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HOSPITALITY DATA ANALYSIS PROJECT

AtliQ Hotels Data Analysis Project

AtliQ Hotels, a luxury hotel chain in India with locations in Mumbai, Delhi, Hyderabad, and Bangalore, is experiencing a decline in business. To address this issue, they have provided a dataset covering three months from May 2022 to July 2022 for analysis, along with separate data for August 2022.

This notebook aims to analyze the data and deliver insights based on the findings.

- Data Import and Data Exploration
- Data Cleaning
- Data Transformation
- Insights Generation

1.0.1 Importing Necessary Libraries.

[10]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

---

1. Data Import and Data Exploration

1.0.3 Datasets

We have 5 csv file

- dim_date.csv

- dim_hotels.csv
- dim_rooms.csv
- fact_aggregated_bookings.csv
- fact_bookings.csv

Load the bookings data into a dataframe.

[1]
```
df_bookings = pd.read_csv('datasets/fact_bookings.csv')
```

Explore the booking dataset using the Head() function.

[12]:
```
df_bookings.head()
```

[12] :

	booking_id	property_id	booking_date	check_in_date	checkout_date	\
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	

	no_guests	room_category	booking_platform	ratings_given	booking_status	\
0	-3.0	RT1	direct online	1.0	Checked Out	
1	2.0	RT1	others	NaN	Cancelled	
2	2.0	RT1	logtrip	5.0	Checked Out	
3	-2.0	RT1	others	NaN	Cancelled	
4	4.0	RT1	direct online	5.0	Checked Out	

	revenue_generated	revenue_realized
0	10010	10010
1	9100	3640
2	9100000	9100
3	9100	3640
4	10920	10920

Determining the total count of rows and columns using the Shape() function.

[13] :
```
df_bookings.shape
```

[13]: (134590, 12)

Lists the distinct room categories found in the bookings data using the Unique() function.

[14] :
```
df_bookings.room_category.unique()
```

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

Lists the unique booking platforms available in the bookings dataset using the Unique() function.

[15]:
```
df_bookings.booking_platform.unique()
```

[15]:
```
array(['direct online', 'others', 'logtrip', 'tripster', 'makeyourtrip',
       'journey', 'direct offline'], dtype=object)
```

Counts the number of bookings per platform in the bookings dataset using the Value_counts() function.

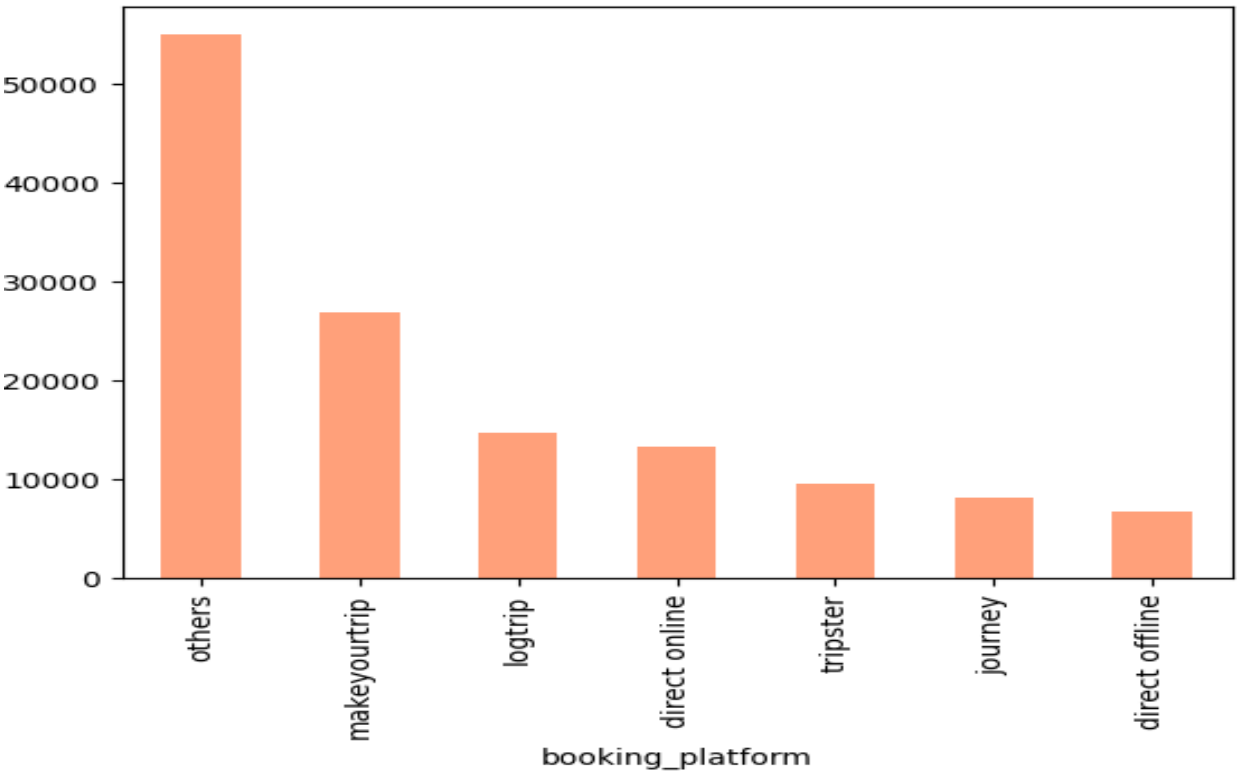
[16]:
```
df_bookings.booking_platform.value_counts()
```

[16]:
```
booking_platform
others            55066
makeyourtrip      26898
logtrip           14756
direct  online    13379
tripster           9630
journey            8106
direct  offline    6755
Name: count, dtype: int64
```

Generates a bar chart showing the distribution of booking platforms in the dataset using the Plot() function.

[183]:
```
df_bookings.booking_platform.value_counts().plot(kind='bar',color  =  '#FFA07A')
```

[183]: <Axes: xlabel='booking_platform'>



Provides a summary of descriptive statistics for the bookings dataframe using the Describe() function.

[18]:
```
df_bookings.describe()
```

[18] :

	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

Read the remaining files.

[19] :
```
df_date = pd.read_csv('datasets/dim_date.csv')
df_hotels = pd.read_csv('datasets/dim_hotels.csv')
df_rooms = pd.read_csv('datasets/dim_rooms.csv')
df_agg_bookings = pd.read_csv('datasets/fact_aggregated_bookings.csv')
```

Provides the number of rows and columns in the hotels dataframe using the Shape() function.

[20] :
```
df_hotels.shape
```

[20]: (25, 4)

Displays the first few rows of the hotels dataframe using the Head() function.

[21] :
```
df_hotels.head()
```

[21]:

	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

Provides a count of each property_category in the hotels dataframe using the Value_counts() function.

[22] :
```
df_hotels.category.value_counts()
```

[22]:
```
category
Luxury      16
Business     9
Name: count, dtype: int64
```

Provides a count of hotels per city in the dataframe using the Value_counts() function.

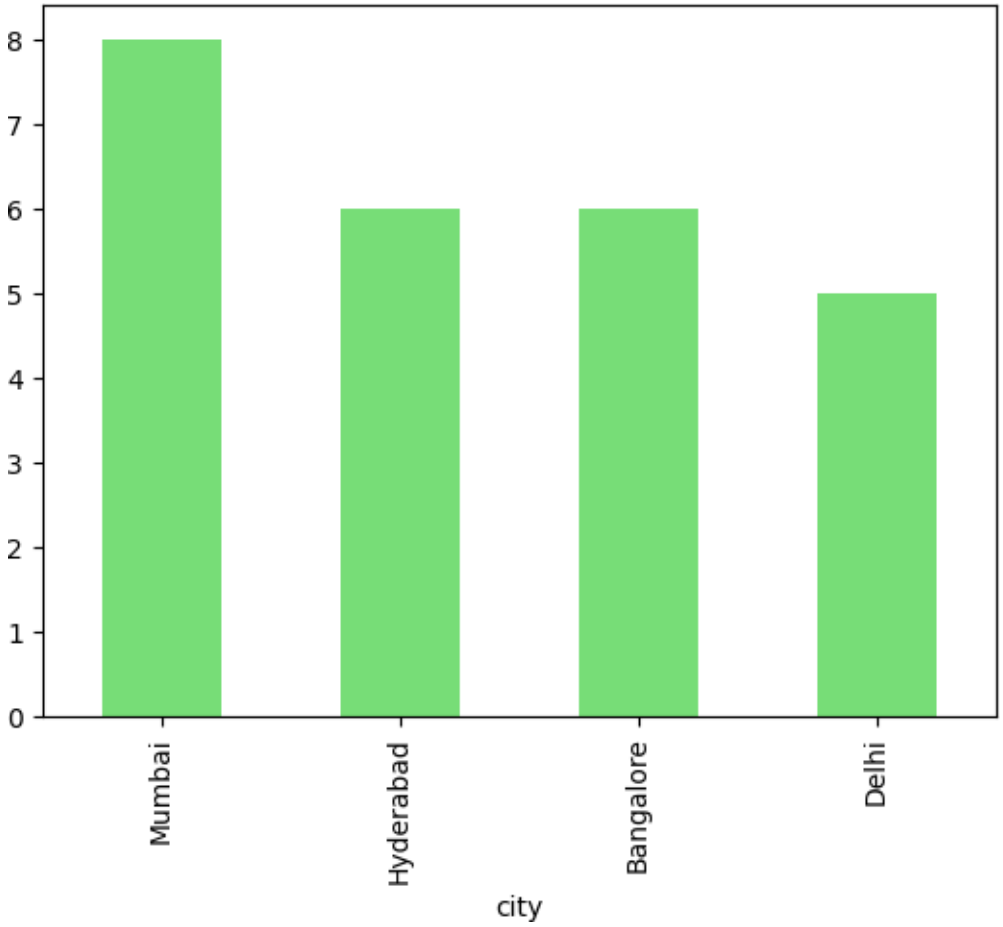
[23]:
```
df_hotels.city.value_counts()
```

[23]:
```
city
Mumbai       8
Hyderabad    6
Bangalore    6
Delhi        5
Name: count, dtype: int64
```

Plot the number of hotels per city with a bar chart using the Plot() function.

[180]:
```
df_hotels.city.value_counts().plot(kind='bar',color  =  '#77DD77')
```

[180]: <Axes: xlabel='city'>



Explore the fact_aggregated_bookings data.

[25]:
```
df_agg_bookings.head(5)
```

[25] :

	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

Provides an overview of the aggregated bookings dataframe, including data types, using the Info() function.

[26]:
```
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
```

Displays descriptive statistics for the aggregated bookings data using the Describe() function.

[26] :
```
df_agg_bookings.describe()
```

[26]:

	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

1.0.4 *1) Find out unique property ids in aggregate bookings dataset.*

[27] :
```
df_agg_bookings.property_id.unique()
```

[27]:
```
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])
```

2) Find out total bookings per property_id.

[28]:
```
df_agg_bookings.groupby('property_id')['successful_bookings'].sum().
  sort_values(ascending=False)
```

[28] :
```
property_id
16559    7338
18562    7333
16563    7211
18560    6638
18561    6458
17563    6337
17559    6142
19560    6079
17560    6013
19562    5812
19561    5736
19563    5413
18559    5256
17561    5183
17558    5053
16562    4820
18563    4737
19559    4729
16560    4693
18558    4475
16561    4418
19558    4400
17564    3982
17562    3424
16558    3153
Name: successful_bookings,  dtype: int64
```

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

[29] :
```
df_agg_bookings[df_agg_bookings.successful_bookings>df_agg_bookings.capacity]
```

[29]:

	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.

[30] :
```
df_agg_bookings.capacity.max()
```

[30] :
```
np.float64(50.0)
```

[31] :
```
df_agg_bookings[df_agg_bookings.capacity==df_agg_bookings.capacity.max()]
```

[31]:

	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 x 5 columns]

---

2. Data Cleaning

Provides a summary of descriptive statistics for the bookings dataframe using the Describe() function.

[32] :
```
df_bookings.describe()
```

[32] :

	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	
50%	17564.000000	2.000000	4.000000	1.350000e+04	
75%	18563.000000	2.000000	5.000000	1.800000e+04	
max	19563.000000	6.000000	5.000000	2.856000e+07	

25%	7600.000000
50%	11700.000000
75%	15300.000000
max	45220.000000

1) Clean invalid no_guests.

Filters bookings where the number of guests is less than or equal to zero.

[33] :
```
df_bookings[df_bookings.no_guests<=0]
```

[33]:

	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	27-04-22	1/5/2022	2/5/2022	-3.0	RT1	direct online	1.0	Checked Out	10010	10010
3	May012216558RT14	16558	28-04-22	1/5/2022	2/5/2022	-2.0	RT1	others	NaN	Cancelled	9100	3640
17924	May122218559RT44	18559	12/5/2022	12/5/2022	14-05-22	-10.0	RT4	direct online	NaN	No Show	20900	20900
18020	May122218561RT22	18561	8/5/2022	12/5/2022	14-05-22	-12.0	RT2	makeyourtrip	NaN	Cancelled	9000	3600
18119	May122218562RT311	18562	5/5/2022	12/5/2022	17-05-22	-6.0	RT3	direct offline	5.0	Checked Out	16800	16800
18121	May122218562RT313	18562	10/5/2022	12/5/2022	17-05-22	-4.0	RT3	direct online	NaN	Cancelled	14400	5760
56715	Jun082218562RT12	18562	5/6/2022	8/6/2022	13-06-22	-17.0	RT1	others	NaN	Checked Out	6500	6500
119765	Jul202219560RT220	19560	19-07-22	20-07-22	22-07-22	-1.0	RT2	others	NaN	Checked Out	13500	13500
134586	Jul312217564RT47	17564	30-07-22	31-07-22	1/8/2022	-4.0	RT4	logtrip	2.0	Checked Out	38760	38760

- The rows above indicate data errors.
- Given that less than 0.5% of the total data is invalid guest data, we can disregard them when generating insights.

Filters the bookings dataframe to include entries with more than zero guests.

[34] :
```
df_bookings = df_bookings[df_bookings.no_guests>0]
df_bookings.head()
```

[34]:

	booking_id	property_id	booking_date	check_in_date	checkout_date	\
1	May012216558RT12	16558	30-04-22	1/5/2022	2/5/2022	
2	May012216558RT13	16558	28-04-22	1/5/2022	4/5/2022	
4	May012216558RT15	16558	27-04-22	1/5/2022	2/5/2022	
5	May012216558RT16	16558	1/5/2022	1/5/2022	3/5/2022	
6	May012216558RT17	16558	28-04-22	1/5/2022	6/5/2022	

	no_guests	room_category	booking_platform	ratings_given	booking_status	\
1	2.0	RT1	others	NaN	Cancelled	
2	2.0	RT1	logtrip	5.0	Checked Out	
4	4.0	RT1	direct online	5.0	Checked Out	
5	2.0	RT1	others	4.0	Checked Out	
6	2.0	RT1	others	NaN	Cancelled	

	revenue_generated	revenue_realized
1	9100	3640
2	9100000	9100
4	10920	10920
5	9100	9100
6	9100	3640

[35] :
```
df_bookings.shape
```

[35]: (134578, 12)

2) Outlier removal in revenue generated.

Calculates the minimum and maximum revenue generated in the bookings dataframe.

[36] :
```
df_bookings.revenue_generated.min(), df_bookings.revenue_generated.max()
```

[36] : (np.int64(6500), np.int64(28560000))

Calculates the mean and median of the revenue generated in the bookings dataframe.

[37] :
```
df_bookings.revenue_generated.mean(), df_bookings.revenue_generated.median()
```

[37] : (np.float64(15378.036937686695), np.float64(13500.0))

Calculates and displays the mean and standard deviation of revenue generated in the bookings dataframe.

[38] :
```
avg, std = df_bookings.revenue_generated.mean(), df_bookings.revenue_generated.
  ₛstd()
```

```
avg, std
```

[38] : (np.float64(15378.036937686695), np.float64(93040.1549314641))

Calculates the Upper Limit using the formula: Higher_limit = avg + 3std.

[39] :
```
higher_limit = avg + 3*std
higher_limit
```

[39] : np.float64(294498.50173207896)

Calculates the Lower Limit using the formula: Lower_limit = avg - 3std.

[40] :
```
Lower_limit = avg - 3*std
Lower_limit
```

[40] : np.float64(-263742.4278567056)

We have no values in the revenue realized column that are less than or equal to zero.

[41] :
```
df_bookings[df_bookings.revenue_realized<=0]
```

[41] : 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: []

Filters bookings where revenue generated exceeds a specified higher limit.

[42] :
```
df_bookings[df_bookings.revenue_generated > higher_limit]
```

[42]:

	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
2	May012216558RT13	16558	28-04-22	1/5/2022	4/5/2022	2.0	RT1	logtrip	5.0	Checked Out	9100000	9100
111	May012216559RT32	16559	29-04-22	1/5/2022	2/5/2022	6.0	RT3	direct online	NaN			
315	May012216562RT22	16562	28-04-22	1/5/2022	4/5/2022	2.0	RT2	direct offline	3.0			
562	May012217559RT118	17559	26-04-22	1/5/2022	2/5/2022	2.0	RT1	others	NaN			
129176	Jul282216562RT26	16562	21-07-22	28-07-22	29-07-22	2.0	RT2	direct online	3.0			

111	Checked Out	28560000	28560
315	Checked Out	12600000	12600
562	Cancelled	2000000	4420
129176	Checked Out	10000000	12600

- We identified five outliers in the revenue_generated column that can be ignored.

Filters the bookings dataframe to include only rows where revenue generated is less than or equal to a specified higher limit, and then displays the shape of the filtered dataframe.

[43] :
```
df_bookings = df_bookings[df_bookings.revenue_generated <= higher_limit]
df_bookings.shape
```

[43]: (134573, 12)

1.0.9 *Removing outliers in revenue_realized.*

Generates summary statistics for the revenue_realized in the bookings dataframe.

[44] :
```
df_bookings.revenue_realized.describe()
```

[44]:
```
count    134573.000000
mean      12695.983585
std        6927.791692
min        2600.000000
25%        7600.000000
50%       11700.000000
75%       15300.000000
max       45220.000000
Name: revenue_realized, dtype: float64
```

[45] :
```
avg, std = df_bookings.revenue_realized.mean(), df_bookings.revenue_realized.
  ₛstd()
higher_limit = avg + 3*std
lower_limit = avg - 3*std
higher_limit, lower_limit
```

[45] : (np.float64(33479.358661845814), np.float64(-8087.391491611072))

Displays bookings where revenue realized exceeds the higher limit.

[46] :
```
df_bookings[df_bookings.revenue_realized > higher_limit]
```

[46] :

	booking_id	property_id	booking_date	check_in_date	\
137	May012216559RT41	16559	27-04-22	1/5/2022	
139	May012216559RT43	16559	1/5/2022	1/5/2022	
143	May012216559RT47	16559	28-04-22	1/5/2022	
149	May012216559RT413	16559	24-04-22	1/5/2022	

```
222       May012216560RT45        16560      30-04-22       1/5/2022
...                  ...          ...          ...            ...
134328   Jul312219560RT49         19560      31-07-22       31-07-22
134331   Jul312219560RT412        19560      31-07-22       31-07-22
134467    Jul312219562RT45        19562      28-07-22       31-07-22
134474   Jul312219562RT412        19562      25-07-22       31-07-22
134581    Jul312217564RT42        17564      31-07-22       31-07-22

        checkout_date  no_guests room_category booking_platform  ratings_given  \
137           7/5/2022        4.0          RT4           others            NaN
139           2/5/2022        6.0          RT4         tripster            3.0
143           3/5/2022        3.0          RT4           others            5.0
149           7/5/2022        5.0          RT4          logtrip            NaN
222           3/5/2022        5.0          RT4           others            3.0
...                ...        ...          ...              ...            ...
134328        2/8/2022        6.0          RT4   direct online              5.0
134331        1/8/2022        6.0          RT4           others            2.0
134467        1/8/2022        6.0          RT4     makeyourtrip            4.0
134474        6/8/2022        5.0          RT4   direct offline            5.0
134581        1/8/2022        4.0          RT4     makeyourtrip            4.0

        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
222        Checked Out              34580             34580
...                ...                ...               ...
134328     Checked Out              39900             39900
134331     Checked Out              39900             39900
134467     Checked Out              39900             39900
134474     Checked Out              37050             37050
134581     Checked Out              38760             38760

[1299 rows x 12 columns]
```

Counts the occurrences of room categories in the bookings dataframe where the revenue_realized exceeds a specified higher limit.

[47] :
```
df_bookings[df_bookings.revenue_realized > higher_limit].room_category.
  value_counts()
```

[47] :
```
room_category
RT4     1299
Name: count, dtype: int64
```

- An important observation from the dataframe above is that all rooms are categorized as **RT4**, denoting the **Presidential Suite** type. Given that RT4 signifies luxurious accommodation,

it's reasonable to expect higher rental rates for these rooms. To ensure a fair analysis, we should focus our data analysis exclusively on the RT4 room type.

Describes the statistical summary of revenue_realized for room category 'RT4' in the bookings dataframe.

[48] :
```
df_bookings[df_bookings.room_category == 'RT4'].revenue_realized.describe()
```

[48]:
```
count    16071.000000
mean     23439.308444
std       9048.599076
min       7600.000000
25%      19000.000000
50%      26600.000000
75%      32300.000000
max      45220.000000
Name: revenue_realized, dtype: float64
```

Calculates the mean and standard deviation of 'revenue_realized' for room category 'RT4' in the bookings dataframe.

[49] :
```
avg, std = df_bookings[df_bookings.room_category=='RT4'].revenue_realized.
    mean(), df_bookings[df_bookings.room_category=='RT4'].revenue_realized.std()
avg, std
```

[49] : (np.float64(23439.308443780723), np.float64(9048.599075739918))

[50] :
```
higher_limit = avg + 3*std
higher_limit
```

[50] : np.float64(50585.10567100048)

- The upper limit is **50,585** and from our dataframe, we observe that the maximum value for revenue_realized is **45,220**. Therefore, we can conclude that there are no outliers, and there is no need for any data cleaning on this column.

Shows the count of missing values in each column of the bookings dataframe.

[51] :
```
df_bookings.isnull().sum()
```

[51]:
```
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     77897
```

```
booking_status          0
revenue_generated       0
revenue_realized        0
dtype: int64
```

- The dataframe contains a total of **134,573** values, with **77,897** rows having null ratings. Due to the significant number of null ratings, we shouldn't filter or replace them with median or mean values. Because not every customer provides a rating, it is logical that our ratings_given column contains null values.

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

Counts the number of missing values in the aggregated bookings dataframe.

[52] :
```
df_agg_bookings.isnull().sum()
```

[52]:
```
property_id             0
check_in_date           0
room_category           0
successful_bookings     0
capacity                2
dtype: int64
```

Filters the df_agg_bookings dataframe to show rows where the 'capacity' column is NaN.

[53]:
```
df_agg_bookings[df_agg_bookings.capacity.isna()]
```

[53]:

	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

Replaces null values in the 'capacity' column of df_agg_bookings using the mean value.

[56]:
```
df_agg_bookings['capacity'] = df_agg_bookings['capacity'].
 fillna(df_agg_bookings['capacity'].mean())
```

Indicates rows 8 and 14 from the aggregated bookings dataframe, which previously contained null values.

[57]:
```
df_agg_bookings.loc[[8,14]]
```

[57] :

	property_id	check_in_date	room_category	successful_bookings	capacity
8	17561	1-May-22	RT1	22	25.280496
14	17562	1-May-22	RT1	12	25.280496

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

Filters aggregated bookings where the number of successful bookings exceeds the capacity.

[58] :
```
df_agg_bookings[df_agg_bookings.successful_bookings > df_agg_bookings.capacity]
```

[58]:

	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

- We have identified **6** records in df_agg_bookings where the number of successful_bookings exceeds the actual capacity, indicating the presence of data errors. It is advisable to exclude these rows from the dataframe for more accurate analysis.

Returns the number of rows and columns of the aggregated bookings dataframe before excluding the data errors.

[59] :
```
df_agg_bookings.shape
```

[59]: (9200, 5)

Filters df_agg_bookings to include only rows where the number of successful bookings is less than or equal to the capacity.

[60] :
```
df_agg_bookings = df_agg_bookings[df_agg_bookings.successful_bookings <=
 df_agg_bookings.capacity]
```

Returns the number of rows and columns of the aggregated bookings dataframe after excluding the data errors.

[61] :
```
df_agg_bookings.shape
```

[61]: (9194, 5)

---

3. Data Transformation

---

[62] :
```
df_agg_bookings.head()
```

[62]:

	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
4        16558       1-May-22            RT1                  18       19.0
5        17560       1-May-22            RT1                  28       40.0
```

Create a new column to indicate the occupancy_percentage.

[70]:
```
df_agg_bookings['Occupancy_pct'] =␣
 ₛround(df_agg_bookings['successful_bookings']*100/
 ₛdf_agg_bookings['capacity'],2)
```

[71]:
```
df_agg_bookings.head()
```

[71]:
```
    property_id check_in_date room_category  successful_bookings  capacity   \
0         16559    2022-05-01            RT1                   25       30.0
1         19562    2022-05-01            RT1                   28       30.0
2         19563    2022-05-01            RT1                   23       30.0
4         16558    2022-05-01            RT1                   18       19.0
5         17560    2022-05-01            RT1                   28       40.0

   Occupancy_pct
0          83.33
1          93.33
2          76.67
4          94.74
5          70.00
```

[72]:
```
df_agg_bookings.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 9194 entries, 0 to 9199
Data columns (total 6 columns):
 #   Column               Non-Null Count  Dtype
---  ------               --------------  -----
 0   property_id          9194 non-null   int64
 1   check_in_date        9194 non-null   datetime64[ns]
     2   room_category9194 non-null   object
   3   successful_bookings9194 non-null   int64
 4   capacity             9194 non-null   float64
 5   Occupancy_pct        9194 non-null   float64
dtypes: datetime64[ns](1), float64(2), int64(2), object(1)
memory usage: 502.8+ KB
```

- As we can see above, the check_in_date column's data type is object, so we need to convert this to datetime data type.

Converts the check_in_date column to datetime format in the df_agg_bookings dataframe.

[73]:
```
df_agg_bookings.check_in_date = pd.
  to_datetime(df_agg_bookings['check_in_date'], format='%d-%b-%y')
```

[74]:
```
df_agg_bookings.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 9194 entries, 0 to 9199
Data columns (total 6 columns):
 #   Column                Non-Null Count  Dtype
---  ------                --------------  -----
 0   property_id           9194 non-null   int64
 1   check_in_date         9194 non-null   datetime64[ns]
 2   room_category         9194 non-null   object
 3   successful_bookings   9194 non-null   int64
 4   capacity              9194 non-null   float64
 5   Occupancy_pct         9194 non-null   float64
dtypes: datetime64[ns](1), float64(2), int64(2), object(1)
memory usage: 502.8+ KB
```

- Now, as we can see above, the data type of the check_in_date column has been successfully converted to datetime.

---

4. Insight Generation and Analysis

---

1) *What is an average occupancy rate in each of the room categories?*

[75]:
```
df_agg_bookings.head()
```

[75]:

	property_id	check_in_date	room_category	successful_bookings	capacity	\
0	16559	2022-05-01	RT1	25	30.0	
1	19562	2022-05-01	RT1	28	30.0	
2	19563	2022-05-01	RT1	23	30.0	
4	16558	2022-05-01	RT1	18	19.0	
5	17560	2022-05-01	RT1	28	40.0	

	Occupancy_pct
0	83.33
1	93.33
2	76.67
4	94.74
5	70.00

Calculates the average occupancy percentage for each room category, rounded to two decimal places.

[76]:
```
df_agg_bookings.groupby('room_category')['Occupancy_pct'].mean().round(2)
```

[76] :
```
room_category
RT1    57.89
RT2    58.01
RT3    58.03
RT4    59.28
Name: Occupancy_pct, dtype: float64
```

[77] :
```
df_rooms.head()
```

[77]:

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

Joins the aggregated bookings data with room details, then previews the first few rows of the combined dataframe.

[78] :
```
df = pd.merge(df_agg_bookings,df_rooms, left_on='room_category',
 right_on='room_id')
df.head()
```

[78]:

	property_id	check_in_date	room_category	successful_bookings	capacity	\
0	16559	2022-05-01	RT1	25	30.0	
1	19562	2022-05-01	RT1	28	30.0	
2	19563	2022-05-01	RT1	23	30.0	
3	16558	2022-05-01	RT1	18	19.0	
4	17560	2022-05-01	RT1	28	40.0	

	Occupancy_pct	room_id	room_class
0	83.33	RT1	Standard
1	93.33	RT1	Standard
2	76.67	RT1	Standard
3	94.74	RT1	Standard
4	70.00	RT1	Standard

Deletes the room_id column from the dataframe df.

[79] :
```
df.drop('room_id', axis=1, inplace=True)
df.head(4)
```

[79]:

	property_id	check_in_date	room_category	successful_bookings	capacity	\
0	16559	2022-05-01	RT1	25	30.0	
1	19562	2022-05-01	RT1	28	30.0	
2	19563	2022-05-01	RT1	23	30.0	
3	16558	2022-05-01	RT1	18	19.0	

	Occupancy_pct	room_class
0	83.33	Standard
1	93.33	Standard
2	76.67	Standard
3	94.74	Standard

Calculates the average occupancy percentage for each room_class, rounded to two decimal places.

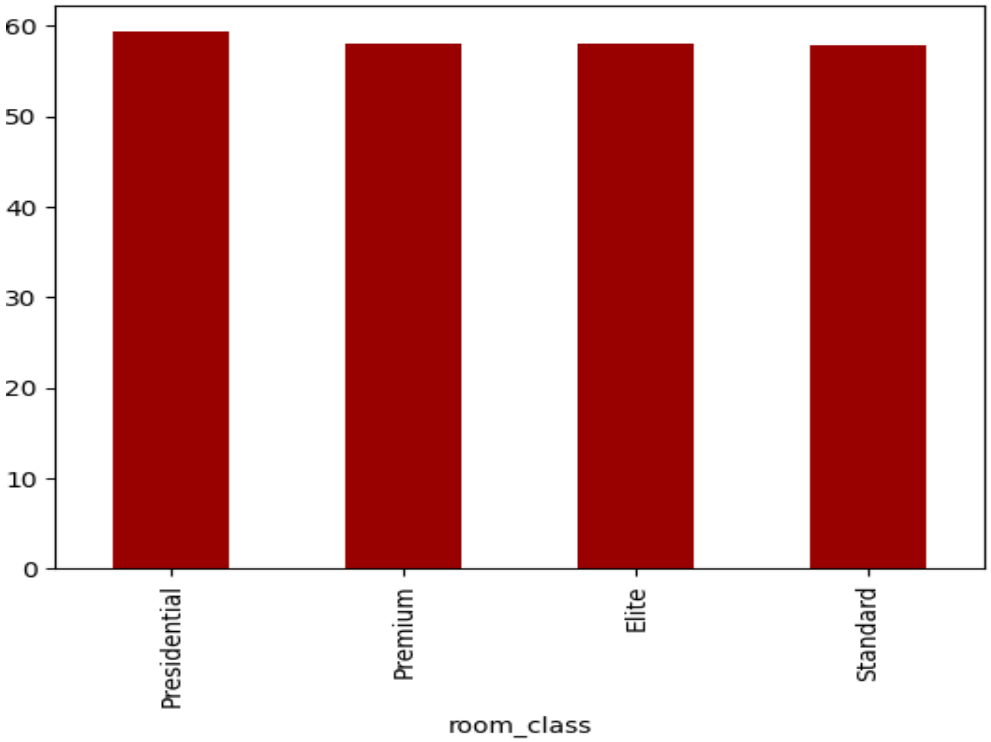
[80] :
```
df.groupby('room_class')['Occupancy_pct'].mean().round(2)
```

[80]:
```
room_class
Elite          58.01
Premium        58.03
Presidential   59.28
Standard       57.89
Name: Occupancy_pct, dtype: float64
```

Plots a bar chart of the average occupancy percentage, for each room class.

[177]:
```
df.groupby('room_class')['Occupancy_pct'].mean().round(2).
  sort_values(ascending=False).plot(kind='bar',  color  =  '#990000')
```

[177]: <Axes: xlabel='room_class'>



2) *Print average occupancy rate per city.*

[82]:
```
df_hotels.head()
```

[82]:

	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

Joins df and df_hotels on property_id and displays the first few rows.

[83]:
```
df = pd.merge(df,df_hotels, on='property_id')
df.head()
```

[83]:

	property_id	check_in_date	room_category	successful_bookings	capacity	\
0	16559	2022-05-01	RT1	25	30.0	
1	19562	2022-05-01	RT1	28	30.0	
2	19563	2022-05-01	RT1	23	30.0	
3	16558	2022-05-01	RT1	18	19.0	
4	17560	2022-05-01	RT1	28	40.0	

	Occupancy_pct	room_class	property_name	category	city
0	83.33	Standard	Atliq Exotica	Luxury	Mumbai
1	93.33	Standard	Atliq Bay	Luxury	Bangalore
2	76.67	Standard	Atliq Palace	Business	Bangalore
3	94.74	Standard	Atliq Grands	Luxury	Delhi
4	70.00	Standard	Atliq City	Business	Mumbai

Calculates the average occupancy percentage for each city.

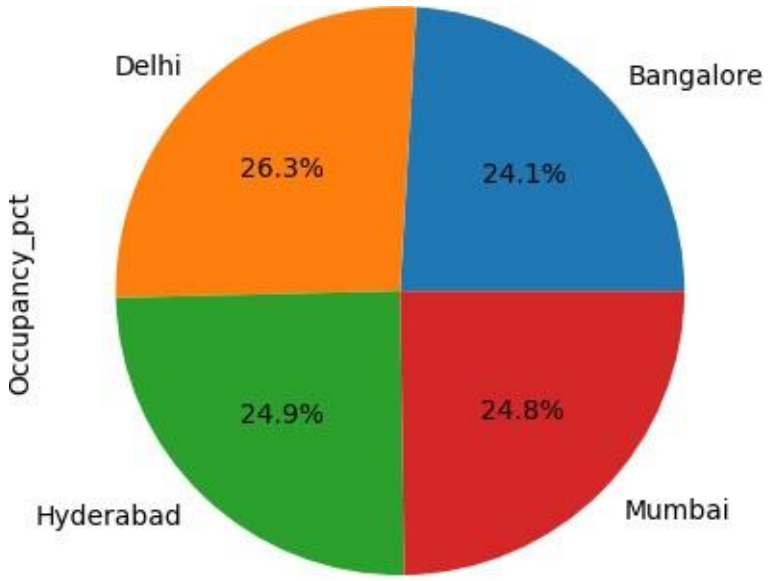
[84]:
```
df.groupby('city')['Occupancy_pct'].mean()
```

[84]:
```
city
Bangalore    56.332376
Delhi        61.507341
Hyderabad    58.120652
Mumbai       57.908668
Name: Occupancy_pct, dtype: float64
```

Plots a pie chart showing the Average occupancy percentage for each city.

[85]:
```
df.groupby('city')['Occupancy_pct'].mean().plot(kind='pie', autopct='%1.1f%%')
```

[85]: <Axes: ylabel='Occupancy_pct'>



3) *When was the occupancy better? Weekday or Weekend?*

[86]:
```
df_date.head()
```

[86] :

	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] :
```
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
```

- As we can see above, the date column's data type is object, so we need to convert this to datetime data type.

Converts the date column to datetime format in the df_date dataframe.

```
df_date['date'] = pd.to_datetime(df_date['date'], format='%d-%b-%y')
```

[88] :
```
df_date.info()
```

[89] :
```
<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     datetime64[ns]
 1   mmm yy      92 non-null     object        
 2   week no     92 non-null     object        
 3   day_type    92 non-null     object        
dtypes: datetime64[ns](1), object(3)
memory usage: 3.0+ KB
```

- Now, as we can see above, the data type of the date column has been successfully converted to datetime.

Joins df with df_date on the check_in_date and date columns.

[90]:
```
df = pd.merge(df,df_date, left_on='check_in_date', right_on='date')
df.head()
```

	property_id	check_in_date	room_category	successful_bookings	capacity	\
0	16559	2022-05-01	RT1	25	30.0	
1	19562	2022-05-01	RT1	28	30.0	
2	19563	2022-05-01	RT1	23	30.0	
3	16558	2022-05-01	RT1	18	19.0	
4	17560	2022-05-01	RT1	28	40.0	

	Occupancy_pct	room_class	property_name	category	city	date	\
0	83.33	Standard	Atliq Exotica	Luxury	Mumbai	2022-05-01	
1	93.33	Standard	Atliq Bay	Luxury	Bangalore	2022-05-01	
2	76.67	Standard	Atliq Palace	Business	Bangalore	2022-05-01	
3	94.74	Standard	Atliq Grands	Luxury	Delhi	2022-05-01	
4	70.00	Standard	Atliq City	Business	Mumbai	2022-05-01	

	mmm yy	week no	day_type
0	May 22	W 19	weekend
1	May 22	W 19	weekend
2	May 22	W 19	weekend
3	May 22	W 19	weekend
4	May 22	W 19	weekend

Calculates the mean occupancy percentage by day_type, rounded to two decimal places.

[90] :
```
df.groupby('day_type')['Occupancy_pct'].mean().round(2)
```

[91] :
```
day_type
weekeday    51.81
weekend     73.96
Name: Occupancy_pct, dtype: float64
```

1.0.16 4) *In the month of June, what is the occupancy for different cities?*

Filters the dataframe to include data only for June 2022.

[92] :
```
df_june_22 = df[df["mmm yy"] == 'Jun 22']
df_june_22.head()
```

[92]:

	property_id	check_in_date	room_category	successful_bookings	capacity	\
3098	16559	2022-06-01	RT1	14	30.0	
3099	18560	2022-06-01	RT1	18	30.0	
3100	19562	2022-06-01	RT1	18	30.0	
3101	19563	2022-06-01	RT1	14	30.0	
3102	17558	2022-06-01	RT1	8	19.0	

	Occupancy_pct	room_class	property_name	category	city	date	\
3098	46.67	Standard	Atliq Exotica	Luxury	Mumbai	2022-06-01	
3099	60.00	Standard	Atliq City	Business	Hyderabad	2022-06-01	
3100	60.00	Standard	Atliq Bay	Luxury	Bangalore	2022-06-01	
3101	46.67	Standard	Atliq Palace	Business	Bangalore	2022-06-01	
3102	42.11	Standard	Atliq Grands	Luxury	Mumbai	2022-06-01	

	mmm yy	week no	day_type
3098	Jun 22	W 23	weekeday
3099	Jun 22	W 23	weekeday
3100	Jun 22	W 23	weekeday
3101	Jun 22	W 23	weekeday
3102	Jun 22	W 23	weekeday

Calculates and sorts the average occupancy percentages by city in descending order.

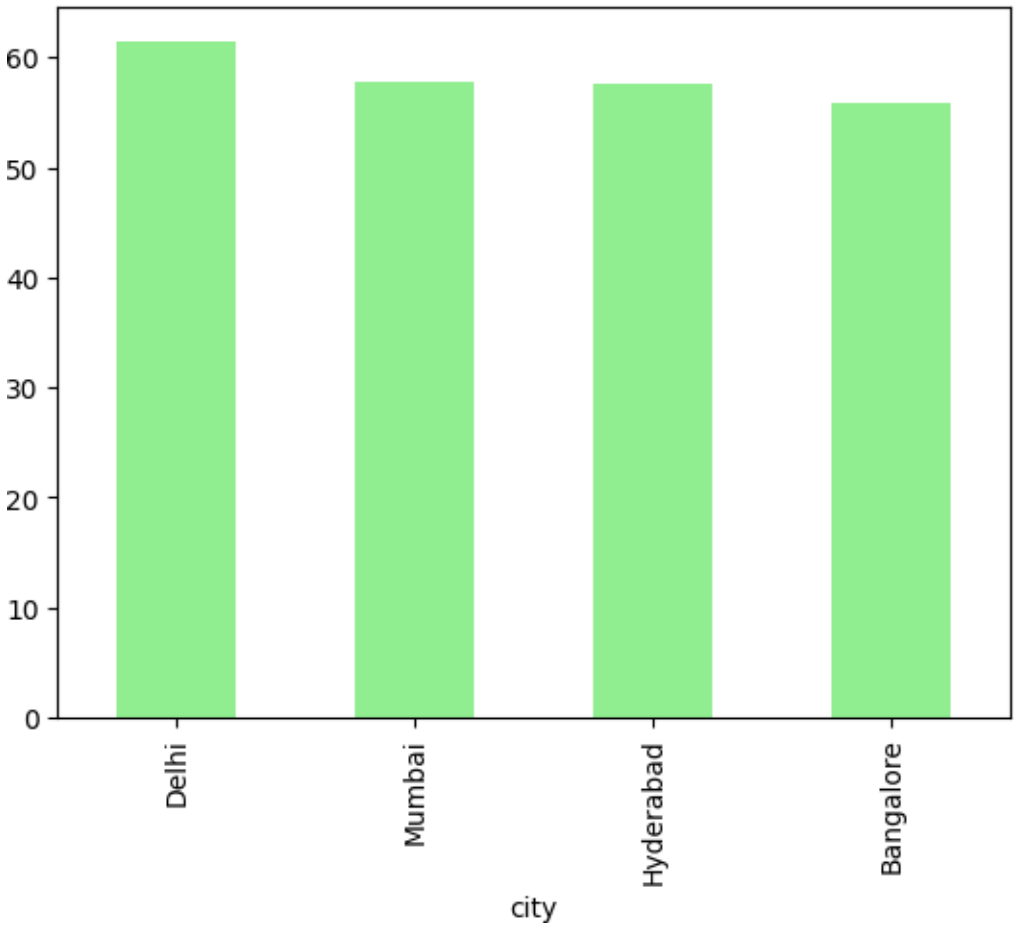
[93] :
```
df_june_22.groupby('city')['Occupancy_pct'].mean().round(2).
  sort_values(ascending=False)
```

[93]:
```
city
Delhi        61.46
Mumbai       57.79
Hyderabad    57.69
Bangalore    55.85
Name: Occupancy_pct, dtype: float64
```

Generates a bar plot of the average occupancy percentage by city, sorted in descending order, using June 2022 data.

[170]:
```
df_june_22.groupby('city')['Occupancy_pct'].mean().round(2).
  sort_values(ascending=False).plot(kind='bar',color  =  '#90EE90')
```

[170]: <Axes: xlabel='city'>



5) *We have received new data for the month of August Append that to the existing data.*

[96]:
```
df_august  =  pd.read_csv('datasets/new_data_august.csv')
df_august.head()
```

[96]:

	property_id	property_name	category	city	room_category	room_class	check_in_date	mmm yy	week no	day_type	successful_bookings	capacity	occ%
0	16559	Atliq Exotica	Luxury	Mumbai	RT1	Standard	01-Aug-22	Aug-22	W 32	weekeday	30	30	100.00
1	19562	Atliq Bay	Luxury	Bangalore	RT1	Standard	01-Aug-22	Aug-22	W 32	weekeday	21	30	70.00
2	19563	Atliq Palace	Business	Bangalore	RT1	Standard	01-Aug-22	Aug-22	W 32	weekeday	23	30	76.67
3	19558	Atliq Grands	Luxury	Bangalore	RT1	Standard	01-Aug-22	Aug-22	W 32	weekeday	30	40	75.00
4	19560	Atliq City	Business	Bangalore	RT1	Standard	01-Aug-22	Aug-22	W 32	weekeday	20	26	76.92

[97]:
```
df_august.columns
```

[97] :
```
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')
```

[98] :
```
df_august.shape
```

[98]: (7, 13)

[99] :
```
df.columns
```

[99] :
```
Index(['property_id', 'check_in_date', 'room_category', 'successful_bookings',
       'capacity', 'Occupancy_pct', 'room_class', 'property_name', 'category',
       'city', 'date', 'mmm yy', 'week no', 'day_type'],
      dtype='object')
```

[100] :
```
df.shape
```

[100]: (9194, 14)

Concatenates 'df' and 'df_august' into latest_df, resetting the index to maintain continuity.

[101] :
```
latest_df = pd.concat([df,df_august], ignore_index=True, axis=0)
latest_df.tail(10)
```

[101]:

	property_id	check_in_date	room_category	successful_bookings	\
9191	17558	2022-07-31 00:00:00	RT4	3	
9192	19563	2022-07-31 00:00:00	RT4	3	
9193	17561	2022-07-31 00:00:00	RT4	3	
9194	16559	01-Aug-22	RT1	30	
9195	19562	01-Aug-22	RT1	21	
9196	19563	01-Aug-22	RT1	23	
9197	19558	01-Aug-22	RT1	30	
9198	19560	01-Aug-22	RT1	20	
9199	17561	01-Aug-22	RT1	18	
9200	17564	01-Aug-22	RT1	10	

	capacity	Occupancy_pct	room_class	property_name	category	\
9191	6.0	50.0	Presidential	Atliq Grands	Luxury	
9192	6.0	50.0	Presidential	Atliq Palace	Business	
9193	4.0	75.0	Presidential	Atliq Blu	Luxury	
9194	30.0	NaN	Standard	Atliq Exotica	Luxury	
9195	30.0	NaN	Standard	Atliq Bay	Luxury	
9196	30.0	NaN	Standard	Atliq Palace	Business	
9197	40.0	NaN	Standard	Atliq Grands	Luxury	
9198	26.0	NaN	Standard	Atliq City	Business	
9199	26.0	NaN	Standard	Atliq Blu	Luxury	
9200	16.0	NaN	Standard	Atliq Seasons	Business	

	city	date	mmm yy	week no	day_type	occ%
9191	Mumbai	2022-07-31	Jul 22	W 32	weekend	NaN
9192	Bangalore	2022-07-31	Jul 22	W 32	weekend	NaN
9193	Mumbai	2022-07-31	Jul 22	W 32	weekend	NaN
9194	Mumbai	NaT	Aug-22	W 32	weekeday	100.00
9195	Bangalore	NaT	Aug-22	W 32	weekeday	70.00
9196	Bangalore	NaT	Aug-22	W 32	weekeday	76.67
9197	Bangalore	NaT	Aug-22	W 32	weekeday	75.00
9198	Bangalore	NaT	Aug-22	W 32	weekeday	76.92
9199	Mumbai	NaT	Aug-22	W 32	weekeday	69.23
9200	Mumbai	NaT	Aug-22	W 32	weekeday	62.50

Calculates and rounds the occupancy_percentage based on successful bookings and capacity in the latest dataframe.

[102] :
```
latest_df['Occupancy_pct'] = round(latest_df['successful_bookings']*100/
 latest_df['capacity'],2)
latest_df.tail()
```

[102]:

	property_id	check_in_date	room_category	successful_bookings	capacity	\
9196	19563	01-Aug-22	RT1	23	30.0	
9197	19558	01-Aug-22	RT1	30	40.0	
9198	19560	01-Aug-22	RT1	20	26.0	
9199	17561	01-Aug-22	RT1	18	26.0	
9200	17564	01-Aug-22	RT1	10	16.0	

	Occupancy_pct	room_class	property_name	category	city	date	\
9196	76.67	Standard	Atliq Palace	Business	Bangalore	NaT	
9197	75.00	Standard	Atliq Grands	Luxury	Bangalore	NaT	
9198	76.92	Standard	Atliq City	Business	Bangalore	NaT	
9199	69.23	Standard	Atliq Blu	Luxury	Mumbai	NaT	
9200	62.50	Standard	Atliq Seasons	Business	Mumbai	NaT	

	mmm yy	week no	day_type	occ%
9196	Aug-22	W 32	weekeday	76.67
9197	Aug-22	W 32	weekeday	75.00
9198	Aug-22	W 32	weekeday	76.92
9199	Aug-22	W 32	weekeday	69.23
9200	Aug-22	W 32	weekeday	62.50

Drops the occ% column from the latest_df dataframe.

[103] :
```
latest_df.drop(columns=['occ%'], inplace=True)
latest_df.head()
```

[103] :

	property_id	check_in_date	room_category	successful_bookings	\
0	16559	2022-05-01 00:00:00	RT1	25	
1	19562	2022-05-01 00:00:00	RT1	28	
2	19563	2022-05-01 00:00:00	RT1	23	
3	16558	2022-05-01 00:00:00	RT1	18	
4	17560	2022-05-01 00:00:00	RT1	28	

	capacity	Occupancy_pct	room_class	property_name	category	city	\
0	30.0	83.33	Standard	Atliq Exotica	Luxury	Mumbai	
1	30.0	93.33	Standard	Atliq Bay	Luxury	Bangalore	
2	30.0	76.67	Standard	Atliq Palace	Business	Bangalore	
3	19.0	94.74	Standard	Atliq Grands	Luxury	Delhi	
4	40.0	70.00	Standard	Atliq City	Business	Mumbai	

	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
3	2022-05-01	May 22	W 19	weekend
4	2022-05-01	May 22	W 19	weekend

[104] :
```
latest_df.shape
```

[104]: (9201, 14)

1.0.20 6) *Print revenue realized per city.*

[105] :
```
df_bookings.head()
```

[105]:

	booking_id	property_id	booking_date	check_in_date	checkout_date	\
1	May012216558RT12	16558	30-04-22	1/5/2022	2/5/2022	
4	May012216558RT15	16558	27-04-22	1/5/2022	2/5/2022	
5	May012216558RT16	16558	1/5/2022	1/5/2022	3/5/2022	
6	May012216558RT17	16558	28-04-22	1/5/2022	6/5/2022	
7	May012216558RT18	16558	26-04-22	1/5/2022	3/5/2022	

	no_guests	room_category	booking_platform	ratings_given	booking_status	\
1	2.0	RT1	others	NaN	Cancelled	
4	4.0	RT1	direct online	5.0	Checked Out	
5	2.0	RT1	others	4.0	Checked Out	
6	2.0	RT1	others	NaN	Cancelled	
7	2.0	RT1	logtrip	NaN	No Show	

	revenue_generated	revenue_realized
1	9100	3640
4	10920	10920
5	9100	9100
6	9100	3640
7	9100	9100

[106] :
```
df_hotels.head()
```

[106]:

	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

Merges the df_bookings and df_hotels dataframes on property_id to create df_bookings_all.

[107] :
```
df_bookings_all = pd.merge(df_bookings,df_hotels, on='property_id')
df_bookings_all.head()
```

[107] :

	booking_id	property_id	booking_date	check_in_date	checkout_date	\
0	May012216558RT12	16558	30-04-22	1/5/2022	2/5/2022	
1	May012216558RT15	16558	27-04-22	1/5/2022	2/5/2022	

2	May012216558RT16	16558	1/5/2022	1/5/2022	3/5/2022
3	May012216558RT17	16558	28-04-22	1/5/2022	6/5/2022
4	May012216558RT18	16558	26-04-22	1/5/2022	3/5/2022

	no_guests	room_category	booking_platform	ratings_given	booking_status	\
0	2.0	RT1	others	NaN	Cancelled	
1	4.0	RT1	direct online	5.0	Checked Out	
2	2.0	RT1	others	4.0	Checked Out	
3	2.0	RT1	others	NaN	Cancelled	
4	2.0	RT1	logtrip	NaN	No Show	

	revenue_generated	revenue_realized	property_name	category	city
0	9100	3640	Atliq Grands	Luxury	Delhi
1	10920	10920	Atliq Grands	Luxury	Delhi
2	9100	9100	Atliq Grands	Luxury	Delhi
3	9100	3640	Atliq Grands	Luxury	Delhi
4	9100	9100	Atliq Grands	Luxury	Delhi

Calculates and sorts the total revenue_realized by city in descending order from the df_bookings_all dataset.

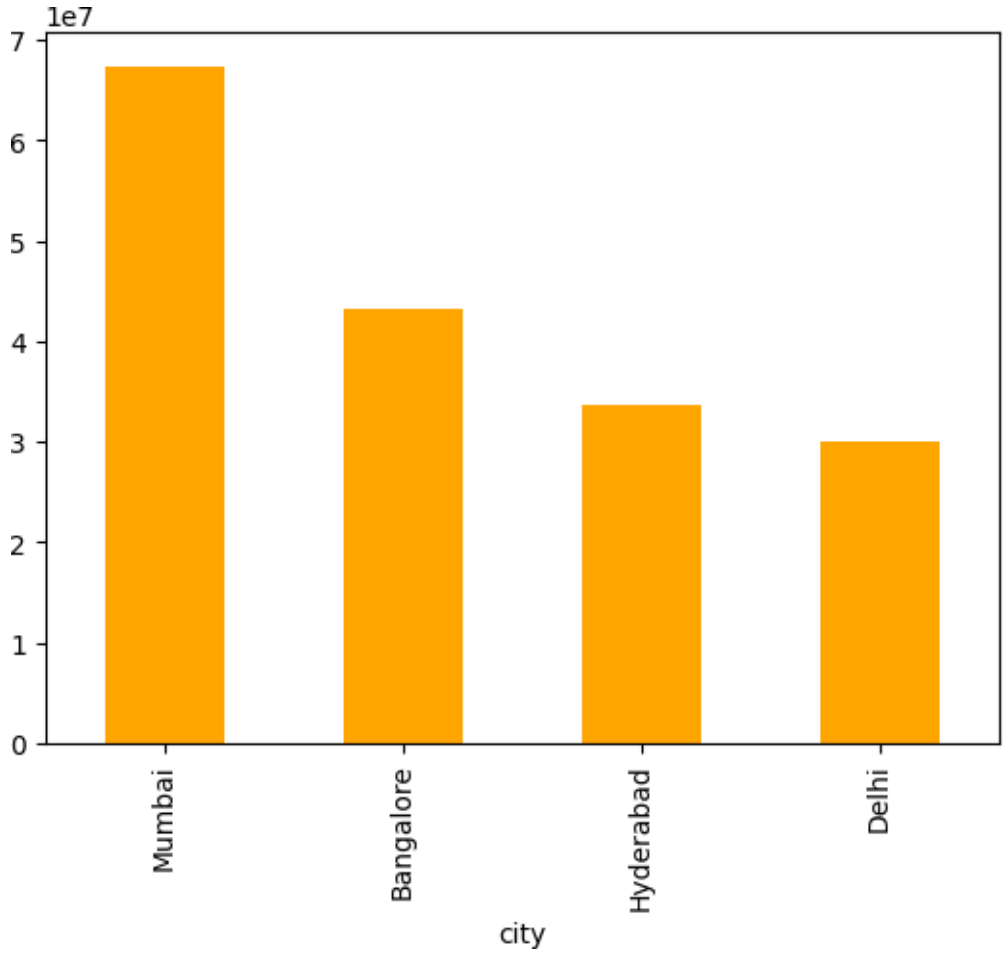
[108] :
```
df_bookings_all.groupby('city')['revenue_realized'].sum().
  sort_values(ascending=False)
```

[108]:
```
city
Mumbai       668569251
Bangalore    420383550
Hyderabad    325179310
Delhi        294404488
Name: revenue_realized, dtype: int64
```

Plots a bar chart showing the total revenue_realized by city.

[166]:
```
df_bookings_all.groupby('city')['revenue_realized'].sum().
  sort_values(ascending=False).plot(kind='bar',  color='orange')
```

[166]:
```
<Axes: xlabel='city'>
```



1.0.21 7) *Print month by month revenue.*

[114]:
```
df_date.head()
```

[114] :

	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

[115] :
```
df_date['mmm yy'].unique()
```

[115] :
```
array(['May 22', 'Jun 22', 'Jul 22'], dtype=object)
```

[116] :
```
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     datetime64[ns]
 1   mmm yy    92 non-null     object
 2   week no   92 non-null     object
 3   day_type  92 non-null     object
dtypes: datetime64[ns](1), object(3)
memory usage: 3.0+ KB
```

[117] :
```
df_bookings_all.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 134573 entries, 0 to 134572
Data columns (total 15 columns):
 #   Column              Non-Null Count   Dtype
---  ------              --------------   -----
 0   booking_id          134573 non-null  object
 1   property_id         134573 non-null  int64
 2   booking_date        134573 non-null  object
 3   check_in_date       134573 non-null  object
 4   checkout_date       134573 non-null  object
 5   no_guests           134573 non-null  float64
 6   room_category       134573 non-null  object
 7   booking_platform    134573 non-null  object
 8   ratings_given       56676 non-null   float64
 9   booking_status      134573 non-null  object
 10  revenue_generated   134573 non-null  int64
 11  revenue_realized    134573 non-null  int64
 12  property_name       134573 non-null  object
 13  category            134573 non-null  object
 14  city                134573 non-nullobject
dtypes: float64(2), int64(3), object(10)
memory usage: 15.4+ MB
```

- As we can see above, the check_in_date column's data type is an object, so we need to convert this to a datetime data type.

Converts the check_in_date column in df_bookings_all to datetime format, handling errors by coercing invalid dates.

[118] :
```
df_bookings_all["check_in_date"] = pd.
  to_datetime(df_bookings_all["check_in_date"], errors='coerce')
```

[119] :
```
df_bookings_all.info()
```

```
<class 'pandas.core.frame.DataFrame'>
```

```
RangeIndex: 134573 entries, 0 to 134572
Data columns (total 15 columns):
 #   Column              Non-Null Count   Dtype
---  ------              --------------   -----
 0   booking_id          134573 non-null  object
 1   property_id         134573 non-null  int64
 2   booking_date        134573 non-null  object
 3   check_in_date       55790 non-null   datetime64[ns]
 4   checkout_date       134573 non-null  object
 5   no_guests           134573 non-null  float64
 6   room_category       134573 non-null  object
 7   booking_platform    134573 non-null  object
 8   ratings_given       56676 non-null   float64
 9   booking_status      134573 non-null  object
 10  revenue_generated   134573 non-null  int64
 11  revenue_realized    134573 non-null  int64
 12  property_name       134573 non-null  object
 13  category            134573 non-null  object
 14  city                134573 non-null  object
dtypes: datetime64[ns](1), float64(2), int64(3), object(9)
memory usage: 15.4+ MB
```

- Now, as we can see above, the data type of the check_in_date column has been successfully converted to datetime.

Joins the bookings dataframe df_bookings_all with the date dataframe df_date using the check_in_date and date columns.

[120] :
```
df_bookings_all = pd.merge(df_bookings_all, df_date, left_on='check_in_date',
 right_on='date')
df_bookings_all.head()
```

[120] :

	booking_id	property_id	booking_date	check_in_date	checkout_date	\
0	May052216558RT11	16558	15-04-22	2022-05-05	7/5/2022	
1	May052216558RT12	16558	30-04-22	2022-05-05	7/5/2022	
2	May052216558RT13	16558	1/5/2022	2022-05-05	6/5/2022	
3	May052216558RT14	16558	3/5/2022	2022-05-05	6/5/2022	
4	May052216558RT15	16558	30-04-22	2022-05-05	10/5/2022	

	no_guests	room_category	booking_platform	ratings_given	booking_status	\
0	3.0	RT1	tripster	5.0	Checked Out	
1	2.0	RT1	others	NaN	Cancelled	
2	3.0	RT1	direct offline	5.0	Checked Out	
3	2.0	RT1	tripster	3.0	Checked Out	
4	4.0	RT1	others	4.0	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	10010	10010	Atliq	Grands	Luxury	Delhi
3	9100	9100	Atliq	Grands	Luxury	Delhi
4	10920	10920	Atliq	Grands	Luxury	Delhi

	date	mmm yy	week no	day_type
0	2022-05-05	May 22	W 19	weekeday
1	2022-05-05	May 22	W 19	weekeday
2	2022-05-05	May 22	W 19	weekeday
3	2022-05-05	May 22	W 19	weekeday
4	2022-05-05	May 22	W 19	weekeday

Calculates the aggregate revenue_realized for each month.

[121] :
```
df_bookings_all.groupby(['mmm  yy'])['revenue_realized'].sum()
```

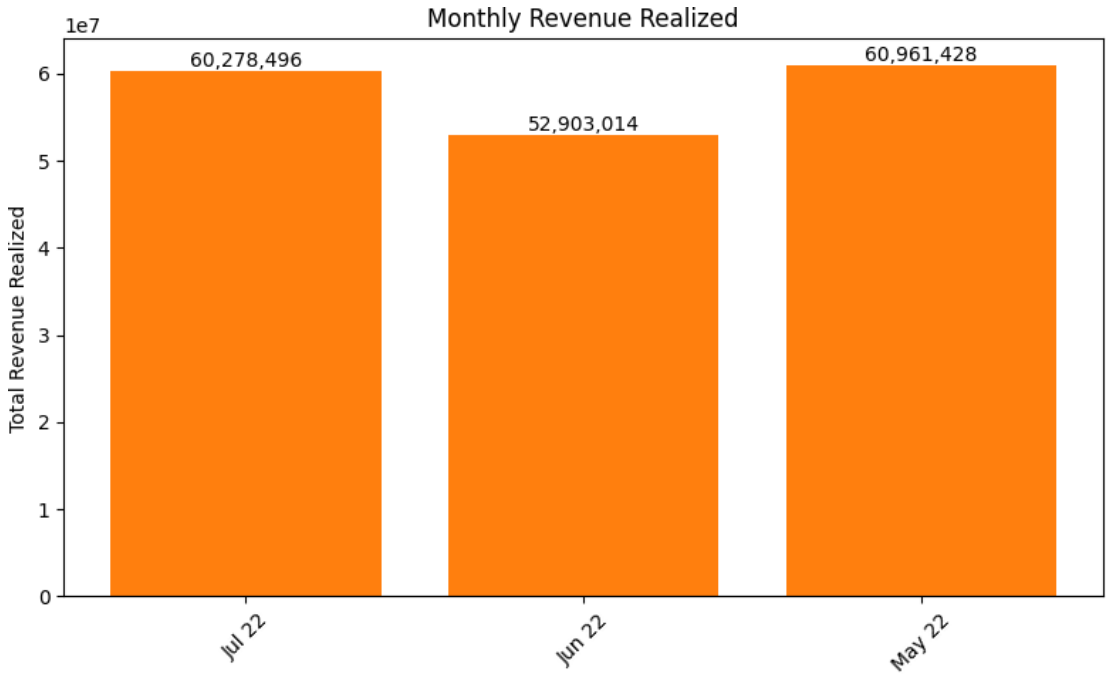
[121]:
```
mmm yy
Jul  22    60278496
Jun  22    52903014
May 22     60961428
Name: revenue_realized, dtype: int64
```

[163]:
```
# Grouping and summing revenue by month
monthly_revenue  =  df_bookings_all.groupby('mmm  yy')['revenue_realized'].sum()

# Plotting vertical bar chart
plt.figure(figsize=(8,  5))
bars = plt.bar(monthly_revenue.index, monthly_revenue.values, color='#ff7f0e')
plt.xticks(rotation=45)
plt.ylabel('Total Revenue Realized')
plt.title('Monthly Revenue Realized')

# Adding value labels on top of bars
for bar in bars:
    height = bar.get_height()
    plt.text(bar.get_x() + bar.get_width() / 2, height, f'{height:,.0f}',␣
 ↪ha='center',  va='bottom',  fontsize=10)

plt.tight_layout()
plt.show()
```



1.0.22 8) *Print revenue realized per hotel type.*

[122]:
```
df_bookings_all['property_name'].unique()
```

[122]:
```
array(['Atliq Grands', 'Atliq Exotica', 'Atliq City', 'Atliq Blu',
       'Atliq Bay', 'Atliq Palace', 'Atliq Seasons'], dtype=object)
```

Displays the total revenue_realized for each property, sorted in descending order.

[123]:
```
df_bookings_all.groupby('property_name')['revenue_realized'].sum().
  sort_values(ascending=False)
```

[123]:
```
property_name
Atliq  Exotica    32436799
Atliq  Palace     30945855
Atliq  City       29047727
Atliq  Bay        26936115
Atliq  Blu        26459751
Atliq  Grands     21644446
Atliq  Seasons     6672245
Name: revenue_realized, dtype: int64
```

Plots the total revenue_realized by property name in a bar chart.

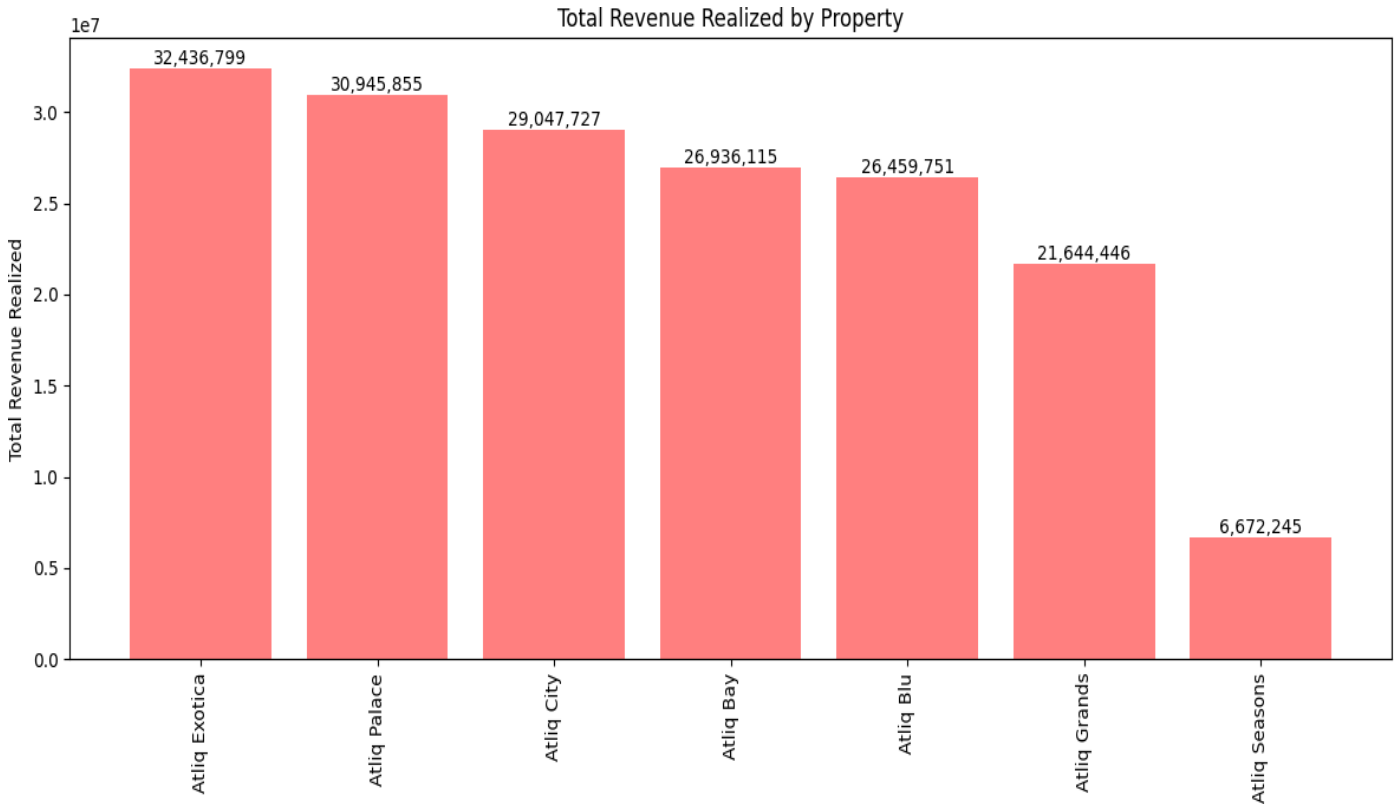
[164]:
```
import matplotlib.pyplot as plt

# Grouping and summing revenue
revenue_by_property = df_bookings_all.
  groupby('property_name')['revenue_realized'].sum().
  sort_values(ascending=False)

# Plotting vertical bar chart
plt.figure(figsize=(12, 6))
bars = plt.bar(revenue_by_property.index, revenue_by_property.values,
  color='#FF7F7F')
plt.xticks(rotation=90)
plt.ylabel('Total Revenue Realized')
plt.title('Total Revenue Realized by Property')

# Adding value labels on top of bars
for bar in bars:
    height = bar.get_height()
    plt.text(bar.get_x() + bar.get_width() / 2, height, f'{height:,.0f}',
  ha='center', va='bottom', fontsize=10)

plt.tight_layout()
plt.show()
```



1.0.23 9) *Print average rating per city.*

[133]:
```
df_bookings_all.head()
```

[133]:

	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	date	mmm yy	week no	day_type
0	May052216558RT11	16558	15-04-22	2022-05-05	7/5/2022	3.0	RT1	tripster	5.0	Checked Out	10010	10010	Atliq Grands	Luxury	Delhi	2022-05-05	May 22	W 19	weekeday
1	May052216558RT12	16558	30-04-22	2022-05-05	7/5/2022	2.0	RT1	others	NaN	Cancelled	9100	3640	Atliq Grands	Luxury	Delhi	2022-05-05	May 22	W 19	weekeday
2	May052216558RT13	16558	1/5/2022	2022-05-05	6/5/2022	3.0	RT1	direct offline	5.0	Checked Out	10010	10010	Atliq Grands	Luxury	Delhi	2022-05-05	May 22	W 19	weekeday
3	May052216558RT14	16558	3/5/2022	2022-05-05	6/5/2022	2.0	RT1	tripster	3.0	Checked Out	9100	9100	Atliq Grands	Luxury	Delhi	2022-05-05	May 22	W 19	weekeday
4	May052216558RT15	16558	30-04-22	2022-05-05	10/5/2022	4.0	RT1	others	4.0	Checked Out	10920	10920	Atliq Grands	Luxury	Delhi	2022-05-05	May 22	W 19	weekeday

Calculates the Average ratings by city, rounds to two decimal places, and ranks them from highest to lowest.

[134]:
```
df_bookings_all.groupby('city')['ratings_given'].mean().round(2).
 sort_values(ascending=False)
```

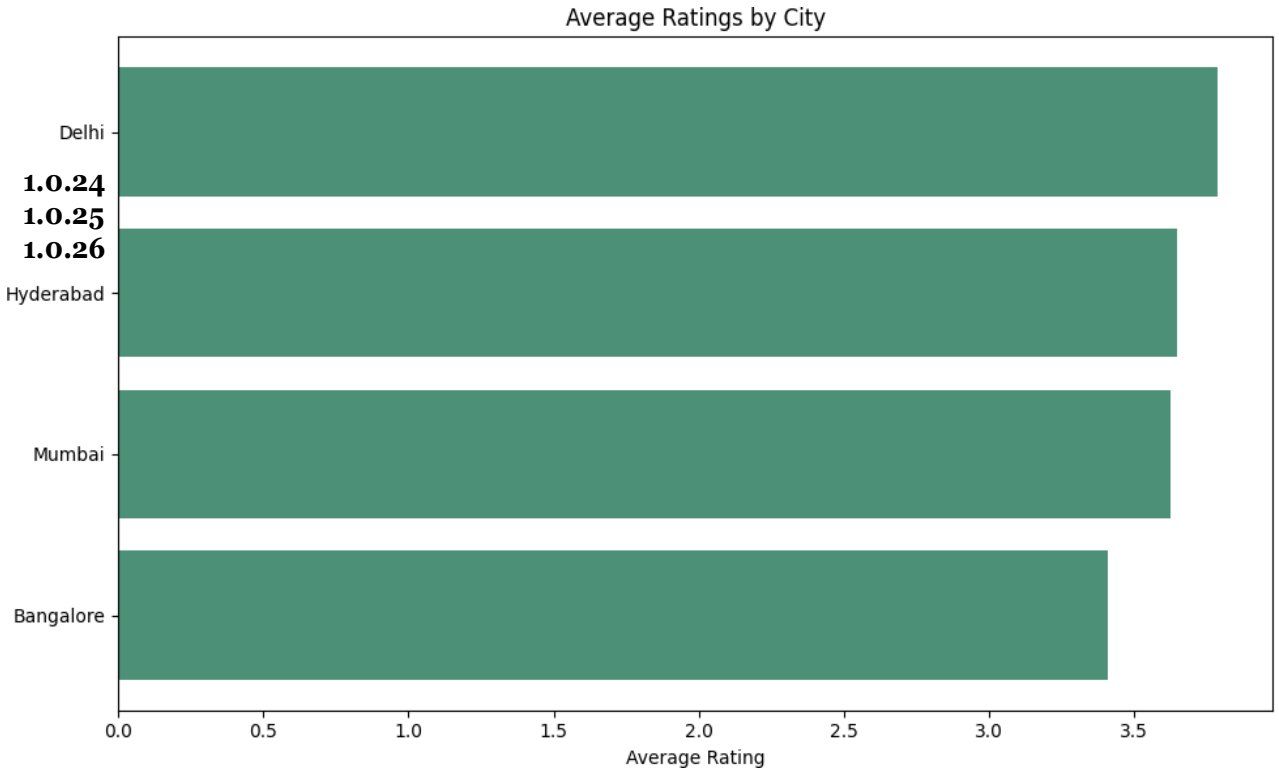
[134]:
```
city
Delhi        3.79
Hyderabad    3.65
Mumbai       3.63
Bangalore    3.41
Name: ratings_given, dtype: float64
```

Plots the Average ratings given by Cities in a horizontal bar chart.

[149]:
```
# Grouping and calculating average ratings
avg_ratings = df_bookings_all.groupby("city")["ratings_given"].mean().round(2)

# Sorting the data for better visualization
avg_ratings = avg_ratings.sort_values(ascending=True)

# Plotting horizontal bar chart
plt.figure(figsize=(10, 6))
plt.barh(avg_ratings.index, avg_ratings.values, color='#4D9078')
plt.xlabel('Average Rating')
plt.title('Average Ratings by City')
plt.tight_layout()
plt.show()
```



10) *Print a pie chart of revenue realized per booking platform.*

[137]:
```
df_bookings_all.groupby('booking_platform')['revenue_realized'].sum().
  sort_values(ascending=False)
```

[137]:
```
booking_platform
others           72310965
makeyourtrip     34034257
logtrip          18605339
direct online    17488976
tripster         11959078
```

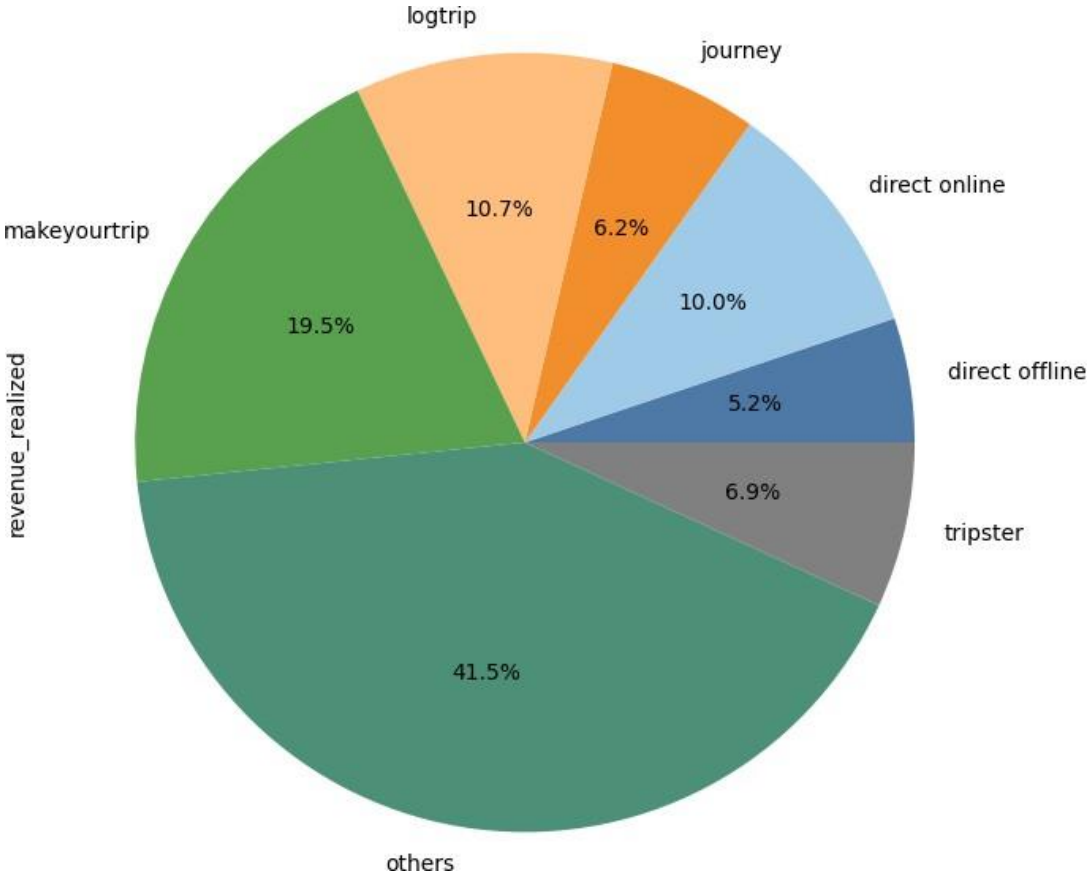
```
journey              10757858
direct  offline       8986465
Name: revenue_realized, dtype: int64
```

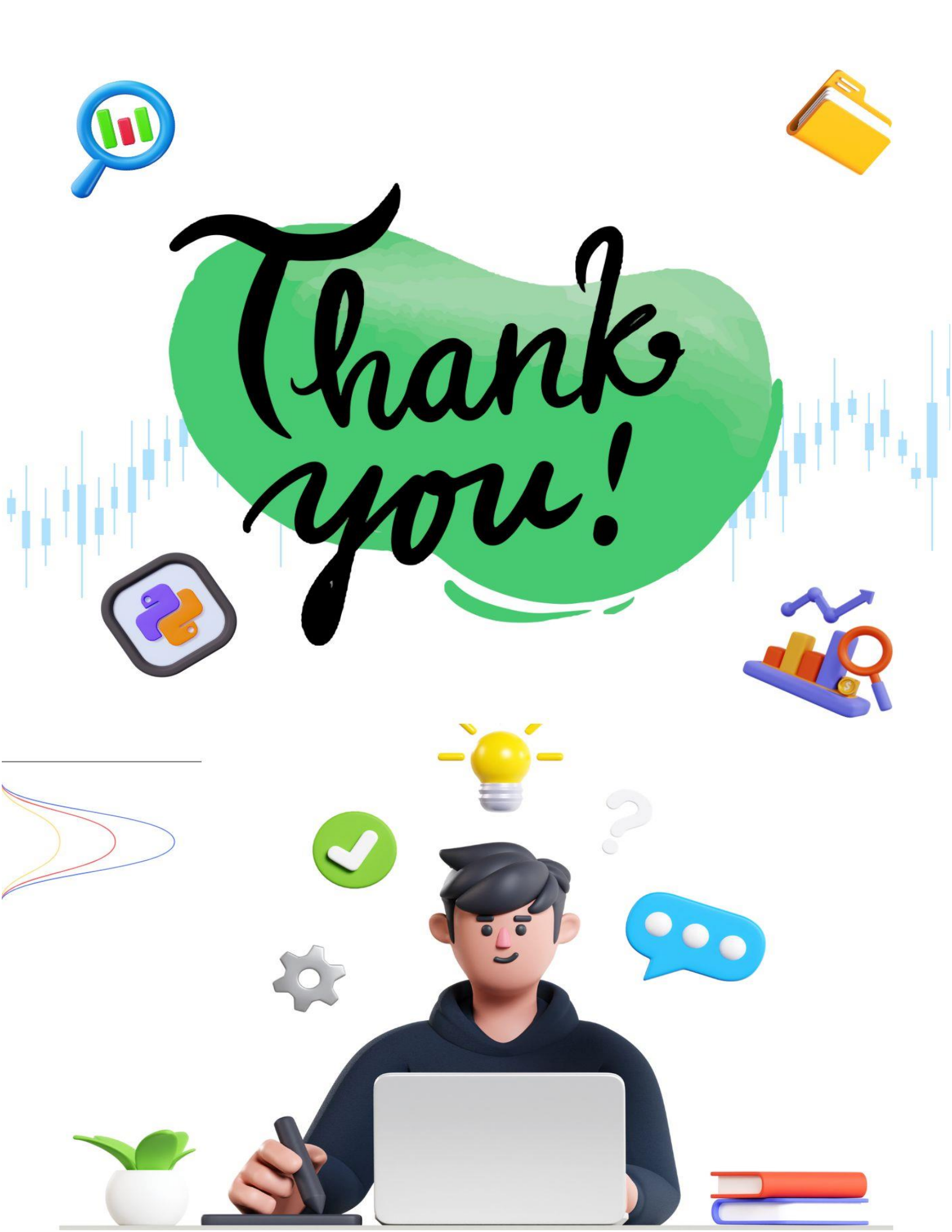
Visualizes the total revenue realized by each booking platform in a pie chart.

[143]:
```
colors = ['#4E79A7', '#A0CBE8', '#F28E2B', '#FFBE7D', '#59A14F', '#4D9078',
 '#808080']

df_bookings_all.groupby("booking_platform")["revenue_realized"].sum().plot(
    kind="pie",
    colors=colors,
    autopct='%1.1f%%',
    figsize=(8, 8)
)
```

[143]: <Axes: ylabel='revenue_realized'




Thank you!