Student Performance Analysis Report

**This report provides a comprehensive analysis of student performance based on gender, parental education level, ethnicity, and test preparation. It includes visual insights derived from a clean dataset to help understand score distributions and influential factors**.

# 1. Dataset Overview

- Dataset: Student Performance (CSV file)  
- Fields include gender, ethnicity, parental level of education, test preparation course, and scores in math, reading, and writing.  
- The dataset contains no missing values and is well-structured.

# 2. Gender Distribution

A bar chart was used to visualize the count of male vs. female students. This helps understand gender representation in the dataset.

# 3. Parental Education and Scores

Average math, reading, and writing scores were grouped by parental education level. A heatmap showed a visible trend—students whose parents had higher education levels tended to perform better.

# 4. Gender-Based Performance

Another heatmap illustrated the average scores for male and female students. While differences were not extreme, females slightly outperformed in reading and writing.

# 5. Distribution of Scores

Boxplots were used to visualize the distribution and spread of scores in math, reading, and writing. These plots highlighted outliers and score ranges among students.

# 6. Ethnicity Group Analysis

The column 'race/ethnicity' was renamed to 'ethnicity'. A pie chart illustrated the proportion of students in each group A through E, showing fairly balanced group sizes with slight variation.

# 7. Test Preparation Impact

Students who completed a test preparation course performed noticeably better across all subjects. This was confirmed via a heatmap and bar plot comparison.

# 8. Conclusion

The analysis indicates that parental education and participation in test preparation courses positively influence student performance. Gender and ethnicity also show minor but notable patterns worth deeper investigation.