Student Result Analysis Report

🔹 What is Student Result Analysis?

Student result analysis involves examining academic performance data to identify trends, patterns, and influencing factors. This kind of analysis helps educators and administrators understand:

- How demographic or socio-economic factors impact student scores
- The effects of parental education and marital status on academic outcomes
- Trends across different student groups (e.g., gender or ethnic group)
- Areas that may need intervention or support

By visualizing student performance data, we can make data-driven decisions in the field of education.

📂 Dataset Information: students_data.csv

This dataset contains detailed academic and demographic information of school students. Here's a summary of the attributes:

Column Name	Description
Unnamed: 0	Index column (auto-generated during data export, removed)
Gender	Gender of the student (Male/Female)
EthnicGroup	Categorical ethnicity label (Group A to Group E)
ParentEduc	Level of education of the student's parents
LunchType	Type of lunch received (e.g., standard, free/reduced)
TestPrep	Test preparation course completion (completed/not completed)
ParentMaritalStatus	Marital status of the student's parents
MathScore	Score in Mathematics (out of 100)
ReadingScore	Score in Reading (out of 100)
WritingScore	Score in Writing (out of 100)

🧰 Libraries Used and Why

import pandas as pd

import numpy as np

import matplotlib.pyplot as plt

import seaborn as sns

- pandas – for loading, cleaning, and manipulating structured data
- numpy – for handling numerical operations and aggregations
- matplotlib.pyplot – for plotting graphs
- seaborn – for creating beautiful statistical visualizations (like heatmaps, boxplots)

🔍 Step-by-Step Analysis

1. Loading the Data

df = pd.read_csv('students_data.csv')

Loads the CSV file into a DataFrame.

2. Data Inspection

df.head()

df.info()

df.describe()

df.isnull().sum()

- Checks the first few rows
- Inspects data types
- Describes summary statistics
- Confirms there are **no missing values**

3. Data Transformation

df = df.drop("Unnamed: 0", axis=1)

Removes the unnecessary index column that was created during export.

4. Gender Distribution

```
sns.countplot(data=df, x='Gender')
```

A countplot is created showing that **female students outnumber males** in the dataset.

5. Impact of Parental Education on Scores

```
gb = df.groupby('ParentEduc').agg({
  'MathScore': 'mean',
  'ReadingScore': 'mean',
  'WritingScore': 'mean'
})
sns.heatmap(gb, annot=True)
```

- A heatmap shows that **students whose parents have higher education levels tend to perform better** academically.

6. Impact of Parents' Marital Status

```
gb1 = df.groupby('ParentMaritalStatus').agg({
  'MathScore': 'mean',
  'ReadingScore': 'mean',
  'WritingScore': 'mean'
})
sns.heatmap(gb1, annot=True)
```

- This analysis shows **negligible or no significant impact** of marital status on academic performance.

7. Outlier Detection (Math Score)

```
sns.boxplot(data=df, x='MathScore')
```

- A boxplot is used to **detect outliers** in math scores. A few students may have exceptionally low or high scores.

8. Distribution of Ethnic Groups

```
# Count members of each ethnic group
# Create pie chart
```

A pie chart is created to visualize the ethnic group distribution.

- **Group C has the highest representation** among students.

📈 Visual Insights Summary

Insight	Conclusion
Gender Distribution	More female students than male
Parent Education	Positively correlates with student performance
Parent Marital Status	Has minimal impact on scores
Ethnic Group	Group C is the most populous
Outliers	Detected in math scores using boxplot

🎯 Real-World Applications

- **School administration** can identify performance gaps and create tailored support systems.
- **Counselors** can better understand students' backgrounds.
- **Policy makers** can allocate resources more effectively based on real data.
- **Parents and educators** can recognize the influence of education and support on students.

✅ Conclusion

This project shows how simple visualizations and group-based aggregation can reveal powerful educational insights.
We observed that:

- Parental education strongly influences academic performance
- Ethnic and gender distribution can be visualized to monitor diversity
- Not all demographic factors (like marital status) impact scores equally

This type of analysis can help design more inclusive, data-backed education systems.