**Question 1:**

a. SELECT accepted\_risk\_level, COUNT(product\_id)

FROM Products

GROUP BY accepted\_risk\_level;

b. SELECT Banks.bank\_name, AVG(Products.interest\_rate)

FROM Banks

RIGHT JOIN Products ON Banks.bank\_id = Products.bank\_id

WHERE Banks.bank\_name = ‘HSBC’

GROUP BY Banks.bank\_name;

c. SELECT COUNT(accepted\_risk\_level), bank\_id

FROM products

WHERE accepted\_risk\_level = ‘high’

GROUP BY bank\_id

ORDER BY COUNT(accepted\_risk\_level) ACS

LIMIT 2;

d. SELECT COUNT(estimated\_risk\_level), source

FROM Customers

WHERE estimated\_risk\_level = ‘low’

GROUP BY source

ORDER BY estimated\_risk\_level DESC;

e. SELECT month(created\_date)

FROM Customers

WHERE year(created\_date) = ‘2017’ AND COUNT(customer\_id) = 1.2\*AVG(COUNT (customer\_id));

f. SELECT Customers.customer\_name, Customers.customer\_age, Leads.apply\_date

FROM Customers

LEFT JOIN Leads ON Customers.customer\_id = Leads.customer\_id

WHERE customer\_age.(year(apply\_date)=2017) > 0.9\*customer\_age.(year(apply\_date)=2016);

**Question 2:**

Please refer to the *“Analysis”* sheet in the excel file named *“mkt\_data (solution).xlsx”* for the analysis that I have come up with based on the given dataset and information. We have:

* **“Net Profit” table:** showing the amount of net profit we receive from selling the razors in each channel and age range, calculated based on the pivot table on the left using the below formula:

*Net profit = order\_value – (18 \* nb\_unit)*

* **“Number of Messages & Cost Allocation” table:** showing the number of messages and cost allocation in each channel and age range. The cost allocation is calculated by the following formula:

*Cost allocation for SMS = SMS message \* 0.05*

*Cost allocation for Email = Email message \* 0.075*

* *SMS message = the number of SMS message sent*
* *Email message = the number of Email message sent*
* **“Budget allocation ratio” table**: showing the budget allocation ratio of each channel and each age range in the last month.
* **“ROI ratio” table:** showing the return on investment ratio in each channel and age range, calculated based on the profit in the “Net Profit” table and the SMS Cost/Email Cost in the “Number of Messages & Cost Allocation” table. This ratio is calculated by the following formula:

*ROI = (Net Profit – Cost Allocation) / Cost Allocation*

* **“Customer Journey Stage” table**: showing the stages of the the buying process that customers are on in each age range (received, bounced, saw review, added to cart, payment page, purchased)

**a. Cost allocation between SMS and Email:** based on the “ROI ratio” and “Budget allocation ratio” table

**Age range 60+:** we can clearly see that the investment allocated for both SMS and Email channel for the age range 60+ returns negative value, which is - 0.71 for SMS channel and - 0.91 for Email channel. This means the profit this age range brings back is less than the amount of money that we invested.

Generally speaking, this actually makes sense since this age range is not very responsive with online channels, people this age are more appealed to traditional marketing channels like TV or word-of-mouth. We can invest in younger age groups and let the word-of-mouth channel do its job.

So, I decide to cut off the budget for this age range completely to save money for other age ranges that generate positive profit.

The budget allocation ratio for both SMS and Email in this age range are 0.04 in the last month. So, I will divide and add it equally to the other 3 age ranges, which will be: 0.04 / 3 = 0.14

**Age range 46-60:** The ROI ratio of the Email channel is 0.82, while the ROI ratio of the SMS channel is 6.04, which is about 7 times higher than Email channel and also the highest ratio in the entire table. So, we should only focus our investment on the SMS channel and cut off the budget for the Email channel completely in order to maximize the profit, this means the budget allocation for this age range for the next quarter will be dedicated 100% to SMS channel.

Based on the “Budget allocation ratio” table of the last month, the budget allocation for the next quarter will be calculated as below:

SMS budget: (0.08 + 0.09 + 0.14 + 0.14) \* 60,000 = 11,800 $

The number of SMS to be sent: 11,800 / 0.05 = 236,000 (SMS messages)

**Age range 31-45:** The ratio between SMS and Email is 1.05 and 2.98, which is relatively close to each other, so I decide to keep the same budget allocation ratio as the previous month.

Based on the “Budget allocation ratio” table of the last month, the budget allocation for the next quarter will be calculated as below:

SMS budget: (0.18 + 0.14) \* 60,000 = $11,600

Email budget: (0.23 + 0.14) \* 60,000 = $14,600

The number of SMS to be sent: 11,600 / 0.05 = 232,000 (SMS messages)

The number of Email to be sent: 14,600/0.075 = 194,667 (Email messages)

**Age range 18-30:** The ratio between SMS and Email is 4.33 and 1.26, which shows an obvious gap, but not really big, so I decide to keep the same budget allocation ratio as the previous month.

Based on the “Budget allocation ratio” table of the last month, the budget allocation for the next quarter will be calculated as below:

SMS budget: (0.15 + 0.14) \* 60,000 = $9,800

Email budget: (0.19 + 0.14) \* 60,000 = $12,200

The number of SMS to be sent: 9,800 / 0.05 = 196,000 (SMS messages)

The number of Email to be sent: 12,200 / 0.075 = 162,667 (Email messages)

**Further suggestion:** I suggest deep diving into each age range to gain a deeper insight into how people behave in smaller subsets of an age range. Because although belonging to the same group, people in different ages may still have different behaviors that will separate them from the rest of the age range. This could make us adjust our budget accordingly to maximize our profit while still keep the cost as low as possible. By breaking down each age range into smaller subsets, we can see more clearly which subset within an age range we should allocate our marketing budget more or less.

*For example:* the age range 18-30 includes both students and people who are already working. Students tend to use SMS more often than Email while working people tend to use Email more than SMS compared to students. If we can break down this age range into 2 separate smaller ranges, let’s say 22 is the age at which students finish their study and start to join the workforce, we can see 22 is the age that separates students and working people into 2 smaller subsets of the age range 18-30, which is 18-22 and 23-30. Therefore, we should focus our SMS budget on the age range from 18 to 22 and Email budget on the age range 23-30.

**b. Suggestion to improve website performance: based on the “Customer Journey Stage” table**

First of all, the number of Received is 282,234, which takes up to 94.08% of customers who received the messages but did not click on the link. There is nothing a website improvement can do to improve this number because the customer did not even go to our website. So we should skip this stage and only care about the other stages.

According to the “Customer Journey Stage” table, we see the Bounced stage has the highest ratio (2.32%) compared to the rest. We want to keep customers around our website; therefore, this number should be decreased. In order to do so, we should improve the landing page, make it more attractive to draw customer’s attention and encourage them to scroll down, read review.

The number of people who reach to the Saw Review stage are close to the Bounced stage, which are 1.75% and 2.32% respectively. This means nothing significantly impacts upon people’s decision who proceed from the Bounced stage to the Saw Review stage. So there is nothing we need to do at this stage.

There is a significant drop in the Payment Page, which is 0.92% compared to the previous stages. So maybe there is something wrong or inconvenient in the Payment Page that gives people a hard time trying to proceed to the Purchased stage. We should take a look at the Payment Page to see if there is a lack in payment options, supported banks or maybe people expect an installment payment option that our website is not offering.