In [3]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
warnings.filterwarnings("ignore")
```

In [4]:

```
house_data = pd.read_csv("bengaluru_house_data.csv")
```

In [5]:

```
house_data.shape
```

Out[5]:

```
(13320, 9)
```

In [6]:

```
house_data.columns
```

Out[6]:

```
Index(['area_type', 'availability', 'location', 'size', 'society',
       'total_sqft', 'bath', 'balcony', 'price'],
      dtype='object')
```

In [7]:

```
house_data.head()
```

Out[7]:

| | area_type | availability | location | size | society | total_sqft | bath | balcony | pric |
|---|---|---|---|---|---|---|---|---|---|
| **0** | Super built-up Area | 19-Dec | Electronic City Phase II | 2 BHK | Coomee | 1056 | 2.0 | 1.0 | 39.0 |
| **1** | Plot Area | Ready To Move | Chikka Tirupathi | 4 Bedroom | Theanmp | 2600 | 5.0 | 3.0 | 120.0 |
| **2** | Built-up Area | Ready To Move | Uttarahalli | 3 BHK | NaN | 1440 | 2.0 | 3.0 | 62.0 |
| **3** | Super built-up Area | Ready To Move | Lingadheeranahalli | 3 BHK | Soiewre | 1521 | 3.0 | 1.0 | 95.0 |
| **4** | Super built-up Area | Ready To Move | Kothanur | 2 BHK | NaN | 1200 | 2.0 | 1.0 | 51.0 |

In [6]:

```
house_data.tail()
```

Out[6]:

| | area_type | availability | location | size | society | total_sqft | bath | balcony | pr |
|---|---|---|---|---|---|---|---|---|---|
| **13315** | Built-up Area | Ready To Move | Whitefield | 5 Bedroom | ArsiaEx | 3453 | 4.0 | 0.0 | 23 |
| **13316** | Super built-up Area | Ready To Move | Richards Town | 4 BHK | NaN | 3600 | 5.0 | NaN | 40 |
| **13317** | Built-up Area | Ready To Move | Raja Rajeshwari Nagar | 2 BHK | Mahla T | 1141 | 2.0 | 1.0 | 6 |
| **13318** | Super built-up Area | 18-Jun | Padmanabhanagar | 4 BHK | SollyCl | 4689 | 4.0 | 1.0 | 48 |
| **13319** | Super built-up Area | Ready To Move | Doddathoguru | 1 BHK | NaN | 550 | 1.0 | 1.0 | 1 |

In [8]:

```
house_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 13320 entries, 0 to 13319
Data columns (total 9 columns):
 #   Column        Non-Null Count  Dtype  
---  ------        --------------  -----  
 0   area_type     13320 non-null  object 
 1   availability  13320 non-null  object 
 2   location      13319 non-null  object 
 3   size          13304 non-null  object 
 4   society       7818 non-null   object 
 5   total_sqft    13320 non-null  object 
 6   bath          13247 non-null  float64
 7   balcony       12711 non-null  float64
 8   price         13320 non-null  float64
dtypes: float64(3), object(6)
memory usage: 936.7+ KB
```

In [9]:

```
house_data.describe()
```

Out[9]:

| | bath | balcony | price |
|---|---|---|---|
| **count** | 13247.000000 | 12711.000000 | 13320.000000 |
| **mean** | 2.692610 | 1.584376 | 112.565627 |
| **std** | 1.341458 | 0.817263 | 148.971674 |
| **min** | 1.000000 | 0.000000 | 8.000000 |
| **25%** | 2.000000 | 1.000000 | 50.000000 |
| **50%** | 2.000000 | 2.000000 | 72.000000 |
| **75%** | 3.000000 | 2.000000 | 120.000000 |
| **max** | 40.000000 | 3.000000 | 3600.000000 |

In [10]:

```
house_data.isnull().sum()
```

Out[10]:

```
area_type          0
availability       0
location           1
size              16
society         5502
total_sqft         0
bath              73
balcony          609
price              0
dtype: int64
```

In [11]:

```
house_data=house_data.drop(['area_type','availability','balcony',
                            'society'],axis=1)
```

In [12]:

```
house_data.head()
```

Out[12]:

|  | location | size | total_sqft | bath | price |
|---|---|---|---|---|---|
| **0** | Electronic City Phase II | 2 BHK | 1056 | 2.0 | 39.07 |
| **1** | Chikka Tirupathi | 4 Bedroom | 2600 | 5.0 | 120.00 |
| **2** | Uttarahalli | 3 BHK | 1440 | 2.0 | 62.00 |
| **3** | Lingadheeranahalli | 3 BHK | 1521 | 3.0 | 95.00 |
| **4** | Kothanur | 2 BHK | 1200 | 2.0 | 51.00 |

In [13]:

```
house_data.isnull().sum()
```

Out[13]:

```
location       1
size          16
total_sqft     0
bath          73
price          0
dtype: int64
```

In [14]:

```
house_data = house_data.dropna()
```

In [15]:

```
house_data.shape
```

Out[15]:

```
(13246, 5)
```

In [16]:

```
house_data['BHK']=house_data['size'].apply(lambda x: int(x.split(' ')[0]))
```

In [17]:

```
house_data.head()
```

Out[17]:

| | location | size | total_sqft | bath | price | BHK |
|---|---|---|---|---|---|---|
| **0** | Electronic City Phase II | 2 BHK | 1056 | 2.0 | 39.07 | 2 |
| **1** | Chikka Tirupathi | 4 Bedroom | 2600 | 5.0 | 120.00 | 4 |
| **2** | Uttarahalli | 3 BHK | 1440 | 2.0 | 62.00 | 3 |
| **3** | Lingadheeranahalli | 3 BHK | 1521 | 3.0 | 95.00 | 3 |
| **4** | Kothanur | 2 BHK | 1200 | 2.0 | 51.00 | 2 |

In [18]:

```
house_data['BHK'].unique()
```

Out[18]:

```
array([ 2,  4,  3,  6,  1,  8,  7,  5, 11,  9, 27, 10, 19, 16, 43, 14, 12,
       13, 18], dtype=int64)
```

In [19]:

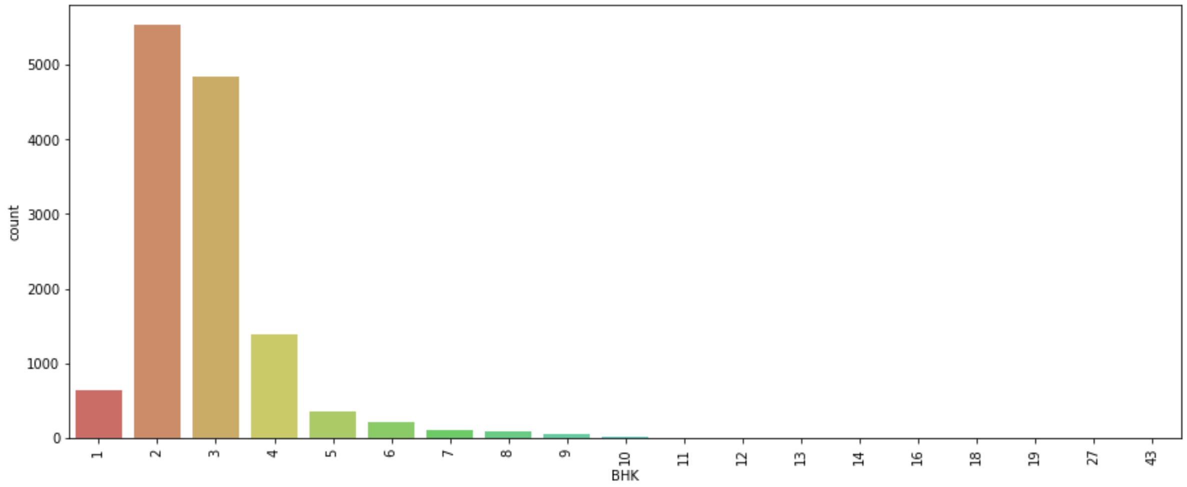
```
house_data['BHK'].value_counts()
```

Out[19]:

```
2     5527
3     4832
4     1395
1      649
5      353
6      221
7      100
8       89
9       54
10      14
11       4
27       1
19       1
16       1
43       1
14       1
12       1
13       1
18       1
Name: BHK, dtype: int64
```

In [20]:

```
plt.figure(figsize=(15,6))
sns.countplot('BHK', data = house_data, palette='hls')
plt.xticks(rotation = 90)
plt.show()
```



In [21]:

```
house_data['bath'].unique()
```

Out[21]:

```
array([ 2.,  5.,  3.,  4.,  6.,  1.,  9.,  8.,  7., 11., 10., 14., 27.,
       12., 16., 40., 15., 13., 18.])
```

In [22]:

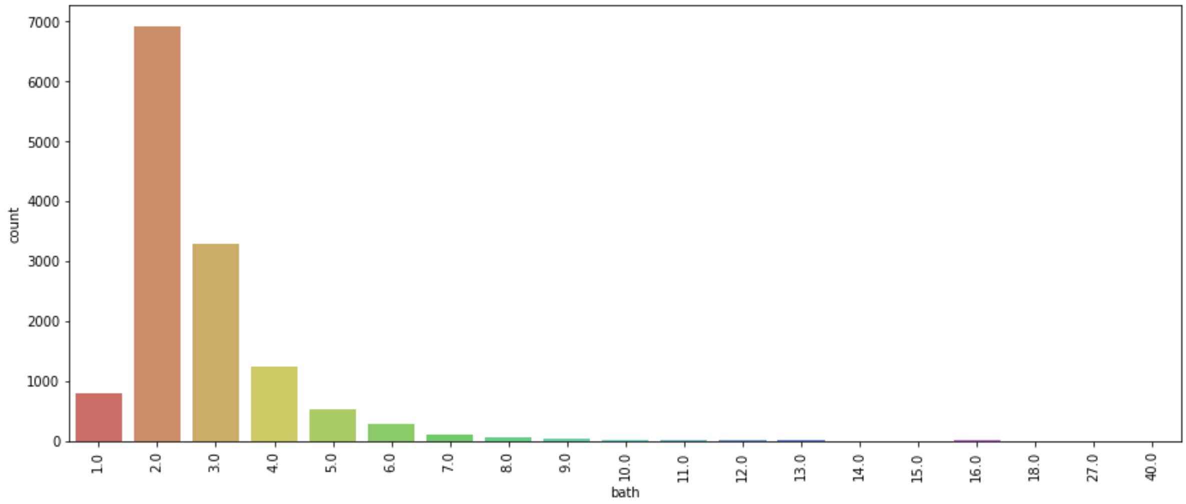
```
house_data['bath'].value_counts()
```

Out[22]:

```
2.0      6908
3.0      3285
4.0      1226
1.0       788
5.0       524
6.0       273
7.0       102
8.0        64
9.0        43
10.0       13
12.0        7
13.0        3
11.0        3
16.0        2
27.0        1
40.0        1
15.0        1
14.0        1
18.0        1
Name: bath, dtype: int64
```

In [23]:

```
plt.figure(figsize=(15,6))
sns.countplot('bath', data = house_data, palette='hls')
plt.xticks(rotation = 90)
plt.show()
```



In [24]:

```
house_data[house_data.BHK>15]
```

Out[24]:

| | location | size | total_sqft | bath | price | BHK |
|---|---|---|---|---|---|---|
| **1718** | 2Electronic City Phase II | 27 BHK | 8000 | 27.0 | 230.0 | 27 |
| **3379** | 1Hanuman Nagar | 19 BHK | 2000 | 16.0 | 490.0 | 19 |
| **3609** | Koramangala Industrial Layout | 16 BHK | 10000 | 16.0 | 550.0 | 16 |
| **4684** | Munnekollal | 43 Bedroom | 2400 | 40.0 | 660.0 | 43 |
| **11559** | 1Kasavanhalli | 18 Bedroom | 1200 | 18.0 | 200.0 | 18 |

In [25]:

```
def isfloat(x):
    try:
        float(x)
    except:
        return False
    return True
```

In [26]:

```
house_data[~house_data['total_sqft'].apply(isfloat)]
```

Out[26]:

| | location | size | total_sqft | bath | price | BHK |
|---|---|---|---|---|---|---|
| **30** | Yelahanka | 4 BHK | 2100 - 2850 | 4.0 | 186.000 | 4 |
| **122** | Hebbal | 4 BHK | 3067 - 8156 | 4.0 | 477.000 | 4 |
| **137** | 8th Phase JP Nagar | 2 BHK | 1042 - 1105 | 2.0 | 54.005 | 2 |
| **165** | Sarjapur | 2 BHK | 1145 - 1340 | 2.0 | 43.490 | 2 |
| **188** | KR Puram | 2 BHK | 1015 - 1540 | 2.0 | 56.800 | 2 |
| **...** | ... | ... | ... | ... | ... | ... |
| **12975** | Whitefield | 2 BHK | 850 - 1060 | 2.0 | 38.190 | 2 |
| **12990** | Talaghattapura | 3 BHK | 1804 - 2273 | 3.0 | 122.000 | 3 |
| **13059** | Harlur | 2 BHK | 1200 - 1470 | 2.0 | 72.760 | 2 |
| **13265** | Hoodi | 2 BHK | 1133 - 1384 | 2.0 | 59.135 | 2 |
| **13299** | Whitefield | 4 BHK | 2830 - 2882 | 5.0 | 154.500 | 4 |

190 rows × 6 columns

In [27]:

```
def convert_sqft_tonum(x):
    token=x.split('-')
    if len(token)==2:
        return (float(token[0])+float(token[1]))/2
    try:
        return float(x)
    except:
        return None
```

In [28]:

```
house_data=house_data.copy()
house_data['total_sqft']=house_data['total_sqft'].apply(convert_sqft_tonum)
```

In [29]:

```
house_data.head()
```

Out[29]:

| | location | size | total_sqft | bath | price | BHK |
|---|---|---|---|---|---|---|
| **0** | Electronic City Phase II | 2 BHK | 1056.0 | 2.0 | 39.07 | 2 |
| **1** | Chikka Tirupathi | 4 Bedroom | 2600.0 | 5.0 | 120.00 | 4 |
| **2** | Uttarahalli | 3 BHK | 1440.0 | 2.0 | 62.00 | 3 |
| **3** | Lingadheeranahalli | 3 BHK | 1521.0 | 3.0 | 95.00 | 3 |
| **4** | Kothanur | 2 BHK | 1200.0 | 2.0 | 51.00 | 2 |

In [30]:

```
house_data.loc[20]
```

Out[30]:

```
location      Kengeri
size            1 BHK
total_sqft      600.0
bath              1.0
price            15.0
BHK                 1
Name: 20, dtype: object
```

In [31]:

```
data1=house_data.copy()
data1['price_per_sqft']=data1['price']*1000000/data1['total_sqft']
data1.head()
```

Out[31]:

| | location | size | total_sqft | bath | price | BHK | price_per_sqft |
|---|---|---|---|---|---|---|---|
| **0** | Electronic City Phase II | 2 BHK | 1056.0 | 2.0 | 39.07 | 2 | 36998.106061 |
| **1** | Chikka Tirupathi | 4 Bedroom | 2600.0 | 5.0 | 120.00 | 4 | 46153.846154 |
| **2** | Uttarahalli | 3 BHK | 1440.0 | 2.0 | 62.00 | 3 | 43055.555556 |
| **3** | Lingadheeranahalli | 3 BHK | 1521.0 | 3.0 | 95.00 | 3 | 62458.908613 |
| **4** | Kothanur | 2 BHK | 1200.0 | 2.0 | 51.00 | 2 | 42500.000000 |

In [32]:

```
len(data1.location.unique())
```

Out[32]:

```
1304
```

In [33]:

```
data1.location=data1.location.apply(lambda x: x.strip())
location_stats=data1.groupby('location')['location'].agg('count').sort_values(ascending
location_stats
```

Out[33]:

```
location
Whitefield                 535
Sarjapur  Road             392
Electronic City            304
Kanakpura Road             266
Thanisandra                236
                          ... 
1 Giri Nagar                 1
Kanakapura Road,             1
Kanakapura main  Road        1
Karnataka Shabarimala        1
whitefiled                   1
Name: location, Length: 1293, dtype: int64
```

In [34]:

```
len(location_stats[location_stats<=10])
```

Out[34]:

```
1052
```

In [35]:

```
locationlessthan10=location_stats[location_stats<=10]
locationlessthan10
```

Out[35]:

```
location
Basapura                 10
1st Block Koramangala    10
Gunjur Palya             10
Kalkere                  10
Sector 1 HSR Layout      10
                         ..
1 Giri Nagar              1
Kanakapura Road,          1
Kanakapura main  Road     1
Karnataka Shabarimala     1
whitefiled                1
Name: location, Length: 1052, dtype: int64
```

In [36]:

```
len(data1.location.unique())
```

Out[36]:

```
1293
```

In [37]:

```
data1.location=data1.location.apply(lambda x: 'other' if x in locationlessthan10 else x
len(data1.location.unique())
```

Out[37]:

```
242
```

In [38]:

```
data1.head()
```

Out[38]:

| | location | size | total_sqft | bath | price | BHK | price_per_sqft |
|---|---|---|---|---|---|---|---|
| **0** | Electronic City Phase II | 2 BHK | 1056.0 | 2.0 | 39.07 | 2 | 36998.106061 |
| **1** | Chikka Tirupathi | 4 Bedroom | 2600.0 | 5.0 | 120.00 | 4 | 46153.846154 |
| **2** | Uttarahalli | 3 BHK | 1440.0 | 2.0 | 62.00 | 3 | 43055.555556 |
| **3** | Lingadheeranahalli | 3 BHK | 1521.0 | 3.0 | 95.00 | 3 | 62458.908613 |
| **4** | Kothanur | 2 BHK | 1200.0 | 2.0 | 51.00 | 2 | 42500.000000 |

In [39]:

```
data1[data1.total_sqft/data1.BHK<300].head()
```

Out[39]:

| | location | size | total_sqft | bath | price | BHK | price_per_sqft |
|---|---|---|---|---|---|---|---|
| **9** | other | 6 Bedroom | 1020.0 | 6.0 | 370.0 | 6 | 362745.098039 |
| **45** | HSR Layout | 8 Bedroom | 600.0 | 9.0 | 200.0 | 8 | 333333.333333 |
| **58** | Murugeshpalya | 6 Bedroom | 1407.0 | 4.0 | 150.0 | 6 | 106609.808102 |
| **68** | Devarachikkanahalli | 8 Bedroom | 1350.0 | 7.0 | 85.0 | 8 | 62962.962963 |
| **70** | other | 3 Bedroom | 500.0 | 3.0 | 100.0 | 3 | 200000.000000 |

In [40]:

```
data2=data1[~(data1.total_sqft/data1.BHK<300)]
data2.head()
```

Out[40]:

| | location | size | total_sqft | bath | price | BHK | price_per_sqft |
|---|---|---|---|---|---|---|---|
| **0** | Electronic City Phase II | 2 BHK | 1056.0 | 2.0 | 39.07 | 2 | 36998.106061 |
| **1** | Chikka Tirupathi | 4 Bedroom | 2600.0 | 5.0 | 120.00 | 4 | 46153.846154 |
| **2** | Uttarahalli | 3 BHK | 1440.0 | 2.0 | 62.00 | 3 | 43055.555556 |
| **3** | Lingadheeranahalli | 3 BHK | 1521.0 | 3.0 | 95.00 | 3 | 62458.908613 |
| **4** | Kothanur | 2 BHK | 1200.0 | 2.0 | 51.00 | 2 | 42500.000000 |

In [41]:

```
data2.shape
```

Out[41]:

```
(12502, 7)
```

In [42]:

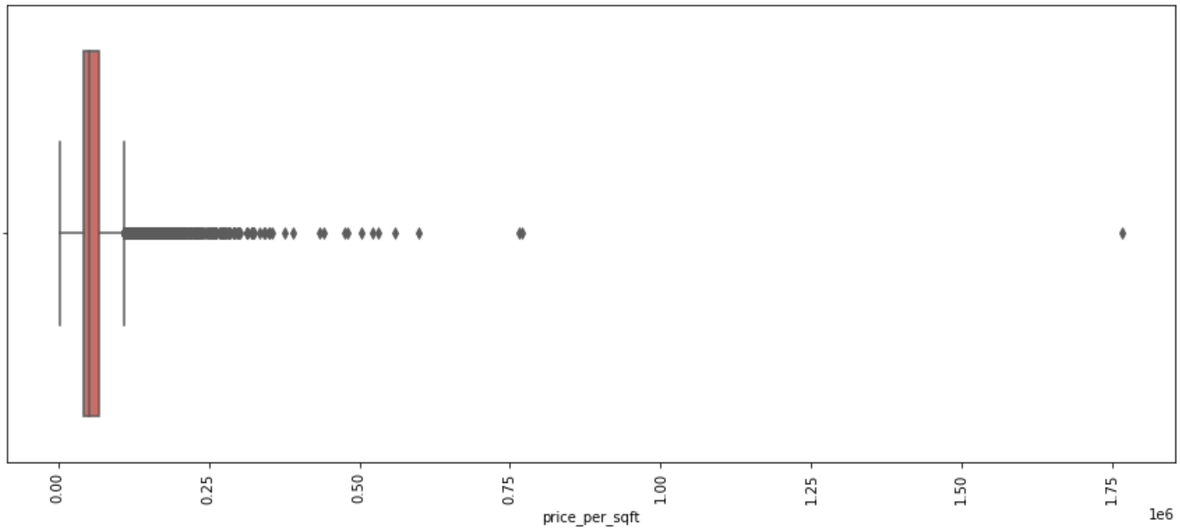
```
data2["price_per_sqft"].describe().apply(lambda x:format(x,'f'))
```

Out[42]:

```
count      12456.000000
mean       63085.028260
std        41681.273385
min         2678.298133
25%        42105.263158
50%        52941.176471
75%        69166.666667
max      1764705.882353
Name: price_per_sqft, dtype: object
```

In [43]:

```
plt.figure(figsize=(15,6))
sns.boxplot('price_per_sqft', data = data2, palette='hls')
plt.xticks(rotation = 90)
plt.show()
```



In [44]:

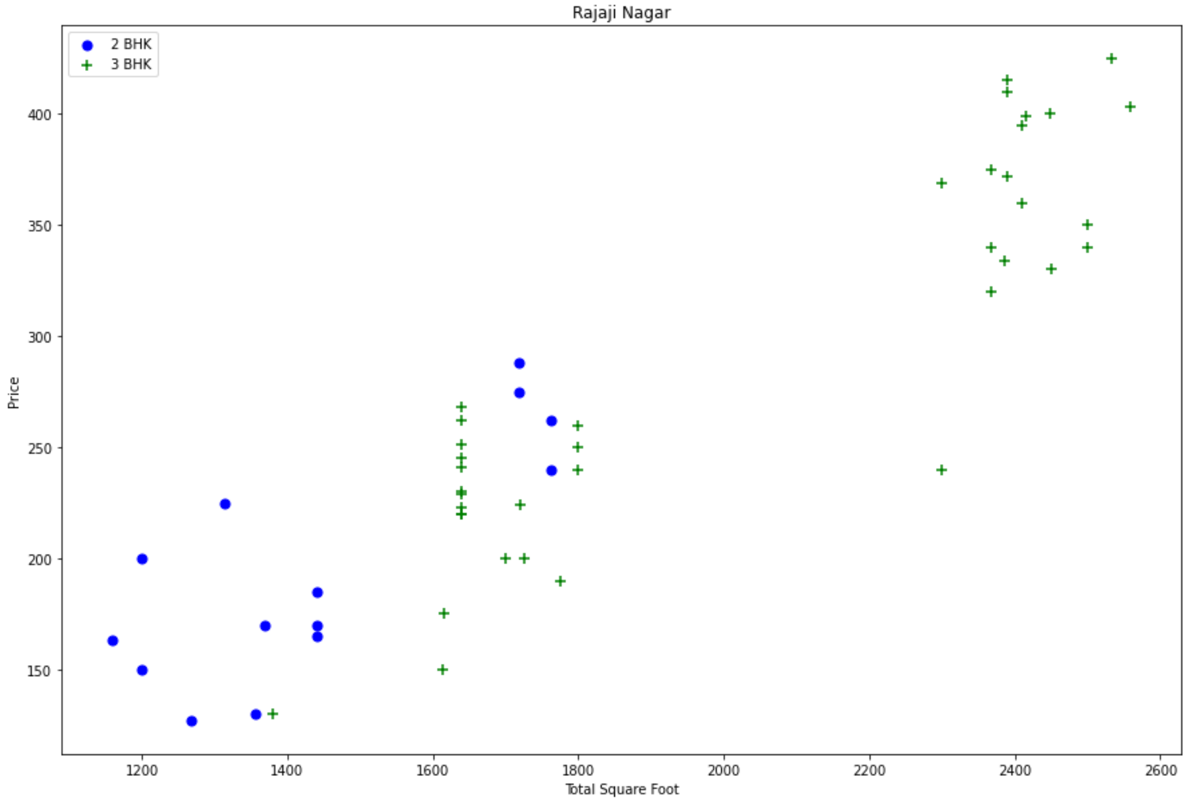
```
def remove_pps_outliers(df):
    df_out=pd.DataFrame()
    for key,subdf in df.groupby('location'):
        m=np.mean(subdf.price_per_sqft)
        st=np.std(subdf.price_per_sqft)
        reduced_df=subdf[(subdf.price_per_sqft>(m-st))& (subdf.price_per_sqft<(m+st))]
        df_out=pd.concat([df_out,reduced_df],ignore_index=True)
    return df_out
data3=remove_pps_outliers(data2)
data3.shape
```

Out[44]:

```
(10241, 7)
```

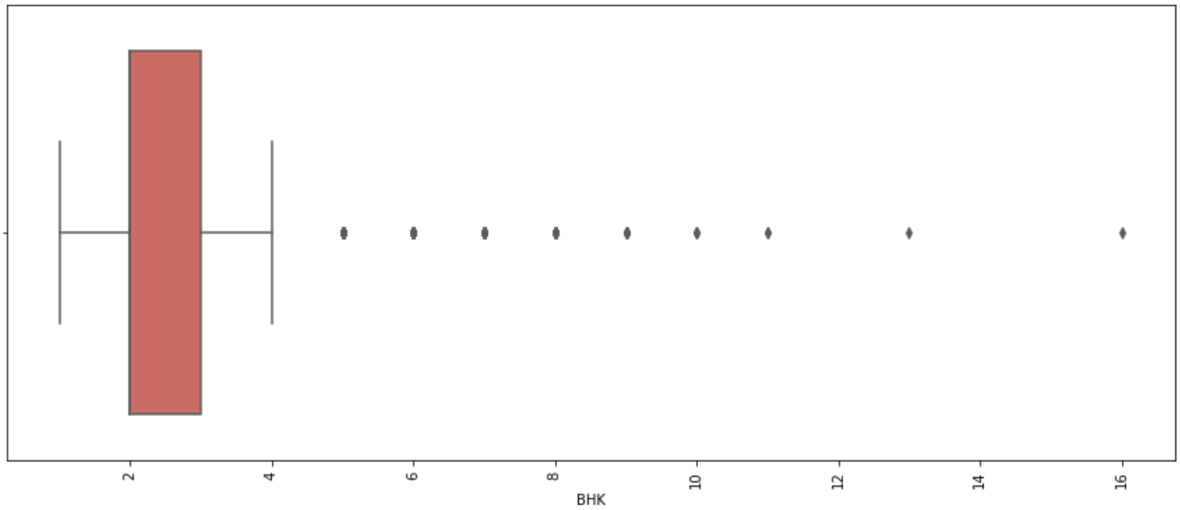
In [45]:

```
import matplotlib.pyplot as plt
def plot_scatter_chart(df,location):
    bhk2=df[(df.location==location)&(df.BHK==2)]
    bhk3=df[(df.location==location)&(df.BHK==3)]
    plt.rcParams['figure.figsize']=(15,10)
    plt.scatter(bhk2.total_sqft,bhk2.price,color='Blue',label='2 BHK',s=50)
    plt.scatter(bhk3.total_sqft,bhk3.price,color='green',marker='+',label='3 BHK',s=50)
    plt.xlabel('Total Square Foot')
    plt.ylabel('Price')
    plt.title(location)
    plt.legend()
plot_scatter_chart(data3,"Rajaji Nagar")
```



In [50]:

```
plt.figure(figsize=(15,6))
sns.boxplot('BHK', data = data3, palette='hls')
plt.xticks(rotation = 90)
plt.show()
```



In [51]:

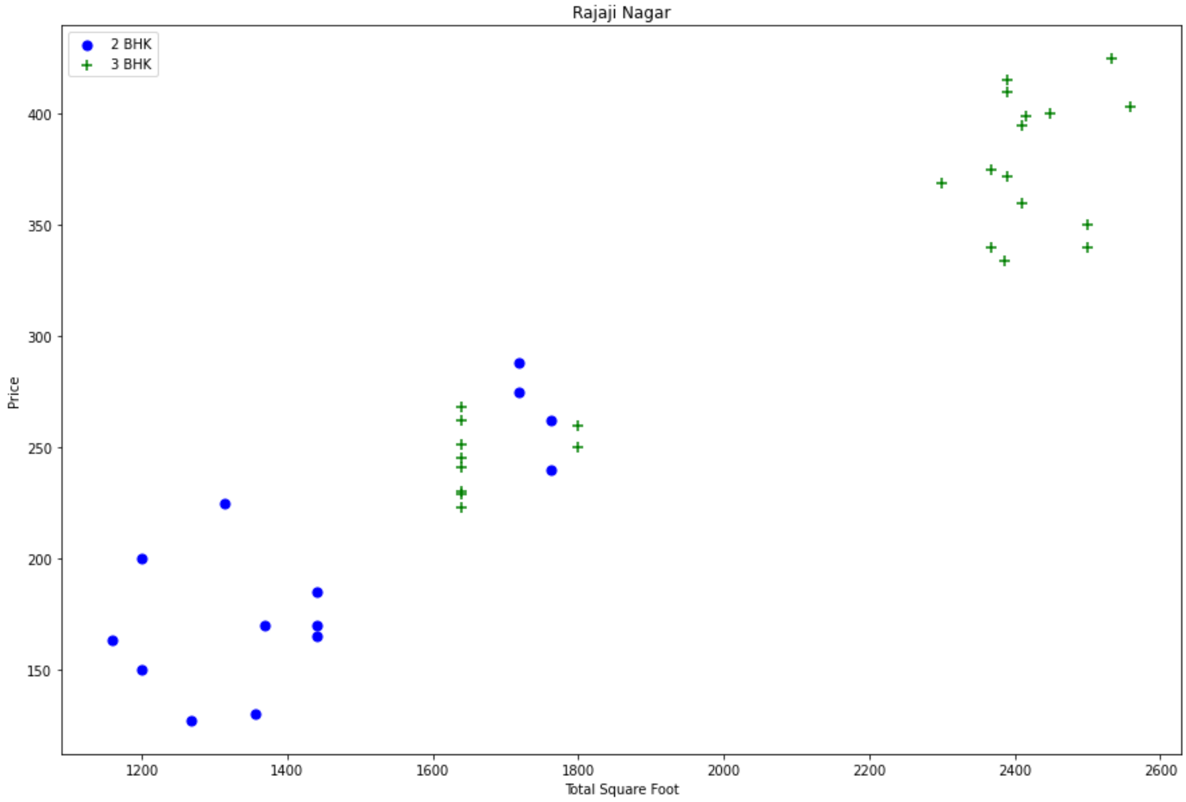
```
def remove_bhk_outliers(df):
    exclude_indices=np.array([])
    for location, location_df in df.groupby('location'):
        bhk_sats={}
        for BHK,BHK_df in location_df.groupby('BHK'):
            bhk_sats[BHK]={
                'mean':np.mean(BHK_df.price_per_sqft),
                'std':np.std(BHK_df.price_per_sqft),
                'count':BHK_df.shape[0]
            }
        for BHK,BHK_df in location_df.groupby('BHK'):
            stats=bhk_sats.get(BHK-1)
            if stats and stats['count']>5:
                exclude_indices=np.append(exclude_indices,BHK_df[BHK_df.price_per_sqft<
    return df.drop(exclude_indices,axis='index')

data4=remove_bhk_outliers(data3)
data4.shape
```

Out[51]:

```
(7329, 7)
```

In [52]:

```
plot_scatter_chart(data4,"Rajaji Nagar")
```

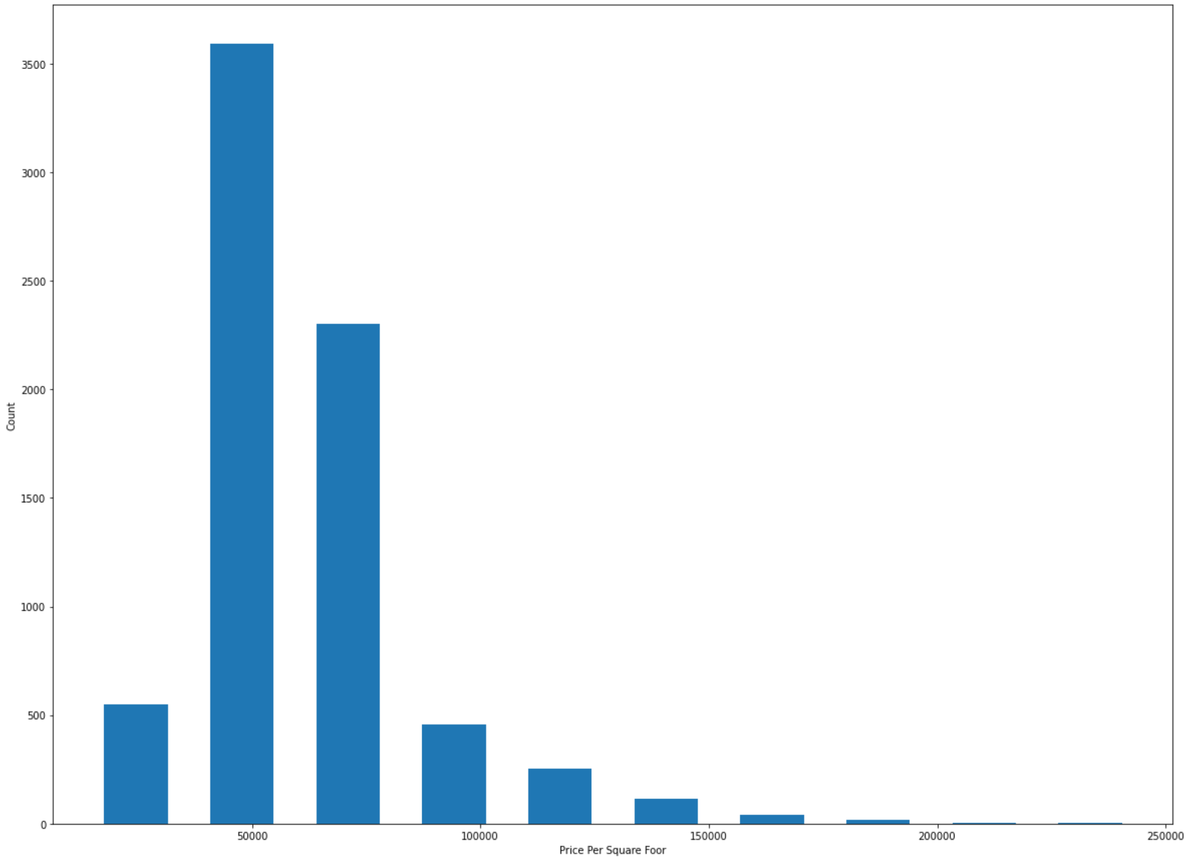


In [53]:

```
plt.rcParams['figure.figsize']=(20,15)
plt.hist(data4.price_per_sqft,rwidth=0.6)
plt.xlabel("Price Per Square Foor")
plt.ylabel("Count")
```

Out[53]:

```
Text(0, 0.5, 'Count')
```



In [54]:

```
data4.bath.unique()
```

Out[54]:

```
array([ 4.,  3.,  2.,  5.,  8.,  1.,  6.,  7.,  9., 12., 16., 13.])
```

In [55]:

```
data4[data4.bath>10]
```

Out[55]:

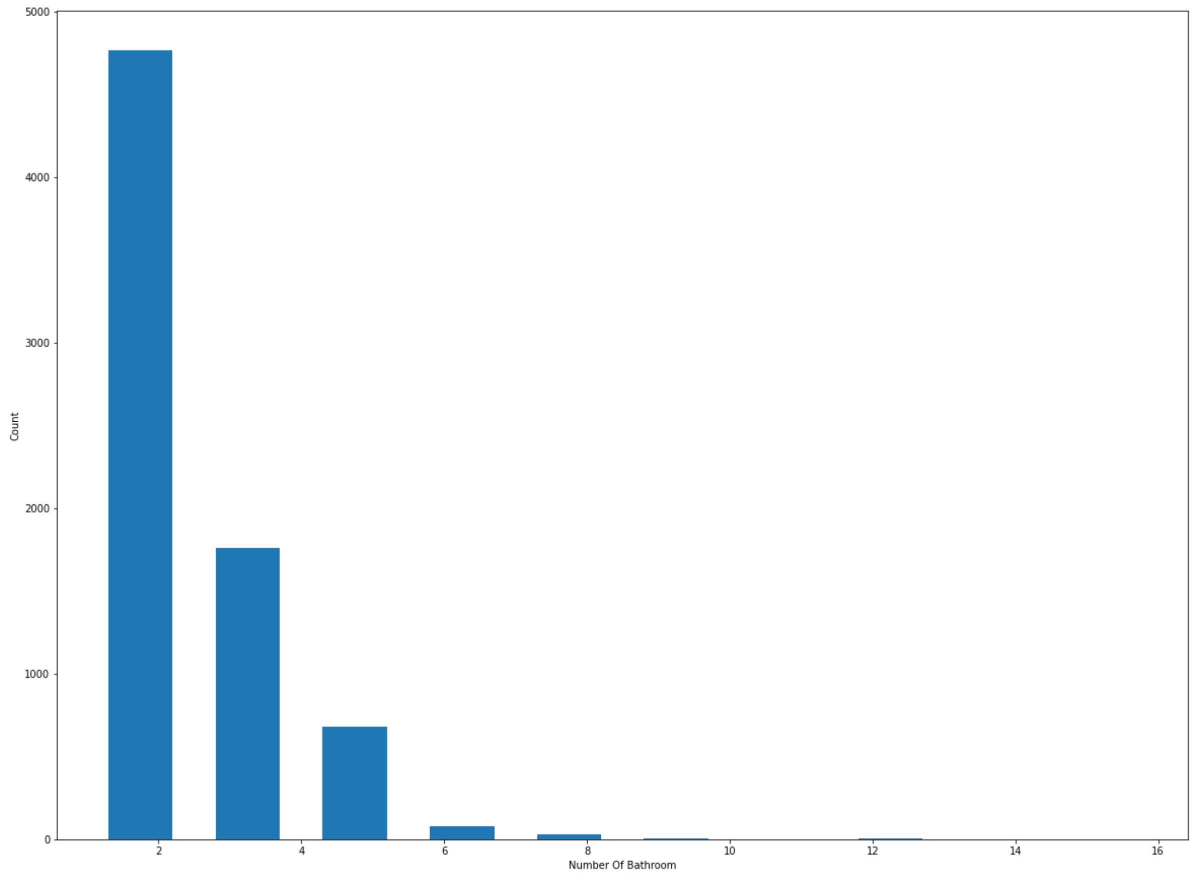
| | location | size | total_sqft | bath | price | BHK | price_per_sqft |
|---|---|---|---|---|---|---|---|
| **5277** | Neeladri Nagar | 10 BHK | 4000.0 | 12.0 | 160.0 | 10 | 40000.00000 |
| **8486** | other | 10 BHK | 12000.0 | 12.0 | 525.0 | 10 | 43750.00000 |
| **8575** | other | 16 BHK | 10000.0 | 16.0 | 550.0 | 16 | 55000.00000 |
| **9308** | other | 11 BHK | 6000.0 | 12.0 | 150.0 | 11 | 25000.00000 |
| **9639** | other | 13 BHK | 5425.0 | 13.0 | 275.0 | 13 | 50691.24424 |

In [56]:

```
plt.rcParams['figure.figsize']=(20,15)
plt.hist(data4.bath,rwidth=0.6)
plt.xlabel("Number Of Bathroom")
plt.ylabel("Count")
```

Out[56]:

```
Text(0, 0.5, 'Count')
```



In [63]:

```
data4[data4.bath>data4.BHK+2]
```

Out[63]:

| | location | size | total_sqft | bath | price | BHK | price_per_sqft |
|---|---|---|---|---|---|---|---|
| **1626** | Chikkabanavar | 4 Bedroom | 2460.0 | 7.0 | 80.0 | 4 | 32520.325203 |
| **5238** | Nagasandra | 4 Bedroom | 7000.0 | 8.0 | 450.0 | 4 | 64285.714286 |
| **6711** | Thanisandra | 3 BHK | 1806.0 | 6.0 | 116.0 | 3 | 64230.343300 |
| **8411** | other | 6 BHK | 11338.0 | 9.0 | 1000.0 | 6 | 88198.976892 |

In [64]:

```
data5=data4[data4.bath<data4.BHK+2]
data5.shape
```

Out[64]:

```
(7251, 7)
```

In [65]:

```
data6=data5.drop(['size','price_per_sqft'],axis='columns')
data6
```

Out[65]:

| | location | total_sqft | bath | price | BHK |
|---|---|---|---|---|---|
| **0** | 1st Block Jayanagar | 2850.0 | 4.0 | 428.0 | 4 |
| **1** | 1st Block Jayanagar | 1630.0 | 3.0 | 194.0 | 3 |
| **2** | 1st Block Jayanagar | 1875.0 | 2.0 | 235.0 | 3 |
| **3** | 1st Block Jayanagar | 1200.0 | 2.0 | 130.0 | 3 |
| **4** | 1st Block Jayanagar | 1235.0 | 2.0 | 148.0 | 2 |
| **...** | ... | ... | ... | ... | ... |
| **10232** | other | 1200.0 | 2.0 | 70.0 | 2 |
| **10233** | other | 1800.0 | 1.0 | 200.0 | 1 |
| **10236** | other | 1353.0 | 2.0 | 110.0 | 2 |
| **10237** | other | 812.0 | 1.0 | 26.0 | 1 |
| **10240** | other | 3600.0 | 5.0 | 400.0 | 4 |

7251 rows × 5 columns

In [66]:

```
dummies=pd.get_dummies(data6.location)
dummies.head(10)
```

Out[66]:

| | 1st Block Jayanagar | 1st Phase JP Nagar | 2nd Phase Judicial Layout | 2nd Stage Nagarbhavi | 5th Block Hbr Layout | 5th Phase JP Nagar | 6th Phase JP Nagar | 7th Phase JP Nagar | 8th Phase JP Nagar | 9th Phase JP Nagar | ... | V |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | ... | |
| **1** | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | ... | |
| **2** | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | ... | |
| **3** | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | ... | |
| **4** | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | ... | |
| **5** | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | ... | |
| **6** | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | ... | |
| **8** | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | ... | |
| **9** | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | ... | |
| **10** | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | ... | |

10 rows × 242 columns

In [67]:

```
data7=pd.concat([data6,dummies.drop('other',axis='columns')],axis='columns')
data7.head()
```

Out[67]:

| | location | total_sqft | bath | price | BHK | 1st Block Jayanagar | 1st Phase JP Nagar | 2nd Phase Judicial Layout | 2nd Stage Nagarbhavi | 5th Block Hbr Layout | ... | V |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 1st Block Jayanagar | 2850.0 | 4.0 | 428.0 | 4 | 1 | 0 | 0 | 0 | 0 | ... | |
| **1** | 1st Block Jayanagar | 1630.0 | 3.0 | 194.0 | 3 | 1 | 0 | 0 | 0 | 0 | ... | |
| **2** | 1st Block Jayanagar | 1875.0 | 2.0 | 235.0 | 3 | 1 | 0 | 0 | 0 | 0 | ... | |
| **3** | 1st Block Jayanagar | 1200.0 | 2.0 | 130.0 | 3 | 1 | 0 | 0 | 0 | 0 | ... | |
| **4** | 1st Block Jayanagar | 1235.0 | 2.0 | 148.0 | 2 | 1 | 0 | 0 | 0 | 0 | ... | |

5 rows × 246 columns

In [68]:

```
data8=data7.drop('location',axis='columns')
data8.head()
```

Out[68]:

| | total_sqft | bath | price | BHK | 1st Block Jayanagar | 1st Phase JP Nagar | 2nd Phase Judicial Layout | 2nd Stage Nagarbhavi | 5th Block Hbr Layout | 5th Phase JP Nagar | ... | Vija |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 2850.0 | 4.0 | 428.0 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | ... | |
| **1** | 1630.0 | 3.0 | 194.0 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | ... | |
| **2** | 1875.0 | 2.0 | 235.0 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | ... | |
| **3** | 1200.0 | 2.0 | 130.0 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | ... | |
| **4** | 1235.0 | 2.0 | 148.0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | ... | |

5 rows × 245 columns

In [69]:

```
data8.shape
```

Out[69]:

```
(7251, 245)
```

In [70]:

```
X=data8.drop('price',axis='columns')
X.head()
```

Out[70]:

| | total_sqft | bath | BHK | 1st Block Jayanagar | 1st Phase JP Nagar | 2nd Phase Judicial Layout | 2nd Stage Nagarbhavi | 5th Block Hbr Layout | 5th Phase JP Nagar | 6th Phase JP Nagar | ... | Vija |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 2850.0 | 4.0 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | ... | |
| **1** | 1630.0 | 3.0 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | ... | |
| **2** | 1875.0 | 2.0 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | ... | |
| **3** | 1200.0 | 2.0 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | ... | |
| **4** | 1235.0 | 2.0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | ... | |

5 rows × 244 columns

In [71]:

```
y=data8.price
```

In [72]:

```
X_train = X.iloc[:5802]
```

In [73]:

```
y_train = y.iloc[:5802]
```

In [74]:

```
X_test = X.iloc[5802:7252]
```

In [75]:

```
y_test = y.iloc[5802:7252]
```

In [76]:

```
from sklearn.linear_model import LinearRegression
model=LinearRegression()
model.fit(X_train,y_train)
model.score(X_test,y_test)
```

Out[76]:

```
0.755747331402168
```

In [77]:

```
from sklearn.model_selection import ShuffleSplit
from sklearn.model_selection import cross_val_score

cv = ShuffleSplit(n_splits=5, test_size=0.2, random_state=0)

cross_val_score(LinearRegression(), X, y, cv=cv)
```

Out[77]:

```
array([0.82430186, 0.77166234, 0.85089567, 0.80837764, 0.83653286])
```

In [78]:

```
from sklearn.model_selection import GridSearchCV

from sklearn.linear_model import Lasso
from sklearn.tree import DecisionTreeRegressor

def find_best_model_using_gridsearchcv(X,y):
    algos = {
        'linear_regression' : {
            'model': LinearRegression(),
            'params': {
                'normalize': [True, False]
            }
        },
        'lasso': {
            'model': Lasso(),
            'params': {
                'alpha': [1,2],
                'selection': ['random', 'cyclic']
            }
        },
        'decision_tree': {
            'model': DecisionTreeRegressor(),
            'params': {
                'criterion' : ['mse','friedman_mse'],
                'splitter': ['best','random']
            }
        }
    }
    scores = []
    cv = ShuffleSplit(n_splits=5, test_size=0.2, random_state=0)
    for algo_name, config in algos.items():
        gs =  GridSearchCV(config['model'], config['params'], cv=cv, return_train_score=
        gs.fit(X,y)
        scores.append({
            'model': algo_name,
            'best_score': gs.best_score_,
            'best_params': gs.best_params_
        })

    return pd.DataFrame(scores,columns=['model','best_score','best_params'])

find_best_model_using_gridsearchcv(X,y)
```

Out[78]:

| | model | best_score | best_params |
|---|---|---|---|
| **0** | linear_regression | 0.818354 | {'normalize': True} |
| **1** | lasso | 0.687429 | {'alpha': 1, 'selection': 'cyclic'} |
| **2** | decision_tree | 0.718892 | {'criterion': 'mse', 'splitter': 'random'} |

In [79]:

```
def price_predict(location,sqft,bath,BHK):
    loc_index=np.where(X.columns==location)[0][0]
    x=np.zeros(len(X.columns))
    x[0]=sqft
    x[1]=bath
    x[2]=BHK
    if loc_index >=0:
        x[loc_index]=1
    return model.predict([x])[0]
```

In [80]:

```
price_predict('1st Phase JP Nagar',1000,2,2)
```

Out[80]:

```
86.50537337722247
```

In [81]:

```
price_predict('1st Phase JP Nagar',1000,2,3)
```

Out[81]:

```
81.9696568636569
```

In [82]:

```
price_predict('5th Phase JP Nagar',1000,2,2)
```

Out[82]:

```
38.93415026548578
```

In [83]:

```
price_predict('Indira Nagar',1000,2,2)
```

Out[83]:

```
180.82820686320383
```