In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
```

In [2]:
```
df= pd.read_csv("C:\\Users\\DELL\\Downloads\\archive (1)\\diamonds.csv")
```

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

Out[3]:

	carat	cut	color	clarity	depth	table	price	x	y	z
0	0.23	Ideal	E	SI2	61.5	55.0	326	3.95	3.98	2.43
1	0.21	Premium	E	SI1	59.8	61.0	326	3.89	3.84	2.31
2	0.23	Good	E	VS1	56.9	65.0	327	4.05	4.07	2.31
3	0.29	Premium	I	VS2	62.4	58.0	334	4.20	4.23	2.63
4	0.31	Good	J	SI2	63.3	58.0	335	4.34	4.35	2.75

In [4]:
```
df.tail()
```

Out[4]:

	carat	cut	color	clarity	depth	table	price	x	y	z
53935	0.72	Ideal	D	SI1	60.8	57.0	2757	5.75	5.76	3.50
53936	0.72	Good	D	SI1	63.1	55.0	2757	5.69	5.75	3.61
53937	0.70	Very Good	D	SI1	62.8	60.0	2757	5.66	5.68	3.56
53938	0.86	Premium	H	SI2	61.0	58.0	2757	6.15	6.12	3.74
53939	0.75	Ideal	D	SI2	62.2	55.0	2757	5.83	5.87	3.64

In [5]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 53940 entries, 0 to 53939
Data columns (total 10 columns):
 #   Column   Non-Null Count  Dtype  
---  ------   --------------  -----  
 0   carat    53940 non-null  float64
 1   cut      53940 non-null  object 
 2   color    53940 non-null  object 
 3   clarity  53940 non-null  object 
 4   depth    53940 non-null  float64
 5   table    53940 non-null  float64
 6   price    53940 non-null  int64  
 7   x        53940 non-null  float64
 8   y        53940 non-null  float64
 9   z        53940 non-null  float64
dtypes: float64(6), int64(1), object(3)
memory usage: 4.1+ MB
```

In [6]:
```
df.describe()
```

Out[6]:

	carat	depth	table	price	x	y	
count	53940.000000	53940.000000	53940.000000	53940.000000	53940.000000	53940.000000	539
mean	0.797940	61.749405	57.457184	3932.799722	5.731157	5.734526	
std	0.474011	1.432621	2.234491	3989.439738	1.121761	1.142135	
min	0.200000	43.000000	43.000000	326.000000	0.000000	0.000000	
25%	0.400000	61.000000	56.000000	950.000000	4.710000	4.720000	
50%	0.700000	61.800000	57.000000	2401.000000	5.700000	5.710000	
75%	1.040000	62.500000	59.000000	5324.250000	6.540000	6.540000	
max	5.010000	79.000000	95.000000	18823.000000	10.740000	58.900000	

In [7]:
```
df.shape
```

Out[7]:
```
(53940, 10)
```

In [8]:
```
df.isnull().sum()
```

Out[8]:
```
carat      0
cut        0
color      0
clarity    0
depth      0
table      0
price      0
x          0
y          0
z          0
dtype: int64
```

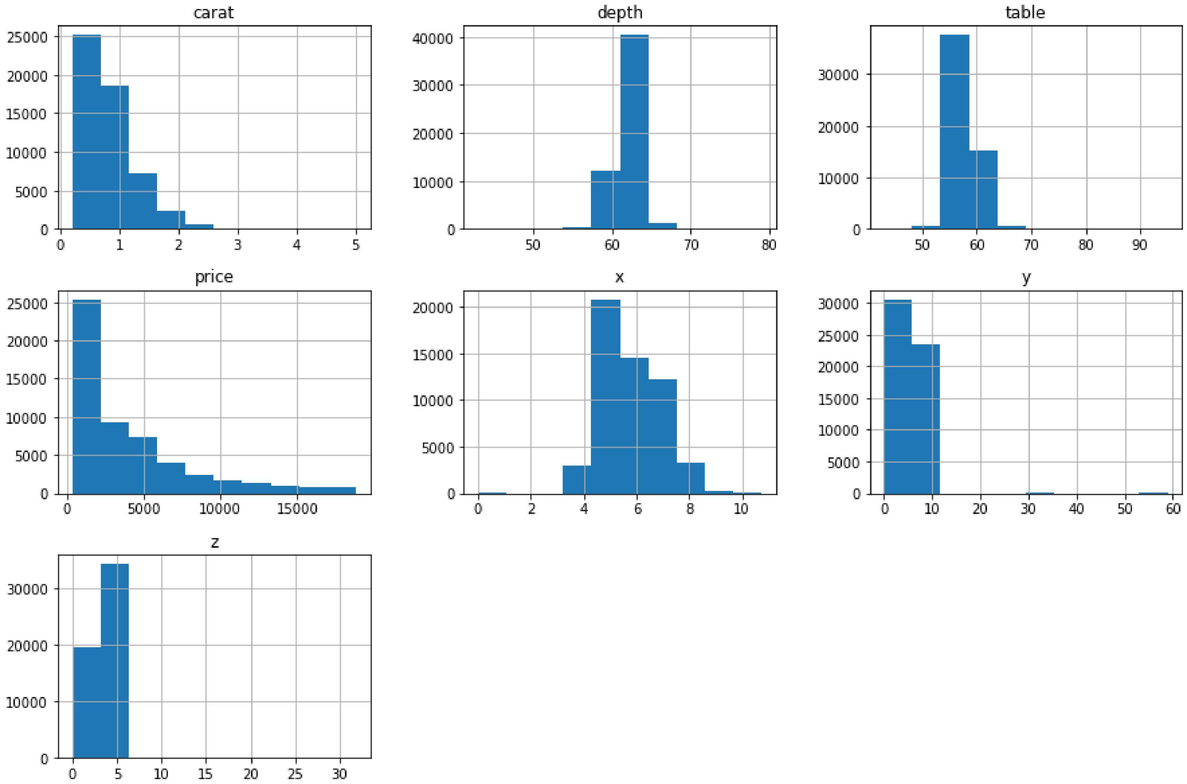
EDA

In [9]:
```
num_features = df.select_dtypes(include =['int64','float64'])
print(num_features.columns)
```

```
Index(['carat', 'depth', 'table', 'price', 'x', 'y', 'z'], dtype='object')
```

```
In [10]: num_features.hist(figsize =(15,10))
```

```
Out[10]: array([[<AxesSubplot:title={'center':'carat'}>,
                 <AxesSubplot:title={'center':'depth'}>,
                 <AxesSubplot:title={'center':'table'}>],
                [<AxesSubplot:title={'center':'price'}>,
                 <AxesSubplot:title={'center':'x'}>,
                 <AxesSubplot:title={'center':'y'}>],
                [<AxesSubplot:title={'center':'z'}>, <AxesSubplot:>,
                 <AxesSubplot:>]], dtype=object)
```



```
In [11]: cat_features = df.select_dtypes(include=['object'])
         print(cat_features.columns)
```

```
Index(['cut', 'color', 'clarity'], dtype='object')
```

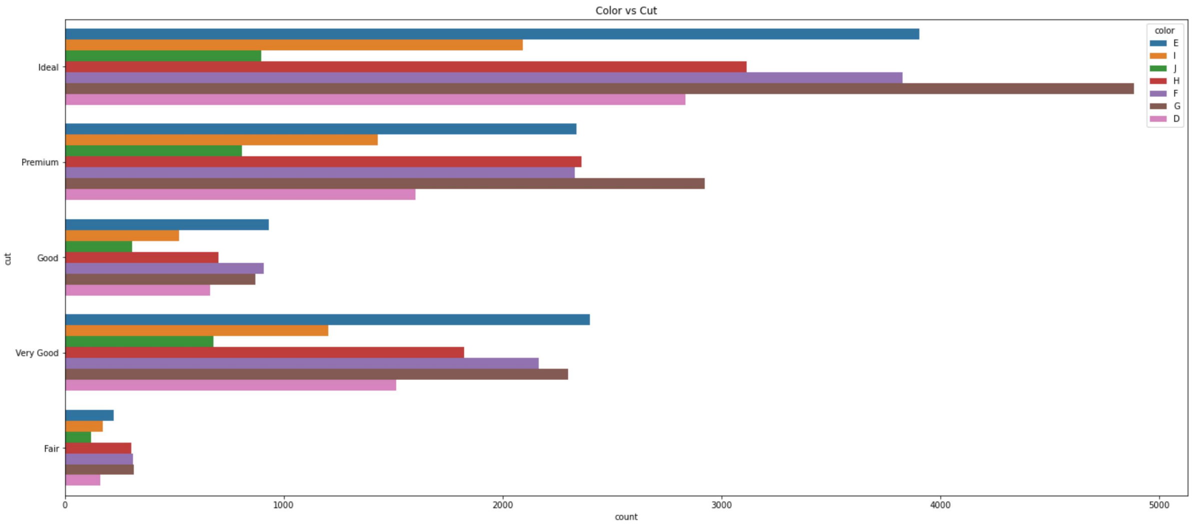
In [12]:

```
plt.figure(figsize=(24, 48))

plt.subplot(411)
sns.countplot(y='cut', hue='color', data = cat_features)
plt.title('Color vs Cut')
```

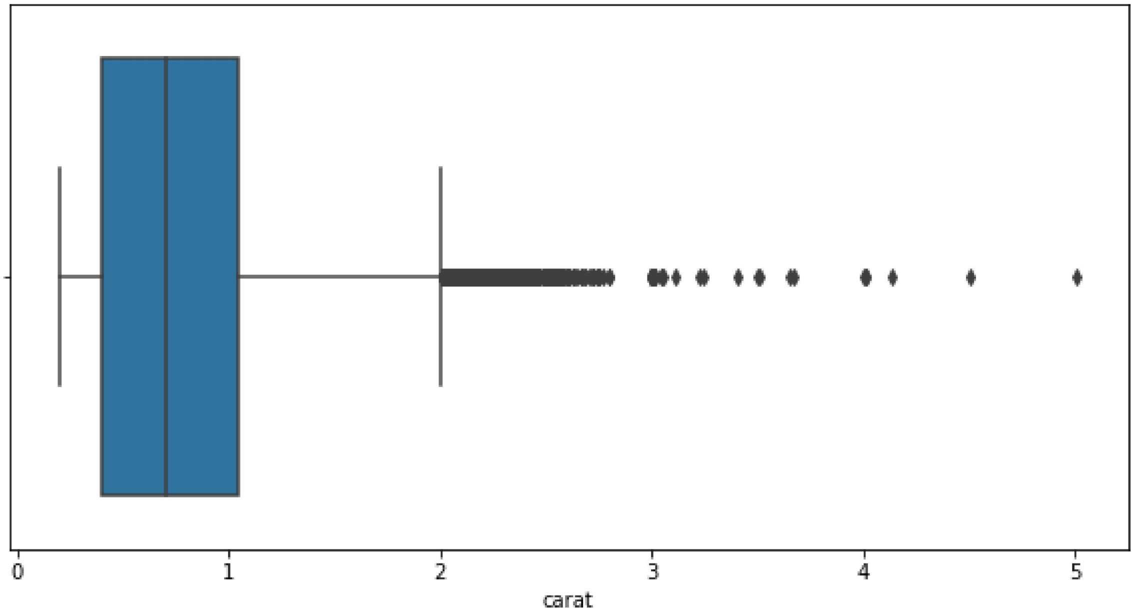
Out[12]:

```
Text(0.5, 1.0, 'Color vs Cut')
```



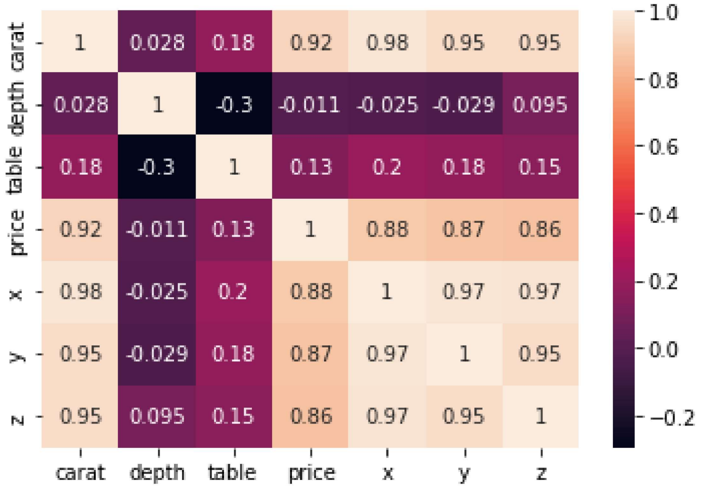
In [13]:

```
for num_var in num_features:
    plt.figure(figsize=(10,5))
    sns.boxplot(x=df[num_var])
```

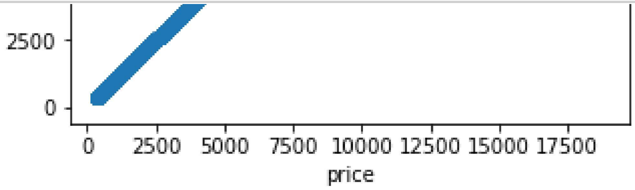


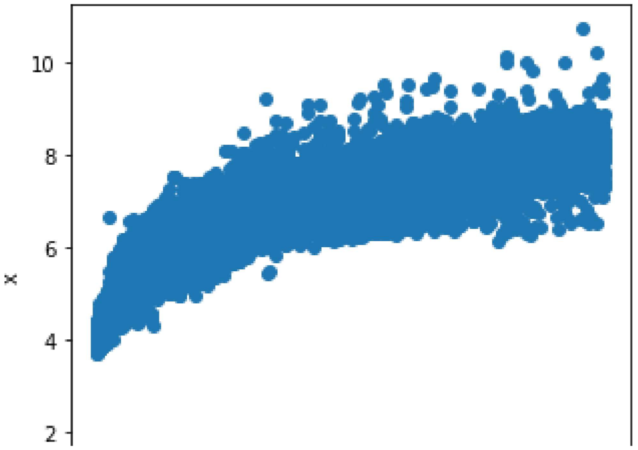
In [14]:
```
corr=df.corr()
sns.heatmap(corr,annot=True)
```

Out[14]:
```
<AxesSubplot:>
```



In [15]:
```
for num_var in num_features:
    plt.figure(figsize=(5,5))
    plt.xlabel('price')
    plt.ylabel(num_var)
    x=df['price']
    y=df[num_var]
    plt.scatter(x,y)
```





Feature Transformation

In [16]:

```python
df_cat = pd.get_dummies(cat_features,drop_first=True)
df_cat.head()
```

Out[16]:

	cut_Good	cut_Ideal	cut_Premium	cut_Very Good	color_E	color_F	color_G	color_H	color_I	col
0	0	1	0	0	1	0	0	0	0	
1	0	0	1	0	1	0	0	0	0	
2	1	0	0	0	1	0	0	0	0	
3	0	0	1	0	0	0	0	0	1	
4	1	0	0	0	0	0	0	0	0	

In [17]:

```python
new_df = pd.concat([num_features, df_cat], axis=1)
new_df.head()
```

Out[17]:

	carat	depth	table	price	x	y	z	cut_Good	cut_Ideal	cut_Premium	...	color_H	c
0	0.23	61.5	55.0	326	3.95	3.98	2.43	0	1	0	...	0	
1	0.21	59.8	61.0	326	3.89	3.84	2.31	0	0	1	...	0	
2	0.23	56.9	65.0	327	4.05	4.07	2.31	1	0	0	...	0	
3	0.29	62.4	58.0	334	4.20	4.23	2.63	0	0	1	...	0	
4	0.31	63.3	58.0	335	4.34	4.35	2.75	1	0	0	...	0	

5 rows × 24 columns

In [18]:

```python
X = new_df.drop(columns = ['price'],axis = 1)
X.head()
```

Out[18]:

	carat	depth	table	x	y	z	cut_Good	cut_Ideal	cut_Premium	cut_Very Good	...	color_H
0	0.23	61.5	55.0	3.95	3.98	2.43	0	1	0	0	...	0
1	0.21	59.8	61.0	3.89	3.84	2.31	0	0	1	0	...	0
2	0.23	56.9	65.0	4.05	4.07	2.31	1	0	0	0	...	0
3	0.29	62.4	58.0	4.20	4.23	2.63	0	0	1	0	...	0
4	0.31	63.3	58.0	4.34	4.35	2.75	1	0	0	0	...	0

5 rows × 23 columns

In [19]:

```
y =new_df['price']
y.head()
```

Out[19]:

```
0    326
1    326
2    327
3    334
4    335
Name: price, dtype: int64
```

Splitting

In [20]:

```
# split into train and test
from sklearn.model_selection import train_test_split

X_train, X_test, y_train, y_test = train_test_split(X, y, train_size=0.7, rand
```

In [21]:

```
print(X_train.shape, y_train.shape)
print(X_test.shape, y_test.shape)
```

```
(37758, 23) (37758,)
(16182, 23) (16182,)
```

In [22]:

```
from sklearn.preprocessing import MinMaxScaler
scaler = MinMaxScaler()
```

In [23]:

```
scaler.fit_transform(X_train)
scaler.transform(X_test)
```

Out[23]:

```
array([[0.07692308, 0.51388889, 0.26923077, ..., 1.        , 0.        ,
        0.        ],
       [0.1995842 , 0.51388889, 0.23076923, ..., 0.        , 0.        ,
        0.        ],
       [0.06444906, 0.56111111, 0.28846154, ..., 0.        , 0.        ,
        0.        ],
       ...,
       [0.08523909, 0.50833333, 0.23076923, ..., 0.        , 0.        ,
        0.        ],
       [0.04365904, 0.525     , 0.25      , ..., 0.        , 0.        ,
        0.        ],
       [0.16216216, 0.51666667, 0.44230769, ..., 0.        , 0.        ,
        0.        ]])
```

Training the Model

Linear Regression

In [24]:

```
from sklearn.linear_model import LinearRegression
linear_model = LinearRegression()
linear_model.fit(X_train, y_train)
```

Out[24]:

```
LinearRegression()
```

In [25]:

```
y_test_pred = linear_model.predict(X_test)
```

In [26]:

```
from sklearn import metrics
```

In [27]:

```
metrics.r2_score(y_test,y_test_pred)
```

Out[27]:

```
0.9182661537265939
```

Random Forest Regressor

In [28]:

```
from sklearn.ensemble import RandomForestRegressor
```

In [29]:

```
model_rf = RandomForestRegressor()
```

In [30]:

```
model_rf.fit(X_train,y_train)
```

Out[30]:

```
RandomForestRegressor()
```

In [31]:

```
y_pred_rf = model_rf.predict(X_test)
```

In [32]:

```
metrics.r2_score(y_test,y_pred_rf)
```

Out[32]:

```
0.9739244252159122
```

Decision Tree

In [33]:

```
from sklearn.tree import DecisionTreeRegressor
```

In [34]:

```
model_tree = DecisionTreeRegressor()
```

In [35]:

```
model_tree = DecisionTreeRegressor()
```

In [36]:

```
model_tree.fit(X_train,y_train)
```

Out[36]:

```
DecisionTreeRegressor()
```

In [37]:

```
y_pred_tree = model_tree.predict(X_test)
```

```
In [38]: metrics.r2_score(y_test,y_pred_tree)

Out[38]: 0.9524367348772984

In [ ]:
```