hotel-data-analysis-project

September 11, 2024

```
<h1 align="center" style="color: white; font-weight: bold;">
    AtliQ Hotels Data Analysis Project
</h1>
<div style="position: absolute; bottom: 10px; right: 20px; color: white; font-size: small;">
    - Amit Vishwakarma
</div>
```

0.1 Problem Statement:

Atliq Grands, a leading player in India's hotel industry, is currently facing challenges with rising competition and declining revenue. The company is also experiencing a loss of market share. To combat these challenges, the management team has decided to harness data and strategic insights. With limited internal expertise in data analysis, they have sought external support to assess the situation, deliver actionable insights, and develop effective strategies for customer retention and revenue growth.

0.2 Project Goal:

The goal of this project is to conduct a comprehensive analysis of the hotel industry domain using Python. By leveraging data-driven insights and strategic recommendations, the objective is to empower Atliq Grands to make informed decisions. The ultimate aim is to assist Atliq Grands in regaining a competitive edge in the market, addressing their challenges of revenue decline and market share loss effectively.

0.3 Datasets:

- dim_date.csv
- dim_hotels.csv
- dim_rooms.csv
- fact_bookings.csv
- new_data_august.csv
- fact_aggregated_bookings.csv

0.4 Data Analysis Process:

1. Data Import & Exploration
2. Data Cleaning
3. Data Transformation
4. Data Insights
5. Key Insights Summary

6. Recommendations

```
<h2 align="center" style="color: white; font-weight: bold ">1. Data Import and Data Exploratio
```

[ ]:
```
import pandas as pd
```

Read bookings data in a datagrame

[ ]:
```
from google.colab import files
uploaded = files.upload()
```

```
<IPython.core.display.HTML object>
```

```
Saving fact_bookings.csv to fact_bookings.csv
```

[ ]:
```
df_bookings = pd.read_csv('fact_bookings.csv')
```

Explore bookings data

[ ]:
```
df_bookings.head()
```

[ ]:

	booking_id	property_id	booking_date	check_in_date	checkout_date	no_guests	room_category	booking_platform	ratings_given	booking_status	revenue_generated	revenue_realized
0	May012216558RT11	16558	2022-04-27	2022-05-01	2022-05-02	3	RT1	direct online	1.0	Checked Out	10010	10010
1	May012216558RT12	16558	2022-04-30	2022-05-01	2022-05-02	2	RT1	others	NaN	Cancelled	9100	3640
2	May012216558RT13	16558	2022-04-28	2022-05-01	2022-05-04	2	RT1	logtrip	5.0	Checked Out	9100	9100
3	May012216558RT14	16558	2022-04-28	2022-05-01	2022-05-02	2	RT1	others	NaN	Cancelled	9100	3640
4	May012216558RT15	16558	2022-04-27	2022-05-01	2022-05-02	4	RT1	direct online	5.0	Checked Out	10920	10920

[ ]:
```
df_bookings.shape
```

[ ]:
```
(134590, 12)
```

[ ]:
```
df_bookings.room_category.unique()
```

[ ]:
```
array(['RT1', 'RT2', 'RT3', 'RT4'], dtype=object)
```

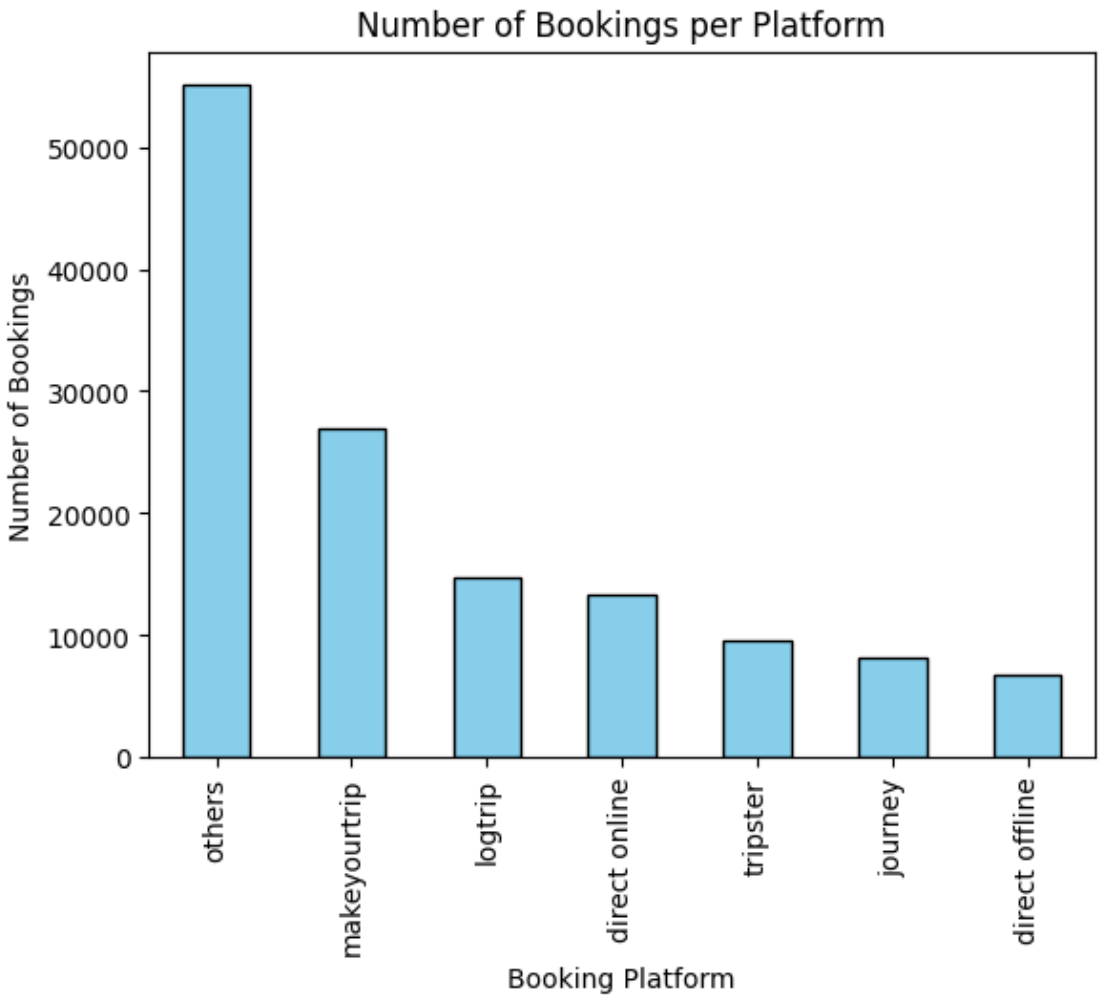
[ ]:
```
df_bookings.booking_platform.unique()
```

[ ]:
```
array(['direct online', 'others', 'logtrip', 'tripster', 'makeyourtrip',
       'journey', 'direct offline'], dtype=object)
```

[ ]:
```
df_bookings.booking_platform.value_counts()
```

[ ]:
```
booking_platform
others            55066
makeyourtrip      26898
logtrip           14756
direct online     13379
tripster           9630
journey            8106
direct offline     6755
Name: count, dtype: int64
```

[ ]:
```
# Plot the value counts of booking platforms as a bar chart

import matplotlib.pyplot as plt

df_bookings.booking_platform.value_counts().plot(kind="bar", color='skyblue',␣
 ↪edgecolor='black')

# Add a title and labels
plt.title("Number of Bookings per Platform")
plt.xlabel("Booking Platform")
plt.ylabel("Number of Bookings")

# Show the plot
plt.show()
```



[ ]:
```
df_bookings.describe()
```

[ ]:
```
         property_id      no_guests  ratings_given  revenue_generated  \
count  134590.000000  134590.000000   56683.000000      134590.000000
mean    18061.113493       2.036808       3.619004       14916.013188
std      1093.055847       1.031766       1.235009        6452.868072
min     16558.000000       1.000000       1.000000        6500.000000
25%     17558.000000       1.000000       3.000000        9900.000000
50%     17564.000000       2.000000       4.000000       13500.000000
75%     18563.000000       2.000000       5.000000       18000.000000
max     19563.000000       6.000000       5.000000       45220.000000

       revenue_realized
count     134590.000000
mean       12696.123256
std         6928.108124
```

```
min          2600.000000
25%          7600.000000
50%         11700.000000
75%         15300.000000
max         45220.000000
```

Read rest of the files

[ ]:
```
from google.colab import files
uploaded = files.upload()
```

```
<IPython.core.display.HTML object>
```

```
Saving fact_aggregated_bookings.csv to fact_aggregated_bookings.csv
```

[ ]:
```
df_date = pd.read_csv('dim_date.csv')
df_hotels = pd.read_csv('dim_hotels.csv')
df_rooms = pd.read_csv('dim_rooms.csv')
df_agg_bookings = pd.read_csv('fact_aggregated_bookings.csv')
```

[ ]:
```
df_hotels.shape
```

[ ]:
```
(25, 4)
```

[ ]:
```
df_hotels.head(3)
```

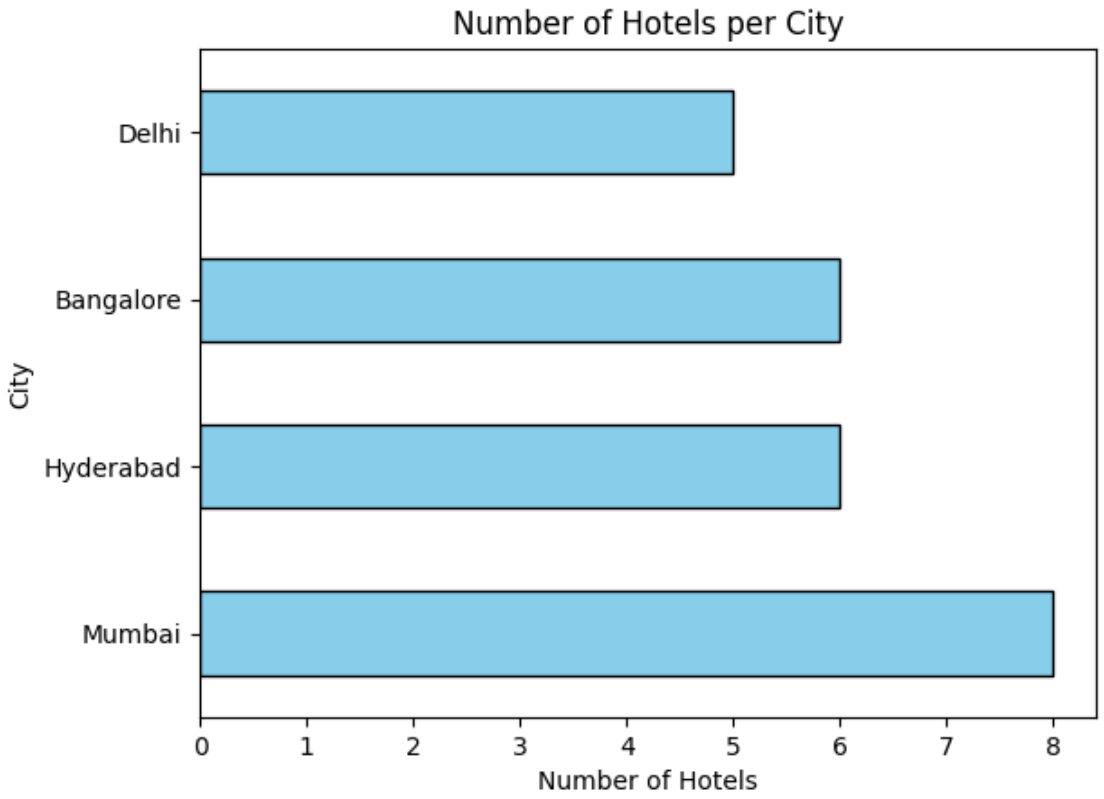
[ ]:
```
   property_id  property_name  category    city
0        16558   Atliq Grands    Luxury   Delhi
1        16559  Atliq Exotica    Luxury  Mumbai
2        16560     Atliq City  Business   Delhi
```

[ ]:
```
df_hotels.category.value_counts()
```

[ ]:
```
category
Luxury      16
Business     9
Name: count, dtype: int64
```

[ ]:
```
import matplotlib.pyplot as plt

# Plot value counts of cities as a horizontal bar chart

ax = df_hotels.city.value_counts().plot(kind="barh", color='skyblue',␣
 ↪edgecolor='black')

# Add title and labels
plt.title("Number of Hotels per City")
plt.xlabel("Number of Hotels")
```

```
plt.ylabel("City")

plt.show()
```



0.5 Exercise: Explore Aggregate Bookings

[ ]:
```
df_agg_bookings.head(3)
```

[ ]:

	property_id	check_in_date	room_category	successful_bookings	capacity
0	16559	1-May-22	RT1	25	30.0
1	19562	1-May-22	RT1	28	30.0
2	19563	1-May-22	RT1	23	30.0

Exercise-1. Find out unique property ids in aggregate bookings dataset

[ ]:
```
df_agg_bookings.property_id.unique()
```

[ ]:
```
array([16559, 19562, 19563, 17558, 16558, 17560, 19558, 19560, 17561,
       16560, 16561, 16562, 16563, 17559, 17562, 17563, 18558, 18559,
       18561, 18562, 18563, 19559, 19561, 17564, 18560])
```

Exercise-2. Find out total bookings per property_id

```
[ ]: df_agg_bookings.groupby("property_id")["successful_bookings"].sum()
```

```
[ ]: property_id
     16558    3153
     16559    7338
     16560    4693
     16561    4418
     16562    4820
     16563    7211
     17558    5053
     17559    6142
     17560    6013
     17561    5183
     17562    3424
     17563    6337
     17564    3982
     18558    4475
     18559    5256
     18560    6638
     18561    6458
     18562    7333
     18563    4737
     19558    4400
     19559    4729
     19560    6079
     19561    5736
     19562    5812
     19563    5413
     Name: successful_bookings, dtype: int64
```

Exercise-3. Find out days on which bookings are greater than capacity

```
[ ]: df_agg_bookings[df_agg_bookings.successful_bookings>df_agg_bookings.capacity]
```

```
[ ]:       property_id check_in_date room_category  successful_bookings  capacity
     3           17558      1-May-22           RT1                  30      19.0
     12          16563      1-May-22           RT1                 100      41.0
     4136        19558     11-Jun-22           RT2                  50      39.0
     6209        19560      2-Jul-22           RT1                 123      26.0
     8522        19559     25-Jul-22           RT1                  35      24.0
     9194        18563     31-Jul-22           RT4                  20      18.0
```

Exercise-4. Find out properties that have highest capacity

```
[ ]: df_agg_bookings.capacity.max()
```

```
[ ]: 50.0
```

```
<h2 align="center" style="color: white; font-weight: bold ">2. Data Cleaning</h2>
```

[ ]:
```
df_bookings.describe()
```

[ ]:
```
         property_id      no_guests  ratings_given  revenue_generated  \
count  134590.000000  134590.000000   56683.000000      134590.000000
mean    18061.113493       2.036808       3.619004       14916.013188
std      1093.055847       1.031766       1.235009        6452.868072
min     16558.000000       1.000000       1.000000        6500.000000
25%     17558.000000       1.000000       3.000000        9900.000000
50%     17564.000000       2.000000       4.000000       13500.000000
75%     18563.000000       2.000000       5.000000       18000.000000
max     19563.000000       6.000000       5.000000       45220.000000

       revenue_realized
count     134590.000000
mean       12696.123256
std         6928.108124
min         2600.000000
25%         7600.000000
50%        11700.000000
75%        15300.000000
max        45220.000000
```

(1) Clean invalid guests

[ ]:
```
df_bookings[df_bookings.no_guests<=0]
```

[ ]:
```
Empty DataFrame
Columns: [booking_id, property_id, booking_date, check_in_date, checkout_date,
no_guests, room_category, booking_platform, ratings_given, booking_status,
revenue_generated, revenue_realized]
Index: []
```

As you can see above, number of guests having less than zero value represents data error. We can ignore these records.

[ ]:
```
df_bookings = df_bookings[df_bookings.no_guests>0]
```

[ ]:
```
df_bookings.shape
```

[ ]:
```
(134590, 12)
```

(2) Outlier removal in revenue generated

[ ]:
```
df_bookings.revenue_generated.min(), df_bookings.revenue_generated.max()
```

[ ]:
```
(6500, 45220)
```

```
[ ]: df_bookings.revenue_generated.mean(), df_bookings.revenue_generated.median()
```

```
[ ]: (14916.013188201203, 13500.0)
```

```
[ ]: avg, std = df_bookings.revenue_generated.mean(), df_bookings.revenue_generated.
      ↪std()
```

```
[ ]: higher_limit = avg + 3*std
     higher_limit
```

```
[ ]: 34274.61740350578
```

```
[ ]: lower_limit = avg - 3*std
     lower_limit
```

```
[ ]: -4442.591027103368
```

```
[ ]: df_bookings[df_bookings.revenue_generated<=0]
```

```
[ ]: Empty DataFrame
     Columns: [booking_id, property_id, booking_date, check_in_date, checkout_date,
     no_guests, room_category, booking_platform, ratings_given, booking_status,
     revenue_generated, revenue_realized]
     Index: []
```

```
[ ]: df_bookings[df_bookings.revenue_generated>higher_limit]
```

```
[ ]:              booking_id  property_id booking_date check_in_date  \
     137      May012216559RT41        16559   2022-04-27    2022-05-01
     139      May012216559RT43        16559   2022-05-01    2022-05-01
     143      May012216559RT47        16559   2022-04-28    2022-05-01
     149     May012216559RT413        16559   2022-04-24    2022-05-01
     153     May012216559RT417        16559   2022-04-30    2022-05-01
     …                     …           …           …           …
     134467   Jul312219562RT45        19562   2022-07-28    2022-07-31
     134469   Jul312219562RT47        19562   2022-07-10    2022-07-31
     134474  Jul312219562RT412        19562   2022-07-25    2022-07-31
     134581   Jul312217564RT42        17564   2022-07-31    2022-07-31
     134586   Jul312217564RT47        17564   2022-07-30    2022-07-31

            checkout_date  no_guests room_category booking_platform  ratings_given  \
     137       2022-05-07          4           RT4           others            NaN
     139       2022-05-02          6           RT4         tripster            3.0
     143       2022-05-03          3           RT4           others            5.0
     149       2022-05-07          5           RT4          logtrip            NaN
     153       2022-05-02          4           RT4           others            NaN
     …              …        …           …              …            …
```

```
134467    2022-08-01          6           RT4     makeyourtrip            4.0
134469    2022-08-06          5           RT4     makeyourtrip            NaN
134474    2022-08-06          5           RT4   direct offline            5.0
134581    2022-08-01          4           RT4     makeyourtrip            4.0
134586    2022-08-01          4           RT4          logtrip            2.0

       booking_status  revenue_generated  revenue_realized
137       Checked Out              38760             38760
139       Checked Out              45220             45220
143       Checked Out              35530             35530
149       Checked Out              41990             41990
153         Cancelled              38760             15504
…                 …                  …                 …
134467    Checked Out              39900             39900
134469      Cancelled              37050             14820
134474    Checked Out              37050             37050
134581    Checked Out              38760             38760
134586    Checked Out              38760             38760

[1520 rows x 12 columns]
```

[ ]:
```
df_bookings = df_bookings[df_bookings.revenue_generated<=higher_limit]
df_bookings.shape
```

[ ]:
```
(133070, 12)
```

[ ]:
```
df_bookings.revenue_realized.describe().round(2)
```

[ ]:
```
count    133070.00
mean      12468.78
std        6537.75
min        2600.00
25%        7600.00
50%       11400.00
75%       15300.00
max       34200.00
Name: revenue_realized, dtype: float64
```

[ ]:
```
higher_limit = df_bookings.revenue_realized.mean() + 3*df_bookings.
 ↪revenue_realized.std()
higher_limit
```

[ ]:
```
32082.021279985467
```

[ ]:
```
df_bookings[df_bookings.revenue_realized>higher_limit]
```

[ ]:
```
              booking_id  property_id booking_date check_in_date  \
140      May012216559RT44        16559   2022-04-28    2022-05-01
141      May012216559RT45        16559   2022-04-28    2022-05-01
144      May012216559RT48        16559   2022-04-26    2022-05-01
145      May012216559RT49        16559   2022-04-28    2022-05-01
146     May012216559RT410        16559   2022-04-30    2022-05-01
…                     …          …           …             …
134580   Jul312217564RT41        17564   2022-07-31    2022-07-31
134582   Jul312217564RT43        17564   2022-07-31    2022-07-31
134584   Jul312217564RT45        17564   2022-07-30    2022-07-31
134585   Jul312217564RT46        17564   2022-07-29    2022-07-31
134588   Jul312217564RT49        17564   2022-07-29    2022-07-31

       checkout_date  no_guests room_category booking_platform  ratings_given  \
140       2022-05-05          2           RT4           others            NaN
141       2022-05-04          2           RT4           others            5.0
144       2022-05-02          2           RT4     makeyourtrip            5.0
145       2022-05-03          2           RT4           others            NaN
146       2022-05-06          2           RT4          logtrip            NaN
…                ...        …           …               …            …
134580    2022-08-02          1           RT4    direct online            NaN
134582    2022-08-03          1           RT4           others            1.0
134584    2022-08-01          2           RT4           others            2.0
134585    2022-08-03          1           RT4     makeyourtrip            2.0
134588    2022-08-01          2           RT4          logtrip            2.0

       booking_status  revenue_generated  revenue_realized
140       Checked Out              32300             32300
141       Checked Out              32300             32300
144       Checked Out              32300             32300
145       Checked Out              32300             32300
146           No Show              32300             32300
…                ...                …                 …
134580    Checked Out              32300             32300
134582    Checked Out              32300             32300
134584    Checked Out              32300             32300
134585    Checked Out              32300             32300
134588    Checked Out              32300             32300

[3256 rows x 12 columns]
```

One observation we can have in above dataframe is that all rooms are RT4 which means presidential suit. Now since RT4 is a luxurious room it is likely their rent will be higher. To make a fair analysis, we need to do data analysis only on RT4 room types

[ ]:
```
df_bookings[df_bookings.room_category=="RT4"].revenue_realized.describe().
↪round(2)
```

[ ]:
```
count    14553.00
mean     22483.44
std       8338.25
min       7600.00
25%      19000.00
50%      22800.00
75%      31350.00
max      34200.00
Name: revenue_realized, dtype: float64
```

[ ]:
```
# mean + 3*standard deviation
23439+3*9048
```

[ ]:
```
50583
```

Here higher limit comes to be 50583 and in our dataframe above we can see that max value for revenue realized is 45220. Hence we can conclude that there is no outlier and we don't need to do any data cleaning on this particular column

[ ]:
```
df_bookings[df_bookings.booking_id=="May012216558RT213"]
```

[ ]:
```
           booking_id  property_id booking_date check_in_date checkout_date  \
30  May012216558RT213        16558   2022-04-29    2022-05-01    2022-05-02

    no_guests room_category booking_platform  ratings_given booking_status  \
30          2           RT2          logtrip            4.0    Checked Out

    revenue_generated  revenue_realized
30              12600             12600
```

[ ]:
```
df_bookings.isnull().sum()
```

[ ]:
```
booking_id              0
property_id             0
booking_date            0
check_in_date           0
checkout_date           0
no_guests               0
room_category           0
booking_platform        0
ratings_given       77054
booking_status          0
revenue_generated       0
revenue_realized        0
dtype: int64
```

Total values in our dataframe is 133070. Out of that 77054 rows has null rating. Since there are many rows with null rating, we should not filter these values. Also we should not replace this rating

with a median or mean rating etc

0.6 Excercises :-

Exercise-1. In aggregate bookings find columns that have null values. Fill these null values with whatever you think is the appropriate subtitute (possible ways is to use mean or median)

[ ]:
```
df_agg_bookings.isnull().sum()
```

[ ]:
```
property_id            0
check_in_date          0
room_category          0
successful_bookings    0
capacity               2
dtype: int64
```

[ ]:
```
df_agg_bookings[df_agg_bookings.capacity.isna()]
```

[ ]:

	property_id	check_in_date	room_category	successful_bookings	capacity
8	17561	1-May-22	RT1	22	NaN
14	17562	1-May-22	RT1	12	NaN

[ ]:
```
df_agg_bookings.capacity.median()
```

[ ]:
```
25.0
```

[ ]:
```
df_agg_bookings.capacity.fillna(df_agg_bookings.capacity.median(), inplace=True)
```

[ ]:
```
df_agg_bookings.loc[[8,15]]
```

[ ]:

	property_id	check_in_date	room_category	successful_bookings	capacity
8	17561	1-May-22	RT1	22	25.0
15	17563	1-May-22	RT1	21	25.0

Exercise-2. In aggregate bookings find out records that have successful_bookings value greater than capacity. Filter those records

[ ]:
```
df_agg_bookings[df_agg_bookings.successful_bookings>df_agg_bookings.capacity]
```

[ ]:

	property_id	check_in_date	room_category	successful_bookings	capacity
3	17558	1-May-22	RT1	30	19.0
12	16563	1-May-22	RT1	100	41.0
4136	19558	11-Jun-22	RT2	50	39.0
6209	19560	2-Jul-22	RT1	123	26.0
8522	19559	25-Jul-22	RT1	35	24.0
9194	18563	31-Jul-22	RT4	20	18.0

```
<h2 align="center" style="color: white; font-weight: bold">3. Data Transformation</h2>
```

Create occupancy percentage column

[ ]:
```
df_agg_bookings.head(3)
```

[ ]:
```
   property_id check_in_date room_category  successful_bookings  capacity
0        16559      1-May-22           RT1                   25      30.0
1        19562      1-May-22           RT1                   28      30.0
2        19563      1-May-22           RT1                   23      30.0
```

[ ]:
```
df_agg_bookings['occ_pct'] = df_agg_bookings.apply(lambda row:␣
↪row['successful_bookings']/row['capacity'], axis=1)
```

You can use following approach to get rid of SettingWithCopyWarning

[ ]:
```
new_col = df_agg_bookings.apply(lambda row: row['successful_bookings']/
↪row['capacity'], axis=1)
df_agg_bookings = df_agg_bookings.assign(occ_pct=new_col.values)
df_agg_bookings.head(3)
```

[ ]:
```
   property_id check_in_date room_category  successful_bookings  capacity  \
0        16559      1-May-22           RT1                   25      30.0
1        19562      1-May-22           RT1                   28      30.0
2        19563      1-May-22           RT1                   23      30.0

    occ_pct
0  0.833333
1  0.933333
2  0.766667
```

Convert it to a percentage value

[ ]:
```
df_agg_bookings['occ_pct'] = df_agg_bookings['occ_pct'].apply(lambda x:␣
↪round(x*100, 2))
df_agg_bookings.head(3)
```

[ ]:
```
   property_id check_in_date room_category  successful_bookings  capacity  \
0        16559      1-May-22           RT1                   25      30.0
1        19562      1-May-22           RT1                   28      30.0
2        19563      1-May-22           RT1                   23      30.0

   occ_pct
0    83.33
1    93.33
2    76.67
```

[ ]:
```
df_bookings.head()
```

[ ]:

	booking_id	property_id	booking_date	check_in_date	checkout_date	\
0	May012216558RT11	16558	2022-04-27	2022-05-01	2022-05-02	
1	May012216558RT12	16558	2022-04-30	2022-05-01	2022-05-02	
2	May012216558RT13	16558	2022-04-28	2022-05-01	2022-05-04	
3	May012216558RT14	16558	2022-04-28	2022-05-01	2022-05-02	
4	May012216558RT15	16558	2022-04-27	2022-05-01	2022-05-02	

	no_guests	room_category	booking_platform	ratings_given	booking_status	\
0	3	RT1	direct online	1.0	Checked Out	
1	2	RT1	others	NaN	Cancelled	
2	2	RT1	logtrip	5.0	Checked Out	
3	2	RT1	others	NaN	Cancelled	
4	4	RT1	direct online	5.0	Checked Out	

	revenue_generated	revenue_realized
0	10010	10010
1	9100	3640
2	9100	9100
3	9100	3640
4	10920	10920

[ ]:
```
df_agg_bookings.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 9200 entries, 0 to 9199
Data columns (total 6 columns):
 #   Column               Non-Null Count  Dtype
---  ------               --------------  -----
 0   property_id          9200 non-null   int64
 1   check_in_date        9200 non-null   object
 2   room_category        9200 non-null   object
 3   successful_bookings  9200 non-null   int64
 4   capacity             9200 non-null   float64
 5   occ_pct              9200 non-null   float64
dtypes: float64(2), int64(2), object(2)
memory usage: 431.4+ KB
```

<h2 align="center" style="color: white; font-weight: bold">4. Insights Generations</h2>

0.6.1 1. What is an average occupancy rate in each of the room categories?

[ ]:
```
df_agg_bookings.head(3)
```

[ ]:

	property_id	check_in_date	room_category	successful_bookings	capacity	\
0	16559	1-May-22	RT1	25	30.0	
1	19562	1-May-22	RT1	28	30.0	
2	19563	1-May-22	RT1	23	30.0	

```
   occ_pct
0    83.33
1    93.33
2    76.67
```

[ ]:
```
df_agg_bookings.groupby("room_category")["occ_pct"].mean().round(2)
```

[ ]:
```
room_category
RT1    58.23
RT2    58.04
RT3    58.03
RT4    59.30
Name: occ_pct, dtype: float64
```

I don't understand RT1, RT2 etc. Print room categories such as Standard, Premium, Elite etc along with average occupancy percentage

[ ]:
```
df = pd.merge(df_agg_bookings, df_rooms, left_on="room_category",␣
 ↪right_on="room_id")
df.head(4)
```

[ ]:
```
   property_id check_in_date room_category  successful_bookings  capacity  \
0        16559      1-May-22           RT1                   25      30.0
1        19562      1-May-22           RT1                   28      30.0
2        19563      1-May-22           RT1                   23      30.0
3        17558      1-May-22           RT1                   30      19.0

   occ_pct room_id room_class
0    83.33     RT1   Standard
1    93.33     RT1   Standard
2    76.67     RT1   Standard
3   157.89     RT1   Standard
```

[ ]:
```
df.drop("room_id",axis=1, inplace=True)
df.head(4)
```

[ ]:
```
   property_id check_in_date room_category  successful_bookings  capacity  \
0        16559      1-May-22           RT1                   25      30.0
1        19562      1-May-22           RT1                   28      30.0
2        19563      1-May-22           RT1                   23      30.0
3        17558      1-May-22           RT1                   30      19.0

   occ_pct room_class
0    83.33   Standard
1    93.33   Standard
2    76.67   Standard
3   157.89   Standard
```

[ ]:
```
df.groupby("room_class")["occ_pct"].mean().round(2)
```

[ ]:
```
room_class
Elite           58.04
Premium         58.03
Presidential    59.30
Standard        58.23
Name: occ_pct, dtype: float64
```

[ ]:
```
df[df.room_class=="Standard"].occ_pct.mean().round(2)
```

[ ]:
```
58.23
```

0.6.2 2. Print average occupancy rate per city

[ ]:
```
df_hotels.head(3)
```

[ ]:
```
   property_id  property_name  category    city
0        16558   Atliq Grands    Luxury   Delhi
1        16559  Atliq Exotica    Luxury  Mumbai
2        16560     Atliq City  Business   Delhi
```

[ ]:
```
df = pd.merge(df, df_hotels, on="property_id")
df.head(3)
```

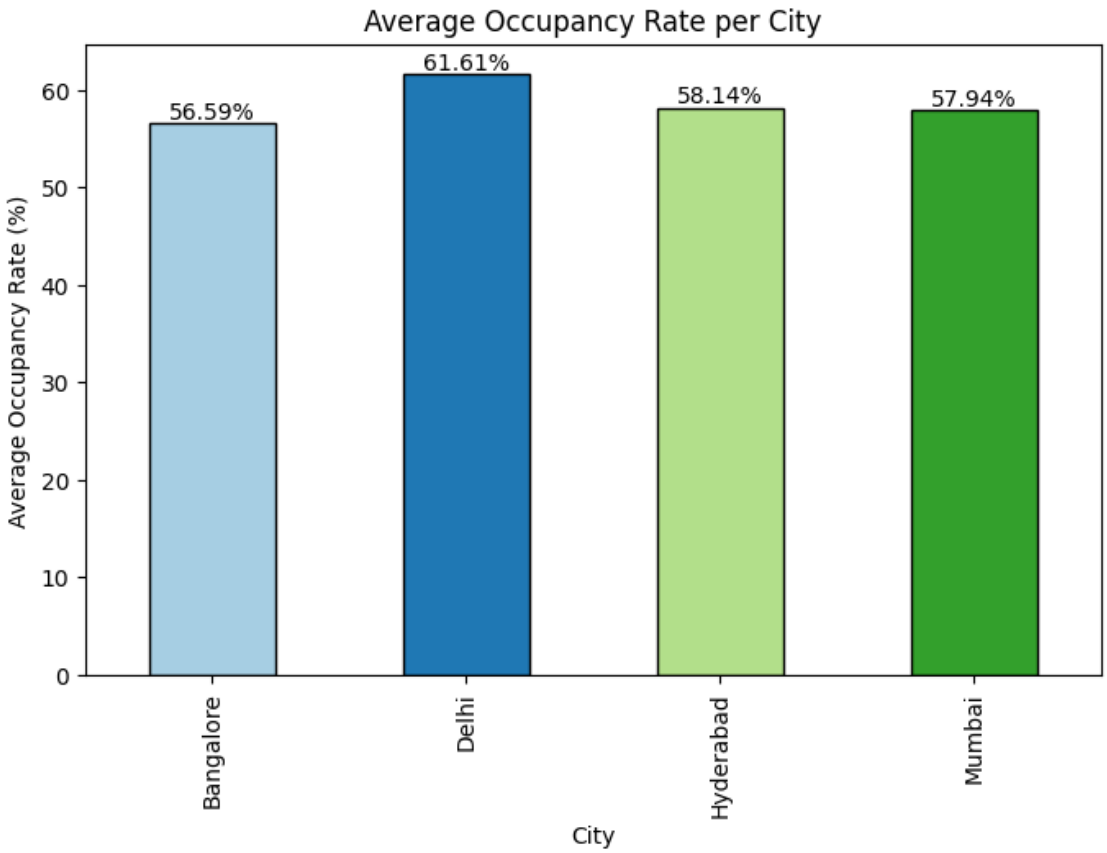
[ ]:
```
   property_id check_in_date room_category  successful_bookings  capacity  \
0        16559      1-May-22           RT1                   25      30.0
1        16559      2-May-22           RT1                   20      30.0
2        16559      3-May-22           RT1                   17      30.0

   occ_pct room_class  property_name category    city
0    83.33   Standard  Atliq Exotica   Luxury  Mumbai
1    66.67   Standard  Atliq Exotica   Luxury  Mumbai
2    56.67   Standard  Atliq Exotica   Luxury  Mumbai
```

[ ]:
```
avg_occupancy_rate_per_city = df.groupby("city")["occ_pct"].mean().round(2)
avg_occupancy_rate_per_city
```

[ ]:
```
city
Bangalore    56.59
Delhi        61.61
Hyderabad    58.14
Mumbai       57.94
Name: occ_pct, dtype: float64
```

[ ]:
```
import matplotlib.pyplot as plt
```

```python
# Create a bar chart
plt.figure(figsize=(8, 5))
avg_occupancy_rate_per_city.plot.bar(
    color=plt.cm.Paired.colors,  # Different colors for each bar
    edgecolor='black'            # Outline the bars
)

# Add a title and labels
plt.title("Average Occupancy Rate per City")
plt.xlabel("City")
plt.ylabel("Average Occupancy Rate (%)")

# Show the percentage value on top of each bar
for i, value in enumerate(avg_occupancy_rate_per_city):
    plt.text(i, value + 0.5, f'{value}%', ha='center', fontsize=10)

# Show the plot
plt.show()
```



0.6.3 3. When was the occupancy better? Weekday or Weekend?

[ ]:
```
df_date.head(3)
```

[ ]:
```
        date  mmm yy week no  day_type
0  01-May-22  May 22    W 19   weekend
1  02-May-22  May 22    W 19  weekeday
2  03-May-22  May 22    W 19  weekeday
```

[ ]:
```
df = pd.merge(df, df_date, left_on="check_in_date", right_on="date")
df.head(3)
```

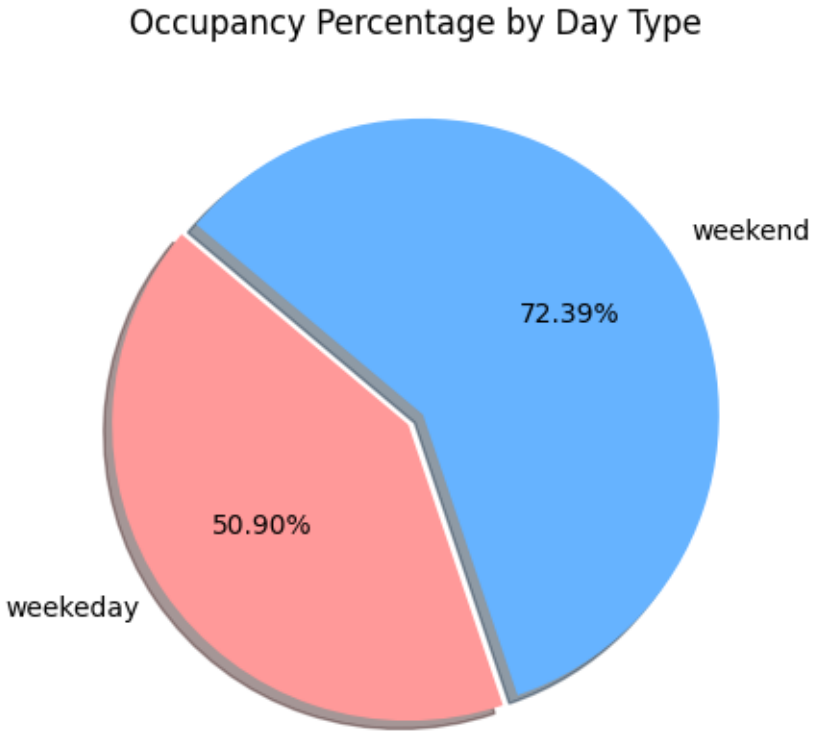
[ ]:
```
   property_id check_in_date room_category  successful_bookings  capacity  \
0        16559     10-May-22           RT1                   18      30.0
1        16559     10-May-22           RT2                   25      41.0
2        16559     10-May-22           RT3                   20      32.0

   occ_pct room_class  property_name category    city       date  mmm yy  \
0    60.00   Standard  Atliq Exotica   Luxury  Mumbai  10-May-22  May 22
1    60.98      Elite  Atliq Exotica   Luxury  Mumbai  10-May-22  May 22
2    62.50    Premium  Atliq Exotica   Luxury  Mumbai  10-May-22  May 22

  week no  day_type
0    W 20  weekeday
1    W 20  weekeday
2    W 20  weekeday
```

[ ]:
```
df.groupby("day_type")["occ_pct"].mean().round(2)
```

[ ]:
```
day_type
weekeday    50.90
weekend     72.39
Name: occ_pct, dtype: float64
```

[ ]:
```
import matplotlib.pyplot as plt

# Group by 'day_type' and calculate the mean of 'occ_pct'
mean_occ_pct = df.groupby("day_type")["occ_pct"].mean().round(2)

# Create and display the pie chart
plt.figure(figsize=(5, 5))  # Set figure size for better readability
plt.pie(
    mean_occ_pct,
    labels=mean_occ_pct.index,  # Use day_type as labels
    autopct=lambda p: '{:.2f}%'.format(p * sum(mean_occ_pct) / 100),  # Display␣
 ↪exact percentage values
    startangle=140,
```

```
    explode=[0.03] * len(mean_occ_pct),  # Slightly explode all slices for␣
 ↪emphasis
    shadow=True,
    colors=['#ff9999', '#66b3ff']  # Adjust colors based on the number of slices
)

plt.title("Occupancy Percentage by Day Type")
plt.gca().set_aspect('equal')  # Ensure the pie chart is circular
plt.show()
```



0.6.4 4: In the month of June, what is the occupancy for different cities

[ ]:
```
df_june_22 = df[df["mmm yy"]=="Jun 22"]
df_june_22.head(4)
```

[ ]:

	property_id	check_in_date	room_category	successful_bookings	capacity	\
2200	16559	10-Jun-22	RT1	20	30.0	
2201	16559	10-Jun-22	RT2	26	41.0	
2202	16559	10-Jun-22	RT3	20	32.0	
2203	16559	10-Jun-22	RT4	11	18.0	

```
      occ_pct    room_class  property_name category    city       date  \
2200    66.67      Standard  Atliq Exotica   Luxury  Mumbai  10-Jun-22
2201    63.41         Elite  Atliq Exotica   Luxury  Mumbai  10-Jun-22
2202    62.50       Premium  Atliq Exotica   Luxury  Mumbai  10-Jun-22
2203    61.11  Presidential  Atliq Exotica   Luxury  Mumbai  10-Jun-22

      mmm yy week no  day_type
2200  Jun 22    W 24  weekeday
2201  Jun 22    W 24  weekeday
2202  Jun 22    W 24  weekeday
2203  Jun 22    W 24  weekeday
```

[ ]:
```
df_june_22.groupby('city')['occ_pct'].mean().round(2).
 ↪sort_values(ascending=False)
```

[ ]:
```
city
Delhi        62.47
Hyderabad    58.46
Mumbai       58.38
Bangalore    56.58
Name: occ_pct, dtype: float64
```

0.6.5 5: We got new data for the month of august. Append that to existing data

[ ]:
```
from google.colab import files
uploaded = files.upload()

df_august = pd.read_csv("new_data_august.csv")
df_august.head(3)
```

```
<IPython.core.display.HTML object>

Saving new_data_august.csv to new_data_august (2).csv
```

[ ]:
```
   property_id  property_name  category       city room_category room_class  \
0        16559  Atliq Exotica    Luxury     Mumbai           RT1   Standard
1        19562      Atliq Bay    Luxury  Bangalore           RT1   Standard
2        19563   Atliq Palace  Business  Bangalore           RT1   Standard

  check_in_date  mmm yy week no  day_type  successful_bookings  capacity  \
0      1-Aug-22  22-Aug    W 32  weekeday                    30        30
1      1-Aug-22  22-Aug    W 32  weekeday                    21        30
2      1-Aug-22  22-Aug    W 32  weekeday                    23        30

     occ%
0  100.00
1   70.00
```

```
2   76.67
```

[ ]:
```
df_august.columns
```

[ ]:
```
Index(['property_id', 'property_name', 'category', 'city', 'room_category',
       'room_class', 'check_in_date', 'mmm yy', 'week no', 'day_type',
       'successful_bookings', 'capacity', 'occ%'],
      dtype='object')
```

[ ]:
```
df.columns
```

[ ]:
```
Index(['property_id', 'check_in_date', 'room_category', 'successful_bookings',
       'capacity', 'occ_pct', 'room_class', 'property_name', 'category',
       'city', 'date', 'mmm yy', 'week no', 'day_type'],
      dtype='object')
```

[ ]:
```
df_august.shape
```

[ ]:
```
(7, 13)
```

[ ]:
```
df.shape
```

[ ]:
```
(6500, 14)
```

[ ]:
```
latest_df = pd.concat([df, df_august], ignore_index = True, axis = 0)
latest_df.tail(8)
```

[ ]:

	property_id	check_in_date	room_category	successful_bookings	capacity	occ_pct	room_class	property_name	category	city	date
6499	18560	31-Jul-22	RT4	12	15.0	80.0	Presidential	Atliq City	Business	Hyderabad	31-Jul-22
6500	16559	1-Aug-22	RT1	30	30.0	NaN	Standard	Atliq Exotica	Luxury	Mumbai	NaN
6501	19562	1-Aug-22	RT1	21	30.0	NaN	Standard	Atliq Bay	Luxury	Bangalore	NaN
6502	19563	1-Aug-22	RT1	23	30.0	NaN	Standard	Atliq Palace	Business	Bangalore	NaN
6503	19558	1-Aug-22	RT1	30	40.0	NaN	Standard	Atliq Grands	Luxury	Bangalore	NaN
6504	19560	1-Aug-22	RT1	20	26.0	NaN	Standard	Atliq City	Business	Bangalore	NaN
6505	17561	1-Aug-22	RT1	18	26.0	NaN	Standard	Atliq Blu	Luxury	Mumbai	NaN
6506	17564	1-Aug-22	RT1	10	16.0	NaN	Standard	Atliq Seasons	Business	Mumbai	NaN

```
      mmm yy week no  day_type    occ%
6499  Jul 22    W 32   weekend     NaN
6500  22-Aug    W 32  weekeday  100.00
6501  22-Aug    W 32  weekeday   70.00
6502  22-Aug    W 32  weekeday   76.67
6503  22-Aug    W 32  weekeday   75.00
6504  22-Aug    W 32  weekeday   76.92
6505  22-Aug    W 32  weekeday   69.23
6506  22-Aug    W 32  weekeday   62.50
```

[ ]:
```
latest_df.shape
```

[ ]:
```
(6507, 15)
```

0.6.6 6. Print revenue realized per city

[ ]:
```
df_bookings.head()
```

[ ]:
```
         booking_id  property_id booking_date check_in_date checkout_date  \
0  May012216558RT11        16558   2022-04-27    2022-05-01    2022-05-02
1  May012216558RT12        16558   2022-04-30    2022-05-01    2022-05-02
2  May012216558RT13        16558   2022-04-28    2022-05-01    2022-05-04
3  May012216558RT14        16558   2022-04-28    2022-05-01    2022-05-02
4  May012216558RT15        16558   2022-04-27    2022-05-01    2022-05-02

   no_guests room_category booking_platform  ratings_given booking_status  \
0          3           RT1    direct online            1.0    Checked Out
1          2           RT1           others            NaN      Cancelled
2          2           RT1          logtrip            5.0    Checked Out
3          2           RT1           others            NaN      Cancelled
4          4           RT1    direct online            5.0    Checked Out

   revenue_generated  revenue_realized
0              10010             10010
1               9100              3640
2               9100              9100
3               9100              3640
4              10920             10920
```

[ ]:
```
df_hotels.head(3)
```

[ ]:
```
   property_id  property_name  category    city
0        16558   Atliq Grands    Luxury   Delhi
1        16559  Atliq Exotica    Luxury  Mumbai
2        16560     Atliq City  Business   Delhi
```

[ ]:
```
df_bookings_all = pd.merge(df_bookings, df_hotels, on="property_id")
df_bookings_all.head(3)
```

[ ]:

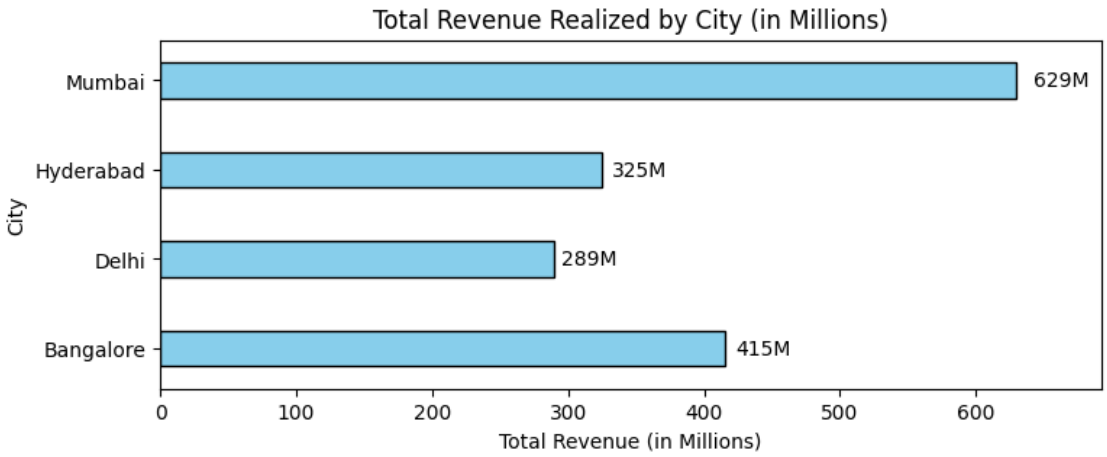
	booking_id	property_id	booking_date	check_in_date	checkout_date	no_guests	room_category	booking_platform	ratings_given	booking_status	revenue_generated	revenue_realized	property_name	category	city
0	May012216558RT11	16558	2022-04-27	2022-05-01	2022-05-02	3	RT1	direct online	1.0	Checked Out	10010	10010	Atliq Grands	Luxury	Delhi
1	May012216558RT12	16558	2022-04-30	2022-05-01	2022-05-02	2	RT1	others	NaN	Cancelled	9100	3640	Atliq Grands	Luxury	Delhi
2	May012216558RT13	16558	2022-04-28	2022-05-01	2022-05-04	2	RT1	logtrip	5.0	Checked Out	9100	9100	Atliq Grands	Luxury	Delhi

[ ]:
```
df_bookings_all.groupby("city")["revenue_realized"].sum()
```

[ ]:
```
city
Bangalore    415122840
Delhi        289472918
Hyderabad    325232870
Mumbai       629391323
Name: revenue_realized, dtype: int64
```

[ ]:
```
import matplotlib.pyplot as plt

# Group by city and calculate the total revenue
city_revenue = df_bookings_all.groupby("city")["revenue_realized"].sum()

# Convert revenue to millions
city_revenue_millions = city_revenue / 1_000_000

# Create the horizontal bar chart with adjusted figure size
plt.figure(figsize=(10, 3))  # Adjust the figure size for better spacing

ax = city_revenue_millions.plot(kind="barh", color='skyblue',␣
 ↪edgecolor='black', width=0.4)  # Adjust bar width

# Add title and labels
plt.title("Total Revenue Realized by City (in Millions)")
plt.xlabel("Total Revenue (in Millions)")
plt.ylabel("City")

# Adjust x-axis limits to ensure highest value is fully shown
```

```
plt.xlim(0, city_revenue_millions.max() * 1.1)  # Extend the x-axis limit by 10%

# Annotate values on bars
for p in ax.patches:
    plt.text(p.get_width() + 0.02 * p.get_width(), p.get_y() + p.get_height() /␣
 ↪2.,
             f'{p.get_width():,.0f}M', ha='left', va='center')

plt.subplots_adjust(left=0.2, right=0.85, top=0.9, bottom=0.1)  # Adjust␣
 ↪subplot parameters for spacing
plt.show()
```



0.6.7 7. Print month by month revenue

[ ]:
```
df_date.head(3)
```

[ ]:
```
        date  mmm yy week no  day_type
0  01-May-22  May 22    W 19   weekend
1  02-May-22  May 22    W 19  weekeday
2  03-May-22  May 22    W 19  weekeday
```

[ ]:
```
df_date["mmm yy"].unique()
```

[ ]:
```
array(['May 22', 'Jun 22', 'Jul 22'], dtype=object)
```

[ ]:
```
df_bookings_all.head(3)
```

[ ]:
```
          booking_id  property_id booking_date check_in_date checkout_date  \
0  May012216558RT11        16558   2022-04-27    2022-05-01    2022-05-02
1  May012216558RT12        16558   2022-04-30    2022-05-01    2022-05-02
```

```
2  May012216558RT13        16558   2022-04-28    2022-05-01    2022-05-04

   no_guests room_category booking_platform  ratings_given booking_status  \
0          3           RT1    direct online            1.0    Checked Out
1          2           RT1           others            NaN      Cancelled
2          2           RT1          logtrip            5.0    Checked Out

   revenue_generated  revenue_realized property_name category   city
0              10010             10010  Atliq Grands   Luxury  Delhi
1               9100              3640  Atliq Grands   Luxury  Delhi
2               9100              9100  Atliq Grands   Luxury  Delhi
```

[ ]:
```
df_date.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 92 entries, 0 to 91
Data columns (total 4 columns):
 #   Column    Non-Null Count  Dtype
---  ------    --------------  -----
 0   date      92 non-null     object
 1   mmm yy    92 non-null     object
 2   week no   92 non-null     object
 3   day_type  92 non-null     object
dtypes: object(4)
memory usage: 3.0+ KB
```

[ ]:
```
df_date["date"] = pd.to_datetime(df_date["date"], errors='coerce')
df_date.head()
```

```
<ipython-input-93-aff778bb3d8a>:1: UserWarning: Could not infer format, so each
element will be parsed individually, falling back to `dateutil`. To ensure
parsing is consistent and as-expected, please specify a format.
  df_date["date"] = pd.to_datetime(df_date["date"], errors='coerce')
```

[ ]:
```
        date  mmm yy week no  day_type
0 2022-05-01  May 22    W 19   weekend
1 2022-05-02  May 22    W 19  weekeday
2 2022-05-03  May 22    W 19  weekeday
3 2022-05-04  May 22    W 19  weekeday
4 2022-05-05  May 22    W 19  weekeday
```

[ ]:
```
df_bookings_all.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 133070 entries, 0 to 133069
Data columns (total 15 columns):
 #   Column             Non-Null Count   Dtype
---  ------             --------------   -----
```

```
 0   booking_id          133070 non-null  object
 1   property_id         133070 non-null  int64
 2   booking_date        133070 non-null  object
 3   check_in_date       133070 non-null  object
 4   checkout_date       133070 non-null  object
 5   no_guests           133070 non-null  int64
 6   room_category       133070 non-null  object
 7   booking_platform    133070 non-null  object
 8   ratings_given       56016 non-null   float64
 9   booking_status      133070 non-null  object
 10  revenue_generated   133070 non-null  int64
 11  revenue_realized    133070 non-null  int64
 12  property_name       133070 non-null  object
 13  category            133070 non-null  object
 14  city                133070 non-null  object
dtypes: float64(1), int64(4), object(10)
memory usage: 15.2+ MB
```

[ ]:
```
df_bookings_all["check_in_date"] = pd.
  ↪to_datetime(df_bookings_all["check_in_date"], errors='coerce')
df_bookings_all.head(3)

#  errors='coerce'
```

[ ]:
```
          booking_id  property_id booking_date check_in_date checkout_date  \
0  May012216558RT11        16558   2022-04-27    2022-05-01    2022-05-02
1  May012216558RT12        16558   2022-04-30    2022-05-01    2022-05-02
2  May012216558RT13        16558   2022-04-28    2022-05-01    2022-05-04

   no_guests room_category booking_platform  ratings_given booking_status  \
0          3           RT1    direct online            1.0    Checked Out
1          2           RT1           others            NaN      Cancelled
2          2           RT1          logtrip            5.0    Checked Out

   revenue_generated  revenue_realized property_name category   city
0              10010             10010  Atliq Grands   Luxury  Delhi
1               9100              3640  Atliq Grands   Luxury  Delhi
2               9100              9100  Atliq Grands   Luxury  Delhi
```

[ ]:
```
df_bookings_all = pd.merge(df_bookings_all, df_date, left_on="check_in_date",␣
  ↪right_on="date")
df_bookings_all.head(3)
```

[ ]:
```
          booking_id  property_id booking_date check_in_date checkout_date  \
0  May012216558RT11        16558   2022-04-27    2022-05-01    2022-05-02
1  May012216558RT12        16558   2022-04-30    2022-05-01    2022-05-02
2  May012216558RT13        16558   2022-04-28    2022-05-01    2022-05-04
```

```
   no_guests room_category booking_platform  ratings_given booking_status  \
0          3           RT1    direct online            1.0    Checked Out
1          2           RT1           others            NaN      Cancelled
2          2           RT1          logtrip            5.0    Checked Out

   revenue_generated  revenue_realized property_name category   city  \
0              10010             10010  Atliq Grands   Luxury  Delhi
1               9100              3640  Atliq Grands   Luxury  Delhi
2               9100              9100  Atliq Grands   Luxury  Delhi

        date  mmm yy week no day_type
0 2022-05-01  May 22    W 19  weekend
1 2022-05-01  May 22    W 19  weekend
2 2022-05-01  May 22    W 19  weekend
```

[ ]:
```
df_bookings_all.groupby("mmm yy")["revenue_realized"].sum()
```

[ ]:
```
mmm yy
Jul 22    556460174
Jun 22    537219271
May 22    565540506
Name: revenue_realized, dtype: int64
```

0.7 Excercises :-

0.7.1 Exercise-1. Print revenue realized per hotel type

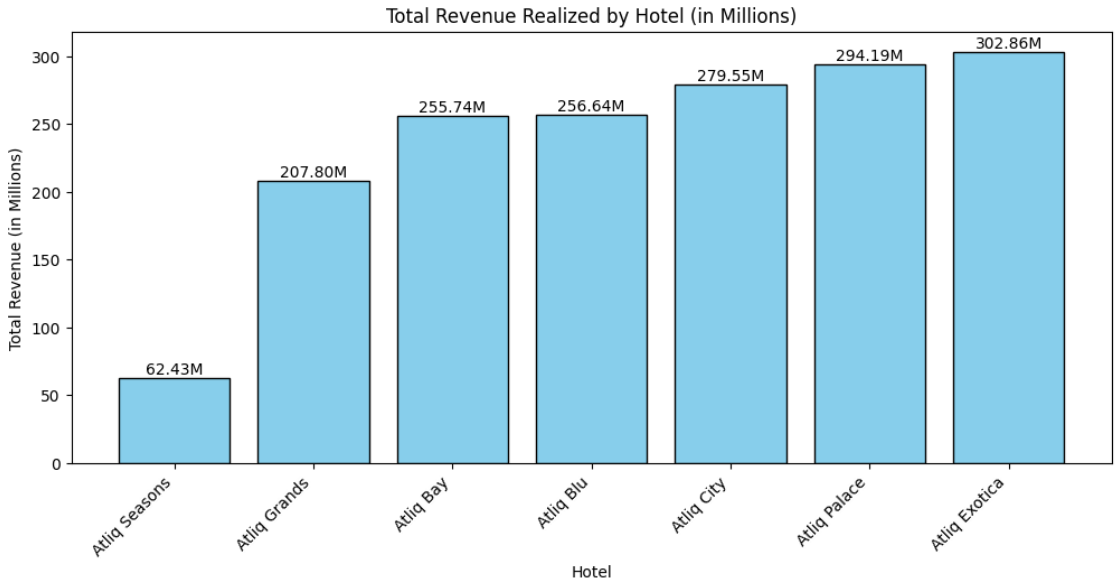
[ ]:
```
df_bookings_all.property_name.unique()
```

[ ]:
```
array(['Atliq Grands', 'Atliq Exotica', 'Atliq City', 'Atliq Blu',
       'Atliq Bay', 'Atliq Palace', 'Atliq Seasons'], dtype=object)
```

[ ]:
```
df_bookings_all.groupby("property_name")["revenue_realized"].sum().round(2).
↪sort_values()
```

[ ]:
```
property_name
Atliq Seasons     62430375
Atliq Grands     207800708
Atliq Bay        255735290
Atliq Blu        256643260
Atliq City       279554213
Atliq Palace     294193161
Atliq Exotica    302862944
Name: revenue_realized, dtype: int64
```

[ ]:
```
import matplotlib.pyplot as plt

# Data for plotting (converted to millions)
revenue_by_hotel_millions = df_bookings_all.
 ↪groupby("property_name")["revenue_realized"].sum().round(2).sort_values() /␣
 ↪1_000_000

# Create vertical bar chart
plt.figure(figsize=(12, 5))
plt.bar(revenue_by_hotel_millions.index, revenue_by_hotel_millions,␣
 ↪color='skyblue', edgecolor='black')
plt.title("Total Revenue Realized by Hotel (in Millions)")
plt.xlabel("Hotel")
plt.ylabel("Total Revenue (in Millions)")
plt.xticks(rotation=45, ha='right')  # Rotate labels for readability

# Annotate values on bars
for i, value in enumerate(revenue_by_hotel_millions):
    plt.text(i, value + 0.3, f'{value:.2f}M', ha='center', va='bottom')

plt.show()
```



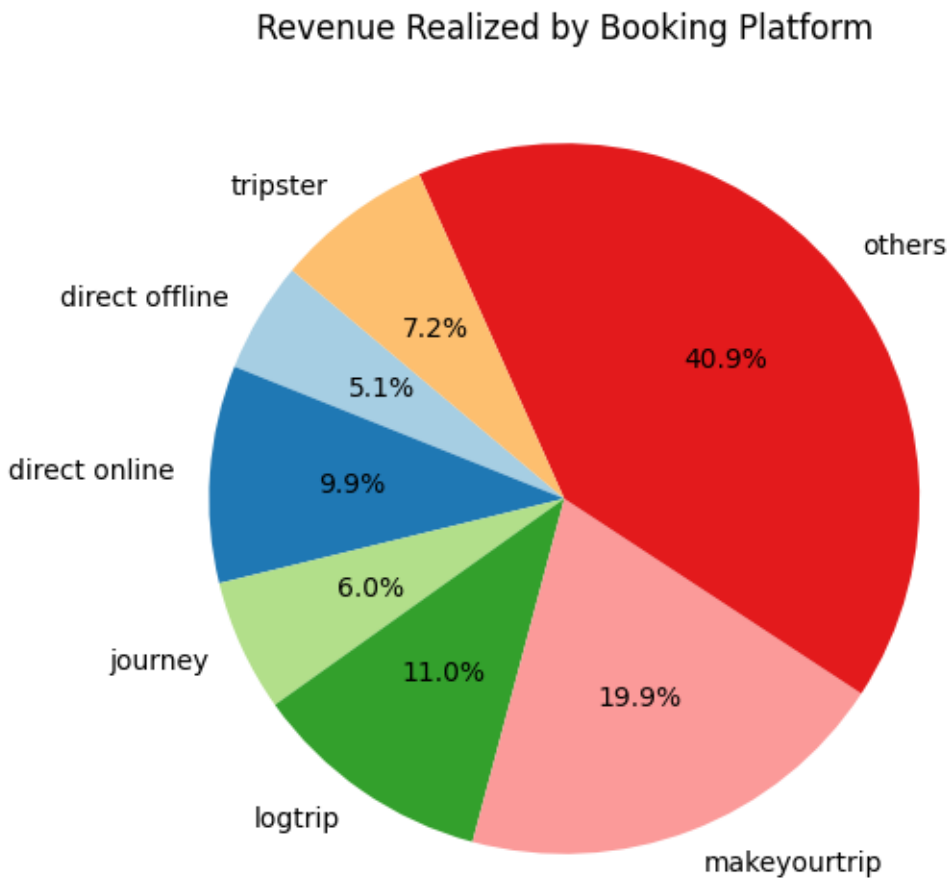
0.7.2 Exercise-2 Print average rating per city

[ ]:
```
df_bookings_all.groupby("city")["ratings_given"].mean().round(2)
```

[ ]:
```
city
Bangalore    3.41
Delhi        3.78
Hyderabad    3.66
Mumbai       3.65
Name: ratings_given, dtype: float64
```

0.7.3 Exercise-3 Print a pie chart of revenue realized per booking platform

[ ]:
```
import matplotlib.pyplot as plt

# Group by booking platform and calculate total revenue realized
revenue_by_platform = df_bookings_all.
  ↪groupby("booking_platform")["revenue_realized"].sum()

# Create the pie chart
plt.figure(figsize=(6, 6))  # Adjust the figure size as needed
plt.pie(revenue_by_platform, labels=revenue_by_platform.index, autopct='%1.
  ↪1f%%', colors=plt.cm.Paired(range(len(revenue_by_platform))), startangle=140)

# Add title
plt.title("Revenue Realized by Booking Platform")

plt.show()
```




```
<h2 align="center" style="color: white; font-weight: bold">5. Key Insights Summary</h2>
```

0.7.4 Average Occupancy by Room Type

- Presidential rooms have the highest average occupancy (59.30%).
- Elite and Premium rooms have the lowest average occupancy (58.03% and 58.04%).

0.7.5 Average Occupancy Rate per City

- Delhi has the highest average occupancy rate (61.61%).
- Bangalore has the lowest average occupancy rate (56.59%).

0.7.6 Weekday vs. Weekend Occupancy

- Occupancy is significantly higher on weekends (72.39%) compared to weekdays (50.90%).

0.7.7 Occupancy Rates in June

- Delhi had the highest occupancy in June (62.47%).

- Bangalore had the lowest occupancy in June (56.58%).

0.7.8 Revenue Realized per City

- Mumbai generates the highest revenue (`$668,569,251`).
- Bangalore generates the lowest revenue (`$420,383,550`).

0.7.9 Revenue by Hotel Type

- Atliq Exotica has the highest revenue (`$32,436,799`).
- Atliq Seasons has the lowest revenue (`$6,672,245`).

0.7.10 Average Rating per City

- Delhi has the highest average rating (3.79).
- Bangalore has the lowest average rating (3.41).

```
<h2 align="center" style="color: white; font-weight: bold">6. Recommendations</h2>
```

0.7.11 1. Promote Less Popular Room Types and Cities

- Use targeted promotions and partnerships to boost occupancy in less popular room types and cities.

0.7.12 2. Enhance Weekday Occupancy

- Create attractive weekday offers and corporate partnerships to balance occupancy rates.

0.7.13 3. Adjust Strategies Based on Revenue and Ratings

- Focus on cities and hotel types with lower revenue and ratings for targeted improvements.

0.7.14 4. Utilize Data for Decision-Making

- Regularly integrate and analyze new data to make informed decisions and forecasts.

0.7.15 5. Improve Customer Satisfaction

- Invest in training and resources to enhance guest experience, particularly in cities and hotel types with lower average ratings.

0.7.16 6. Optimize Marketing Efforts

- Tailor marketing campaigns based on historical data to effectively target high-potential markets and improve overall occupancy and revenue.

<———————— Presented by Amit Vishwakarma ————————>