🎓 Student Performance Data Analysis

This project is part of my data science internship at Prodigy InfoTech. Over here I analyze the *Students Performance* dataset to explore patterns in test scores based on gender, parental education, and more.

🧰 Tools Used:

- Python
- Pandas
- Seaborn
- Matplotlib

📌 Goals:

- Understand the structure of the dataset
- Visualize categorical and continuous variables
- Discover trends in student performance

```
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt

%matplotlib inline
```

```
df = pd.read_csv('/content/StudentsPerformance.csv')
df.head()
```

	gender	race/ethnicity	parental level of education	lunch	test preparation course	math score	reading score	writing score
0	female	group B	bachelor's degree	standard	none	72	72	74
1	female	group C	some college	standard	completed	69	90	88
2	female	group B	master's degree	standard	none	90	95	93
3	male	group A	associate's degree	free/reduced	none	47	57	44
4	male	group C	some college	standard	none	76	78	75

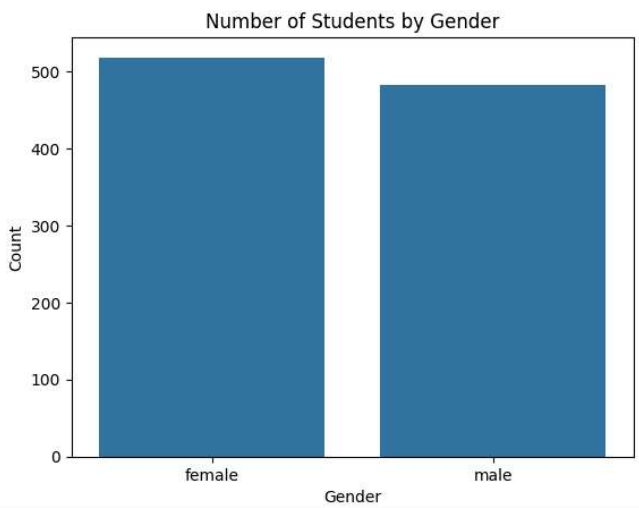
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1000 entries, 0 to 999
Data columns (total 8 columns):
 #   Column                       Non-Null Count  Dtype 
---  ------                       --------------  ----- 
 0   gender                       1000 non-null   object
 1   race/ethnicity               1000 non-null   object
 2   parental level of education  1000 non-null   object
 3   lunch                        1000 non-null   object
 4   test preparation course      1000 non-null   object
 5   math score                   1000 non-null   int64 
 6   reading score                1000 non-null   int64 
 7   writing score                1000 non-null   int64 
dtypes: int64(3), object(5)
memory usage: 62.6+ KB
```

Dataset Overview

The dataset contains 1000 student records with 8 columns.
Columns include both **categorical** (like gender, race, lunch) and **continuous** (math score, reading score) variables.
There are no missing values, which makes analysis easier.

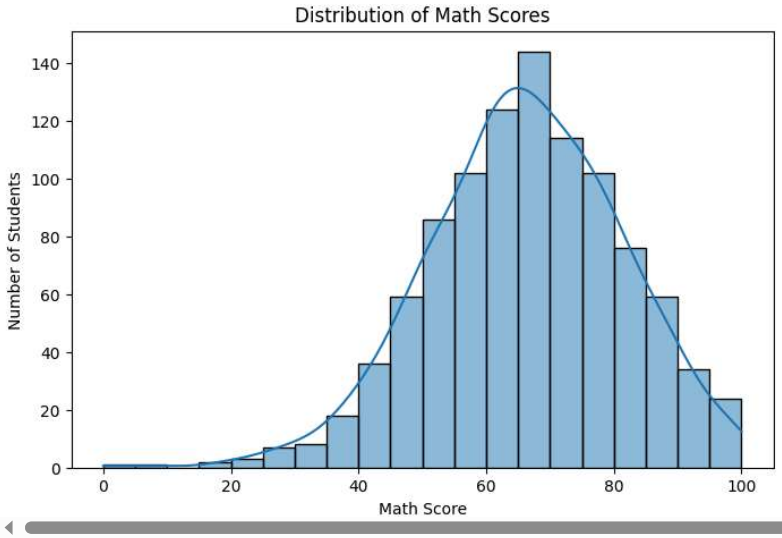
```
sns.countplot(x='gender', data=df)
plt.title('Number of Students by Gender')
plt.xlabel('Gender')
plt.ylabel('Count')
plt.show()
```



Gender Distribution

This bar chart shows the number of male and female students.
We see there are more female students than male students in this dataset.

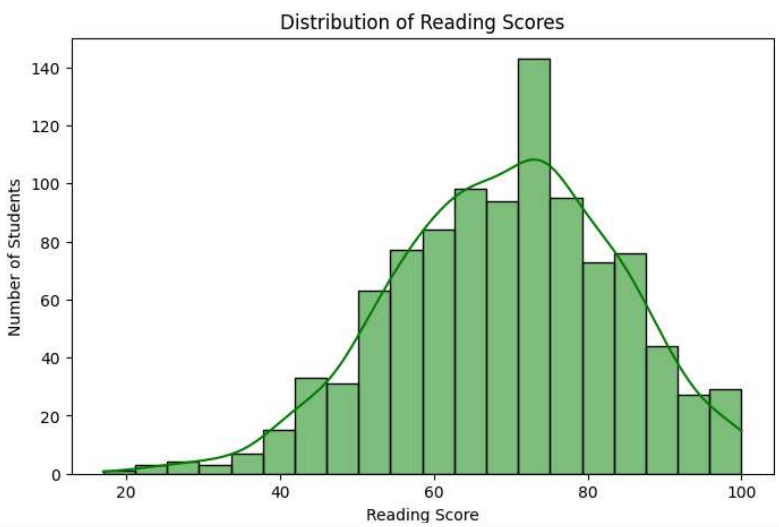
```
plt.figure(figsize=(8,5))
sns.histplot(df['math score'], bins=20, kde=True)
plt.title('Distribution of Math Scores')
plt.xlabel('Math Score')
plt.ylabel('Number of Students')
plt.show()
```



Math Score Distribution

This histogram shows how math scores are spread among students.
Most students scored between 60 and 90, with a few scoring very low or very high.

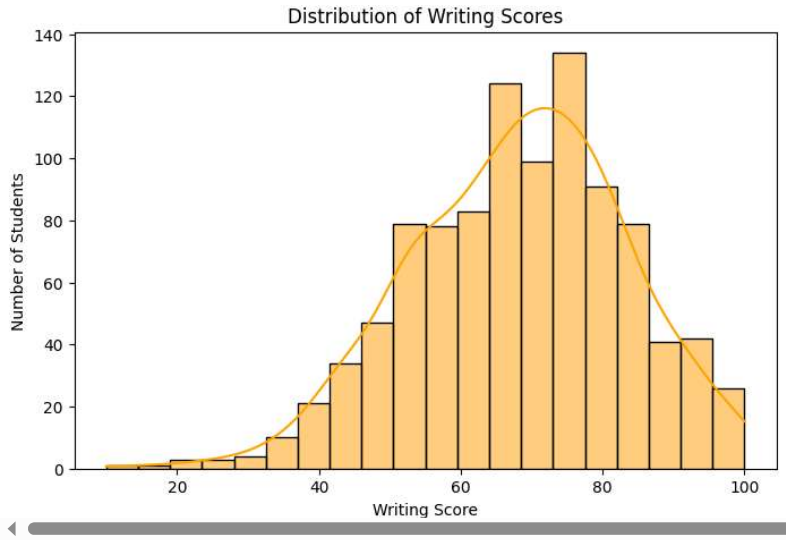
```
plt.figure(figsize=(8,5))
sns.histplot(df['reading score'], bins=20, kde=True, color='green')
plt.title('Distribution of Reading Scores')
plt.xlabel('Reading Score')
plt.ylabel('Number of Students')
plt.show()
```



Reading Score Distribution

The reading scores mostly cluster around 70 to 100, showing many students have strong reading skills.
The distribution is slightly skewed towards higher scores.

```
plt.figure(figsize=(8,5))
sns.histplot(df['writing score'], bins=20, kde=True, color='orange')
plt.title('Distribution of Writing Scores')
plt.xlabel('Writing Score')
plt.ylabel('Number of Students')
plt.show()
```



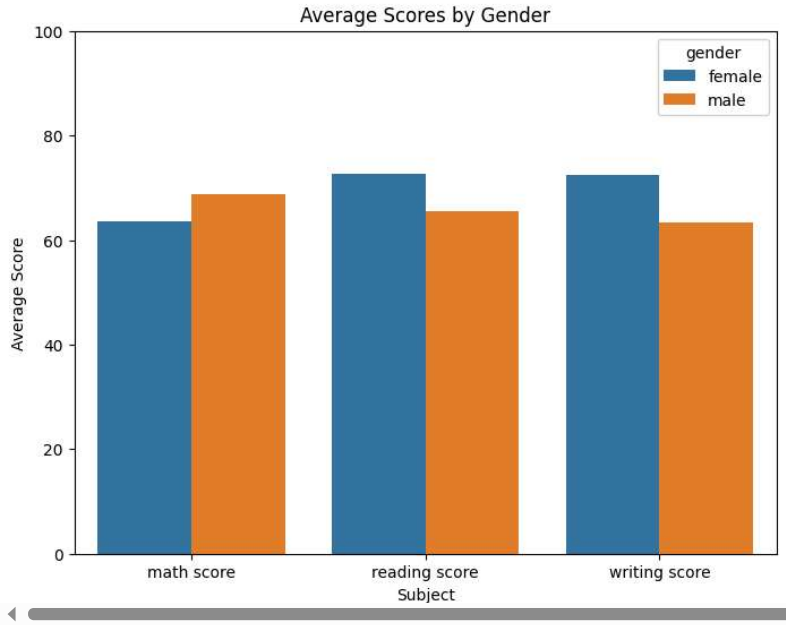
Writing Score Distribution

Most students scored between 60 and 100 in writing, with the distribution skewed slightly towards higher scores. This indicates generally strong writing skills in the group.

```
avg_scores = df.groupby('gender')[['math score', 'reading score', 'writing score']].mean().reset_index()

avg_scores_melted = avg_scores.melt(id_vars='gender', var_name='subject', value_name='average_score')

plt.figure(figsize=(8,6))
sns.barplot(x='subject', y='average_score', hue='gender', data=avg_scores_melted)
plt.title('Average Scores by Gender')
plt.ylabel('Average Score')
plt.xlabel('Subject')
plt.ylim(0, 100)
plt.show()
```



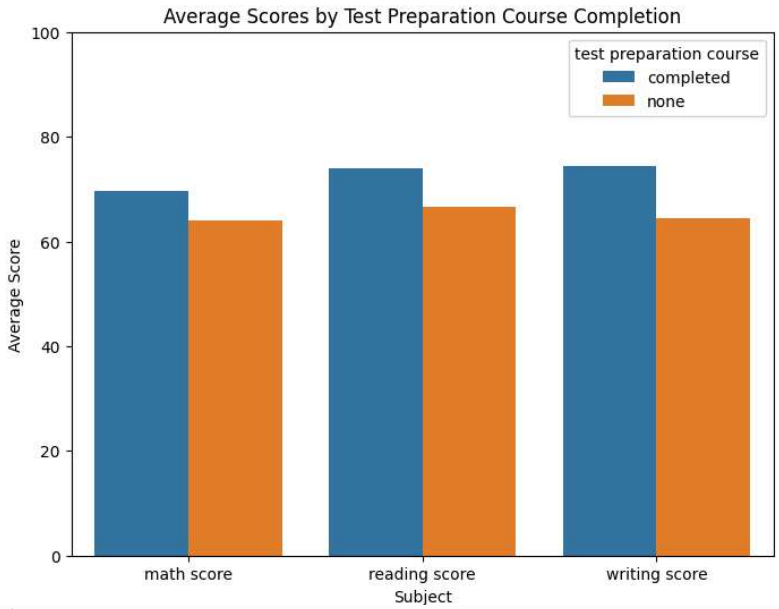
Average Scores by Gender

This grouped bar chart shows that female students generally score higher than male students across all three subjects: math, reading, and writing.

```
prep_avg = df.groupby('test preparation course')[['math score', 'reading score', 'writing score']].mean().reset_index()

prep_avg_melted = prep_avg.melt(id_vars='test preparation course', var_name='subject', value_name='average_score')

plt.figure(figsize=(8,6))
sns.barplot(x='subject', y='average_score', hue='test preparation course', data=prep_avg_melted)
plt.title('Average Scores by Test Preparation Course Completion')
plt.ylabel('Average Score')
plt.xlabel('Subject')
plt.ylim(0, 100)
plt.show()
```



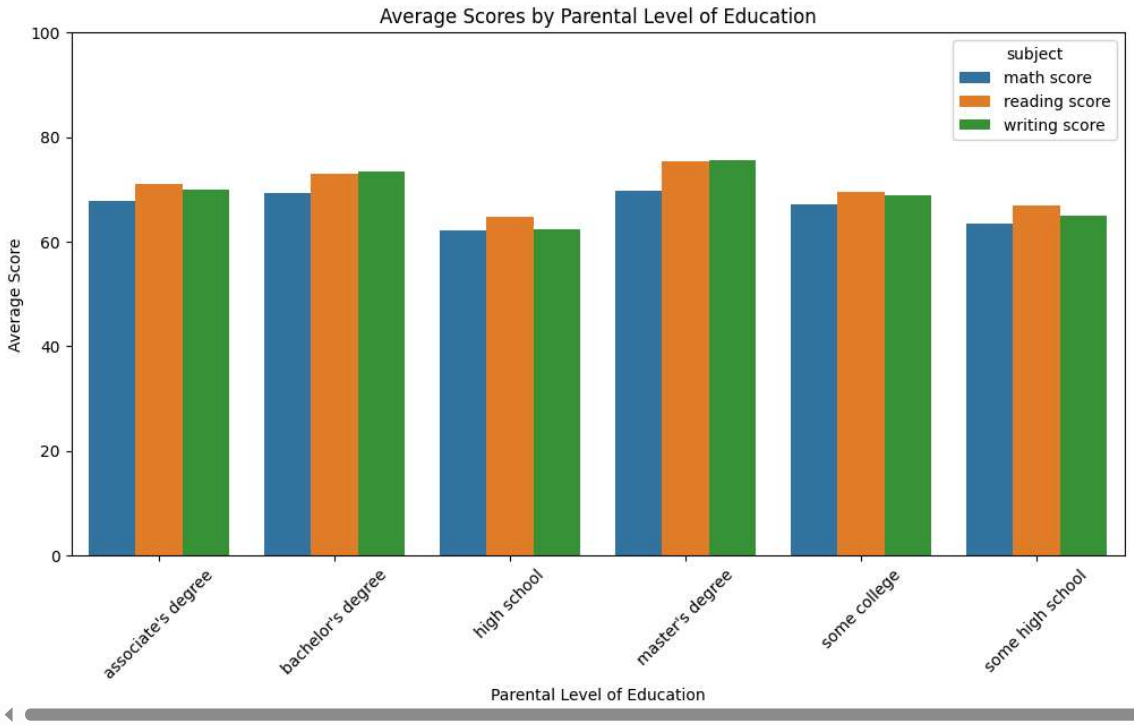
Impact of Test Preparation Course

Students who completed the test preparation course tend to have higher average scores across all subjects compared to those who did not.

```
parent_edu_avg = df.groupby('parental level of education')[['math score', 'reading score', 'writing score']].mean().reset_index()

parent_edu_melted = parent_edu_avg.melt(id_vars='parental level of education', var_name='subject', value_name='average_score')

plt.figure(figsize=(12,6))
sns.barplot(x='parental level of education', y='average_score', hue='subject', data=parent_edu_melted)
plt.title('Average Scores by Parental Level of Education')
plt.xlabel('Parental Level of Education')
plt.ylabel('Average Score')
plt.xticks(rotation=45)
plt.ylim(0, 100)
plt.show()
```



Average Scores by Parental Education

Students with parents who have higher education levels (like master's degree) tend to score higher across subjects.
This suggests parental education may influence student performance.

```
corr = df[['math score', 'reading score', 'writing score']].corr()

plt.figure(figsize=(6,4))
sns.heatmap(corr, annot=True, cmap='coolwarm', vmin=0.5, vmax=1)
plt.title('Correlation Between Test Scores')
plt.show()
```

Conclusion

- The dataset contains 1000 student records with a mix of categorical and continuous variables.
- Female students generally score higher than male students across all subjects.
- Completing the test preparation course positively impacts average scores.
- Higher parental education correlates with better student performance.
- Math, reading, and writing scores are strongly correlated, indicating consistent academic ability across subjects.

This analysis provides useful insights into factors affecting student performance and can guide educators to target support effectively.