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

In [ ]:
```
csv_file = './academic_performance_data.csv'
dataset = pd.read_csv(csv_file)
df = pd.DataFrame(dataset)
```

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

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 358 entries, 0 to 357
Data columns (total 7 columns):
 #   Column        Non-Null Count  Dtype  
---  ------        --------------  -----  
 0   student_name  358 non-null    object 
 1   roll_num      358 non-null    int64  
 2   attendance    358 non-null    int64  
 3   gender        358 non-null    object 
 4   sem1_marks    352 non-null    float64
 5   sem2_marks    352 non-null    float64
 6   cgpa          358 non-null    float64
dtypes: float64(3), int64(2), object(2)
memory usage: 19.7+ KB
```

Replacing null marks with mean marks

In [ ]:
```
sem1_mean_marks = df["sem1_marks"].mean()
sem2_mean_marks = df["sem2_marks"].mean()

df["sem1_marks"].fillna(sem1_mean_marks,inplace=True)
df["sem2_marks"].fillna(sem2_mean_marks,inplace=True)

df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 358 entries, 0 to 357
Data columns (total 7 columns):
 #   Column        Non-Null Count  Dtype  
---  ------        --------------  -----  
 0   student_name  358 non-null    object 
 1   roll_num      358 non-null    int64  
 2   attendance    358 non-null    int64  
 3   gender        358 non-null    object 
 4   sem1_marks    358 non-null    float64
 5   sem2_marks    358 non-null    float64
 6   cgpa          358 non-null    float64
dtypes: float64(3), int64(2), object(2)
memory usage: 19.7+ KB
```

Finding and fixing outliers

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

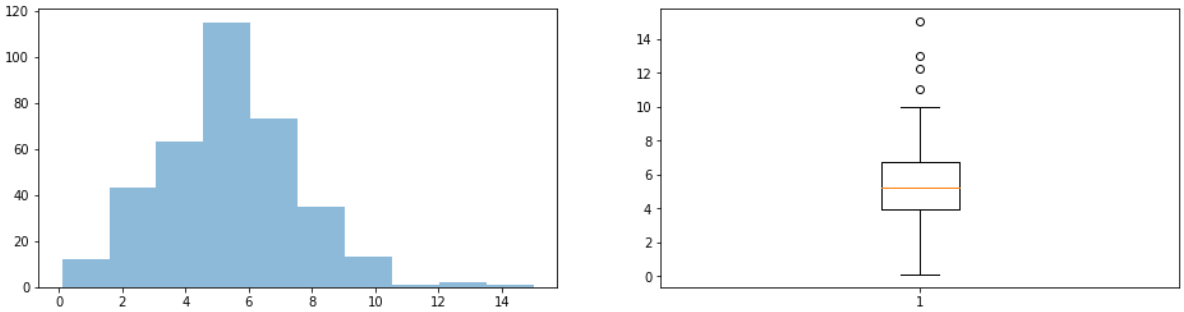
Out[ ]:

	roll_num	attendance	sem1_marks	sem2_marks	cgpa
count	358.000000	358.000000	358.000000	358.000000	358.000000
mean	248.114525	50.522346	304.866477	323.877841	5.356285
std	139.388222	29.461047	178.426398	173.375790	2.139807
min	1.000000	0.000000	-15.000000	-125.000000	0.090000
25%	125.250000	25.250000	159.000000	187.500000	3.912500
50%	241.500000	50.000000	304.866477	323.877841	5.250000
75%	381.750000	77.000000	459.500000	461.500000	6.705000
max	471.000000	99.000000	650.000000	720.000000	15.000000

In [ ]:
```
def plotvariable(df, variable):
  plt.figure(figsize=(16,4))
  #histogram
  plt.subplot(1,2,1)
  plt.hist(df[variable],alpha = .5)

  #boxplot
  plt.subplot(1,2,2)
  plt.boxplot(df[variable])
  plt.show()
```

In [ ]:
```
plotvariable(df,"cgpa")
```



In [ ]:
```
Q1 = df["cgpa"].quantile(0.25)
Q3 = df["cgpa"].quantile(0.75)
Q1,Q3
```

Out[ ]:
```
(3.9125, 6.705)
```

In [ ]:
```
IQR = Q3 - Q1
IQR
```

Out[ ]:
```
2.7925
```

In [ ]:
```
lower_limit = Q1 - 1.5*IQR
upper_limit = Q3 + 1.5*IQR
lower_limit,upper_limit
```

Out[ ]:
```
(-0.27624999999999966, 10.89375)
```

In [ ]:
```
df_no_outlier = df[(df["cgpa"] > lower_limit) & (df["cgpa"] < upper_limit)]
```

In [ ]:
```
df_no_outlier.describe()
```

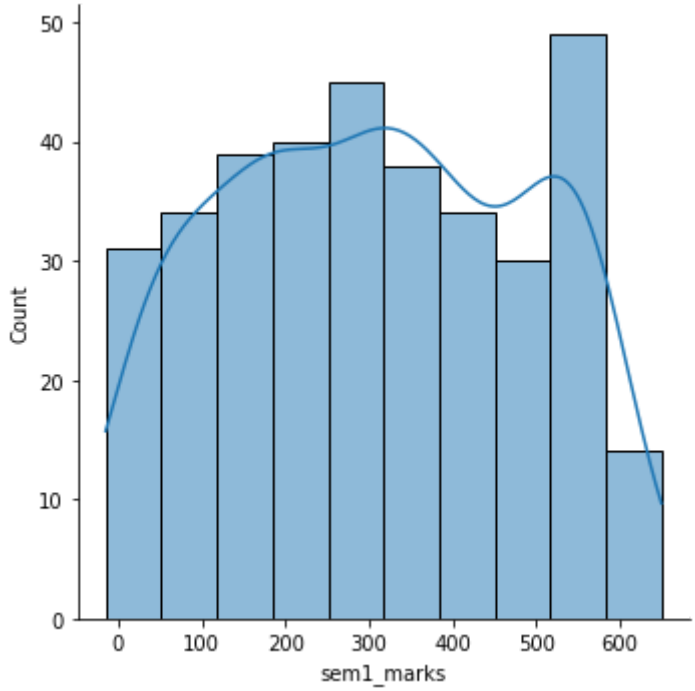
Out[ ]:

	roll_num	attendance	sem1_marks	sem2_marks	cgpa
count	354.000000	354.000000	354.000000	354.000000	354.000000
mean	246.245763	50.437853	307.161579	324.031828	5.272175
std	138.969636	29.449295	177.804920	173.139628	1.992907
min	1.000000	0.000000	-15.000000	-125.000000	0.090000
25%	124.250000	25.250000	162.750000	189.000000	3.885000
50%	239.500000	49.500000	304.866477	323.877841	5.245000
75%	379.750000	77.000000	460.000000	461.500000	6.657500
max	470.000000	99.000000	650.000000	720.000000	9.940000

Data transformation

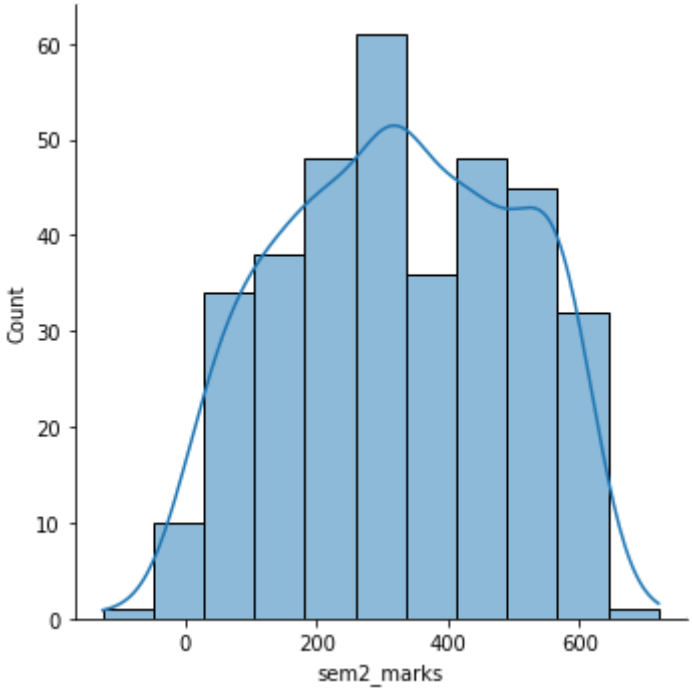
In [ ]:
```
sns.displot(df_no_outlier["sem1_marks"],kde=True)
```

Out[ ]:
```
<seaborn.axisgrid.FacetGrid at 0x7f2ec36f4340>
```



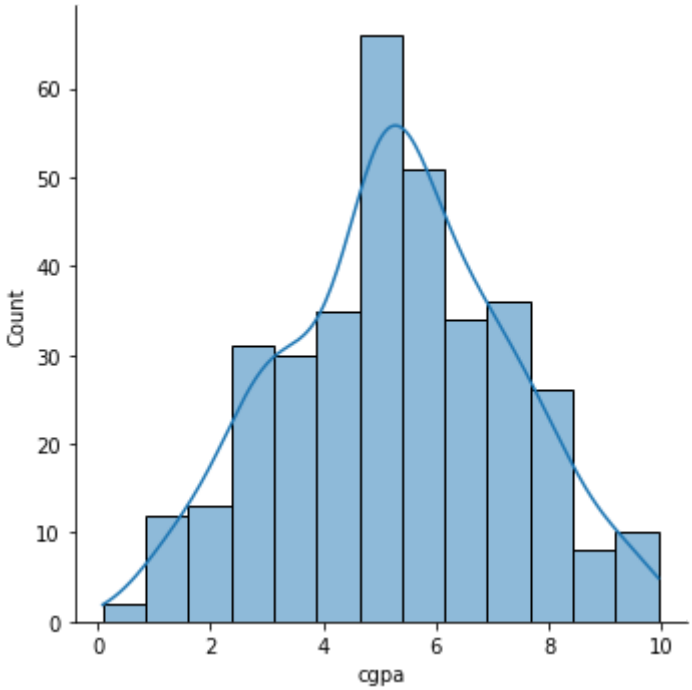
In [ ]:
```
sns.displot(df_no_outlier["sem2_marks"],kde=True)
```

Out[ ]:
```
<seaborn.axisgrid.FacetGrid at 0x7f2ec3808220>
```



In [ ]:
```
sns.displot(df_no_outlier["cgpa"],kde=True)
```

Out[ ]:
```
<seaborn.axisgrid.FacetGrid at 0x7f2ec37a1910>
```



In [ ]:
```
from sklearn.preprocessing import MinMaxScaler
df_min_max_scaled = df_no_outlier.copy()

scaler = MinMaxScaler()

numeric_cols = ["sem1_marks","sem2_marks","cgpa"]

df_scaled = scaler.fit_transform(df_no_outlier[numeric_cols].to_numpy())
df_scaled = pd.DataFrame(df_scaled, columns=numeric_cols)

print("Scaled Dataset Using MinMaxScaler")
df_scaled.describe()
```

```
Scaled Dataset Using MinMaxScaler
```

Out[ ]:

	sem1_marks	sem2_marks	cgpa
count	354.000000	354.000000	354.000000
mean	0.484454	0.531399	0.526109
std	0.267376	0.204899	0.202326
min	0.000000	0.000000	0.000000
25%	0.267293	0.371598	0.385279
50%	0.481002	0.531216	0.523350
75%	0.714286	0.694083	0.666751
max	1.000000	1.000000	1.000000