```r
# 1. F-Test Between Two Samples
sample1 <- c(20, 16, 26, 27, 23, 22, 18, 24, 25, 19)
sample2 <- c(27, 33, 42, 35, 32, 34, 38, 28, 41, 43, 30, 37)
var1 <- var(sample1)
var2 <- var(sample2)
cat("Variance of Sample I:", var1, "\n")
cat("Variance of Sample II:", var2, "\n")
f_test <- var.test(sample1, sample2)
print(f_test)

# 2. Two-Way ANOVA on Sales Data
sales <- data.frame(
  Salesman = rep(c("A", "B", "C", "D"), each = 3),
  Season = rep(c("Summer", "Winter", "Monsoon"), 4),
  Sales = c(45, 43, 39, 40, 41, 39, 38, 45, 41, 37, 38, 41)
)
anova_result <- aov(Sales ~ Salesman + Season, data = sales)
summary(anova_result)

# 3. Latin Square Design ANOVA
treatments <- c("A", "C", "B", "D", "C", "B", "D", "A", "B", "D", "A", "C", "D", "A", "C", "B")
rows <- factor(rep(1:4, each = 4))
cols <- factor(rep(1:4, times = 4))
response <- c(12, 19, 10, 8, 18, 12, 6, 7, 22, 10, 5, 21, 12, 7, 27, 17)
data <- data.frame(response, treatments = factor(treatments), rows, cols)
anova_result <- aov(response ~ treatments + rows + cols, data = data)
summary(anova_result)

# 4. X-Bar Chart (Mean Chart)
samples <- 1:12
mean_values <- c(120, 127, 152, 157, 160, 134, 137, 123, 140, 144, 120, 127)
CL <- mean(mean_values)
A2 <- 0.577
range_values <- c(30, 44, 60, 34, 38, 35, 45, 62, 39, 50, 35, 41)
R_bar <- mean(range_values)
UCL <- CL + (A2 * R_bar)
LCL <- CL - (A2 * R_bar)

plot(samples, mean_values, type = "o", col = "blue",
     ylim = c(min(LCL, min(mean_values)) - 5, max(UCL, max(mean_values)) + 5),
     main = "Mean Chart (X-Bar Chart)",
     xlab = "Sample Number", ylab = "Mean Life (hours)")
abline(h = CL, col = "black", lwd = 2)
abline(h = UCL, col = "red", lwd = 2, lty = 2)
abline(h = LCL, col = "green", lwd = 2, lty = 2)
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# 5. C Chart (Defect Count)
units <- 1:15
defects <- c(2, 4, 3, 1, 1, 2, 5, 3, 6, 7, 3, 1, 4, 2, 1)
C_bar <- mean(defects)
UCL_C <- C_bar + 3 * sqrt(C_bar)
LCL_C <- C_bar - 3 * sqrt(C_bar)

plot(units, defects, type = "o", col = "blue",
     ylim = c(min(LCL_C, min(defects)) - 1, max(UCL_C, max(defects)) + 1),
     main = "C Chart (Defect Count)",
     xlab = "Unit Number", ylab = "Number of Defects")
abline(h = C_bar, col = "black", lwd = 2)
abline(h = UCL_C, col = "red", lwd = 2, lty = 2)
abline(h = LCL_C, col = "green", lwd = 2, lty = 2)

# 6. F-Test on Two Diet Groups
dietA <- c(5, 6, 8, 1, 12, 4, 3, 9, 6, 10)
dietB <- c(2, 3, 6, 8, 10, 1, 2, 8)
var.test(dietA, dietB)

# 7. Latin Square Design for Yield
Yield <- c(122, 121, 123, 122,
           124, 123, 122, 125,
           120, 119, 120, 121,
           122, 123, 121, 122)
Method <- factor(c("S", "P", "R", "Q",
                   "Q", "R", "P", "S",
                   "P", "Q", "S", "R",
                   "R", "S", "Q", "P"))
Row <- factor(rep(1:4, each = 4))
Column <- factor(rep(1:4, times = 4))
data <- data.frame(Yield, Method, Row, Column)
anova_result <- aov(Yield ~ Row + Column + Method, data = data)
summary(anova_result)

# 8. Two-Factor ANOVA (Temperature & Detergent)
data <- data.frame(
  Temperature = rep(c("Cold", "Warm", "Hot"), each = 3),
  Detergent = rep(c("A", "B", "C"), 3),
  Whiteness = c(57, 55, 67, 49, 52, 68, 54, 46, 58)
)
anova_result <- aov(Whiteness ~ Temperature + Detergent, data = data)
summary(anova_result)
```