AtliQ Hotels Data Analysis Project

Importing pandas as a module

```
In [1]: import pandas as pd
```

1.Data Importation and exploration to understand the datasets

Importing CSV files in Data Frames using pandas module

```
In [2]: df_bookings=pd.read_csv('fact_bookings.csv')
        df_date=pd.read_csv('dim_date.csv')
        df_rooms=pd.read_csv('dim_rooms.csv')
        df_agg_bookings=pd.read_csv('fact_aggregated_bookings.csv')
        df_hotels=pd.read_csv('dim_hotels.csv')
```

Now lets view each data frame and understand each dataframe and its significance

```
In [3]: df_bookings.head()
```

Out[3]:

	booking_id	property_id	booking_date	check_in_date	checkout_date	no_guests
0	May012216558RT11	16558	27-04-22	1/5/2022	2/5/2022	-3.0
1	May012216558RT12	16558	30-04-22	1/5/2022	2/5/2022	2.0
2	May012216558RT13	16558	28-04-22	1/5/2022	4/5/2022	2.0
3	May012216558RT14	16558	28-04-22	1/5/2022	2/5/2022	-2.0
4	May012216558RT15	16558	27-04-22	1/5/2022	2/5/2022	4.0

```
In [4]: df_bookings.revenue_realized.max()

Out[4]: 45220
```

Now lets check how many rows and columns are there in the above data frame

```
In [5]: df_bookings.shape

Out[5]: (134590, 12)
```

134590 rows and 12 columns

Just by displaying the dataframe itself we found a error such as no_guests has negative values. Other thing is that if a booking is cancelled that means a specific amount is refunded to the customer and other specific amount is taken by the hotel as a penalty thats why there is a difference between the revenue_generated and revenue_realized in the records whos

Now lets do some exploratory tasks

In [6]:
```
df_bookings.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 134590 entries, 0 to 134589
Data columns (total 12 columns):
 #   Column             Non-Null Count   Dtype  
---  ------             --------------   -----  
 0   booking_id         134590 non-null  object 
 1   property_id        134590 non-null  int64  
 2   booking_date       134590 non-null  object 
 3   check_in_date      134590 non-null  object 
 4   checkout_date      134590 non-null  object 
 5   no_guests          134587 non-null  float64
 6   room_category      134590 non-null  object 
 7   booking_platform   134590 non-null  object 
 8   ratings_given      56683 non-null   float64
 9   booking_status     134590 non-null  object 
 10  revenue_generated  134590 non-null  int64  
 11  revenue_realized   134590 non-null  int64  
dtypes: float64(2), int64(3), object(7)
memory usage: 12.3+ MB
```

Here We can see that the columns containing dates are object which we might need to convert to datetime format in future for analysis

In [7]:
```
df_bookings.room_category.unique()
```

Out[7]:
```
array(['RT1', 'RT2', 'RT3', 'RT4'], dtype=object)
```

We can now know the number of bookings through each platform

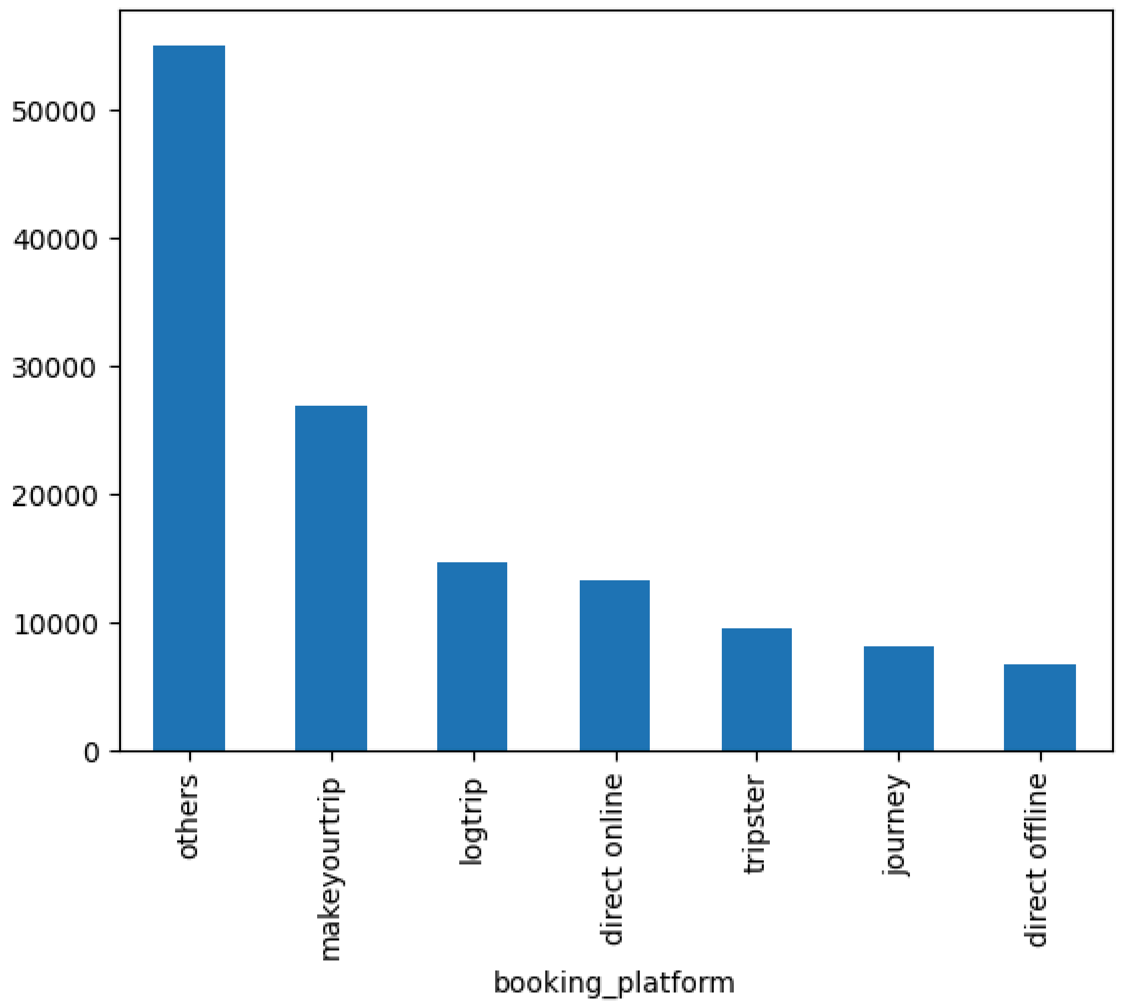
In [8]:
```
df_bookings.booking_platform.value_counts()
```

Out[8]:
```
booking_platform
others            55066
makeyourtrip      26898
logtrip           14756
direct online     13379
tripster           9630
journey            8106
direct offline     6755
Name: count, dtype: int64
```

We will now plot a simple bar chart for better understanding

In [9]:
```
df_bookings.booking_platform.value_counts().plot(kind="bar")
```

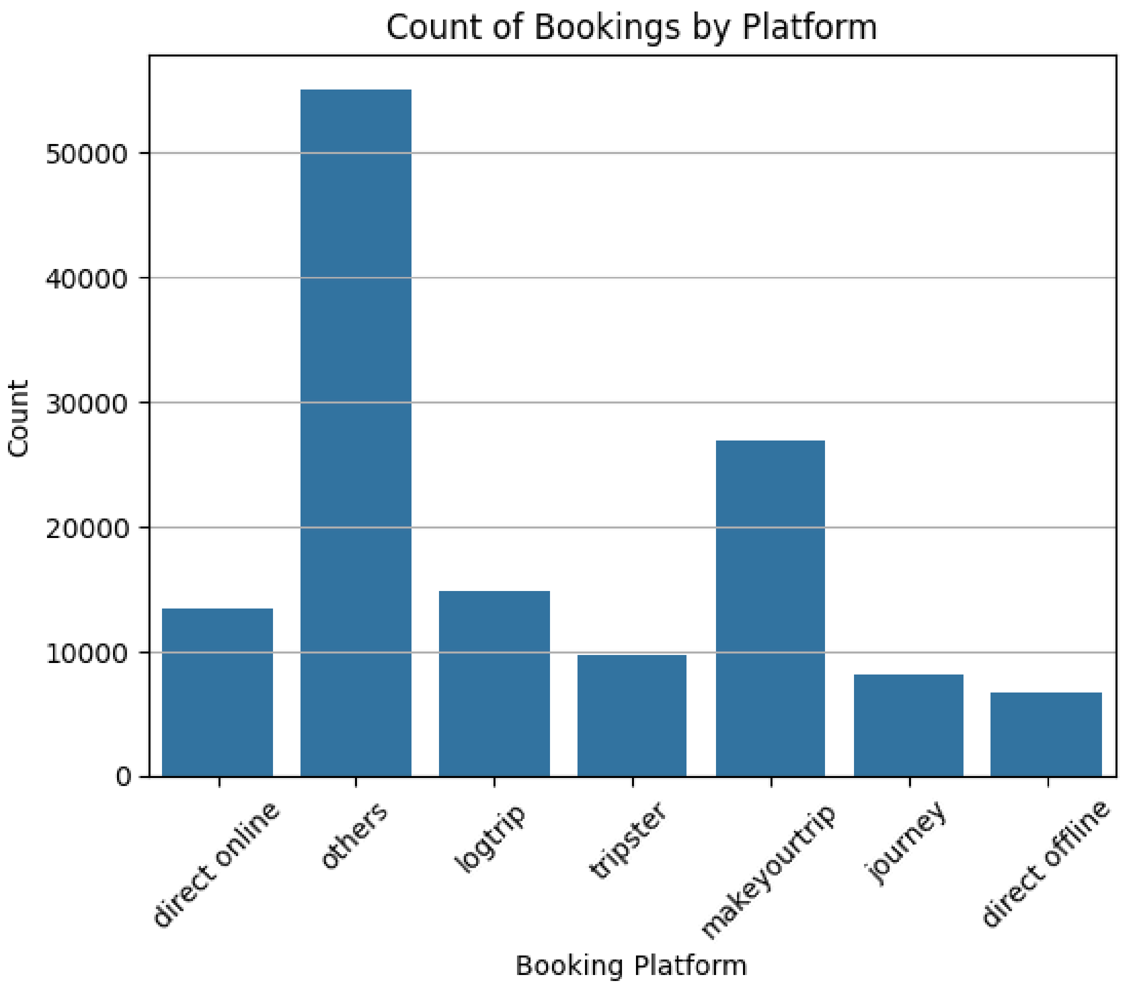
Out[9]:
```
<Axes: xlabel='booking_platform'>
```



Same visualization using Seaborn and Matplotlib library

In [10]:
```
import seaborn as sns
import matplotlib.pyplot as plt
```

In [11]:
```
# Create a count plot using Seaborn
sns.countplot(x='booking_platform',data=df_bookings)
plt.title('Count of Bookings by Platform')# Add a title
plt.xlabel('Booking Platform')# Label for x-axis
plt.ylabel('Count')# Label for y-axis
plt.xticks(rotation=45)# Rotate x-axis labels for better readability
plt.grid(axis='y')# Add grid lines for y-axis
```



As Seaborn is build on top of Matplotlib,its better to use it together by creating plot using seaborn and modifying using Matplotlib.

In [12]:
```
df_bookings.describe()
```

Out[12]:

	property_id	no_guests	ratings_given	revenue_generated	revenue_realized
count	134590.000000	134587.000000	56683.000000	1.345900e+05	134590.000000
mean	18061.113493	2.036170	3.619004	1.537805e+04	12696.123256
std	1093.055847	1.034885	1.235009	9.303604e+04	6928.108124
min	16558.000000	-17.000000	1.000000	6.500000e+03	2600.000000
25%	17558.000000	1.000000	3.000000	9.900000e+03	7600.000000
50%	17564.000000	2.000000	4.000000	1.350000e+04	11700.000000
75%	18563.000000	2.000000	5.000000	1.800000e+04	15300.000000
max	19563.000000	6.000000	5.000000	2.856000e+07	45220.000000

As by using describe function we now get common metrics of the dataframe.As we can see the number of guest has negative values.Which we will clean in the cleaning process.Also we would check for the maximum value in revenue_realized, if it is true or wrong answer.

```
In [13]:  df_bookings.isnull().sum()
```

```
Out[13]: booking_id               0
         property_id              0
         booking_date             0
         check_in_date            0
         checkout_date            0
         no_guests                3
         room_category            0
         booking_platform         0
         ratings_given        77907
         booking_status           0
         revenue_generated        0
         revenue_realized         0
         dtype: int64
```

As we display the null values we got to know that not all customers have left a review after their visit which is understandable.

Now we check for the unique values in dataframe to check if there is any abnormality in the data entered

```
In [14]: df_bookings.property_id.unique()
```

```
Out[14]: array([16558, 16559, 16560, 16561, 16562, 16563, 17558, 17559, 17560,
                17561, 17562, 17563, 18558, 18559, 18560, 18561, 18562, 18563,
                19558, 19559, 19560, 19561, 19562, 19563, 17564], dtype=int64)
```

```
In [15]: df_bookings.no_guests.unique()
```

```
Out[15]: array([ -3.,   2.,  -2.,   4.,   1.,   3.,  nan,   6.,   5., -10., -12.,
                 -6.,  -4., -17.,  -1.])
```

```
In [16]: df_bookings.ratings_given.unique()
```

```
Out[16]: array([ 1., nan,  5.,  4.,  3.,  2.])
```

```
In [17]: df_bookings.revenue_generated.unique()
```

```
Out[17]: array([   10010,     9100,  9100000,    10920,    12600,    13860,
                   15120,    18480,    20160,    16800,    26600,    11050,
                   12155,    13260,    16830,    15300,    18360,    20400,
                28560000,    22440,    28560,    38760,    32300,    45220,
                   35530,    41990,    21840,    34580,    23520,    29260,
                   31920, 12600000,    24480,  2000000,    26520,     7150,
                    6500,     7800,     9000,     9900,    10800,    12000,
                   13200,    19000,    20900,    22800,    24700,    14400,
                   15600,     9750,    11700,    10725,    13500,    14850,
                   16200,    18000,    19800,    23400,    28500,    25200,
                   34200,    39900,    31350,    21600,    37240,    37050,
                10000000], dtype=int64)
```

```
In [18]: df_bookings.revenue_realized.unique()
```

```
Out[18]: array([10010,  3640,  9100, 10920, 12600,  5544,  5040, 15120,  6048,
               13860, 18480, 20160, 16800, 10640, 26600, 11050,  4420, 12155,
                4862,  5304, 13260, 16830, 15300,  7344, 18360,  6120,  8160,
               28560,  8976, 22440, 20400, 11424, 38760, 12920, 45220, 32300,
               35530, 41990, 15504,  4004,  8736,  6720, 34580,  7392,  9408,
               11704, 13832, 12768, 21840, 29260,  6732,  9792, 10608, 24480,
               26520,  7150,  6500,  2600,  7800,  9000,  9900, 10800,  3600,
                4800, 13200, 12000,  5280, 19000, 20900, 22800, 24700,  9120,
                7600,  3960,  4320, 14400,  2860,  3120,  8360, 15600,  9880,
                9750, 11700,  3900, 10725,  4680, 13500,  5400, 14850, 16200,
               18000,  7200,  7920,  9360, 19800, 28500,  4290,  5940, 25200,
                6480, 23400, 11400, 34200, 39900, 31350, 21600, 15960,  4368,
               14212, 23520, 37240, 31920,  8064,  5760,  8640, 10080, 18088,
                6240, 37050, 14820, 16796, 14896, 13680, 12540], dtype=int64)
```

```
In [19]: df_bookings.check_in_date.unique()
```

```
Out[19]: array(['1/5/2022', '2/5/2022', '3/5/2022', '4/5/2022', '5/5/2022',
                '6/5/2022', '7/5/2022', '8/5/2022', '9/5/2022', '10/5/2022',
                '11/5/2022', '12/5/2022', '13-05-22', '14-05-22', '15-05-22',
                '16-05-22', '17-05-22', '18-05-22', '19-05-22', '20-05-22',
                '21-05-22', '22-05-22', '23-05-22', '24-05-22', '25-05-22',
                '26-05-22', '27-05-22', '28-05-22', '29-05-22', '30-05-22',
                '31-05-22', '1/6/2022', '2/6/2022', '3/6/2022', '4/6/2022',
                '5/6/2022', '6/6/2022', '7/6/2022', '8/6/2022', '9/6/2022',
                '10/6/2022', '11/6/2022', '12/6/2022', '13-06-22', '14-06-22',
                '15-06-22', '16-06-22', '17-06-22', '18-06-22', '19-06-22',
                '20-06-22', '21-06-22', '22-06-22', '23-06-22', '24-06-22',
                '25-06-22', '26-06-22', '27-06-22', '28-06-22', '29-06-22',
                '30-06-22', '1/7/2022', '2/7/2022', '3/7/2022', '4/7/2022',
                '5/7/2022', '6/7/2022', '7/7/2022', '8/7/2022', '9/7/2022',
                '10/7/2022', '11/7/2022', '12/7/2022', '13-07-22', '14-07-22',
                '15-07-22', '16-07-22', '17-07-22', '18-07-22', '19-07-22',
                '20-07-22', '21-07-22', '22-07-22', '23-07-22', '24-07-22',
                '25-07-22', '26-07-22', '27-07-22', '28-07-22', '29-07-22',
                '30-07-22', '31-07-22'], dtype=object)
```

```
In [20]: df_bookings.check_in_date.nunique()
```

```
Out[20]: 92
```

Now lets explore other dataframes

```
In [21]: df_date.head()
```

Out[21]:

	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
3	04-May-22	May 22	W 19	weekeday
4	05-May-22	May 22	W 19	weekeday

```
In [22]: 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
```

Here also the column containing dates are in object format which we might need to change to time format in future.

```
In [23]: df_date.shape
```

```
Out[23]: (92, 4)
```

```
In [24]: df_date.isnull().sum()
```

```
Out[24]: date        0
         mmm yy      0
         week no     0
         day_type    0
         dtype: int64
```

```
In [25]: df_date.describe()
```

Out[25]:

	date	mmm yy	week no	day_type
count	92	92	92	92
unique	92	3	14	2
top	01-May-22	May 22	W 19	weekeday
freq	1	31	7	65

```
In [26]: df_date.date.unique()
```

```
Out[26]: array(['01-May-22', '02-May-22', '03-May-22', '04-May-22', '05-May-22',
                '06-May-22', '07-May-22', '08-May-22', '09-May-22', '10-May-22',
                '11-May-22', '12-May-22', '13-May-22', '14-May-22', '15-May-22',
                '16-May-22', '17-May-22', '18-May-22', '19-May-22', '20-May-22',
                '21-May-22', '22-May-22', '23-May-22', '24-May-22', '25-May-22',
                '26-May-22', '27-May-22', '28-May-22', '29-May-22', '30-May-22',
                '31-May-22', '01-Jun-22', '02-Jun-22', '03-Jun-22', '04-Jun-22',
                '05-Jun-22', '06-Jun-22', '07-Jun-22', '08-Jun-22', '09-Jun-22',
                '10-Jun-22', '11-Jun-22', '12-Jun-22', '13-Jun-22', '14-Jun-22',
                '15-Jun-22', '16-Jun-22', '17-Jun-22', '18-Jun-22', '19-Jun-22',
                '20-Jun-22', '21-Jun-22', '22-Jun-22', '23-Jun-22', '24-Jun-22',
                '25-Jun-22', '26-Jun-22', '27-Jun-22', '28-Jun-22', '29-Jun-22',
                '30-Jun-22', '01-Jul-22', '02-Jul-22', '03-Jul-22', '04-Jul-22',
                '05-Jul-22', '06-Jul-22', '07-Jul-22', '08-Jul-22', '09-Jul-22',
                '10-Jul-22', '11-Jul-22', '12-Jul-22', '13-Jul-22', '14-Jul-22',
                '15-Jul-22', '16-Jul-22', '17-Jul-22', '18-Jul-22', '19-Jul-22',
                '20-Jul-22', '21-Jul-22', '22-Jul-22', '23-Jul-22', '24-Jul-22',
                '25-Jul-22', '26-Jul-22', '27-Jul-22', '28-Jul-22', '29-Jul-22',
                '30-Jul-22', '31-Jul-22'], dtype=object)
```

```
In [27]: df_date['mmm yy'].unique()
```

```
Out[27]: array(['May 22', 'Jun 22', 'Jul 22'], dtype=object)
```

```
In [28]: df_date['week no'].unique()
```

```
Out[28]: array(['W 19', 'W 20', 'W 21', 'W 22', 'W 23', 'W 24', 'W 25', 'W 26',
                'W 27', 'W 28', 'W 29', 'W 30', 'W 31', 'W 32'], dtype=object)
```

```
In [29]: df_date['day_type'].unique()
```

```
Out[29]: array(['weekend', 'weekeday'], dtype=object)
```

We found one more error weekeday should be weekday.

By using describe we can see all the relevent details of the dataframe.

```
In [30]: df_hotels.head()
```

Out[30]:

	property_id	property_name	category	city
0	16558	Atliq Grands	Luxury	Delhi
1	16559	Atliq Exotica	Luxury	Mumbai
2	16560	Atliq City	Business	Delhi
3	16561	Atliq Blu	Luxury	Delhi
4	16562	Atliq Bay	Luxury	Delhi

```
In [31]: df_hotels.shape
```

```
Out[31]: (25, 4)
```

In [32]:
```
df_hotels.isnull().sum()
```
Out[32]:
```
property_id      0
property_name    0
category         0
city             0
dtype: int64
```

In [33]:
```
df_hotels.info()
```
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 25 entries, 0 to 24
Data columns (total 4 columns):
 #   Column         Non-Null Count  Dtype 
---  ------         --------------  ----- 
 0   property_id    25 non-null     int64 
 1   property_name  25 non-null     object
 2   category       25 non-null     object
 3   city           25 non-null     object
dtypes: int64(1), object(3)
memory usage: 928.0+ bytes
```

In [34]:
```
df_hotels.describe()
```
Out[34]:

	property_id
count	25.000000
mean	18040.640000
std	1122.436371
min	16558.000000
25%	17558.000000
50%	17564.000000
75%	18563.000000
max	19563.000000

In [35]:
```
df_hotels.property_id.unique()
```
Out[35]:
```
array([16558, 16559, 16560, 16561, 16562, 16563, 17558, 17559, 17560,
       17561, 17562, 17563, 18558, 18559, 18560, 18561, 18562, 18563,
       19558, 19559, 19560, 19561, 19562, 19563, 17564], dtype=int64)
```

In [36]:
```
df_hotels.property_name.unique()
```
Out[36]:
```
array(['Atliq Grands', 'Atliq Exotica', 'Atliq City', 'Atliq Blu',
       'Atliq Bay', 'Atliq Palace', 'Atliq Seasons'], dtype=object)
```

In [37]:
```
df_hotels.category.unique()
```
Out[37]:
```
array(['Luxury', 'Business'], dtype=object)
```

In [38]:
```
df_hotels.city.unique()
```
Out[38]:
```
array(['Delhi', 'Mumbai', 'Hyderabad', 'Bangalore'], dtype=object)
```

```
In [39]: df_rooms
```

Out[39]:

	room_id	room_class
0	RT1	Standard
1	RT2	Elite
2	RT3	Premium
3	RT4	Presidential

```
In [40]: df_agg_bookings
```

Out[40]:

	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
4	16558	1-May-22	RT1	18	19.0
...	...	...	...	...	...
9195	16563	31-Jul-22	RT4	13	18.0
9196	16559	31-Jul-22	RT4	13	18.0
9197	17558	31-Jul-22	RT4	3	6.0
9198	19563	31-Jul-22	RT4	3	6.0
9199	17561	31-Jul-22	RT4	3	4.0

9200 rows × 5 columns

```
In [41]: df_agg_bookings.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 9200 entries, 0 to 9199
Data columns (total 5 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             9198 non-null   float64
dtypes: float64(1), int64(2), object(2)
memory usage: 359.5+ KB
```

```
In [42]: df_agg_bookings.describe()
```

Out[42]:

	property_id	successful_bookings	capacity
count	9200.000000	9200.000000	9198.000000
mean	18040.640000	14.655761	25.280496
std	1099.818325	7.736170	11.442080
min	16558.000000	1.000000	3.000000
25%	17558.000000	9.000000	18.000000
50%	17564.000000	14.000000	25.000000
75%	18563.000000	19.000000	34.000000
max	19563.000000	123.000000	50.000000

```
In [43]: df_agg_bookings.isnull().sum()
```

```
Out[43]: property_id            0
         check_in_date          0
         room_category          0
         successful_bookings    0
         capacity               2
         dtype: int64
```

So in capacity we got two enteries as null.

As we have found out earlier that the null values are present in the capacity column in the dataframe we now display them real quick and drop those entries as they serve no purpose.As it is not found in any other dataframe.

```
In [44]: df_agg_bookings.property_id.unique()
```

```
Out[44]: 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], dtype=int64)
```

```
In [45]: df_agg_bookings.check_in_date.unique()
```

```
Out[45]: array(['1-May-22', '2-May-22', '3-May-22', '4-May-22', '5-May-22',
                '6-May-22', '7-May-22', '8-May-22', '9-May-22', '10-May-22',
                '11-May-22', '12-May-22', '13-May-22', '14-May-22', '15-May-22',
                '16-May-22', '17-May-22', '18-May-22', '19-May-22', '20-May-22',
                '21-May-22', '22-May-22', '23-May-22', '24-May-22', '25-May-22',
                '26-May-22', '27-May-22', '28-May-22', '29-May-22', '30-May-22',
                '31-May-22', '1-Jun-22', '2-Jun-22', '3-Jun-22', '4-Jun-22',
                '5-Jun-22', '6-Jun-22', '7-Jun-22', '8-Jun-22', '9-Jun-22',
                '10-Jun-22', '11-Jun-22', '12-Jun-22', '13-Jun-22', '14-Jun-22',
                '15-Jun-22', '16-Jun-22', '17-Jun-22', '18-Jun-22', '19-Jun-22',
                '20-Jun-22', '21-Jun-22', '22-Jun-22', '23-Jun-22', '24-Jun-22',
                '25-Jun-22', '26-Jun-22', '27-Jun-22', '28-Jun-22', '29-Jun-22',
                '30-Jun-22', '1-Jul-22', '2-Jul-22', '3-Jul-22', '4-Jul-22',
                '5-Jul-22', '6-Jul-22', '7-Jul-22', '8-Jul-22', '9-Jul-22',
                '10-Jul-22', '11-Jul-22', '12-Jul-22', '13-Jul-22', '14-Jul-22',
                '15-Jul-22', '16-Jul-22', '17-Jul-22', '18-Jul-22', '19-Jul-22',
                '20-Jul-22', '21-Jul-22', '22-Jul-22', '23-Jul-22', '24-Jul-22',
                '25-Jul-22', '26-Jul-22', '27-Jul-22', '28-Jul-22', '29-Jul-22',
                '30-Jul-22', '31-Jul-22'], dtype=object)
```

```
In [46]: df_agg_bookings.room_category.unique()
```

```
Out[46]: array(['RT1', 'RT2', 'RT3', 'RT4'], dtype=object)
```

```
In [47]: df_agg_bookings.successful_bookings.unique()
```

```
Out[47]: array([ 25,  28,  23,  30,  18,  22,  24,  16,  20, 100,  26,  12,  21,
                 11,  29,  31,  34,   9,  32,  38,  37,  35,  33,  40,  19,  36,
                 27,  15,  17,   8,  13,  14,   2,   4,   5,   6,  10,   3,   7,
                  1,  39,  50,  43,  41, 123], dtype=int64)
```

```
In [48]: df_agg_bookings.capacity.unique()
```

```
Out[48]: array([30., 19., 40., 26., nan, 34., 18., 31., 41., 32., 25., 15., 42.,
                33., 38., 27., 24., 36., 16., 23., 29., 50., 43., 22., 39., 44.,
                45., 21., 20.,  8.,  3.,  6.,  7., 10., 13.,  9., 17., 14.,  4.])
```

```
In [49]: df_agg_bookings[df_agg_bookings['capacity'].isnull()]
```

Out[49]:

	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

1.Finding out unique property ids in aggregate bookings dataset

```
In [50]: df_agg_bookings.property_id.unique()
```

```
Out[50]: 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], dtype=int64)
```

2.Finding out total Bookings per property_id

```
In [51]: df_agg_bookings.groupby("property_id")["successful_bookings"].sum()
```

```
Out[51]: 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
```

3.Finding out days on which bookings are greater than capacity

```
In [52]: df_agg_bookings[df_agg_bookings.capacity<df_agg_bookings.successful_booking
```

Out[52]:

	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

4.Find out properties that have highest capacity

In [53]:
```
n=df_agg_bookings.capacity.max()
df_agg_bookings[df_agg_bookings['capacity']==n]
```

Out[53]:

	property_id	check_in_date	room_category	successful_bookings	capacity
27	17558	1-May-22	RT2	38	50.0
128	17558	2-May-22	RT2	27	50.0
229	17558	3-May-22	RT2	26	50.0
328	17558	4-May-22	RT2	27	50.0
428	17558	5-May-22	RT2	29	50.0
...	...	...	...	...	...
8728	17558	27-Jul-22	RT2	22	50.0
8828	17558	28-Jul-22	RT2	21	50.0
8928	17558	29-Jul-22	RT2	23	50.0
9028	17558	30-Jul-22	RT2	32	50.0
9128	17558	31-Jul-22	RT2	30	50.0

92 rows × 5 columns

The above result shows all the records of the property that has the maximum capacity.

Now if we only want to show the property we can use.

In [54]:
```
df_agg_bookings[df_agg_bookings["capacity"] == n].groupby("property_id")[['
```

Out[54]:

	room_category	capacity
property_id		
17558	RT2	50.0

Data Cleaning Process

In [55]:
```
df_bookings.describe()
```

Out[55]:

	property_id	no_guests	ratings_given	revenue_generated	revenue_realized
count	134590.000000	134587.000000	56683.000000	1.345900e+05	134590.000000
mean	18061.113493	2.036170	3.619004	1.537805e+04	12696.123256
std	1093.055847	1.034885	1.235009	9.303604e+04	6928.108124
min	16558.000000	-17.000000	1.000000	6.500000e+03	2600.000000
25%	17558.000000	1.000000	3.000000	9.900000e+03	7600.000000
50%	17564.000000	2.000000	4.000000	1.350000e+04	11700.000000
75%	18563.000000	2.000000	5.000000	1.800000e+04	15300.000000
max	19563.000000	6.000000	5.000000	2.856000e+07	45220.000000

A.Cleaning invalid guests that means we clear out the columns that have no_guests as negative values.

In [56]:
```
df_bookings[df_bookings.no_guests<=0]
```

Out[56]:

	booking_id	property_id	booking_date	check_in_date	checkout_date	no_gu
0	May012216558RT11	16558	27-04-22	1/5/2022	2/5/2022	
3	May012216558RT14	16558	28-04-22	1/5/2022	2/5/2022	
17924	May122218559RT44	18559	12/5/2022	12/5/2022	14-05-22	
18020	May122218561RT22	18561	8/5/2022	12/5/2022	14-05-22	
18119	May122218562RT311	18562	5/5/2022	12/5/2022	17-05-22	
18121	May122218562RT313	18562	10/5/2022	12/5/2022	17-05-22	
56715	Jun082218562RT12	18562	5/6/2022	8/6/2022	13-06-22	
119765	Jul202219560RT220	19560	19-07-22	20-07-22	22-07-22	
134586	Jul312217564RT47	17564	30-07-22	31-07-22	1/8/2022	

In [57]:
```
df_bookings['no_guests'][df_bookings['no_guests'] <= 0].count()
```

Out[57]:
```
9
```

We now able to get how many records have negative no of guests.

As we can see that there are few enteries with guests less than 0 value which is an invalid answer.We can use any of the various ways such as dropping those records or filling the no_guests with any other value with the use of any function such as mean or max of the positive values etc.

In [58]:
```
df_bookings.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 134590 entries, 0 to 134589
Data columns (total 12 columns):
 #   Column             Non-Null Count   Dtype  
---  ------             --------------   -----  
 0   booking_id         134590 non-null  object 
 1   property_id        134590 non-null  int64  
 2   booking_date       134590 non-null  object 
 3   check_in_date      134590 non-null  object 
 4   checkout_date      134590 non-null  object 
 5   no_guests          134587 non-null  float64
 6   room_category      134590 non-null  object 
 7   booking_platform   134590 non-null  object 
 8   ratings_given      56683 non-null   float64
 9   booking_status     134590 non-null  object 
 10  revenue_generated  134590 non-null  int64  
 11  revenue_realized   134590 non-null  int64  
dtypes: float64(2), int64(3), object(7)
memory usage: 12.3+ MB
```

In [59]:
```
def neg(g):
    if g<=0:
        return -g
    else:
        return  g
df_bookings['no_guests']=df_bookings.apply(lambda x:neg(x['no_guests']),axi
```

As there we only few Negative values we can consider it as a typo error and convert the non positive numbers into positive numbers

In [60]:
```
(df_bookings[df_bookings['property_id']==16558])
```

Out[60]:

	booking_id	property_id	booking_date	check_in_date	checkout_date	no_gue
0	May012216558RT11	16558	27-04-22	1/5/2022	2/5/2022	
1	May012216558RT12	16558	30-04-22	1/5/2022	2/5/2022	
2	May012216558RT13	16558	28-04-22	1/5/2022	4/5/2022	
3	May012216558RT14	16558	28-04-22	1/5/2022	2/5/2022	
4	May012216558RT15	16558	27-04-22	1/5/2022	2/5/2022	
...	...	...	...	...	...	
132973	Jul312216558RT35	16558	29-07-22	31-07-22	5/8/2022	
132974	Jul312216558RT36	16558	27-07-22	31-07-22	2/8/2022	
132975	Jul312216558RT37	16558	28-07-22	31-07-22	6/8/2022	
132976	Jul312216558RT41	16558	26-07-22	31-07-22	1/8/2022	
132977	Jul312216558RT42	16558	28-07-22	31-07-22	1/8/2022	

3153 rows × 12 columns

We took one of the proeprty_id of the record which had a negative value in the no of guests and then print it to find out if the values have been changed or not.

def neg(n,g): if g<=0: q=df_bookings[df_bookings['property_id']==n]['no_guests'].max() return q else: return g df_bookings['no_guests']=df_bookings.apply(lambda x:neg(x['property_id'],x['no_guests']),axis=1) (df_bookings)

We can use the above code if we want to find the max of the no_guests of a property.

B.Outlier Removal in Revenue Generated and Revenue Realized

In [61]:
```
df_bookings.describe()
```

Out[61]:

	property_id	no_guests	ratings_given	revenue_generated	revenue_realized
count	134590.000000	134587.000000	56683.000000	1.345900e+05	134590.000000
mean	18061.113493	2.037047	3.619004	1.537805e+04	12696.123256
std	1093.055847	1.033158	1.235009	9.303604e+04	6928.108124
min	16558.000000	1.000000	1.000000	6.500000e+03	2600.000000
25%	17558.000000	1.000000	3.000000	9.900000e+03	7600.000000
50%	17564.000000	2.000000	4.000000	1.350000e+04	11700.000000
75%	18563.000000	2.000000	5.000000	1.800000e+04	15300.000000
max	19563.000000	17.000000	5.000000	2.856000e+07	45220.000000

To find out the outliers we use Z Score Method.

In [62]:
```
min,max=df_bookings.revenue_generated.min(), df_bookings.revenue_generated.r
min,max
```

Out[62]:
```
(6500, 28560000)
```

std stands for Standard Deviation.Standard deviation tells us how spread out are values from the mean.The std is found in such a way that each value is subracted from mean and then these values are squared and then its sum is divided by the total count.

In [63]:
```
mean,std = df_bookings.revenue_generated.mean(),df_bookings.revenue_generate
mean,std
```

Out[63]:
```
(15378.05412734973, 93036.03867095453)
```

In this method we use a formula to find out the higher_limit.Whatever value comes after that value is considered as a outlier.Vice versa for lower_limit

In [64]:
```
higher_limit=mean+3*std
higher_limit
```

Out[64]:
```
294486.17014021333
```

In [65]:
```
lower_limit=mean-3*std
lower_limit
```
Out[65]:
```
-263730.06188551383
```

lets check if the revenue generated has any negative values.

In [66]:
```
df_bookings[df_bookings.revenue_generated<=0]
```
Out[66]:

booking_id	property_id	booking_date	check_in_date	checkout_date	no_guests	room_cat

In [67]:
```
df_bookings[df_bookings.revenue_generated>higher_limit]
```
Out[67]:

	booking_id	property_id	booking_date	check_in_date	checkout_date	no_gu
2	May012216558RT13	16558	28-04-22	1/5/2022	4/5/2022	
111	May012216559RT32	16559	29-04-22	1/5/2022	2/5/2022	
315	May012216562RT22	16562	28-04-22	1/5/2022	4/5/2022	
562	May012217559RT118	17559	26-04-22	1/5/2022	2/5/2022	
129176	Jul282216562RT26	16562	21-07-22	28-07-22	29-07-22	

In [68]:
```
df_rooms
```
Out[68]:

	room_id	room_class
0	RT1	Standard
1	RT2	Elite
2	RT3	Premium
3	RT4	Presidential

Since there is a vast difference between the revenue generated and revenue realized.And also the rooms above the higher_limit is of standard,elite,premium.And main fact is that no room would cost this much.So we remove those records.

In [69]:
```
df_bookings.shape
```
Out[69]:
```
(134590, 12)
```

In [70]:
```
df_bookings = df_bookings[df_bookings.revenue_generated<=higher_limit]
df_bookings.shape
```
Out[70]:
```
(134585, 12)
```

Now lets check the Revenue Realized.

In [71]:
```
df_bookings.revenue_realized.describe()
```

Out[71]:
```
count    134585.000000
mean      12696.095025
std        6928.058192
min        2600.000000
25%        7600.000000
50%       11700.000000
75%       15300.000000
max       45220.000000
Name: revenue_realized, dtype: float64
```

In [72]:
```
mean_r,std_r=df_bookings.revenue_realized.mean(),df_bookings.revenue_realize
mean_r,std_r
```

Out[72]:
```
(12696.095025448602, 6928.058192036858)
```

In [73]:
```
min_r,max_r=df_bookings.revenue_realized.min(),df_bookings.revenue_realized
min_r,max_r
```

Out[73]:
```
(2600, 45220)
```

Now lets create the higher limit and lower limit.

In [74]:
```
higher_limit_r,lower_limit_r=mean_r+3*std_r,mean_r-3*std_r
higher_limit_r,lower_limit_r
```

Out[74]:
```
(33480.26960155918, -8088.0795506619725)
```

Now lets check if the revenue realized has any negative values.

In [75]:
```
df_bookings[df_bookings['revenue_realized']<0]
```

Out[75]:

booking_id	property_id	booking_date	check_in_date	checkout_date	no_guests	room_cat

In [76]:
```
df_bookings[df_bookings.revenue_realized>higher_limit_r]
```

Out[76]:

	booking_id	property_id	booking_date	check_in_date	checkout_date	no_gu
137	May012216559RT41	16559	27-04-22	1/5/2022	7/5/2022	
139	May012216559RT43	16559	1/5/2022	1/5/2022	2/5/2022	
143	May012216559RT47	16559	28-04-22	1/5/2022	3/5/2022	
149	May012216559RT413	16559	24-04-22	1/5/2022	7/5/2022	
222	May012216560RT45	16560	30-04-22	1/5/2022	3/5/2022	
...	...	...	...	...	...	
134331	Jul312219560RT412	19560	31-07-22	31-07-22	1/8/2022	
134467	Jul312219562RT45	19562	28-07-22	31-07-22	1/8/2022	
134474	Jul312219562RT412	19562	25-07-22	31-07-22	6/8/2022	
134581	Jul312217564RT42	17564	31-07-22	31-07-22	1/8/2022	
134586	Jul312217564RT47	17564	30-07-22	31-07-22	1/8/2022	

1300 rows × 12 columns

In [77]:
```
df_bookings['room_category'][df_bookings.revenue_realized>higher_limit_r].ur
```

Out[77]:
```
array(['RT4'], dtype=object)
```

Upon reviewing the room categories, we found that all values exceeding the upper limit belong to the RT4 category, with the highest value recorded at 45,220. Given that presidential suites are priced significantly higher, we do not classify these instances as outliers.

To verify again we can find the std and mean for only the RT4 room category.From those we can find outlier cut off limits.

In [78]:
```
df_bookings[df_bookings.room_category=="RT4"].revenue_realized.describe()
```

Out[78]:
```
count    16073.000000
mean     23440.103652
std       9048.865206
min       7600.000000
25%      19000.000000
50%      26600.000000
75%      32300.000000
max      45220.000000
Name: revenue_realized, dtype: float64
```

Now lets check the higher limit and check if the maximum value comes within the higher limit.

In [79]:
```
df_bookings[df_bookings.room_category=="RT4"].revenue_realized.mean()+3*df_
```
Out[79]:
```
50586.69926930781
```

Subsequently, we confirmed that the maximum value falls within the upper limit, reinforcing our conclusion that these values do not qualify as outliers. In cases where a value appears to exceed the established outlier threshold, we will calculate the mean and upper limit for that specific category to determine if they should be classified as outliers.

In [80]:
```
df_bookings.isnull().sum()
```
Out[80]:
```
booking_id                0
property_id               0
booking_date              0
check_in_date             0
checkout_date             0
no_guests                 3
room_category             0
booking_platform          0
ratings_given         77905
booking_status            0
revenue_generated         0
revenue_realized          0
dtype: int64
```

Since the rating is null for a large number of records we should not fill those null values with anything.

C.Since we have found the Category to be null in few records of def_agg_bookings lets fix it.

In [81]:
```
df_agg_bookings[df_agg_bookings['capacity'].isnull()]
```
Out[81]:

	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

Lets fill those values null values with median.

In [82]:
```
df_agg_bookings.capacity.fillna(df_agg_bookings.capacity.median(), inplace=
```

We can also use other operations like filling a null value by its mean or null according to the characteristics of data series or according to the business type.We can also use other functions etc to fill the null values.

ex-df_agg_bookings['capacity'].fillna(df_agg_bookings['capacity'].mean(), inplace=True) ex-df_agg_bookings['capacity'].fillna(method='ffill', inplace=True) ex-df_agg_bookings['capacity'].fillna(method='bfill', inplace=True) ex-df_agg_bookings.dropna(subset=['capacity'], inplace=True)

Checking if the operation has happened or not.

In [83]:
```
df_agg_bookings[df_agg_bookings['capacity'].isnull()]
```

Out[83]:

property_id	check_in_date	room_category	successful_bookings	capacity

The null values has been replaced with median.

D.Since we have found that in def_agg_bookings few records have successfully bookings greater than capacity,lets fix those.

In [84]:
```
df_agg_bookings[df_agg_bookings.capacity<df_agg_bookings.successful_bookings
```

Out[84]:

	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

Since the values are wrong here and the records are of less number we can remove those records.

In [85]:
```
df_agg_bookings = df_agg_bookings[df_agg_bookings.successful_bookings<=df_ag
```

Lets now check if the operation has been done or not.

In [86]:
```
df_agg_bookings[df_agg_bookings.capacity<df_agg_bookings.successful_bookings
```

Out[86]:

property_id	check_in_date	room_category	successful_bookings	capacity

The records has been successfully removed.

E.Lets correct the spelling of values in date data frame.

In [87]:
```
df_date
```
Out[87]:

	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
3	04-May-22	May 22	W 19	weekeday
4	05-May-22	May 22	W 19	weekeday
...	...	...	...	...
87	27-Jul-22	Jul 22	W 31	weekeday
88	28-Jul-22	Jul 22	W 31	weekeday
89	29-Jul-22	Jul 22	W 31	weekeday
90	30-Jul-22	Jul 22	W 31	weekend
91	31-Jul-22	Jul 22	W 32	weekend

92 rows × 4 columns

In [88]:
```
def chg(d):
    if d=='weekeday':
        return 'weekday'
    else:
        return d

df_date.day_type=df_date['day_type'].apply(lambda x:chg(x))
```
In [89]:
```
df_date['day_type'].unique()
```
Out[89]:
```
array(['weekend', 'weekday'], dtype=object)
```

Data Transformations Process

Creating a occupance percentage column.

In [90]:
```
n_c=df_agg_bookings.apply(lambda x: x['successful_bookings']/x['capacity'],
df_agg_bookings = df_agg_bookings.assign(occ_pct=n_c)
```

In [91]:
```
df_agg_bookings
```
Out[91]:

	property_id	check_in_date	room_category	successful_bookings	capacity	occ_pct
0	16559	1-May-22	RT1	25	30.0	0.833333
1	19562	1-May-22	RT1	28	30.0	0.933333
2	19563	1-May-22	RT1	23	30.0	0.766667
4	16558	1-May-22	RT1	18	19.0	0.947368
5	17560	1-May-22	RT1	28	40.0	0.700000
...	...	...	...	...	...	...
9195	16563	31-Jul-22	RT4	13	18.0	0.722222
9196	16559	31-Jul-22	RT4	13	18.0	0.722222
9197	17558	31-Jul-22	RT4	3	6.0	0.500000
9198	19563	31-Jul-22	RT4	3	6.0	0.500000
9199	17561	31-Jul-22	RT4	3	4.0	0.750000

9194 rows × 6 columns

As we can see a coulmn has been added successfully.

Lets now convert the occ_pct to percentage and also round it.

In [92]:
```
df_agg_bookings['occ_pct']=df_agg_bookings['occ_pct'].apply(lambda x: round
```
In [93]:
```
df_agg_bookings
```
Out[93]:

	property_id	check_in_date	room_category	successful_bookings	capacity	occ_pct
0	16559	1-May-22	RT1	25	30.0	83.33
1	19562	1-May-22	RT1	28	30.0	93.33
2	19563	1-May-22	RT1	23	30.0	76.67
4	16558	1-May-22	RT1	18	19.0	94.74
5	17560	1-May-22	RT1	28	40.0	70.00
...	...	...	...	...	...	...
9195	16563	31-Jul-22	RT4	13	18.0	72.22
9196	16559	31-Jul-22	RT4	13	18.0	72.22
9197	17558	31-Jul-22	RT4	3	6.0	50.00
9198	19563	31-Jul-22	RT4	3	6.0	50.00
9199	17561	31-Jul-22	RT4	3	4.0	75.00

9194 rows × 6 columns

Now we have successfully changed.

There are actually manly types of data transformations that can be done

Insights Generation

I) What is an average occupancy rate in each room categories?

In [94]:
```
round(df_agg_bookings.groupby("room_category")["occ_pct"].mean(),2)
```

Out[94]:
```
room_category
RT1    57.89
RT2    58.01
RT3    58.03
RT4    59.28
Name: occ_pct, dtype: float64
```

Now lets add other details of each room category.

In [95]:
```
df_rooms
```

Out[95]:

	room_id	room_class
0	RT1	Standard
1	RT2	Elite
2	RT3	Premium
3	RT4	Presidential

Now lets df_rooms and df_agg_bookings.

In [96]:
```
df=pd.merge(df_agg_bookings,df_rooms,left_on="room_category",right_on="room_
df.head()
```

Out[96]:

	property_id	check_in_date	room_category	successful_bookings	capacity	occ_pct	room_
0	16559	1-May-22	RT1	25	30.0	83.33	R
1	19562	1-May-22	RT1	28	30.0	93.33	R
2	19563	1-May-22	RT1	23	30.0	76.67	R
3	16558	1-May-22	RT1	18	19.0	94.74	R
4	17560	1-May-22	RT1	28	40.0	70.00	R

We use left_on and right_on in the above code since the values on which we can join has two column names in both.

Now we find the name of the rooms.

In [97]:
```
grouped = df.groupby('room_category').agg( Occupancy_Percent=('occ_pct', 'me
grouped['Occupancy_Percent']=grouped['Occupancy_Percent'].round(2)
print(grouped)
```

```
               Occupancy_Percent  Successful_bookings_count    Room_class
room_category
RT1                        57.89                       2296      Standard
RT2                        58.01                       2299         Elite
RT3                        58.03                       2300       Premium
RT4                        59.28                       2299  Presidential
```

Now we print the relevant details of the room category that is name and average occupancy rate ,Successful booking count and room class.

2. Print average occupancy rate per day.

Now we merge the two dataframes of gotel and agg booking together to find the solution.

In [98]:
```
df_hotels.head()
```

Out[98]:

	property_id	property_name	category	city
0	16558	Atliq Grands	Luxury	Delhi
1	16559	Atliq Exotica	Luxury	Mumbai
2	16560	Atliq City	Business	Delhi
3	16561	Atliq Blu	Luxury	Delhi
4	16562	Atliq Bay	Luxury	Delhi

In [99]:
```
df_agg_bookings.head()
```

Out[99]:

	property_id	check_in_date	room_category	successful_bookings	capacity	occ_pct
0	16559	1-May-22	RT1	25	30.0	83.33
1	19562	1-May-22	RT1	28	30.0	93.33
2	19563	1-May-22	RT1	23	30.0	76.67
4	16558	1-May-22	RT1	18	19.0	94.74
5	17560	1-May-22	RT1	28	40.0	70.00

In [100]:
```
grouped_2=pd.merge(df_agg_bookings,df_hotels,on="property_id")
grouped_2.head()
```

Out[100]:

	property_id	check_in_date	room_category	successful_bookings	capacity	occ_pct	prope
0	16559	1-May-22	RT1	25	30.0	83.33	At
1	16559	1-May-22	RT2	35	41.0	85.37	At
2	16559	1-May-22	RT3	27	32.0	84.38	At
3	16559	1-May-22	RT4	17	18.0	94.44	At
4	16559	2-May-22	RT1	20	30.0	66.67	At

In [101]:
```
grouped_2.groupby('city')['occ_pct'].mean()
```

Out[101]:
```
city
Bangalore    56.332376
Delhi        61.507341
Hyderabad    58.120652
Mumbai       57.909181
Name: occ_pct, dtype: float64
```

3. Lets find out when was the occupancy better,weekday or weekend?

In [102]:
```
df_date.head()
```

Out[102]:

	date	mmm yy	week no	day_type
0	01-May-22	May 22	W 19	weekend
1	02-May-22	May 22	W 19	weekday
2	03-May-22	May 22	W 19	weekday
3	04-May-22	May 22	W 19	weekday
4	05-May-22	May 22	W 19	weekday

In [103]:
```
grouped_3=pd.merge(grouped_2,df_date,left_on="check_in_date",right_on="date'
grouped_3.head()
```

Out[103]:

	property_id	check_in_date	room_category	successful_bookings	capacity	occ_pct	prope
0	16559	10-May-22	RT2	25	41.0	60.98	Atl
1	16559	10-May-22	RT1	18	30.0	60.00	Atl
2	16559	10-May-22	RT3	20	32.0	62.50	Atl
3	16559	10-May-22	RT4	13	18.0	72.22	Atl
4	19562	10-May-22	RT1	18	30.0	60.00	

In [104]:
```
grouped_3.groupby('day_type')['occ_pct'].mean().round(2)
```

Out[104]:
```
day_type
weekday    50.88
weekend    72.34
Name: occ_pct, dtype: float64
```

We got to know weekend is better in terms of occupancy rate.

4.In the month of June,What is the occupancy for different cities.

```
In [105]: df_june_22=grouped_3[grouped_3["mmm yy"]=="Jun 22"]
          df_june_22.head()
```

Out[105]:

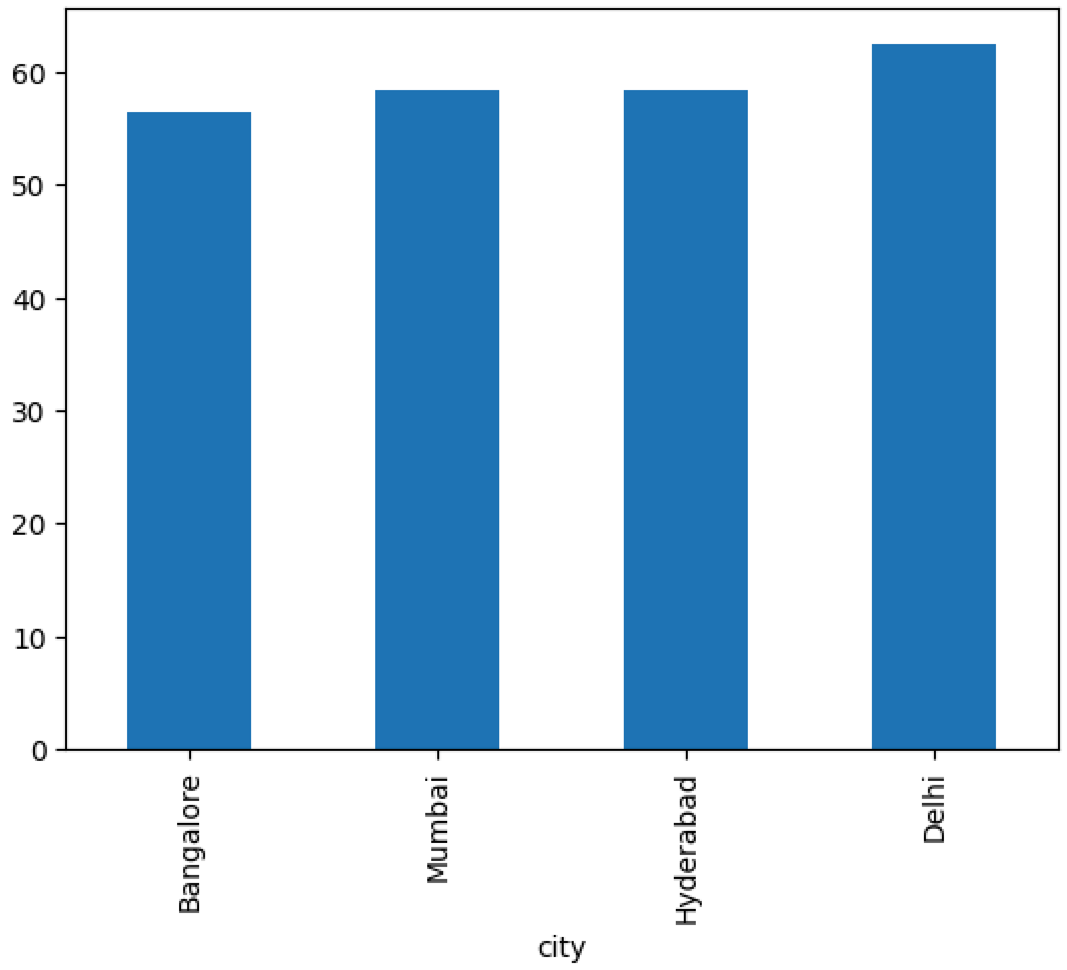
	property_id	check_in_date	room_category	successful_bookings	capacity	occ_pct	pr
2200	16559	10-Jun-22	RT1	20	30.0	66.67	
2201	16559	10-Jun-22	RT2	26	41.0	63.41	
2202	16559	10-Jun-22	RT3	20	32.0	62.50	
2203	16559	10-Jun-22	RT4	11	18.0	61.11	
2204	19562	10-Jun-22	RT1	19	30.0	63.33	

```
In [106]: df_june_22.groupby('city')['occ_pct'].mean().round(2).sort_values()
```

```
Out[106]: city
          Bangalore    56.44
          Mumbai       58.38
          Hyderabad    58.46
          Delhi        62.47
          Name: occ_pct, dtype: float64
```

In [107]:
```
df_june_22.groupby('city')['occ_pct'].mean().round(2).sort_values().plot(ki
```

Out[107]:
```
<Axes: xlabel='city'>
```



5.We hot new data for the month of August.Lets Append that to the existing data.

In [108]:
```
df_august=pd.read_csv("new_data_august.csv")
df_august.head()
```

Out[108]:

	property_id	property_name	category	city	room_category	room_class	check_in_da
0	16559	Atliq Exotica	Luxury	Mumbai	RT1	Standard	01-Aug-2
1	19562	Atliq Bay	Luxury	Bangalore	RT1	Standard	01-Aug-2
2	19563	Atliq Palace	Business	Bangalore	RT1	Standard	01-Aug-2
3	19558	Atliq Grands	Luxury	Bangalore	RT1	Standard	01-Aug-2
4	19560	Atliq City	Business	Bangalore	RT1	Standard	01-Aug-2

```
In [109]: df_august.day_type.unique()
```

```
Out[109]: array(['weekeday'], dtype=object)
```

```
In [110]: df_august
```

Out[110]:

	property_id	property_name	category	city	room_category	room_class	check_in_da
0	16559	Atliq Exotica	Luxury	Mumbai	RT1	Standard	01-Aug-2
1	19562	Atliq Bay	Luxury	Bangalore	RT1	Standard	01-Aug-2
2	19563	Atliq Palace	Business	Bangalore	RT1	Standard	01-Aug-2
3	19558	Atliq Grands	Luxury	Bangalore	RT1	Standard	01-Aug-2
4	19560	Atliq City	Business	Bangalore	RT1	Standard	01-Aug-2
5	17561	Atliq Blu	Luxury	Mumbai	RT1	Standard	01-Aug-2
6	17564	Atliq Seasons	Business	Mumbai	RT1	Standard	01-Aug-2

```
In [111]: df_august.columns
```

```
Out[111]: Index(['property_id', 'property_name', 'category', 'city', 'room_categor
y',
       'room_class', 'check_in_date', 'mmm yy', 'week no', 'day_type',
       'successful_bookings', 'capacity', 'occ%'],
      dtype='object')
```

```
In [112]: grouped_3.columns
```

```
Out[112]: Index(['property_id', 'check_in_date', 'room_category', 'successful_bookin
gs',
       'capacity', 'occ_pct', 'property_name', 'category', 'city', 'date',
       'mmm yy', 'week no', 'day_type'],
      dtype='object')
```

We have found a small typo error in day type of august dataframe lets quickly fix it.

```
In [113]: def typo(x):
    if(x=='weekeday'):
        return 'weekday'
    else:
        return x
df_august['day_type']=df_august['day_type'].apply(lambda x:typo(x))
```

In [114]:
```python
df_august_renamed=df_august.rename(columns={'occ%':'occ_pct'})
grouped_4=pd.concat([grouped_3,df_august_renamed],ignore_index=True,axis=0)
grouped_4.head()
```

Out[114]:

	property_id	check_in_date	room_category	successful_bookings	capacity	occ_pct	prope
0	16559	10-May-22	RT2	25	41.0	60.98	At
1	16559	10-May-22	RT1	18	30.0	60.00	At
2	16559	10-May-22	RT3	20	32.0	62.50	At
3	16559	10-May-22	RT4	13	18.0	72.22	At
4	19562	10-May-22	RT1	18	30.0	60.00	

In [115]:
```python
grouped_4.tail()
```

Out[115]:

	property_id	check_in_date	room_category	successful_bookings	capacity	occ_pct	pr
6499	19563	01-Aug-22	RT1	23	30.0	76.67	
6500	19558	01-Aug-22	RT1	30	40.0	75.00	
6501	19560	01-Aug-22	RT1	20	26.0	76.92	
6502	17561	01-Aug-22	RT1	18	26.0	69.23	
6503	17564	01-Aug-22	RT1	10	16.0	62.50	

We have renamed one of the column in the august dataframe because other wise it would return null for occ% and it would have null for occ_pct.

6.Lets now print revenue realized per city.

In [116]:
```
df_bookings.head()
```

Out[116]:

	booking_id	property_id	booking_date	check_in_date	checkout_date	no_guests
0	May012216558RT11	16558	27-04-22	1/5/2022	2/5/2022	3.0
1	May012216558RT12	16558	30-04-22	1/5/2022	2/5/2022	2.0
3	May012216558RT14	16558	28-04-22	1/5/2022	2/5/2022	2.0
4	May012216558RT15	16558	27-04-22	1/5/2022	2/5/2022	4.0
5	May012216558RT16	16558	1/5/2022	1/5/2022	3/5/2022	2.0

In [117]:
```
df_hotels.head()
```

Out[117]:

	property_id	property_name	category	city
0	16558	Atliq Grands	Luxury	Delhi
1	16559	Atliq Exotica	Luxury	Mumbai
2	16560	Atliq City	Business	Delhi
3	16561	Atliq Blu	Luxury	Delhi
4	16562	Atliq Bay	Luxury	Delhi

In [118]:
```
grouped_5=pd.merge(df_bookings,df_hotels,on='property_id')
grouped_5.head()
```

Out[118]:

	booking_id	property_id	booking_date	check_in_date	checkout_date	no_guests
0	May012216558RT11	16558	27-04-22	1/5/2022	2/5/2022	3.0
1	May012216558RT12	16558	30-04-22	1/5/2022	2/5/2022	2.0
2	May012216558RT14	16558	28-04-22	1/5/2022	2/5/2022	2.0
3	May012216558RT15	16558	27-04-22	1/5/2022	2/5/2022	4.0
4	May012216558RT16	16558	1/5/2022	1/5/2022	3/5/2022	2.0

In [119]:
```
grouped_5.groupby('city')['revenue_realized'].sum().sort_values(ascending=Fa
```

Out[119]:
```
city
Mumbai       668608011
Bangalore    420397050
Hyderabad    325232870
Delhi        294466018
Name: revenue_realized, dtype: int64
```

7.Print month by month revenue.

In [120]:
```
df_date.head()
```

Out[120]:

	date	mmm yy	week no	day_type
0	01-May-22	May 22	W 19	weekend
1	02-May-22	May 22	W 19	weekday
2	03-May-22	May 22	W 19	weekday
3	04-May-22	May 22	W 19	weekday
4	05-May-22	May 22	W 19	weekday

In [121]:
```
df_bookings.head()
```

Out[121]:

	booking_id	property_id	booking_date	check_in_date	checkout_date	no_guests
0	May012216558RT11	16558	27-04-22	1/5/2022	2/5/2022	3.0
1	May012216558RT12	16558	30-04-22	1/5/2022	2/5/2022	2.0
3	May012216558RT14	16558	28-04-22	1/5/2022	2/5/2022	2.0
4	May012216558RT15	16558	27-04-22	1/5/2022	2/5/2022	4.0
5	May012216558RT16	16558	1/5/2022	1/5/2022	3/5/2022	2.0

In [122]:
```
df_bookings.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 134585 entries, 0 to 134589
Data columns (total 12 columns):
 #   Column             Non-Null Count   Dtype  
---  ------             --------------   -----  
 0   booking_id         134585 non-null  object 
 1   property_id        134585 non-null  int64  
 2   booking_date       134585 non-null  object 
 3   check_in_date      134585 non-null  object 
 4   checkout_date      134585 non-null  object 
 5   no_guests          134582 non-null  float64
 6   room_category      134585 non-null  object 
 7   booking_platform   134585 non-null  object 
 8   ratings_given      56680 non-null   float64
 9   booking_status     134585 non-null  object 
 10  revenue_generated  134585 non-null  int64  
 11  revenue_realized   134585 non-null  int64  
dtypes: float64(2), int64(3), object(7)
memory usage: 13.3+ MB
```

In [123]:
```
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
```

In [124]:
```
from datetime import datetime
```

We can see that the check in date and the date formats in both the data frames are different so it would return null if we merge on those two values.So we can convert both of its data type object datatype to datetime.

To achieve a clean and visually appealing transformation of the check_in_date column, which contains various date formats, we will create a straightforward function. This function will clearly specify the different formats used, allowing for easy identification and conversion of the data into a standardized datetime format.

```
In [125]: def date_spliting(x):
              for fmt in ("%d/%m/%Y", "%d-%m-%y", "%m/%d/%Y"):
                  try:
                      return datetime.strptime(x, fmt)
                  except ValueError:

                      continue

          df_bookings["check_in_date"] = df_bookings["check_in_date"].apply(lambda x:
          df_bookings.check_in_date.unique()
```

```
Out[125]: <DatetimeArray>
          ['2022-05-01 00:00:00', '2022-05-02 00:00:00', '2022-05-03 00:00:00',
           '2022-05-04 00:00:00', '2022-05-05 00:00:00', '2022-05-06 00:00:00',
           '2022-05-07 00:00:00', '2022-05-08 00:00:00', '2022-05-09 00:00:00',
           '2022-05-10 00:00:00', '2022-05-11 00:00:00', '2022-05-12 00:00:00',
           '2022-05-13 00:00:00', '2022-05-14 00:00:00', '2022-05-15 00:00:00',
           '2022-05-16 00:00:00', '2022-05-17 00:00:00', '2022-05-18 00:00:00',
           '2022-05-19 00:00:00', '2022-05-20 00:00:00', '2022-05-21 00:00:00',
           '2022-05-22 00:00:00', '2022-05-23 00:00:00', '2022-05-24 00:00:00',
           '2022-05-25 00:00:00', '2022-05-26 00:00:00', '2022-05-27 00:00:00',
           '2022-05-28 00:00:00', '2022-05-29 00:00:00', '2022-05-30 00:00:00',
           '2022-05-31 00:00:00', '2022-06-01 00:00:00', '2022-06-02 00:00:00',
           '2022-06-03 00:00:00', '2022-06-04 00:00:00', '2022-06-05 00:00:00',
           '2022-06-06 00:00:00', '2022-06-07 00:00:00', '2022-06-08 00:00:00',
           '2022-06-09 00:00:00', '2022-06-10 00:00:00', '2022-06-11 00:00:00',
           '2022-06-12 00:00:00', '2022-06-13 00:00:00', '2022-06-14 00:00:00',
           '2022-06-15 00:00:00', '2022-06-16 00:00:00', '2022-06-17 00:00:00',
           '2022-06-18 00:00:00', '2022-06-19 00:00:00', '2022-06-20 00:00:00',
           '2022-06-21 00:00:00', '2022-06-22 00:00:00', '2022-06-23 00:00:00',
           '2022-06-24 00:00:00', '2022-06-25 00:00:00', '2022-06-26 00:00:00',
           '2022-06-27 00:00:00', '2022-06-28 00:00:00', '2022-06-29 00:00:00',
           '2022-06-30 00:00:00', '2022-07-01 00:00:00', '2022-07-02 00:00:00',
           '2022-07-03 00:00:00', '2022-07-04 00:00:00', '2022-07-05 00:00:00',
           '2022-07-06 00:00:00', '2022-07-07 00:00:00', '2022-07-08 00:00:00',
           '2022-07-09 00:00:00', '2022-07-10 00:00:00', '2022-07-11 00:00:00',
           '2022-07-12 00:00:00', '2022-07-13 00:00:00', '2022-07-14 00:00:00',
           '2022-07-15 00:00:00', '2022-07-16 00:00:00', '2022-07-17 00:00:00',
           '2022-07-18 00:00:00', '2022-07-19 00:00:00', '2022-07-20 00:00:00',
           '2022-07-21 00:00:00', '2022-07-22 00:00:00', '2022-07-23 00:00:00',
           '2022-07-24 00:00:00', '2022-07-25 00:00:00', '2022-07-26 00:00:00',
           '2022-07-27 00:00:00', '2022-07-28 00:00:00', '2022-07-29 00:00:00',
           '2022-07-30 00:00:00', '2022-07-31 00:00:00']
          Length: 92, dtype: datetime64[ns]
```

```
In [126]: df_bookings.nunique()
```

```
Out[126]: booking_id           134585
          property_id              25
          booking_date            116
          check_in_date            92
          checkout_date            97
          no_guests                 9
          room_category             4
          booking_platform          7
          ratings_given             5
          booking_status            3
          revenue_generated        62
          revenue_realized        124
          dtype: int64
```

```
In [127]: df_date['date']=pd.to_datetime(df_date['date'],format="%d-%b-%y")
          df_date.date.unique()
```

```
Out[127]: <DatetimeArray>
          ['2022-05-01 00:00:00', '2022-05-02 00:00:00', '2022-05-03 00:00:00',
           '2022-05-04 00:00:00', '2022-05-05 00:00:00', '2022-05-06 00:00:00',
           '2022-05-07 00:00:00', '2022-05-08 00:00:00', '2022-05-09 00:00:00',
           '2022-05-10 00:00:00', '2022-05-11 00:00:00', '2022-05-12 00:00:00',
           '2022-05-13 00:00:00', '2022-05-14 00:00:00', '2022-05-15 00:00:00',
           '2022-05-16 00:00:00', '2022-05-17 00:00:00', '2022-05-18 00:00:00',
           '2022-05-19 00:00:00', '2022-05-20 00:00:00', '2022-05-21 00:00:00',
           '2022-05-22 00:00:00', '2022-05-23 00:00:00', '2022-05-24 00:00:00',
           '2022-05-25 00:00:00', '2022-05-26 00:00:00', '2022-05-27 00:00:00',
           '2022-05-28 00:00:00', '2022-05-29 00:00:00', '2022-05-30 00:00:00',
           '2022-05-31 00:00:00', '2022-06-01 00:00:00', '2022-06-02 00:00:00',
           '2022-06-03 00:00:00', '2022-06-04 00:00:00', '2022-06-05 00:00:00',
           '2022-06-06 00:00:00', '2022-06-07 00:00:00', '2022-06-08 00:00:00',
           '2022-06-09 00:00:00', '2022-06-10 00:00:00', '2022-06-11 00:00:00',
           '2022-06-12 00:00:00', '2022-06-13 00:00:00', '2022-06-14 00:00:00',
           '2022-06-15 00:00:00', '2022-06-16 00:00:00', '2022-06-17 00:00:00',
           '2022-06-18 00:00:00', '2022-06-19 00:00:00', '2022-06-20 00:00:00',
           '2022-06-21 00:00:00', '2022-06-22 00:00:00', '2022-06-23 00:00:00',
           '2022-06-24 00:00:00', '2022-06-25 00:00:00', '2022-06-26 00:00:00',
           '2022-06-27 00:00:00', '2022-06-28 00:00:00', '2022-06-29 00:00:00',
           '2022-06-30 00:00:00', '2022-07-01 00:00:00', '2022-07-02 00:00:00',
           '2022-07-03 00:00:00', '2022-07-04 00:00:00', '2022-07-05 00:00:00',
           '2022-07-06 00:00:00', '2022-07-07 00:00:00', '2022-07-08 00:00:00',
           '2022-07-09 00:00:00', '2022-07-10 00:00:00', '2022-07-11 00:00:00',
           '2022-07-12 00:00:00', '2022-07-13 00:00:00', '2022-07-14 00:00:00',
           '2022-07-15 00:00:00', '2022-07-16 00:00:00', '2022-07-17 00:00:00',
           '2022-07-18 00:00:00', '2022-07-19 00:00:00', '2022-07-20 00:00:00',
           '2022-07-21 00:00:00', '2022-07-22 00:00:00', '2022-07-23 00:00:00',
           '2022-07-24 00:00:00', '2022-07-25 00:00:00', '2022-07-26 00:00:00',
           '2022-07-27 00:00:00', '2022-07-28 00:00:00', '2022-07-29 00:00:00',
           '2022-07-30 00:00:00', '2022-07-31 00:00:00']
          Length: 92, dtype: datetime64[ns]
```

b in the format stands for short form of month in 3letters ex january = jan.

```
In [128]: grouped_6=pd.merge(df_bookings,df_date,left_on="check_in_date",right_on="dat
          grouped_6.head()
```

Out[128]:

	booking_id	property_id	booking_date	check_in_date	checkout_date	no_guests
0	May012216558RT11	16558	27-04-22	2022-05-01	2/5/2022	3.0
1	May012216558RT12	16558	30-04-22	2022-05-01	2/5/2022	2.0
2	May012216558RT14	16558	28-04-22	2022-05-01	2/5/2022	2.0
3	May012216558RT15	16558	27-04-22	2022-05-01	2/5/2022	4.0
4	May012216558RT16	16558	1/5/2022	2022-05-01	3/5/2022	2.0

```
In [129]: grouped_6.groupby('mmm yy')['revenue_realized'].sum()
```

```
Out[129]: mmm yy
          Jul 22    572895608
          Jun 22    553932355
          May 22    581875986
          Name: revenue_realized, dtype: int64
```

If we make rename date in df_date to check_in_date we can avoid the duplicate column in grouped_6 dataframe.

8.Print revenue realized per hotel.

```
In [130]: df_bookings.head()
```

Out[130]:

	booking_id	property_id	booking_date	check_in_date	checkout_date	no_guests
0	May012216558RT11	16558	27-04-22	2022-05-01	2/5/2022	3.0
1	May012216558RT12	16558	30-04-22	2022-05-01	2/5/2022	2.0
3	May012216558RT14	16558	28-04-22	2022-05-01	2/5/2022	2.0
4	May012216558RT15	16558	27-04-22	2022-05-01	2/5/2022	4.0
5	May012216558RT16	16558	1/5/2022	2022-05-01	3/5/2022	2.0

```
In [131]: df_hotels.head()
```

Out[131]:

	property_id	property_name	category	city
0	16558	Atliq Grands	Luxury	Delhi
1	16559	Atliq Exotica	Luxury	Mumbai
2	16560	Atliq City	Business	Delhi
3	16561	Atliq Blu	Luxury	Delhi
4	16562	Atliq Bay	Luxury	Delhi

```
In [132]: grouped_7=pd.merge(df_bookings,df_hotels,on='property_id')
          grouped_7.head()
```

Out[132]:

	booking_id	property_id	booking_date	check_in_date	checkout_date	no_guests
0	May012216558RT11	16558	27-04-22	2022-05-01	2/5/2022	3.0
1	May012216558RT12	16558	30-04-22	2022-05-01	2/5/2022	2.0
2	May012216558RT14	16558	28-04-22	2022-05-01	2/5/2022	2.0
3	May012216558RT15	16558	27-04-22	2022-05-01	2/5/2022	4.0
4	May012216558RT16	16558	1/5/2022	2022-05-01	3/5/2022	2.0

In [133]:
```
grouped_7.groupby("property_name")["revenue_realized"].sum().round(2).sort_v
```

Out[133]:
```
property_name
Atliq Seasons     66125495
Atliq Grands     211523664
Atliq Bay        260025978
Atliq Blu        260855522
Atliq City       285811939
Atliq Palace     304081863
Atliq Exotica    320279488
Name: revenue_realized, dtype: int64
```

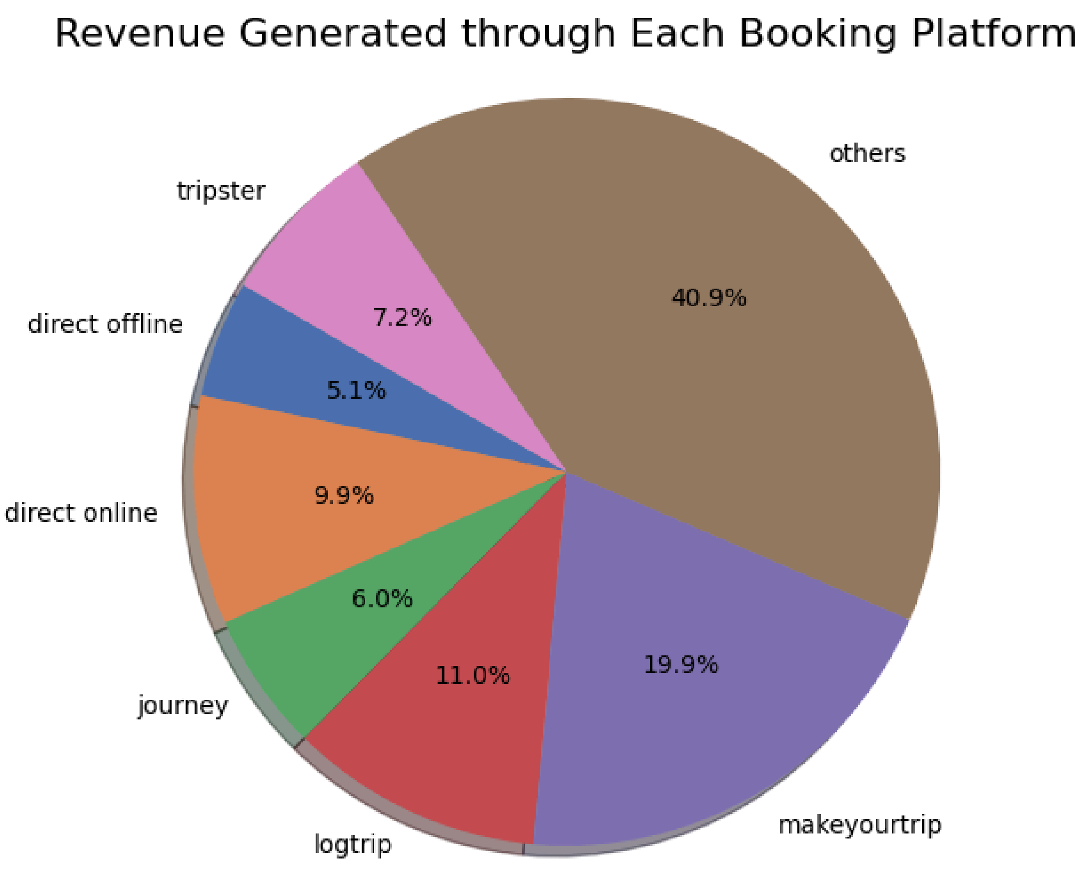
9.Print average rating per city.

In [134]:
```
grouped_7.groupby("city")["ratings_given"].mean().round(2).sort_values(ascen
```

Out[134]:
```
city
Delhi        3.78
Hyderabad    3.66
Mumbai       3.65
Bangalore    3.41
Name: ratings_given, dtype: float64
```

10.Print a pie chart of revenue realized per bookings platform.

```
In [135]: import matplotlib.pyplot as plt
          import seaborn as sns
          plt.figure(figsize=(8, 6))
          revenue_data = df_bookings.groupby('booking_platform')['revenue_realized'].s
          plt.pie(revenue_data,
                  labels=revenue_data.index,  # After grouping the booking_platform be
                  colors=sns.color_palette("deep"),  # Use a color palette from Seabor
                  autopct='%1.1f%%',
                  startangle=150,
                  shadow=True)
          plt.axis('equal')
          plt.title('Revenue Generated through Each Booking Platform', fontsize=16)
          plt.show()
```



```
In [ ]:
```