EXPT NO:1	Implementation of data charts
DATE: 06.01.2026	

PRE-LAB QUESTIONS (PROVIDE BRIEF ANSWERS TO THE FOLLOWING QUESTIONS)

1. **How can visualization help an academic institution improve student outcomes?**
   Visualization makes trends, gaps, and patterns in student performance easier to understand, allowing faculty to identify weak areas and tailor interventions for better learning outcomes.

2. **Which chart types are suitable for comparing subject-wise performance?**
   Bar charts and column charts are ideal for comparing average marks across subjects.

3. **What type of data scale is used for student marks?**
   Student marks use a ratio scale (numeric scale with a true zero, e.g., 0–100 marks).

4. **Why should raw academic data be cleaned before visualization?**
   Cleaning ensures accuracy by removing errors, missing values, or inconsistencies, which prevents misleading charts and wrong conclusions.

5. **How does visualization support evidence-based decision making?**
   Visualization presents data clearly, enabling administrators to make informed decisions on curriculum changes, teaching strategies, or student interventions based on actual performance data.

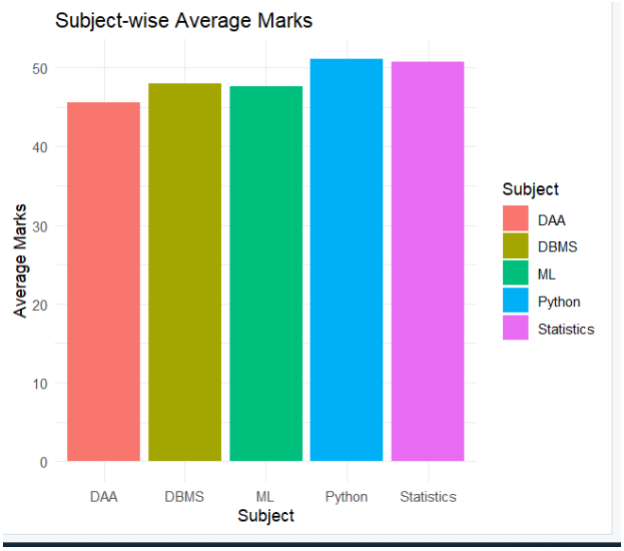
IN-LAB EXERCISE:
OBJECTIVE:
To design appropriate data charts to analyze and compare academic performance indicators.
SCENARIO:
An autonomous engineering college wants to analyze internal assessment performance of first-year students across five subjects to identify difficult courses and improve teaching strategies.
IN-LAB TASKS (Using R Language)

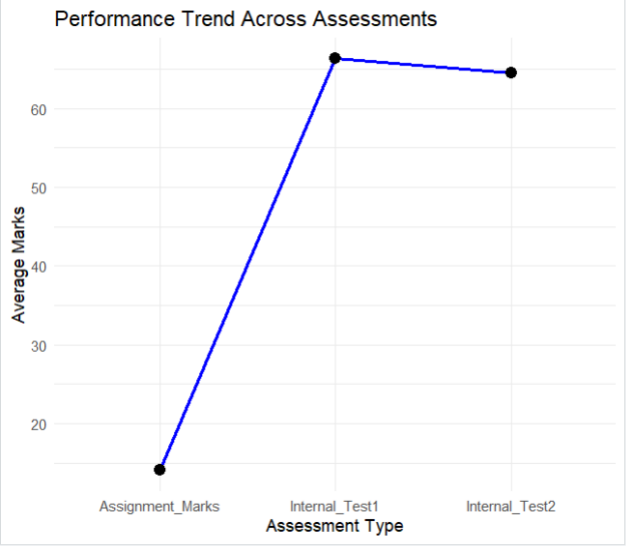
- Load required R libraries (ggplot2, dplyr)
- Import dataset using read.csv()
- Perform basic data preprocessing
- Create bar chart for subject-wise average marks
- Generate line chart for performance trend across tests
- Plot pie chart for grade distribution

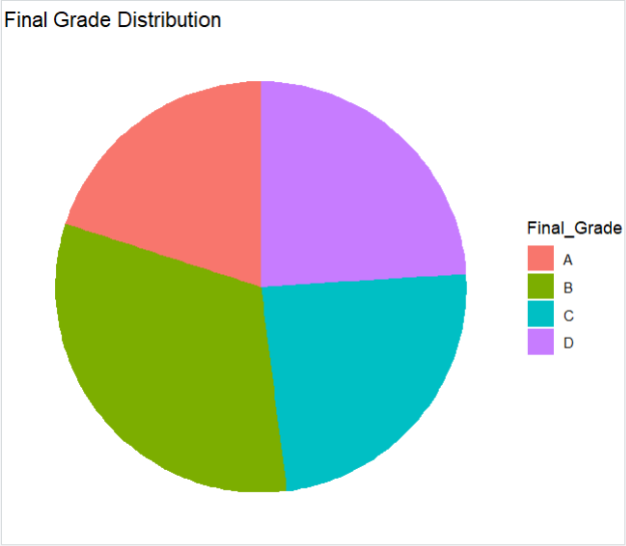
CODE:

```r
library(ggplot2)
library(dplyr)
library(tidyr)
student_data <- read.csv("C:/Users/Hey Fam!/Downloads/1.student_performance.csv")
head(student_data)
str(student_data)
student_data <- student_data %>%
  mutate(Average = rowMeans(
    select(., Internal_Test1, Internal_Test2, Assignment_Marks),
    na.rm = TRUE
  ))

# ----------------------------
# Bar Chart: Subject-wise Average Marks
# ----------------------------
subject_avg <- student_data %>%
  group_by(Subject) %>%
  summarise(Average_Marks = mean(Average))
ggplot(subject_avg, aes(x=Subject, y=Average_Marks, fill=Subject)) +
  geom_bar(stat="identity") +
  labs(title="Subject-wise Average Marks", y="Average Marks") +
  theme_minimal()

# ----------------------------
# Line Chart: Performance Trend Across Tests
# ----------------------------
# Calculate average per assessment type
test_avg <- student_data %>%
  summarise(
    Internal_Test1 = mean(Internal_Test1, na.rm = TRUE),
    Internal_Test2 = mean(Internal_Test2, na.rm = TRUE),
    Assignment_Marks = mean(Assignment_Marks, na.rm = TRUE)
  ) %>%
  pivot_longer(cols = everything(),
               names_to = "Assessment",
               values_to = "Average_Marks")
ggplot(test_avg, aes(x=Assessment, y=Average_Marks, group=1)) +
  geom_line(color="blue", size=1) +
  geom_point(size=3) +
  labs(title="Performance Trend Across Assessments",
       x="Assessment Type",
       y="Average Marks") +
  theme_minimal()

# ----------------------------
# Pie Chart: Final Grade Distribution
# ----------------------------
grade_dist <- student_data %>%
  group_by(Final_Grade) %>%
  summarise(Count = n())
ggplot(grade_dist, aes(x="", y=Count, fill=Final_Grade)) +
  geom_bar(stat="identity", width=1) +
  coord_polar(theta="y") +
  labs(title="Final Grade Distribution") +
  theme_void()
```

OUTPUT:







POST-LAB QUESTIONS (PROVIDE BRIEF ANSWERS TO THE FOLLOWING QUESTIONS)

1. **Which subject shows consistently low performance and why?**
   From the Subject-wise Average Marks bar chart, DAA has the lowest average marks compared to DBMS, ML, Python, and Statistics. This suggests students are scoring lower overall in DAA across assessments. DAA is typically concept-heavy and logic-intensive, which may make it harder for students to perform well consistently compared to more practical or scoring subjects like Python or Statistics.

2. **Why is a line chart suitable for trend analysis?**
   Line charts display changes over time or sequential tests, making it easy to spot performance trends and fluctuations.

3. **What limitations does a pie chart have in analytics?**
   Pie charts are less effective when there are many categories or small differences, making comparisons difficult and potentially misleading.

4. **How can this analysis help curriculum planning?**
   Identifying weak subjects allows curriculum designers to allocate more teaching time, provide remedial sessions, or revise content for better learning outcomes.

5. **How can such visualizations be integrated into AI-driven academic analytics**
   Visualizations can be fed into AI models for predictive analytics, personalized learning recommendations, performance forecasting, and automated reporting dashboards.

ASSESSMENT

Description	Max Marks	Marks Awarded
Pre Lab Exercise	**5**	
In Lab Exercise	**10**	
Post Lab Exercise	**5**	
Viva	**10**	
Total	**30**	
	Faculty Signature	