AtliQ_Hotels_Data_Analysis

March 10, 2024

1 AtliQ Hotels Data Analysis Project

AtliQ Hotels is a luxury hotels chain in India spread across 4 cities, viz Mumbai, Delhi, Hyderabad and Banglore. They are witnessing a drop in business and hence they have made available 3 months dataset from May 2022 to July 2022 for analysis. Data for August 2022 is separately given.

The objective of this notebook is to analyse thier data and present data driven insights.

1. Data Import and Data Exploration
2. Data Cleaning
3. Data Transformation
4. Analysis Insights

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

1.1 1. Data Import and Data Exploration

1.1.1 Datasets

We have 6 csv files - dim_date.csv - dim_hotels.csv - dim_rooms.csv - fact_aggregated_bookings.csv - fact_bookings.csv - new_data_august.csv

1.1.2 1.1 Importing all datasets

[ ]:
```
df_date = pd.read_csv("dim_date.csv")
df_hotels = pd.read_csv("dim_hotels.csv")
df_rooms = pd.read_csv("dim_rooms.csv")
df_agg_bookings = pd.read_csv("fact_aggregated_bookings.csv")
df_bookings = pd.read_csv("fact_bookings.csv")
df_august = pd.read_csv("new_data_august.csv")
```

1.1.3 1.2 Explore `dim_date` table

[ ]:
```
# DataFrame
df_date
```

[ ]:
```
          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 x 4 columns]
```

[ ]:
```
# info
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
```

- Format of the `date` column is `object`. Needs to be converted to `datetime`
- There are no null values

[ ]:
```
df_date.date = pd.to_datetime(df_date.date)
df_date.dtypes
```

[ ]:
```
date        datetime64[ns]
mmm yy              object
week no             object
day_type            object
dtype: object
```

[ ]:
```
# date range
df_date.date.max(), df_date.date.min()
```

[ ]:
```
(Timestamp('2022-07-31 00:00:00'), Timestamp('2022-05-01 00:00:00'))
```

- Date in this table ranges from `May 2022` to `July 2022`

[ ]:
```
# monthwise value counts
df_date["mmm yy"].value_counts()
```

[ ]:
```
May 22    31
Jul 22    31
Jun 22    30
Name: mmm yy, dtype: int64
```

1.1.4 1.3 Explore `dim_hotels` table

[ ]:
```
# head
df_hotels
```

[ ]:

	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
5	16563	Atliq Palace	Business	Delhi
6	17558	Atliq Grands	Luxury	Mumbai
7	17559	Atliq Exotica	Luxury	Mumbai
8	17560	Atliq City	Business	Mumbai
9	17561	Atliq Blu	Luxury	Mumbai
10	17562	Atliq Bay	Luxury	Mumbai
11	17563	Atliq Palace	Business	Mumbai
12	18558	Atliq Grands	Luxury	Hyderabad
13	18559	Atliq Exotica	Luxury	Hyderabad
14	18560	Atliq City	Business	Hyderabad
15	18561	Atliq Blu	Luxury	Hyderabad
16	18562	Atliq Bay	Luxury	Hyderabad
17	18563	Atliq Palace	Business	Hyderabad
18	19558	Atliq Grands	Luxury	Bangalore
19	19559	Atliq Exotica	Luxury	Bangalore
20	19560	Atliq City	Business	Bangalore
21	19561	Atliq Blu	Luxury	Bangalore
22	19562	Atliq Bay	Luxury	Bangalore
23	19563	Atliq Palace	Business	Bangalore
24	17564	Atliq Seasons	Business	Mumbai

[ ]:
```
# duplicate rows
df_hotels.duplicated().sum()
```

[ ]:
```
0
```

[ ]:
```
# no of unique properties/names/category/city
print("Unique counts related to 'dim_hotels' table")
for column in df_hotels.columns:
  print(f"{column} --> {df_hotels[column].nunique()}")
```

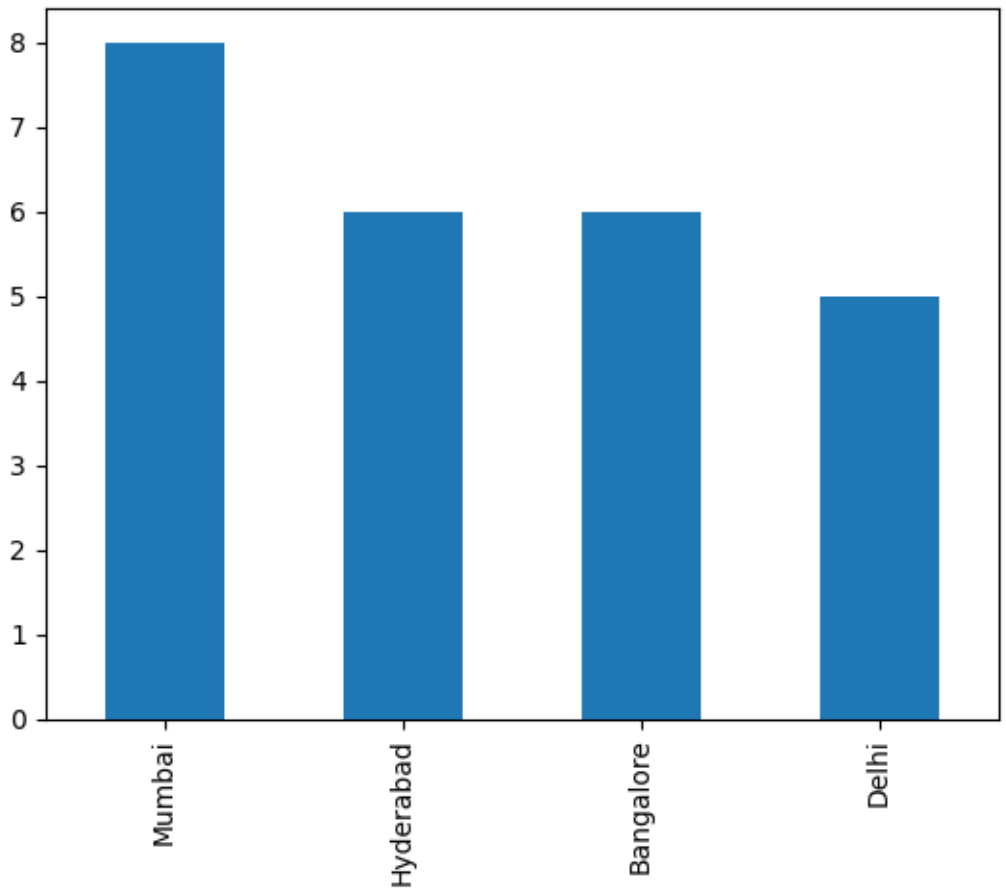
```
Unique counts related to 'dim_hotels' table
property_id --> 25
property_name --> 7
category --> 2
city --> 4
```

[ ]:
```
# citywise no of properties
df_hotels.city.value_counts()
```

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

[ ]:
```
df_hotels.city.value_counts().plot(kind="bar")
```

[ ]:
```
<Axes: >
```



[ ]:
```
# category wise count
df_hotels.category.value_counts()
```

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

- No duplicates rows
- AtliQ Hotes has **25 properties** spread across **4 cities** viz. Mumbai, Hyderabad, Banglore & Delhi
- There are **16 Luxury and 9 Business** properties.

1.1.5 1.4 Explore `dim_rooms` table

[ ]:
```
df_rooms
```

[ ]:
```
  room_id    room_class
0     RT1      Standard
1     RT2         Elite
```

```
2     RT3       Premium
3     RT4  Presidential
```

- There are 4 types of rooms in AtliQ Hotels

1.1.6 1.5 Explore `fact_aggregated_bookings` data

[ ]:
```
df_agg_bookings
```

[ ]:
```
      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 x 5 columns]
```

[ ]:
```
df_agg_bookings[df_agg_bookings.check_in_date == "1-May-22"]
```

[ ]:
```
    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
..          …          …              …                     …       …
95        18563      1-May-22           RT4                   13      18.0
96        16563      1-May-22           RT4                   17      18.0
97        16559      1-May-22           RT4                   17      18.0
98        17561      1-May-22           RT4                    3       4.0
99        16558      1-May-22           RT4                    3       3.0

[100 rows x 5 columns]
```

[ ]:
```
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 `capacity` column we have 2 `null` values

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

[ ]:
```
        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
```

Q 1. Find out unique property ids in aggregate bookings dataset

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

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

Q 2. Find out total bookings per property_id

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

[ ]:
```
property_id
16558    3153
16559    7338
16560    4693
16561    4418
16562    4820
16563    7211
17558    5053
17559    6142
17560    6013
17561    5183
17562    3424
17563    6337
17564    3982
```

```
18558    4475
18559    5256
18560    6638
18561    6458
18562    7333
18563    4737
19558    4400
19559    4729
19560    6079
19561    5736
19562    5812
19563    5413
Name: successful_bookings, dtype: int64
```

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

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

[ ]:
```
3        1-May-22
12       1-May-22
4136    11-Jun-22
6209     2-Jul-22
8522    25-Jul-22
9194    31-Jul-22
Name: check_in_date, dtype: object
```

Q 4. Find out properties that have highest capacity

[258]:
```
df_agg_bookings[df_agg_bookings.capacity == df_agg_bookings.capacity.max()].
↪groupby("property_id")["capacity"].max()
```

[258]:
```
property_id
17558    50.0
Name: capacity, dtype: float64
```

1.1.7 1.6 Explore `fact_bookings` data

[ ]:
```
df_bookings
```

[ ]:
```
                booking_id  property_id booking_date check_in_date  \
0        May012216558RT11        16558     27-04-22      1/5/2022
1        May012216558RT12        16558     30-04-22      1/5/2022
2        May012216558RT13        16558     28-04-22      1/5/2022
3        May012216558RT14        16558     28-04-22      1/5/2022
4        May012216558RT15        16558     27-04-22      1/5/2022
…                     …           …           …            …
```

```
134585   Jul312217564RT46        17564     29-07-22      31-07-22
134586   Jul312217564RT47        17564     30-07-22      31-07-22
134587   Jul312217564RT48        17564     30-07-22      31-07-22
134588   Jul312217564RT49        17564     29-07-22      31-07-22
134589  Jul312217564RT410        17564     31-07-22      31-07-22

       checkout_date  no_guests room_category booking_platform  ratings_given  \
0           2/5/2022       -3.0           RT1    direct online            1.0
1           2/5/2022        2.0           RT1           others            NaN
2           4/5/2022        2.0           RT1          logtrip            5.0
3           2/5/2022       -2.0           RT1           others            NaN
4           2/5/2022        4.0           RT1    direct online            5.0
…              …          …             …              …            …
134585      3/8/2022        1.0           RT4     makeyourtrip            2.0
134586      1/8/2022       -4.0           RT4          logtrip            2.0
134587      2/8/2022        1.0           RT4         tripster            NaN
134588      1/8/2022        2.0           RT4          logtrip            2.0
134589      1/8/2022        2.0           RT4     makeyourtrip            NaN

       booking_status  revenue_generated  revenue_realized
0         Checked Out              10010             10010
1           Cancelled               9100              3640
2         Checked Out            9100000              9100
3           Cancelled               9100              3640
4         Checked Out              10920             10920
…              …                 …                 …
134585    Checked Out              32300             32300
134586    Checked Out              38760             38760
134587      Cancelled              32300             12920
134588    Checked Out              32300             32300
134589      Cancelled              32300             12920

[134590 rows x 12 columns]
```

[ ]:
```
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
```

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

[ ]:
```
0
```

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

[ ]:
```
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
```

- No duplicate records
- 1,34,590 unique booking entries
- Two columns `no_guests` and `ratings_given` have 3 & 77907 `nan` values respectively
- Dates in the dataframe are in wrong format
- `room_category` in this df is `room_id` in `df_rooms`
- Some `no_guests` values are negative

[ ]:
```
# Unique booking platforms
df_bookings.booking_platform.unique(), df_bookings.booking_platform.nunique()
```

[ ]:
```
(array(['direct online', 'others', 'logtrip', 'tripster', 'makeyourtrip',
        'journey', 'direct offline'], dtype=object),
 7)
```

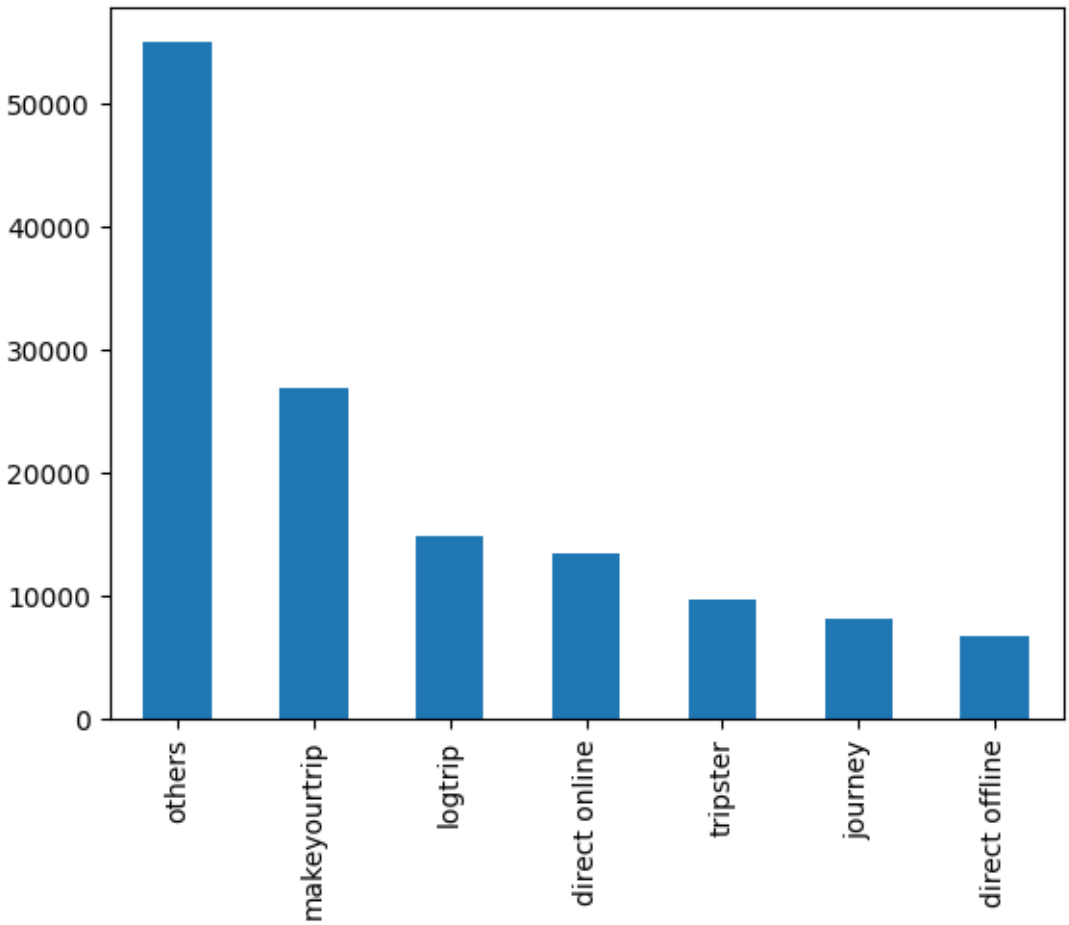
[ ]:
```
# Value counts per booking platforms
df_bookings.booking_platform.value_counts()
```

[ ]:
```
others            55066
makeyourtrip      26898
```

```
logtrip           14756
direct online     13379
tripster           9630
journey            8106
direct offline     6755
Name: booking_platform, dtype: int64
```

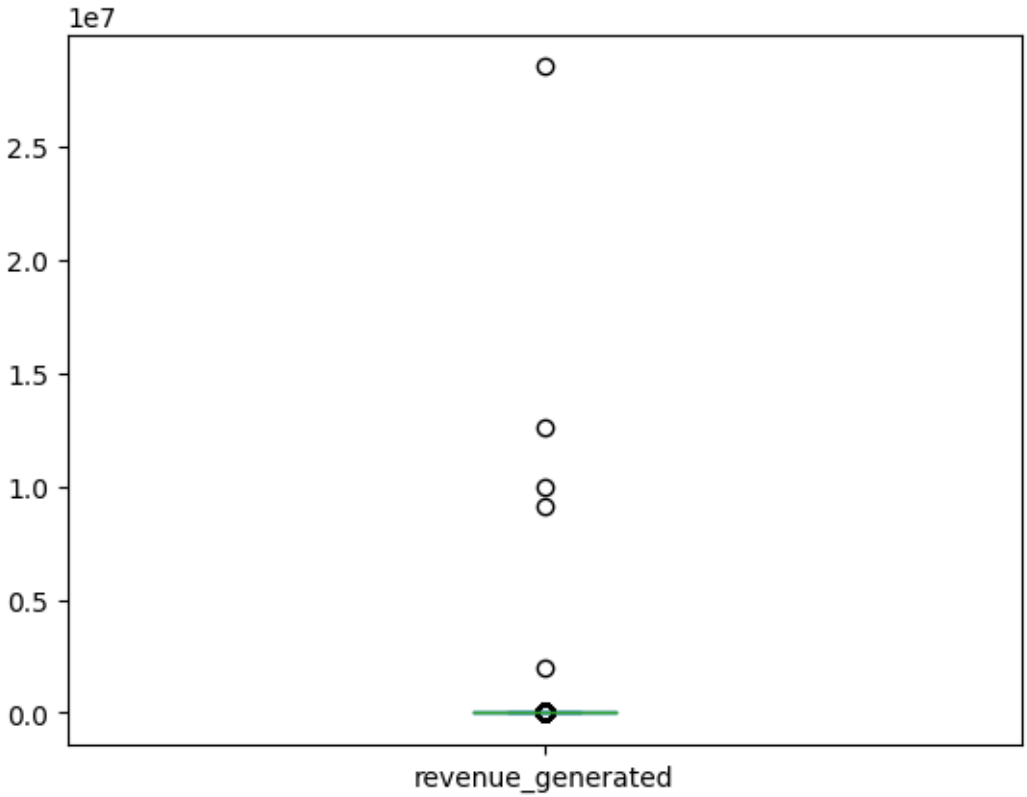
[ ]:
```
df_bookings.booking_platform.value_counts().plot(kind="bar")
```

[ ]:
```
<Axes: >
```



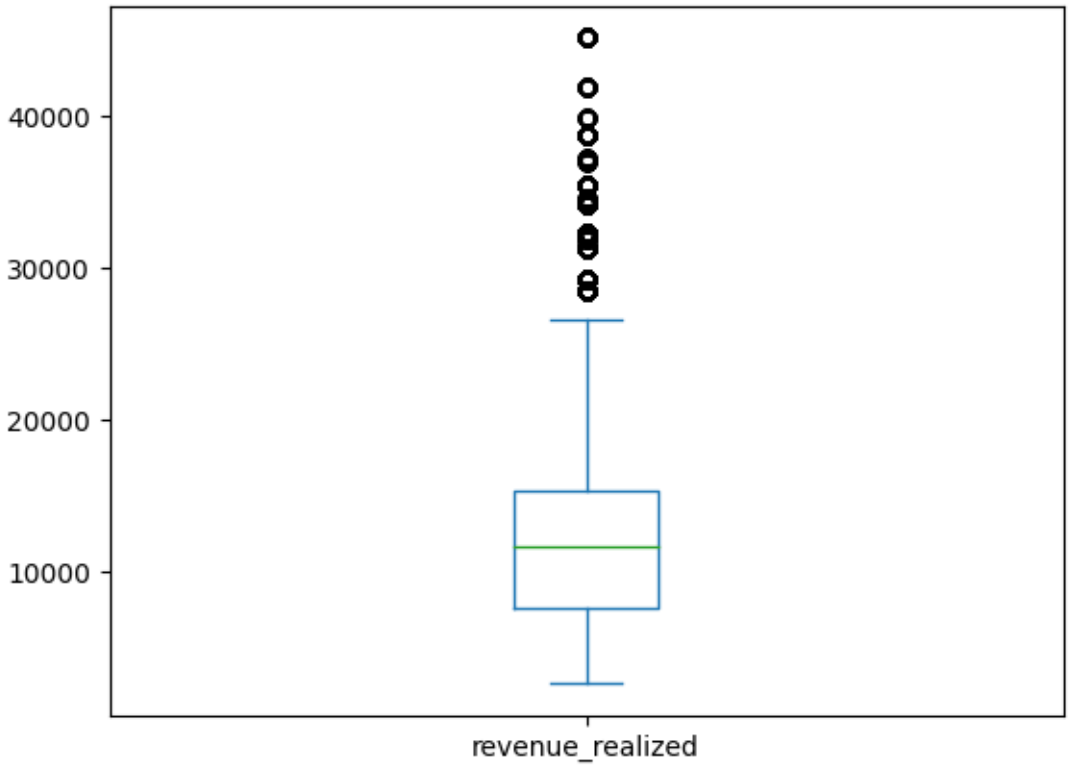
[ ]:
```
# Check outliers
df_bookings.revenue_generated.plot(kind='box')
```

[ ]:
```
<Axes: >
```



[ ]:
```
df_bookings.revenue_realized.plot(kind='box')
```

[ ]: <Axes: >



- From Boxplots we can see outliers are there in `revenue_generated` and `revenue_realized` columns.

1.2 2. Data Cleaning

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

[ ]:
```
         property_id      no_guests  ratings_given  revenue_generated  \
count  134590.000000  134587.000000   56683.000000       1.345900e+05
mean    18061.113493       2.036170       3.619004       1.537805e+04
std      1093.055847       1.034885       1.235009       9.303604e+04
min     16558.000000     -17.000000       1.000000       6.500000e+03
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

       revenue_realized
count     134590.000000
```

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

1.2.1 2.1 Clean invalid no_guests

[ ]:
```
df_invalid_guest = df_bookings[(df_bookings.no_guests <= 0) | (df_bookings.
↪no_guests.isnull())]
df_invalid_guest
```

[ ]:

	booking_id	property_id	booking_date	check_in_date	\
0	May012216558RT11	16558	27-04-22	1/5/2022	
3	May012216558RT14	16558	28-04-22	1/5/2022	
30	May012216558RT213	16558	29-04-22	1/5/2022	
43	May012216558RT35	16558	29-04-22	1/5/2022	
46	May012216558RT38	16558	27-04-22	1/5/2022	
17924	May122218559RT44	18559	12/5/2022	12/5/2022	
18020	May122218561RT22	18561	8/5/2022	12/5/2022	
18119	May122218562RT311	18562	5/5/2022	12/5/2022	
18121	May122218562RT313	18562	10/5/2022	12/5/2022	
56715	Jun082218562RT12	18562	5/6/2022	8/6/2022	
119765	Jul202219560RT220	19560	19-07-22	20-07-22	
134586	Jul312217564RT47	17564	30-07-22	31-07-22	

	checkout_date	no_guests	room_category	booking_platform	ratings_given	\
0	2/5/2022	-3.0	RT1	direct online	1.0	
3	2/5/2022	-2.0	RT1	others	NaN	
30	2/5/2022	NaN	RT2	logtrip	4.0	
43	4/5/2022	NaN	RT3	others	NaN	
46	3/5/2022	NaN	RT3	makeyourtrip	NaN	
17924	14-05-22	-10.0	RT4	direct online	NaN	
18020	14-05-22	-12.0	RT2	makeyourtrip	NaN	
18119	17-05-22	-6.0	RT3	direct offline	5.0	
18121	17-05-22	-4.0	RT3	direct online	NaN	
56715	13-06-22	-17.0	RT1	others	NaN	
119765	22-07-22	-1.0	RT2	others	NaN	
134586	1/8/2022	-4.0	RT4	logtrip	2.0	

	booking_status	revenue_generated	revenue_realized
0	Checked Out	10010	10010
3	Cancelled	9100	3640
30	Checked Out	12600	12600
43	Checked Out	18480	18480

```
46        Checked Out              16800             16800
17924         No Show              20900             20900
18020       Cancelled               9000              3600
18119     Checked Out              16800             16800
18121       Cancelled              14400              5760
56715     Checked Out               6500              6500
119765    Checked Out              13500             13500
134586    Checked Out              38760             38760
```

- Above rows represent data errors.
- Since invalid guest data is less that 0.5 % of the total data, we can ignore them for insights generation.

[ ]:
```
df_bookings = df_bookings[(df_bookings.no_guests > 0) & ~(df_bookings.no_guests.
↪isnull())]
df_bookings.shape
```

[ ]:
```
(134578, 12)
```

1.2.2 2.2 Outlier removal in revenue_generated

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

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

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

[ ]:
```
(15378.036937686695, 13500.0)
```

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

[ ]:
```
(15378.036937686695, 93040.1549314641)
```

[ ]:
```
higher_limit = avg + 3*std
lower_limit = avg - 3*std
higher_limit, lower_limit
```

[ ]:
```
(294498.50173207896, -263742.4278567056)
```

[ ]:
```
# we have no negative value in rev_generated column
df_bookings[df_bookings.revenue_generated > higher_limit]
```

[ ]:
```
              booking_id  property_id booking_date check_in_date  \
2        May012216558RT13        16558     28-04-22      1/5/2022
111      May012216559RT32        16559     29-04-22      1/5/2022
```

```
315      May012216562RT22        16562     28-04-22      1/5/2022
562     May012217559RT118        17559     26-04-22      1/5/2022
129176   Jul282216562RT26        16562     21-07-22      28-07-22

       checkout_date  no_guests room_category booking_platform  ratings_given  \
2          4/5/2022        2.0           RT1          logtrip            5.0
111        2/5/2022        6.0           RT3   direct online            NaN
315        4/5/2022        2.0           RT2  direct offline            3.0
562        2/5/2022        2.0           RT1          others            NaN
129176     29-07-22        2.0           RT2   direct online            3.0

       booking_status  revenue_generated  revenue_realized
2         Checked Out            9100000              9100
111       Checked Out           28560000             28560
315       Checked Out           12600000             12600
562         Cancelled            2000000              4420
129176    Checked Out           10000000             12600
```

We have 5 outliers in `revenue_generated` column and we can ignore them.

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

[ ]:
```
(134573, 12)
```

1.2.3 2.3 Outlier removal in `revenue_realized`

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

[ ]:
```
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
```

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

[ ]:
```
(33479.358661845814, -8087.391491611072)
```

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

[ ]:
```
              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]
```

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

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

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

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

[ ]:
```
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
```

[ ]:
```
RT4 = df_bookings[df_bookings.room_category == "RT4"].revenue_realized
avg, std = RT4.mean(), RT4.std()
higher_limit = avg + 3*std
higher_limit
```

[ ]:
```
50585.10567100048
```

- Here higher limit comes to be 50,585 and in our dataframe above we can see that max value for `revenue_realized` is 45,220. Hence, we can conclude that there is no outlier and we don't need to do any data cleaning on this particular column.

1.2.4 2.4 Null values in `ratings_given` column

Since, it is logical that every customer don't provide rating, our `ratings_given` column has null values.

1.2.5 2.5 Null values in `df_agg_bookings`

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

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

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

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

[ ]:

	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

[ ]:
```
# Let's find out capacity for property_id 17561 with room_type RT1
df_17561_RT1 = df_agg_bookings[(df_agg_bookings.property_id == 17561) &␣
 ↪(df_agg_bookings.room_category == "RT1")]
df_17561_RT1.capacity.unique(), df_17561_RT1.capacity.mode()
```

[ ]:
```
(array([nan, 26.]),
 0    26.0
 Name: capacity, dtype: float64)
```

[ ]:
```
# Let's find out capacity for property_id 17562 with room_type RT1
df_17562_RT1 = df_agg_bookings[(df_agg_bookings.property_id == 17562) &␣
 ↪(df_agg_bookings.room_category == "RT1")]
df_17562_RT1.capacity.unique(), df_17562_RT1.capacity.mode()
```

[ ]:
```
(array([nan, 20.]),
 0    20.0
 Name: capacity, dtype: float64)
```

Here, we have found that - for property_id 17561 and room_type RT1 capacity is **26** - for property_id 17562 and room_type RT1 capacity is **20**

Let's replace missing values with actual capacity values.

[ ]:
```
def fill_capacity(row):
  if (row.property_id == 17561) & (row.room_category == "RT1"):
    return df_17561_RT1.capacity.median()
  if (row.property_id == 17562) & (row.room_category == "RT1"):
    return df_17562_RT1.capacity.median()
```

[ ]:
```
df_agg_bookings = df_agg_bookings.apply(lambda row: row.
 ↪fillna(fill_capacity(row)) if row.isnull().sum() == 1 else row, axis=1)
df_agg_bookings.isnull().sum()
```

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

1.2.6 2.6 successful_bookings > capacity in df_agg_bookings

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

[ ]:
```
df_agg_bookings.columns
```

[ ]:
```
Index(['property_id', 'check_in_date', 'room_category', 'successful_bookings',
       'capacity'],
      dtype='object')
```

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

[ ]:

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

- We have 6 records in `df_agg_bookings` where `successful_bookings` are greater than actual `capacity`, which show presence of data errors. It's better to filter out those rows from the dataframe for further analysis.

[ ]:
```
df_agg_bookings = df_agg_bookings[df_agg_bookings.successful_bookings <=␣
↪df_agg_bookings.capacity]
```

1.3 3. Data Transformation

1.3.1 3.1 Create occupancy percentage column

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

[ ]:

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

[ ]:
```
df_agg_bookings["occ_pct"] = round(df_agg_bookings.successful_bookings*100/
↪df_agg_bookings.capacity,2)
df_agg_bookings.head()
```

[ ]:

	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

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

1.3.2 3.2 cast dates to datetime format

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

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

   occ_pct
0    83.33
1    93.33
2    76.67
```

[ ]:
```
df_agg_bookings.dtypes
```

[ ]:
```
property_id              int64
check_in_date           object
room_category           object
successful_bookings      int64
capacity               float64
occ_pct                float64
dtype: object
```

[ ]:
```
df_agg_bookings.check_in_date = pd.to_datetime(df_agg_bookings.check_in_date)
```

1.4 4. Analysis Insights

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

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

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

   occ_pct
0    83.33
1    93.33
2    76.67
```

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

[ ]:
```
room_category
RT1    57.893397
RT2    58.009756
RT3    58.028213
RT4    59.277925
Name: occ_pct, dtype: float64
```

[ ]:
```
df_rooms
```

[ ]:
```
  room_id    room_class
0     RT1      Standard
1     RT2         Elite
2     RT3       Premium
3     RT4  Presidential
```

[ ]:
```
pd.merge(df_rooms, df_agg_bookings.groupby("room_category")["occ_pct"].mean(),␣
↪left_on="room_id", right_on="room_category").sort_values("occ_pct")
```

[ ]:
```
  room_id    room_class    occ_pct
0     RT1      Standard  57.893397
1     RT2         Elite  58.009756
2     RT3       Premium  58.028213
3     RT4  Presidential  59.277925
```

Print average occupancy rate per city

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

[ ]:
```
   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
```

[ ]:
```
df_agg_bookings_city = pd.merge(df_agg_bookings, df_hotels[["property_id",␣
↪"city"]], on='property_id', how="left")
df_agg_bookings_city.groupby("city")["occ_pct"].mean()
```

[ ]:
```
city
Bangalore    56.332376
Delhi        61.507341
Hyderabad    58.120652
Mumbai       57.912110
Name: occ_pct, dtype: float64
```

When was the occupancy better? Weekday or Weekend?

[ ]:
```
df_date.head(2)
```

[ ]:
```
        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
```

[ ]:
```
df_agg_bookings.head(2)
```

[ ]:
```
   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

   occ_pct
0    83.33
1    93.33
```

[ ]:
```
df_day_type = pd.merge(df_agg_bookings, df_date, left_on="check_in_date",␣
↪right_on="date", how="left")
df_day_type.groupby("day_type")["occ_pct"].mean().round(2)
```

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

In the month of June, what is the occupancy for different cities?

[ ]:
```
df_agg_bookings_city.check_in_date.dt.month
```

[ ]:
```
0       5
1       5
2       5
3       5
4       5
       ..
```

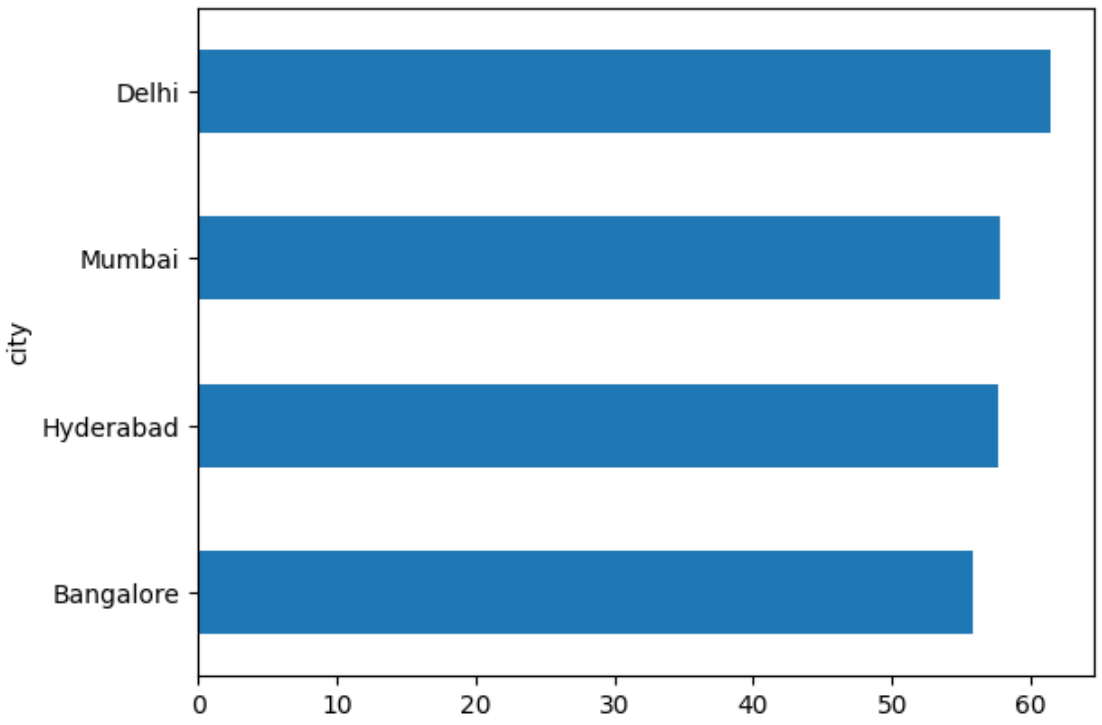
```
9189    7
9190    7
9191    7
9192    7
9193    7
Name: check_in_date, Length: 9194, dtype: int64
```

[ ]:
```
df_agg_bookings_city[df_agg_bookings_city.check_in_date.dt.month == 6].
↪groupby("city")["occ_pct"].mean().round(2)
```

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

[ ]:
```
x = df_agg_bookings_city[df_agg_bookings_city.check_in_date.dt.month == 6].
↪groupby("city")["occ_pct"].mean().round(2)
x.sort_values().plot(kind="barh")
```

[ ]:
```
<Axes: ylabel='city'>
```



We got new data for the month of August. Append that to existing data.

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

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

  check_in_date  mmm yy week no  day_type  successful_bookings  capacity  \
0     01-Aug-22  Aug-22    W 32  weekeday                    30        30
1     01-Aug-22  Aug-22    W 32  weekeday                    21        30
2     01-Aug-22  Aug-22    W 32  weekeday                    23        30

     occ%
0  100.00
1   70.00
2   76.67
```

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

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

[ ]:
```
print(df_agg_bookings.columns)
print(df_hotels.columns)
print(df_date.columns)
```

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

[ ]:
```
# Create a dataframe having columns from agg_df, hotels_df, date_df
df = pd.merge(df_agg_bookings, df_hotels, on="property_id", how="left")
df = pd.merge(df, df_date, left_on="check_in_date", right_on="date").
 ↪drop(columns=["date"])

# Transformations on df_august
df_august.rename(columns={"occ%": "occ_pct"}, inplace=True)
df_august.check_in_date = pd.to_datetime(df_august.check_in_date)
df_august.drop(columns=["room_class"], inplace=True)

# Print shapes of both dataframes
df.shape, df_august.shape
```

[ ]:
```
((9194, 12), (7, 12))
```

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

[ ]:

	property_id	check_in_date	room_category	successful_bookings	capacity	occ_pct	property_name	category	city	mmm yy	week no	day_type
9191	17558	2022-07-31	RT4	3	6.0	50.00	Atliq Grands	Luxury	Mumbai	Jul 22	W 32	weekend
9192	19563	2022-07-31	RT4	3	6.0	50.00	Atliq Palace	Business	Bangalore	Jul 22	W 32	weekend
9193	17561	2022-07-31	RT4	3	4.0	75.00	Atliq Blu	Luxury	Mumbai	Jul 22	W 32	weekend
9194	16559	2022-08-01	RT1	30	30.0	100.00	Atliq Exotica	Luxury	Mumbai	Aug-22	W 32	weekeday
9195	19562	2022-08-01	RT1	21	30.0	70.00	Atliq Bay	Luxury	Bangalore	Aug-22	W 32	weekeday
9196	19563	2022-08-01	RT1	23	30.0	76.67	Atliq Palace	Business	Bangalore	Aug-22	W 32	weekeday
9197	19558	2022-08-01	RT1	30	40.0	75.00	Atliq Grands	Luxury	Bangalore	Aug-22	W 32	weekeday
9198	19560	2022-08-01	RT1	20	26.0	76.92	Atliq City	Business	Bangalore	Aug-22	W 32	weekeday
9199	17561	2022-08-01	RT1	18	26.0	69.23	Atliq Blu	Luxury	Mumbai	Aug-22	W 32	weekeday
9200	17564	2022-08-01	RT1	10	16.0	62.50	Atliq Seasons	Business	Mumbai	Aug-22	W 32	weekeday

Print revenue realized per city

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

[ ]:

	booking_id	property_id	booking_date	check_in_date	checkout_date	no_guests	room_category	booking_platform	ratings_given	booking_status	revenue_generated	revenue_realized
1	May012216558RT12	16558	30-04-22	1/5/2022	2/5/2022	2.0	RT1	others	NaN	Cancelled	9100	3640
4	May012216558RT15	16558	27-04-22	1/5/2022	2/5/2022	4.0	RT1	direct online	5.0	Checked Out	10920	10920
5	May012216558RT16	16558	1/5/2022	1/5/2022	3/5/2022	2.0	RT1	others	4.0	Checked Out	9100	9100

[ ]:
```
df_bookings_city = pd.merge(df_bookings, df_hotels, on="property_id",␣
↪how="left")
df_bookings_city.groupby("city")["revenue_realized"].sum()
```

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

Print month by month revenue

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

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 134573 entries, 1 to 134589
Data columns (total 12 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
dtypes: float64(2), int64(3), object(7)
memory usage: 13.3+ MB
```

[ ]:
```
df_bookings.check_in_date = pd.to_datetime(df_bookings.check_in_date)
df_bookings.dtypes
```

[ ]:
```
booking_id                  object
property_id                  int64
booking_date                object
check_in_date       datetime64[ns]
checkout_date               object
no_guests                  float64
room_category               object
booking_platform            object
ratings_given              float64
```

```
booking_status                object
revenue_generated              int64
revenue_realized               int64
dtype: object
```

[ ]:
```
df_bookings_date = pd.merge(df_bookings, df_date, left_on="check_in_date",␣
↪right_on="date", how="left")
df_bookings_date.groupby("mmm yy")["revenue_realized"].sum()
```

[ ]:
```
mmm yy
Jul 22    389940912
Jun 22    377191229
May 22    408375641
Name: revenue_realized, dtype: int64
```

Print revenue realized per hotel type

[248]:
```
df_bookings_hotels = pd.merge(df_bookings, df_hotels, on="property_id",␣
↪how="left")
df_bookings_hotels.groupby("category")["revenue_realized"].sum()
```

[248]:
```
category
Business     655967037
Luxury      1052569562
Name: revenue_realized, dtype: int64
```

Print average rating per city

[249]:
```
df_bookings_city.ratings_given.unique()
```

[249]:
```
array([nan,  5.,  4.,  3.,  1.,  2.])
```

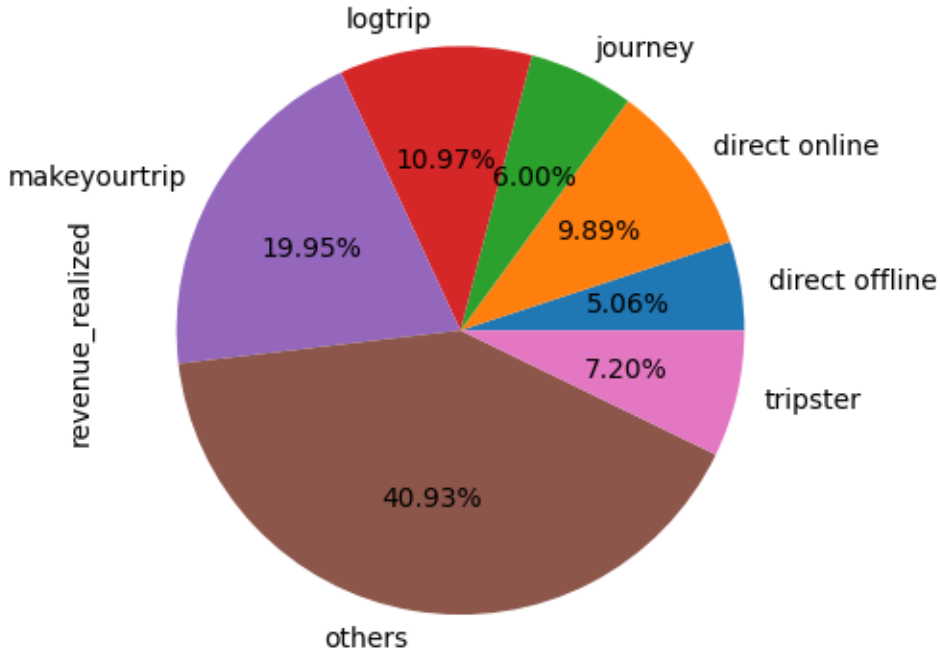
[250]:
```
df_bookings_city.groupby("city")["ratings_given"].mean()
```

[250]:
```
city
Bangalore    3.407681
Delhi        3.779298
Hyderabad    3.661041
Mumbai       3.650545
Name: ratings_given, dtype: float64
```

Print a pie chart of revenue realized per booking platform

[255]:
```
df_rev_per_platform = df_bookings.
↪groupby("booking_platform")["revenue_realized"].sum()
df_rev_per_platform.plot(kind="pie", autopct="%.2f%%")
```

[255]:
```
<Axes: ylabel='revenue_realized'>
```


logtrip
journey
direct online
direct offline
tripster
others
makeyourtrip
revenue_realized
10.97%
6.00%
9.89%
5.06%
7.20%
40.93%
19.95%