Question 1
Examine the relationship between daily study hours and exam scores using the following data:
- Study Hours: \{1, 2, 3, 4, 5\}
- Exam Scores: \{50, 60, 70, 80, 90\}

Predict the exam score for a student who studies 3.5 hours using linear regression.

```
# Sample data
study_hours <- c(1, 2, 3, 4, 5)
exam_scores <- c(50, 60, 70, 80, 90)

# Perform linear regression
model <- lm(exam_scores ~ study_hours)

# Summary of the model
summary(model)

# Predict a value
study_time <- 3.5
predicted_score <- predict(model, newdata = data.frame(study_hours = study_time))
cat("Predicted exam score for studying", study_time, "hours:", predicted_score, "\n")

# Plotting
plot(study_hours, exam_scores, main = "Linear Regression: Study Hours vs Exam Scores", xlab = "Study Hours", ylab = "Exam Scores", pch = 19, col = "blue")
abline(model, col = "red")
```

Question 2

Analyze the association between vehicle type (Sedan, SUV, Truck) and fuel efficiency (Low, Medium, High) using the following contingency table with a chi-square test for independence:

	Low	Medium	High
Sedan	15	25	10
SUV	10	30	20
Truck	20	10	5

```
# Contingency table
data <- matrix(c(15, 25, 10, 10, 30, 20, 20, 10, 5), nrow = 3, byrow = TRUE)
colnames(data) <- c("Low", "Medium", "High")
rownames(data) <- c("Sedan", "SUV", "Truck")

# Perform Chi-Square test
chi_square_test <- chisq.test(data)

# Results
cat("Chi-Square Statistic:", chi_square_test$statistic, "\n")
cat("P-value:", chi_square_test$p.value, "\n")

# Interpretation of the p-value
alpha <- 0.05
if (chi_square_test$p.value < alpha) {
  cat("Reject the null hypothesis: There is a significant association.\n")
} else {
  cat("Fail to reject the null hypothesis: No significant association.\n")
}
```

Question 3

Assess the differences in customer satisfaction ratings across three different service types:
- Service Type A: \{4, 5, 4, 5\}
- Service Type B: \{3, 3, 4, 2\}
- Service Type C: \{5, 5, 4, 5\}. Use one-way ANOVA to determine if there are significant differences in mean ratings at a significance level of 0.05.

```
# Sample data from three different groups
service_a <- c(4, 5, 4, 5)
service_b <- c(3, 3, 4, 2)
service_c <- c(5, 5, 4, 5)

# Combine groups into a data frame
data <- data.frame(
  ratings = c(service_a, service_b, service_c),
  service = factor(rep(c("Service_A", "Service_B", "Service_C"), each = 4))
)

# Perform One-Way ANOVA
anova_result <- aov(ratings ~ service, data = data)
summary(anova_result)

# Interpretation
anova_p_value <- summary(anova_result)[[1]][["Pr(>F)"]][1]
alpha <- 0.05
if (anova_p_value < alpha) {
  cat("Reject the null hypothesis: At least one group mean is significantly different.\n")
} else {
  cat("Fail to reject the null hypothesis: No significant differences between group means.\n")
}
```

Question 4

Compare the average waiting times for two different restaurants:

- Restaurant A: \{15, 20, 18, 16, 14\}
- Restaurant B: \{30, 25, 28, 32, 29\}. Use a two-sample t-test to determine if the means are significantly different at a significance level of 0.05.

```r
# Sample data from two independent groups
restaurant_a <- c(15, 20, 18, 16, 14)
restaurant_b <- c(30, 25, 28, 32, 29)

# Perform Two-Sample T-Test
t_test_result <- t.test(restaurant_a, restaurant_b)

# Results
cat("T-Statistic:", t_test_result$statistic, "\n")
cat("P-Value:", t_test_result$p.value, "\n")

# Interpretation of the p-value
alpha <- 0.05
if (t_test_result$p.value < alpha) {
  cat("Reject the null hypothesis: The means are significantly different.\n")
} else {
  cat("Fail to reject the null hypothesis: No significant difference between the means.\n")
}
```