	3	Caffe Mocha	0	Caffe Mocha	9
Regular Espresso	0		Regular Espresso	0	Regular Espresso	0	Regular Espresso	0
Coffee			Coffee		Coffee		Coffee	
Amaretto	0		Amaretto	0	Amaretto	4	Amaretto	0
Decaf Irish Cream	0		Decaf Irish Cream	6	Decaf Irish Cream	2	Decaf Irish Cream	6
Columbian	0		Columbian	1	Columbian	11	Columbian	1
Herbal Tea			Herbal Tea		Herbal Tea		Herbal Tea	
Lemon	3		Lemon	0	Lemon	9	Lemon	3
Chamomile	0		Chamomile	0	Chamomile	1	Chamomile	0
Mint	7		Mint	0	Mint	4	Mint	7
Tea			Tea		Tea		Tea	
Green Tea	5		Green Tea	7	Green Tea	4	Green Tea	12
Earl Grey	0		Earl Grey	0	Earl Grey	0	Earl Grey	0
Darjeeling	0		Darjeeling	0	Darjeeling	0	Darjeeling	0
Total	30		Total	17	Total units	45	Total units	47

It show the number of products sold by different regions. It also generate the pie chart to visible the data.
Pic 4:

Product sold by different region on 22/1-28/1

New Territories ■ Kowloon ■ Hong Kong Island
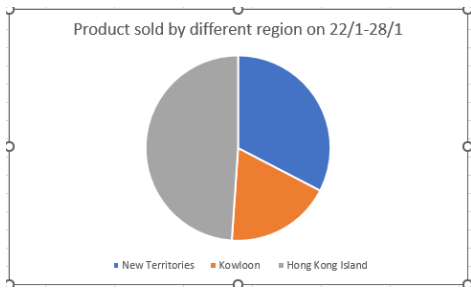
The second thing need to be done for weekly report is generate weekly profit report for different product.

Pic 5:

Weekly sales report on 22/1-28/1				
Total sales				
Product		Total sales	Total cost	Profit
Expresso	18			
Decaf Espresso	9	292.5	136.8	155.7
Caffe Latte	0	0	0	0
Caffe Mocha	9	272.7	117	155.7
Regular Espresso	0	0	0	0
Coffee	7			
Amaretto	0	0	0	0
Decaf Irish Cream	6	211.8	168	43.8
Columbian	1	20	15	5
Herbal Tea	10			
Lemon	3	55.5	16.5	39
Chamomile	0	0	0	0
Mint	7	128.24	62.3	65.94
Tea	12			
Green Tea	12	210	84	126
Earl Grey	0	0	0	0
Darjeeling	0	0	0	0
Total		1190.74	599.6	591.14

It shows the total number of products sold at that week.

Pic 6:

	Frequency	Profit	Mean	147.785
Expresso	18	311.4	Max	311.4
Coffee	7	48.8	Min	48.8
Herbal Tea	10	104.94		
Tea	12	126		

Also, the frequency table of type of product will be calculated and shown.

Pic 7:
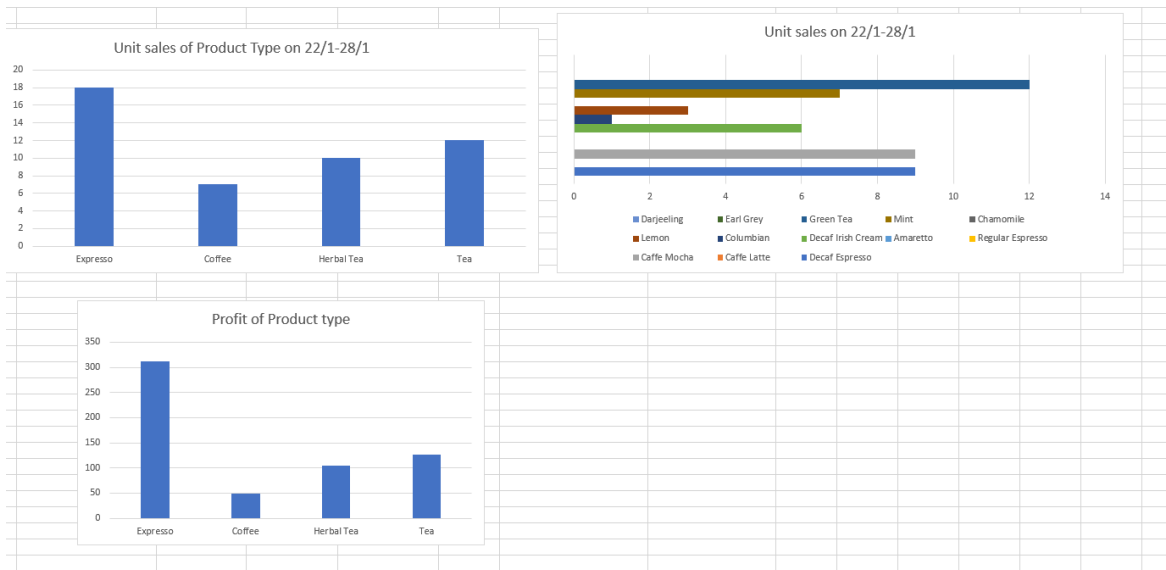
The data of weekly sales will be shown as chart in product type, unit sales and profit. The unit sales of product type can help company to know what customers would like to buy. The Unit sales in product can point out more specifically of what product the customer would like to buy. The profit chart shows the profit generated by that week. It may help company to adjust the inventory in next week.

Another report would be generated is Monthly sales and profit report.
Pic 7:

New Territories	Quantity Sales	Sales	Cost	Kowloon	Quantity Sales	Sales	Cost	Hong Kong Island	Quantity Sales	Sales	Cost		
Product				Product				Product					
Expresso				Expresso				Expresso					
Decaf Espresso	31	1007.5	471.2	Decaf Espresso	0	0	0	Decaf Espresso	58	1885	881.6		
Caffe Latte	0	0	0	Caffe Latte	0	0	0	Caffe Latte	32	800	390.4		
Caffe Mocha	29	878.7	377	Caffe Mocha	13	393.9	169	Caffe Mocha	23	696.9	299		
Regular Espresso	0	0	0	Regular Espresso	0	0	0	Regular Espresso	3	66	42.6		
Coffee				Coffee				Coffee					
Amaretto	0	0	0	Amaretto	0	0	0	Amaretto	8	121.6	68		
Decaf Irish Cream	0	0	0	Decaf Irish Cream	31	1094.3	868	Decaf Irish Cream	2	70.6	56	Mean	1895.54
Columbian	26	520	390	Columbian	16	320	240	Columbian	24	480	360	Min	835.7
												Max	3024.62
Herbal Tea				Herbal Tea				Herbal Tea				Sum	5686.62
Lemon	13	240.5	71.5	Lemon	0	0	0	Lemon	38	703	209	Range	2188.92
Chamomile	0	0	0	Chamomile	0	0	0	Chamomile	27	567	378		
Mint	15	274.8	133.5	Mint	0	0	0	Mint	11	201.52	97.9		
Tea				Tea				Tea					
Green Tea	16	280	112	Green Tea	29	507.5	203	Green Tea	7	122.5	49		
Earl Grey	0	0	0	Earl Grey	0	0	0	Earl Grey	4	88	56		
Darjeeling	18	450	270	Darjeeling	0	0	0	Darjeeling	11	275	165		
Total	148	3651.5	1825.2	Total	89	2315.7	1480	Total	248	6077.12	3052.5	Total Sales	12044.32
Profit			1826.3	Profit			835.7	Profit			3024.62	Total Cost	6357.7
Net profit margin			0.500151	Net profit margin			0.360884	Net profit margin			0.497706	Total Profit	5686.62

The report will generate the quantity sales, Revenue and Cost, and profit margin for different region respectively. It will also calculate the total profit and he summary statistic of the profit.
The data is extracted the source data Workbook_salesrecord. With analyzing the data, marketing strategies for different region can be suggested.
Pic 8:

product	Total Sales	Revenue	Cost	Profit	Margin
Decaf Espresso	89	2892.5	1352.8	1539.7	0.532307692
Caffe Latte	32	800	390.4	409.6	0.512
Caffe Mocha	65	1969.5	845	1124.5	0.570957096
Regular Espresso	3	66	42.6	23.4	0.354545455
Amaretto	8	121.6	68	53.6	0.440789474
Decaf Irish Cream	33	1164.9	924	240.9	0.206798867
Columbian	66	1320	990	330	0.25
Lemon	51	943.5	280.5	663	0.702702703
Chamomile	27	567	378	189	0.333333333
Mint	26	476.32	231.4	244.92	0.51419214
Green Tea	66	1155	462	693	0.6
Earl Grey	21	462	294	168	0.363636364
Darjeeling	39	975	585	390	0.4

The second of Monthly report is Product analysis, by calculating and profit margin of each product. Company can know which product having a higher margin can generate higher profit in future. New variable Margin is calculated by (Profit/Revenue).

Pic 9:
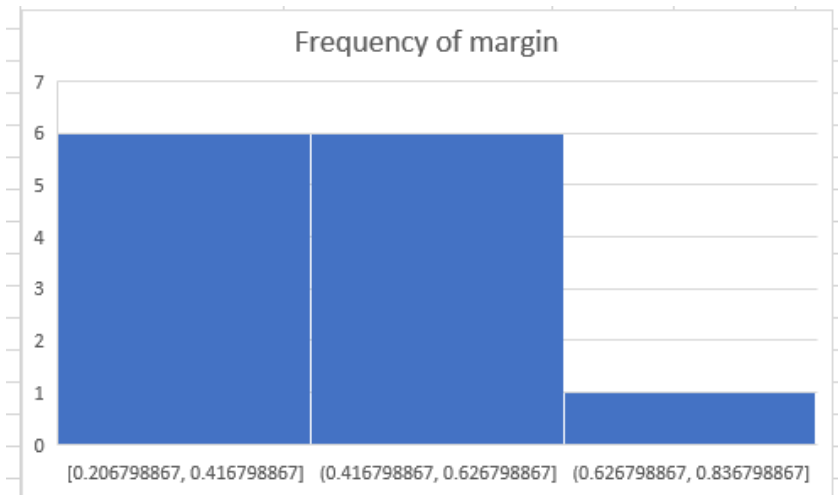
It shows only few products have a relatively high margin for selling.

Frequency Table	
52.5-131.5	5
131.5-210.5	21
210.5-289.5	15
289.5-368.5	11
368.5-447.5	4
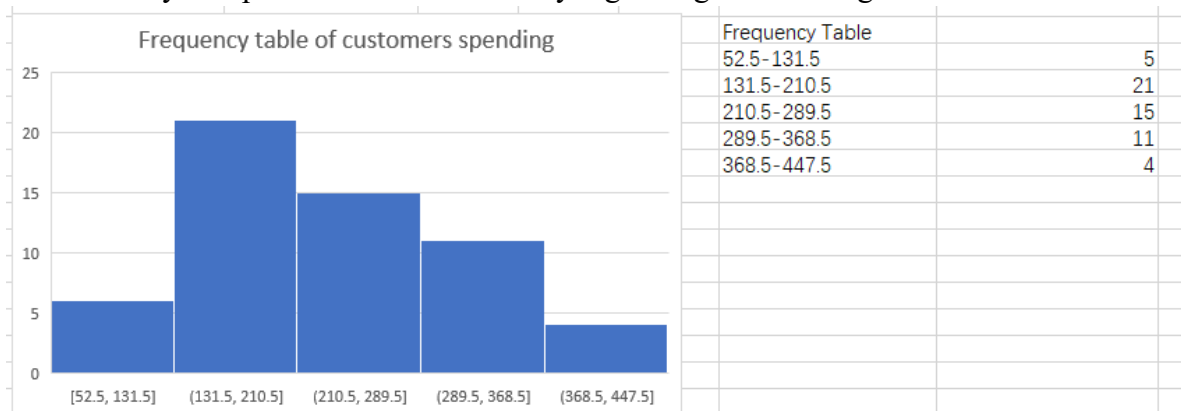
With acknowledging the Frequency of customers spending, company can know who is target customers, and adjust price in the future.