**Project Description:**

With the dataset provided for ABC company, my job is to analyze it and provide insights that can help it reallocate the call agents to ensure maximum customer satisfaction in terms of calls being answered thus winning new customers and maintaining quality relationships with them. The approach and the corresponding insights and results will be listed down in detail in the coming pages of this report.

**Tech-Stack Used:**

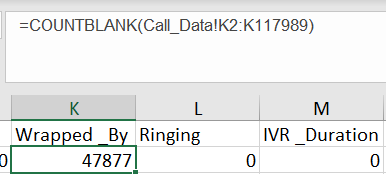
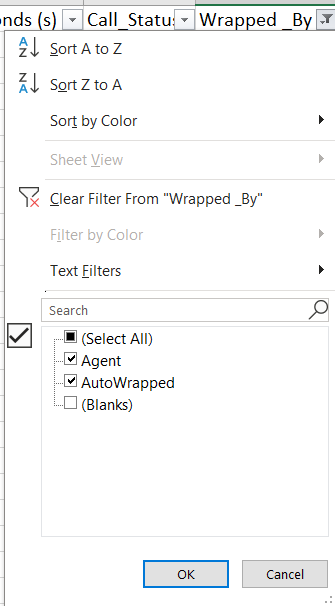
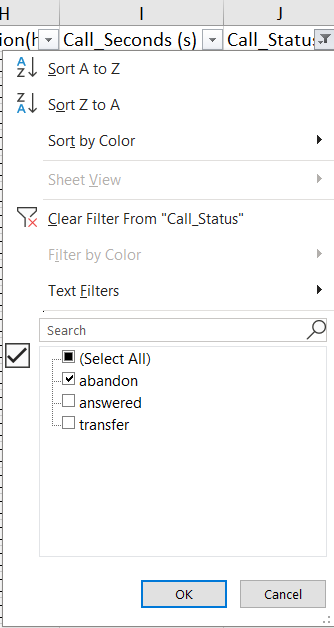
To implement this project, I have used Microsoft Excel 365 Version 2302. There are two reasons for this:

* MS Excel 365 allows a lot of features that are not available in the previous version such as there are a lot of automated charts which help me to quickly use them on my data without having to perform the calculations manually.
* This subscription is offered to me by the company I currently work in, so I am quite familiar with its ins and outs.

Kindly download the dataset from the link below and view in Excel to see all the charts and tables for the problems (Google sheets doesn’t show all the analytics done). In total there are 5 sheets in this workbook.

[**Call\_data\_analyzed**](https://docs.google.com/spreadsheets/d/1RJIq-qZhcehNTw7V3izil3kfgzRnxAaC/edit?usp=sharing&ouid=104611970421205783778&rtpof=true&sd=true)

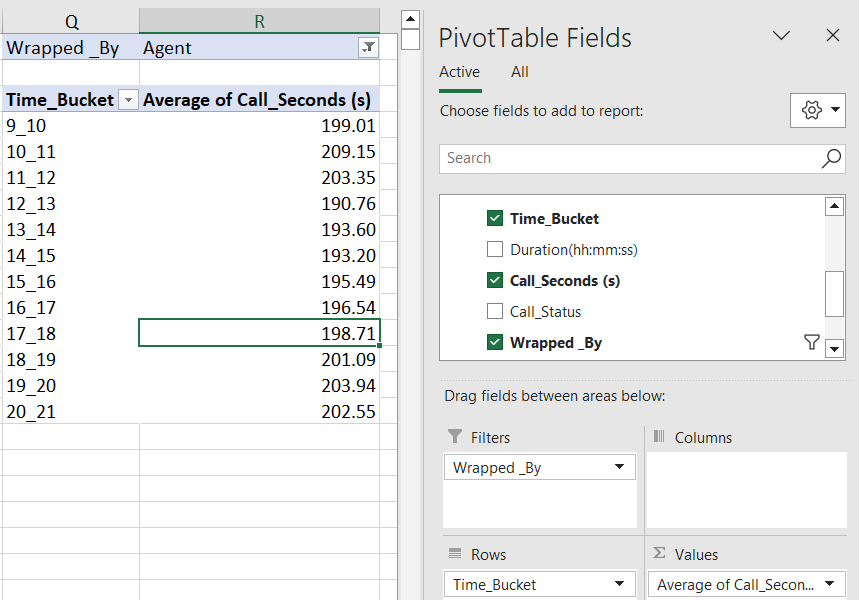
**Data cleaning:**

1. First, I will count the number of blank cells in each column with the help of COUNTBLANK function.
2. We have only one attribute “Wrapped\_By” where there are a total of 47877 empty cells.  
   
3. Now out of these 47877 empty cells, there are 34403 cells for which the “Call\_Status” is abandon.
4. Therefore, leaving these 34403 records, I will delete all the other (47877-34403 = 13474) records for my analysis table and create a new sheet “Call\_Data\_Cleaned”.
5. For doing this, I have simply first filtered the “Wrapped\_By” column as shown below to exclude **all the empty** cells and then copied the records in the “Call\_Data\_Cleaned” sheet. This gives us 70111 records.  
   
6. Next, I have applied the following filter to select the records where the **“Wrapped\_By” attribute is empty because the “Call\_Status” is ‘abandon’** and then copied these records in the “Call\_Data\_Cleaned” sheet. This gives us 34403 records.  
   
7. Finally, in the “Call\_Data\_Cleaned” sheet, we have a total of **104514 records**.

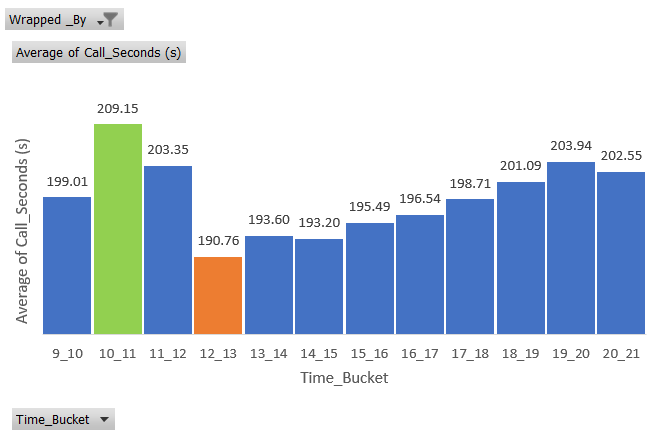
Problem Description No. 1:

Determine the average duration of all incoming calls received by agents. This should be calculated for each time bucket.

**Approach:**

1. I will create a pivot table with the following fields:  
   
2. Note that I have selected the “Wrapped\_By” attribute as a filter field because I have to calculate the average of call durations received **only** **by the agents**.

**Insights:**

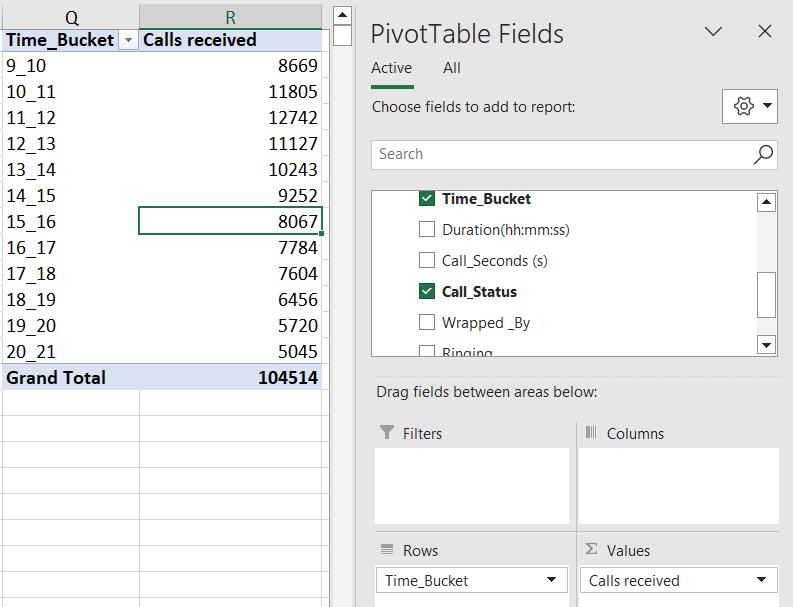


It is clearly visible from the chart that the maximum average duration of calls occurs between 10-11 AM while the least average duration of calls is between 12-1 PM. This tells us that the agents are highly productive between 10-11 AM whereas around lunch hours they are least productive after which their productivity increases at a slow pace. Alternatively, this could also mean that lesser calls are received by the company in after 12 PM. We will confirm this finding in our next problem.

Problem Description No. 2:

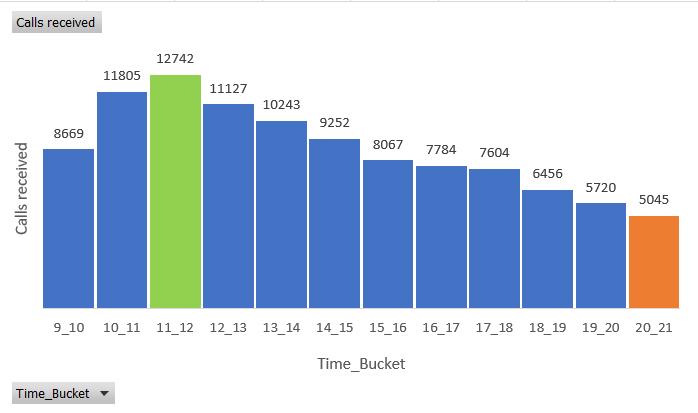
Visualize the total number of calls received. This should be represented as a graph or chart showing the number of calls against time. Time should be represented in buckets (e.g., 1-2, 2-3, etc.)

**Approach:**

1. We will create another pivot table with the following fields:  
   
2. To calculate the number of calls **received**, I have counted the “Call\_Status” attribute despite the status being abandoned, transferred, or answered.

**Insights:**

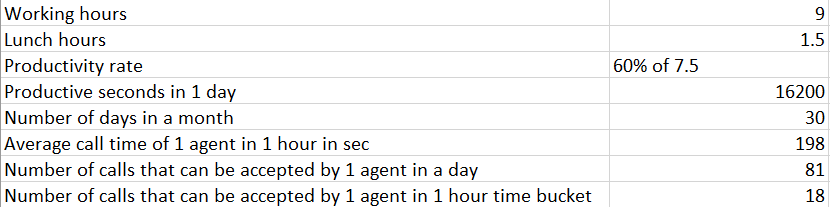
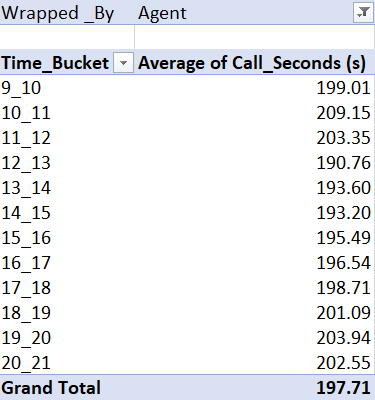
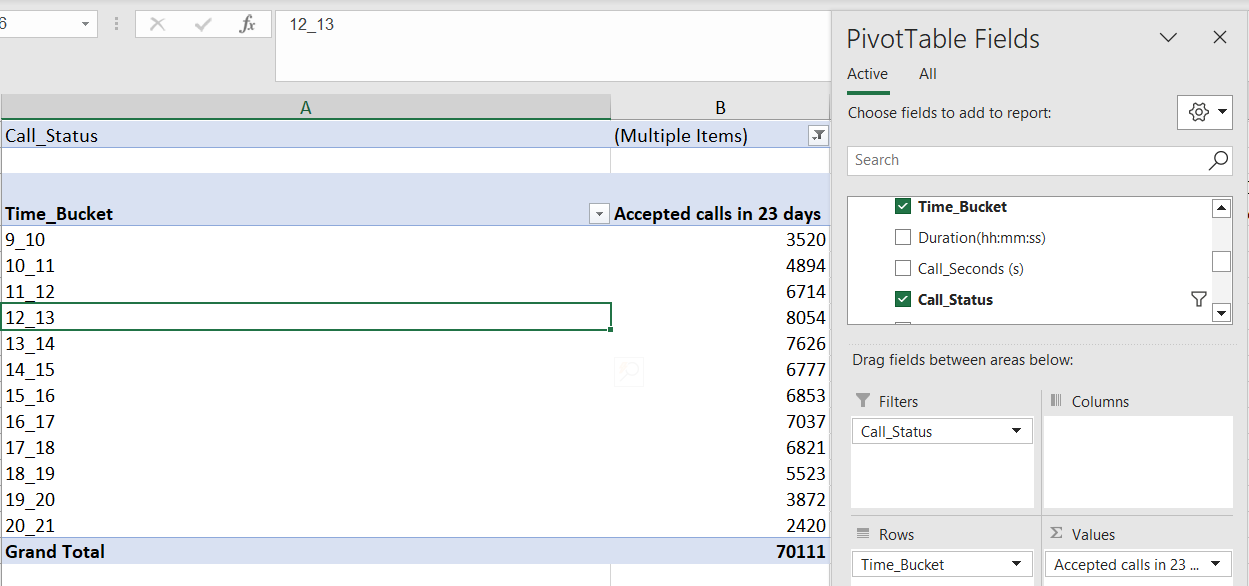
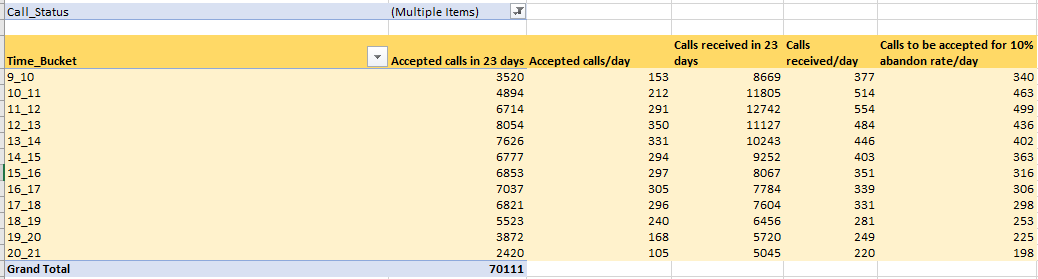
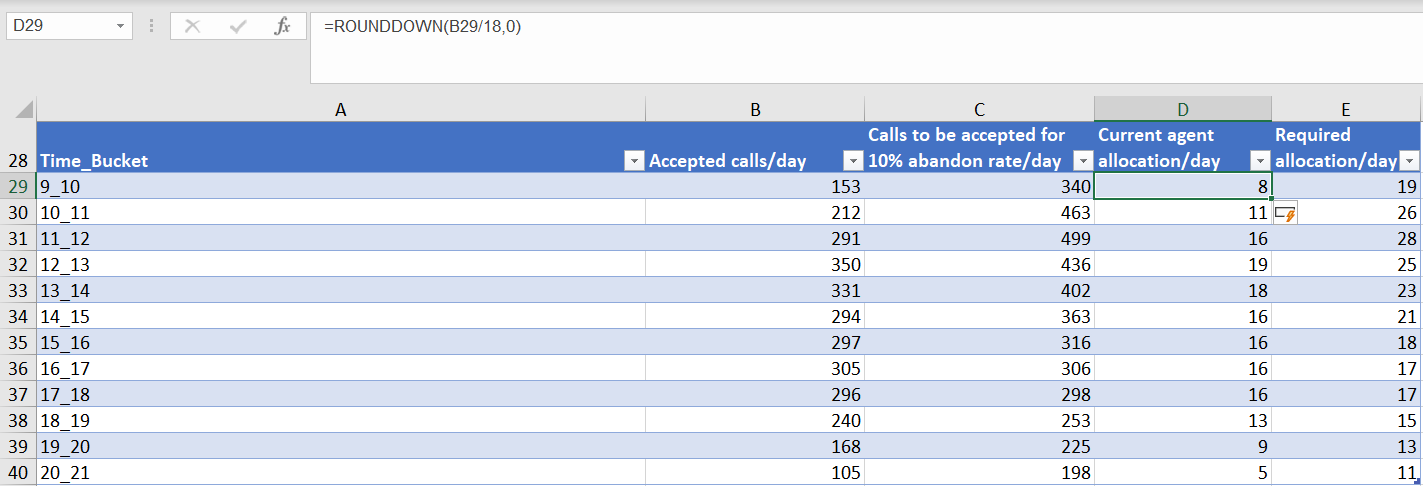
We can see that the maximum number of calls that are received is between 11-12 AM whereas between 8-9 PM, least number of calls are received. We also see a steady decline in the number of calls received after 12PM. This is a valuable finding in that it helps us allocate the resources (call agents) on the basis of time, i.e., more number of agents can be allocated in the morning shift and lesser in the afternoon shift.



Problem Description No. 3:

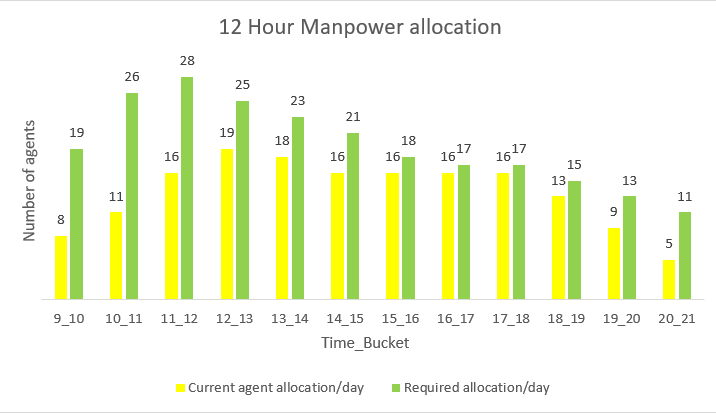
What is the minimum number of agents required in each time bucket to reduce the abandon rate to 10%?

**Approach:**

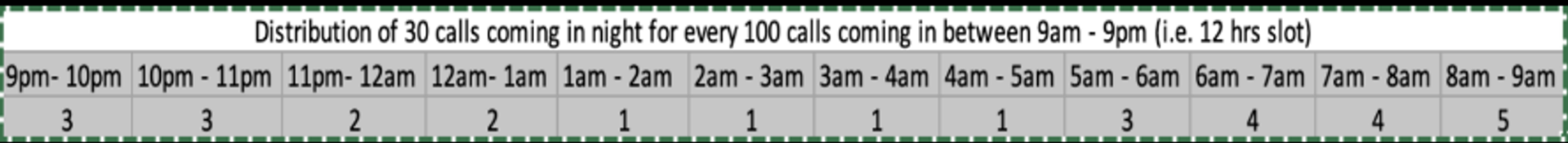
1. Because we want to allocate manpower **for 30 days**, I have done my calculation on an average of 1 day.
2. Our aim is to allocate the number of agents required to accept x number of calls (x will be derived from the 90% of calls received in one day) in 1 hour time\_bucket considering the assumptions given in terms of working and lunch hours along with productivity rate.
3. With the assumptions given, I have made the following calculations:  
   
4. Here the average call time of 1 agent in 1 hour in seconds is taken from the solution to problem 1. I have rounded up the result to 198.  
   
5. Thus, the **number of calls** that can be accepted by 1 agent in **1 day** considering the productive seconds is 16200 and 1 call on an average takes 198 seconds will be 16200/198 ≈ **81**. Here I have rounded down the result.
6. And finally, **number of calls** taken by 1 agent for **1 hour** time bucket will be number of calls that can be taken in 4.5 hours divided by 4.5 or 81/4.5 = **18**.
7. This final result we will use for our manpower allocation calculation.
8. Now, I have created a pivot table to find the total number of accepted calls over 23 days.  
   
9. Next, I have calculated the accepted calls per day and rounded down the figure and also taken the total number of calls received from the pivot table created in problem 2 and found the per day calls received. For taking in account the margins, I have rounded up this figure.
10. Then, I have calculated the number of calls that **should be accepted to bring down the abandon rate to 10%**. For this I have simply taken 90% of the calls received in 1 day in the last column as shown below:  
    
11. Finally, for my current agent allocation rate and my required agent allocation rate, I have divided the number of calls accepted (should be accepted) in one hour by the number of calls 1 agent can take in one hour time bucket and **rounded down the result for current agent allocation whereas rounded up the result for required agent** allocation for a ballpark figure as shown below:  
    

**Insights:**

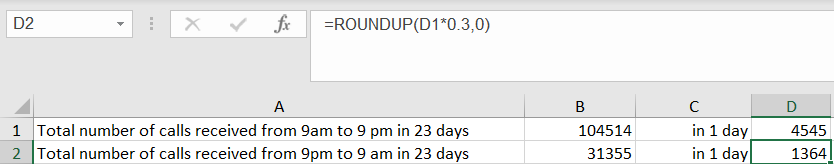
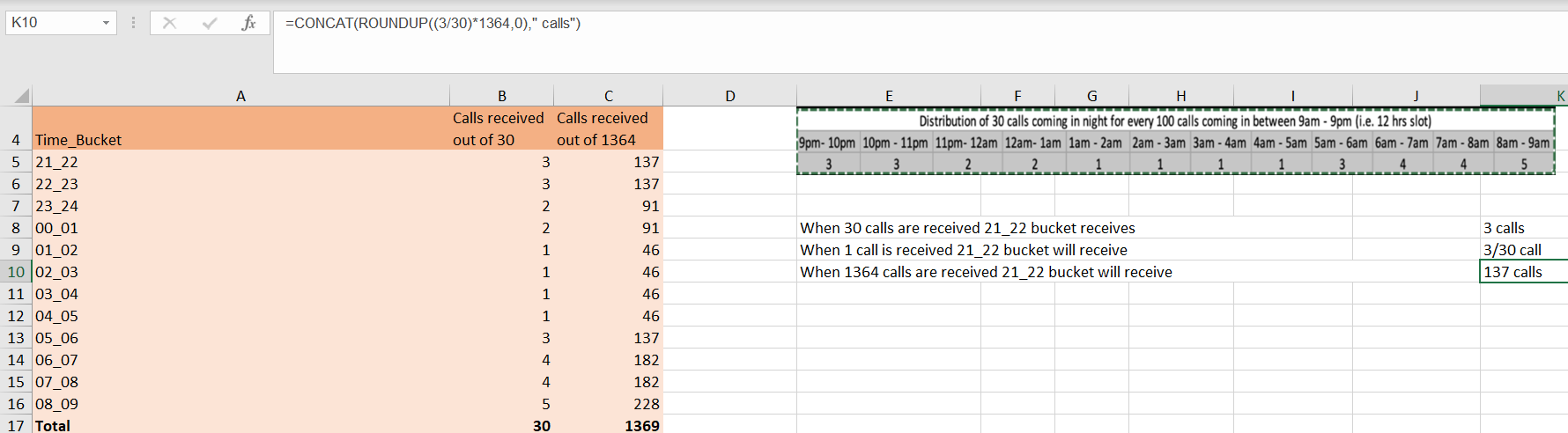
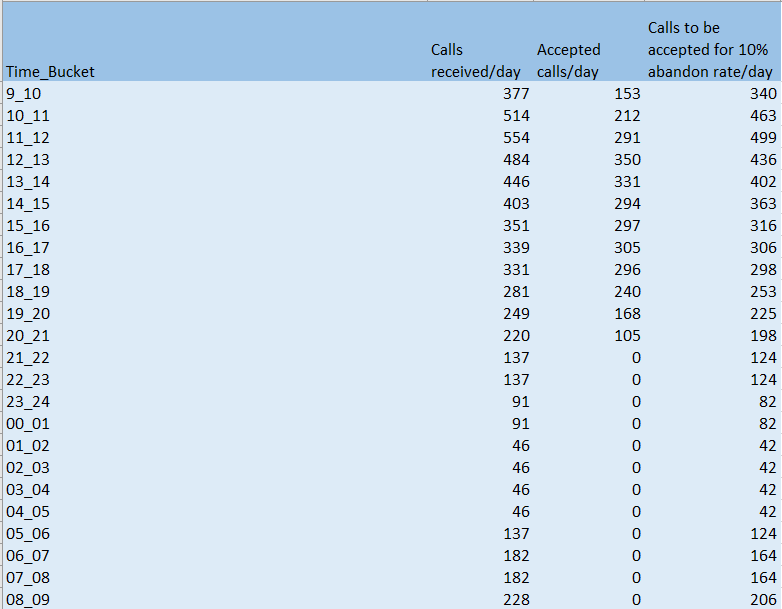
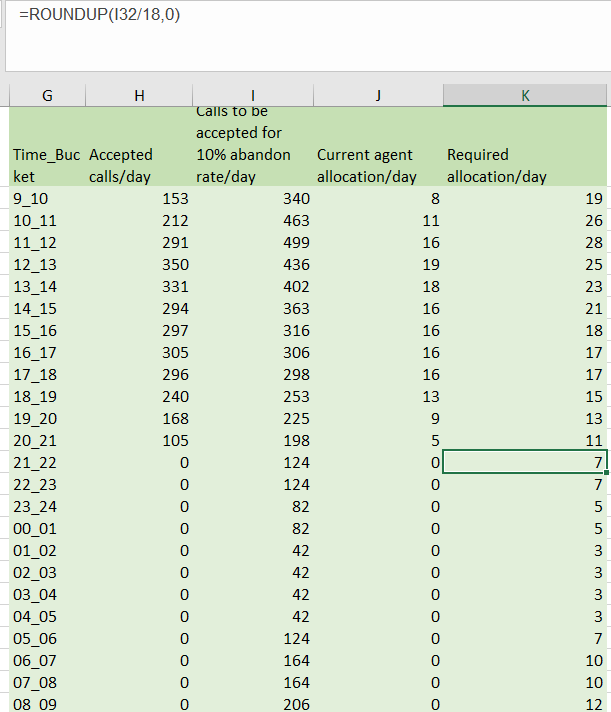
Upon visualizing the result, we see a clear difference in the supply and demand. For none of the time buckets we have a surplus of agents which means no reallocation is possible. In other words, the ABC company must hire new call agents to reduce the call abandon rate to 10%.



Problem Description No. 4:

Propose a manpower plan for each time bucket throughout the day, keeping the maximum abandon rate at 10%. Assume that for every 100 calls that customers make between 9 am and 9 pm, they also make 30 calls at night between 9 pm and 9 am.  


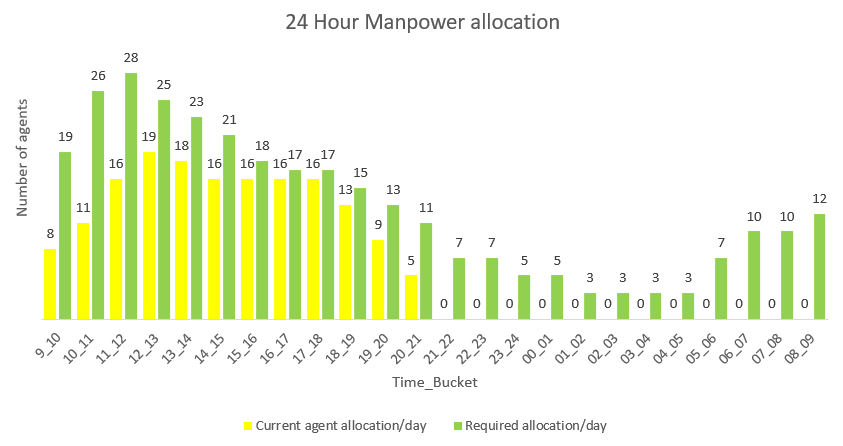
**Approach:**

1. For this problem our approach will be exactly like the previous problem except first we need to find out the calls received for the night shift time buckets.
2. We have been told for every 100 calls received between 9am to 9 pm, the company receives 30 calls between 9pm to 9am. We already know that from 9am to 9pm calls received are 104514. Therefore, calls received between 9pm to 9am would be 30% of calls received from 9am to 9pm or 30% of 104514.  
   
3. Now, with the distribution given in the assumption above, I have found out the percentage share of 1364 calls for each time bucket as shown below:  
   
4. Note that upon totaling, the number of calls received out of 1364 comes more than 1364 because we have rounded up the results in each time bucket. If we had rounded down the results the total would have been less than 1364. But I have rounded up to make sure the abandon rate is not more than 10%.
5. Next, I have copied the data for the morning shift from the pivot table created for the previous problem and calculated the data for the night shift in a similar way. The one thing to note here is that 0 calls are accepted in the night shift:  
   
6. Now because the productive hours of an agent is the same, I have used the same formula as in morning shift to count the minimum number of agents required for each time bucket in the night shift as well such that the acceptance rate is 90% or in other words, the abandon rate is 10%.  
   

**Insights:**

While it is clear that ABC needs to hire more call agents, the allocation can be done by looking at the chart below. We see that in the night shift the number of calls received is just 30% of what is received in the morning. Hence, the number of agents required are also less as compared to the morning shift.

Specifically, after 11pm, the number of agents required is very less up until 5am.



**Results:**

This project was quite different from the previous projects because here I had to apply foundational mathematical skills such as unitary method and percentages for calculating the manpower allocation. I also found that each new task in this project had derived results from the previous tasks. This helped me understand the flow in which analytics can be helpful as the insights can be debated and verified with further analysis. I found the problems very interesting and applied multiple approaches first for a total of 23 days and then for an average of 1 day because we had to allocate the manpower for a 30-day month while also keeping into mind the off days. Using the results derived above, ABC company can hire more agents and allocate them in shifts to ensure a great customer experience. This result can also be taken while allocating the proxies under vacations and off days as I have calculated the allocation for one single day.