**Exe 8.1B.xlsx (Diets - Independent Samples t-test)**

**Step 1: State the Hypotheses**

H₀: μ\_A = μ\_B (The mean weight loss is the same for both diets)

H₁: μ\_A ≠ μ\_B (The mean weight loss differs between diets)

**Step 2: Set Decision Criteria**

α = 0.05

**Step 3: Compute Test Statistic**

From the data:

Diet A: n=50, Mean=5.876, SD=2.287

Diet B: n=50, Mean=3.742, SD=2.532

Using Excel's Data Analysis t-Test: Two-Sample Assuming Unequal Variances:

t-statistic = 4.416

df = 96

p-value = 0.000025

**Step 4: Make Decision**

Since p-value (0.000025) < α (0.05), we REJECT the null hypothesis.

There is strong evidence that the mean weight loss differs significantly between Diet A and Diet B. Diet A shows greater weight loss (5.876 kg) compared to Diet B (3.742 kg).

**Exe 8.2B.xlsx (Diets - Non-parametric analysis)**

**Step 1: State the Hypotheses**

H₀: The distributions of weight loss are the same for both diets

H₁: The distributions of weight loss differ between diets

**Step 2: Set Decision Criteria**

α = 0.05

**Step 3: Compute Descriptive Statistics**

From the data:

Diet A: Median=5.861, Q1=4.007, Q3=7.265, IQR=3.258

Diet B: Median=3.840, Q1=1.757, Q3=5.123, IQR=3.366

**Step 4: Make Decision**

The medians and quartiles show clear differences between diets. Diet A has higher central tendency across all measures.

The descriptive statistics support the t-test results from File 1, showing Diet A produces better weight loss outcomes.

**Exe 8.3D.xlsx (Brand Preference - Chi-square Test)**

**Step 1: State the Hypotheses**

H₀: There is no association between Area and Brand Preference

H₁: There is an association between Area and Brand Preference

**Step 2: Set Decision Criteria**

α = 0.05

**Step 3: Compute Test Statistic**

Chi-square test results:

* χ² = 2.894
* df = 2
* p-value = 0.235

**Step 4: Make Decision**

Since p-value (0.235) > α (0.05), we FAIL TO REJECT the null hypothesis.

There is no significant evidence of an association between geographic area and brand preference.

**File 4: Exe 8.4G.xlsx (Filtration Agents – Paired t-test)**

**Step 1: State the Hypotheses**

H₀: μ\_d = 0 (No difference in mean impurities between agents)

H₁: μ\_d ≠ 0 (Difference in mean impurities between agents)

**Step 2: Set Decision Criteria**

α = 0.05

**Step 3: Compute Test Statistic**

Paired differences (Agent1 - Agent2):

Mean difference: -0.408

SD of differences: 0.447

t-statistic = -3.164

df = 11

p-value (two-tail) = 0.009

**Step 4: Make Decision**

**Since p-value (0.009) < α (0.05), we REJECT the null hypothesis.**

There is a significant difference in impurity levels between the two filtration agents. Agent 1 shows lower impurity levels than Agent 2.

**Exe 8.6C.xlsx (Income by Sex - Independent Samples t-test)**

**Step 1: State the Hypotheses**

H₀: μ\_M = μ\_F (Mean income is the same for males and females)

H₁: μ\_M ≠ μ\_F (Mean income differs between males and females)

**Step 2: Set Decision Criteria**

α = 0.05

**Step 3: Compute Test Statistic**

From the data:

Male: n=60, Mean=52.383, SD=14.892

Female: n=60, Mean=44.695, SD=14.218

Using Excel's Data Analysis t-Test: Two-Sample Assuming Unequal Variances:

t-statistic = 2.941

df = 117

p-value = 0.004

**Step 4: Make Decision**

**Since p-value (0.004) < α (0.05), we REJECT the null hypothesis.**

There is strong evidence that mean income differs significantly between male and female cardholders. Males have higher average income (£52,383) compared to females (£44,695).