---------------------------------- Linear Regression ---

Connecting with Drive

```
from google.colab import drive
drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

Import necessary libraries

```
import pandas as pd
import numpy as np
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_absolute_error, mean_squared_error
from sklearn.feature_selection import chi2
from sklearn.preprocessing import StandardScaler, LabelEncoder
import matplotlib.pyplot as plt
import seaborn as sns
```

```
dataset = pd.read_csv('/content/drive/MyDrive/ML Project/Bengaluru_House_Data.csv')
dataset.head()
```

	area_type	availability	location	size	society	total_sqft	bath	balcony	price
0	Super built-up Area	19-Dec	Electronic City Phase II	2 BHK	Coomee	1056	2.0	1.0	39.07
1	Plot Area	Ready To Move	Chikka Tirupathi	4 Bedroom	Theanmp	2600	5.0	3.0	120.00
2	Built-up Area	Ready To Move	Uttarahalli	3 BHK	NaN	1440	2.0	3.0	62.00
3	Super built-up Area	Ready To Move	Lingadheeranahalli	3 BHK	Soiewre	1521	3.0	1.0	95.00
4	Super built-up Area	Ready To Move	Kothanur	2 BHK	NaN	1200	2.0	1.0	51.00

Next steps: Generate code with dataset | View recommended plots | New interactive sheet

Data Cleaning

```
dataset.drop_duplicates(inplace=True)
dataset.dropna(subset=['total_sqft', 'size', 'price'], inplace=True)
```

```
dataset.head()
```

	area_type	availability	location	size	society	total_sqft	bath	balcony	price
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Convert 'size' to number of bedrooms

```
dataset['size'] = dataset['size'].apply(lambda x: int(str(x).split(' ')[0]) if isinstance(x, str) else x)
```

Convert 'total_sqft' to a numeric value

```
def convert_sqft_to_num(x):
    if '-' in str(x):
        tokens = x.split('-')
        return (float(tokens[0]) + float(tokens[1])) / 2
    try:
        return float(x)
    except:
        return None

dataset['total_sqft'] = dataset['total_sqft'].apply(convert_sqft_to_num)
dataset.dropna(inplace=True)
```

Log-transform the 'price' column to reduce range

```
dataset['price'] = np.log1p(dataset['price'])
dataset.head()
```

	area_type	availability	location	size	society	total_sqft	bath	balcony	price
0	Super built-up Area	19-Dec	Electronic City Phase II	2	Coomee	1056.0	2.0	1.0	3.690628
1	Plot Area	Ready To Move	Chikka Tirupathi	4	Theanmp	2600.0	5.0	3.0	4.795791
3	Super built-up Area	Ready To Move	Lingadheeranahalli	3	Soiewre	1521.0	3.0	1.0	4.564348
5	Super built-up Area	Ready To Move	Whitefield	2	DuenaTa	1170.0	2.0	1.0	3.663562
11	Plot Area	Ready To Move	Whitefield	4	Prrry M	2785.0	5.0	3.0	5.690359

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Handle categorical variable 'location'

```
location_counts = dataset['location'].value_counts()
dataset['location'] = dataset['location'].apply(lambda x: x if location_counts[x] > 10 else 'Other')
```

Check if 'location' exists, then encode it

```
label_encoder = LabelEncoder()
if 'location' in dataset.columns:
    dataset['location_encoded'] = label_encoder.fit_transform(dataset['location'])
```

```
dataset.head()
```

	area_type	availability	location	size	society	total_sqft	bath	balcony	price	location_encoded
0	Super built-up Area	19-Dec	Electronic City Phase II	2	Coomee	1056.0	2.0	1.0	3.690628	44
1	Plot Area	Ready To Move	Chikka Tirupathi	4	Theanmp	2600.0	5.0	3.0	4.795791	34
3	Super built-up Area	Ready To Move	Lingadheeranahalli	3	Soiewre	1521.0	3.0	1.0	4.564348	99
5	Super built-up Area	Ready To Move	Whitefield	2	DuenaTa	1170.0	2.0	1.0	3.663562	136

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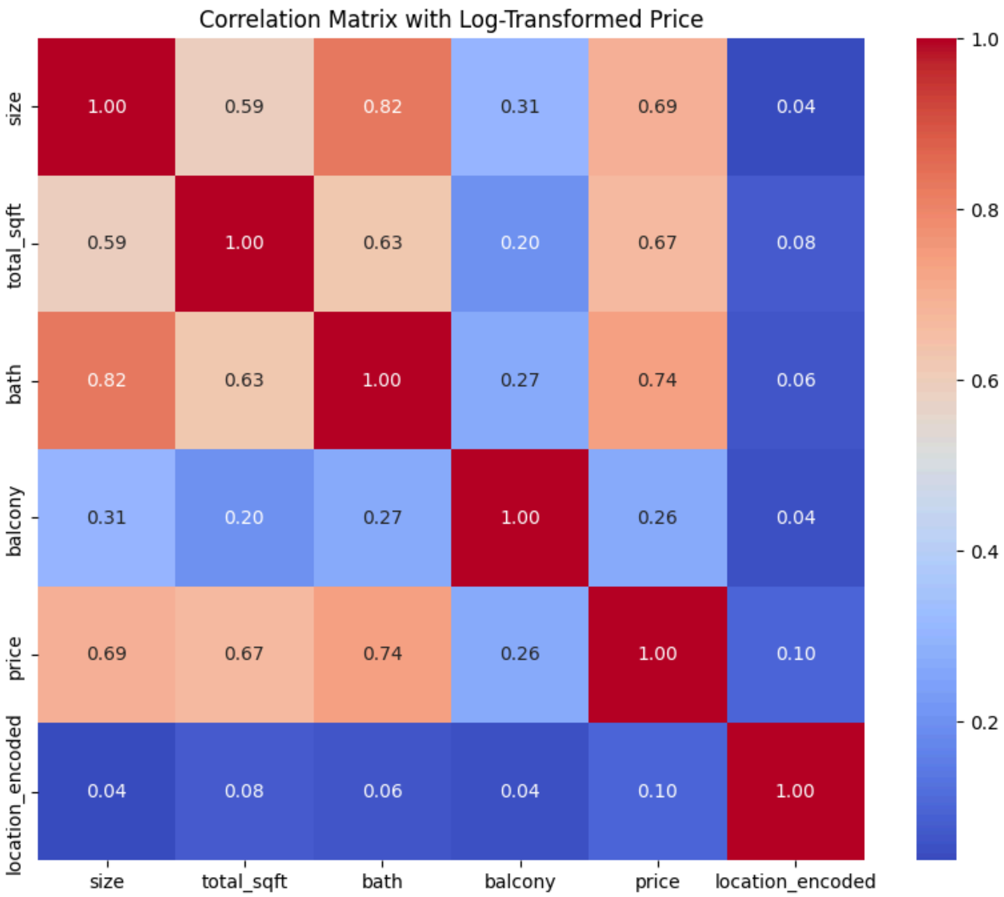
Double-click (or enter) to edit

Ensure only numeric columns are included for the correlation matrix

```
numeric_data = dataset.select_dtypes(include=[np.number])
```

Correlation Matrix for Numerical Features

```
plt.figure(figsize=(10, 8))
sns.heatmap(numeric_data.corr(), annot=True, cmap='coolwarm', fmt=".2f")
plt.title("Correlation Matrix with Log-Transformed Price")
plt.show()
```



Drop columns with low correlation to 'price' in the main dataset

```
correlation_matrix = numeric_data.corr()
low_correlation_features = correlation_matrix.index[abs(correlation_matrix['price']) < 0.1]
dataset = dataset.drop(columns=low_correlation_features)
```

```
dataset.head()
```

	area_type	availability	location	size	society	total_sqft	bath	balcony	price
0	Super built-up Area	19-Dec	Electronic City Phase II	2	Coomee	1056.0	2.0	1.0	3.690628
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11	Plot Area	Ready To Move	Whitefield	4	Prrry M	2785.0	5.0	3.0	5.690359

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One-hot encode remaining categorical variables

```
dataset = pd.get_dummies(dataset, columns=['location', 'area_type', 'availability', 'society'], drop_first=True)
```

Define features and target variable

```
X = dataset.drop(['price'], axis=1)
y = dataset['price']
```

Standardize features

```
scaler = StandardScaler()
X_scaled = scaler.fit_transform(X)
```

Split data into training and testing sets

```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
```

Model Training with Linear Regression

```
model = LinearRegression()
model.fit(X_train, y_train)
```

```
▾ LinearRegression
LinearRegression()
```

Predict on test set and convert predictions back to original scale

```
y_pred = model.predict(X_test)
y_test_exp = np.expm1(y_test)  # Convert log-transformed prices back to original scale
y_pred_exp = np.exp(y_pred)
```

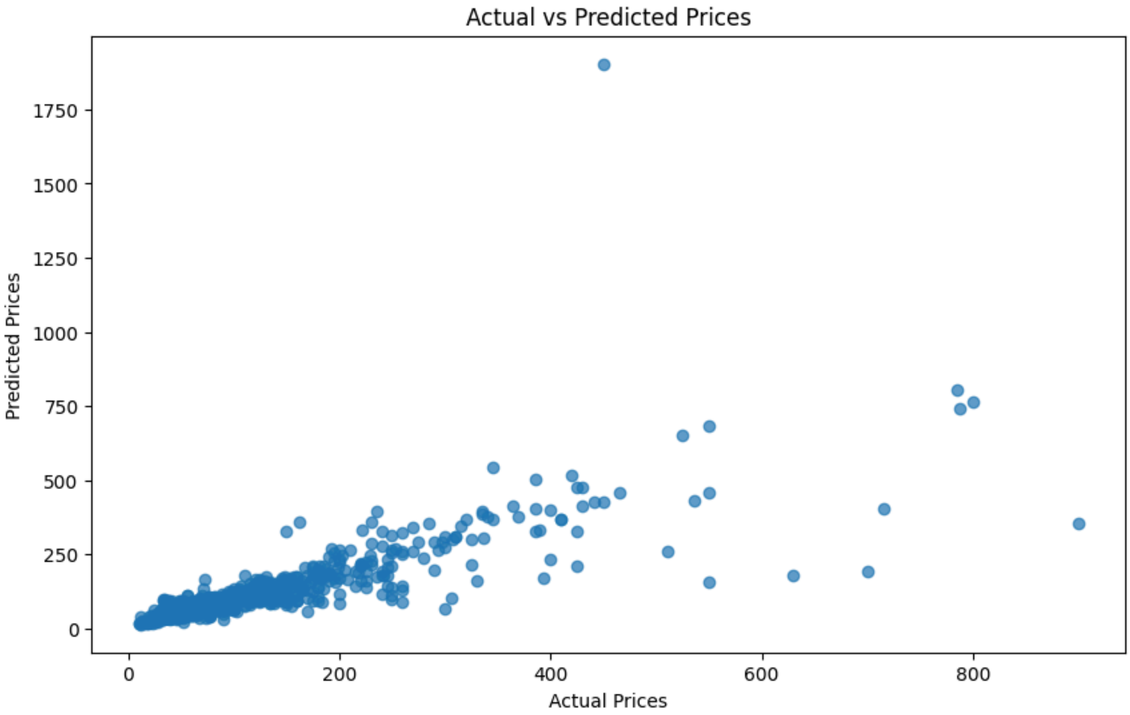
Evaluate the model on the original scale

```
mae = mean_absolute_error(y_test_exp, y_pred_exp)
rmse = np.sqrt(mean_squared_error(y_test_exp, y_pred_exp))
print(f"Mean Absolute Error (MAE): {mae}")
print(f"Root Mean Squared Error (RMSE): {rmse}")
```

```
Mean Absolute Error (MAE): 18.2681967684906
Root Mean Squared Error (RMSE): 55.51325389232715
```

Plot Actual vs Predicted values on original scale

```
plt.figure(figsize=(10, 6))
plt.scatter(y_test_exp, y_pred_exp, alpha=0.7)
plt.xlabel("Actual Prices")
plt.ylabel("Predicted Prices")
plt.title("Actual vs Predicted Prices")
plt.show()
```


Actual vs Predicted Prices
Predicted Prices
Actual Prices
0
250
500
750
1000
1250
1500
1750
0
200
400
600
800