

## Unit 7 – Inferential Statistics and Hypothesis Testing

### 1. Purpose

Complete the Hypothesis Testing and Summary Measures worksheets using Excel datasets (Exa 7.1B, 7.2B, 7.3D, 7.4F, 7.6B). Provide the required calculations, charts, and interpretations as evidence for the compulsory e-Portfolio component.

### 2. Summary Measures (from Unit 6 Worksheet)

Diet	count	mean	median	std
A	50	5.341	5.642	2.536
B	50	3.710	3.745	2.769

Figure: Exercise 7.1B – Mean, median, and standard deviation by diet.

Diet	count	mean	median	std
A	50	5.341	5.642	2.536
B	50	3.710	3.745	2.769

Figure: Exercise 7.2B – Mean, median, and standard deviation by diet.



### 3. Hypothesis Tests and Charts

#### 3.1 Exercise 7.4F – Paired t-Test (Con1 vs Con2)

t-statistic = 2.875 ; p(two-tailed) = 0.01834 ; n = 10 pairs

Decision ( $\alpha = 0.05$ ): Reject  $H_0$ . There is a significant difference between Con1 and Con2.



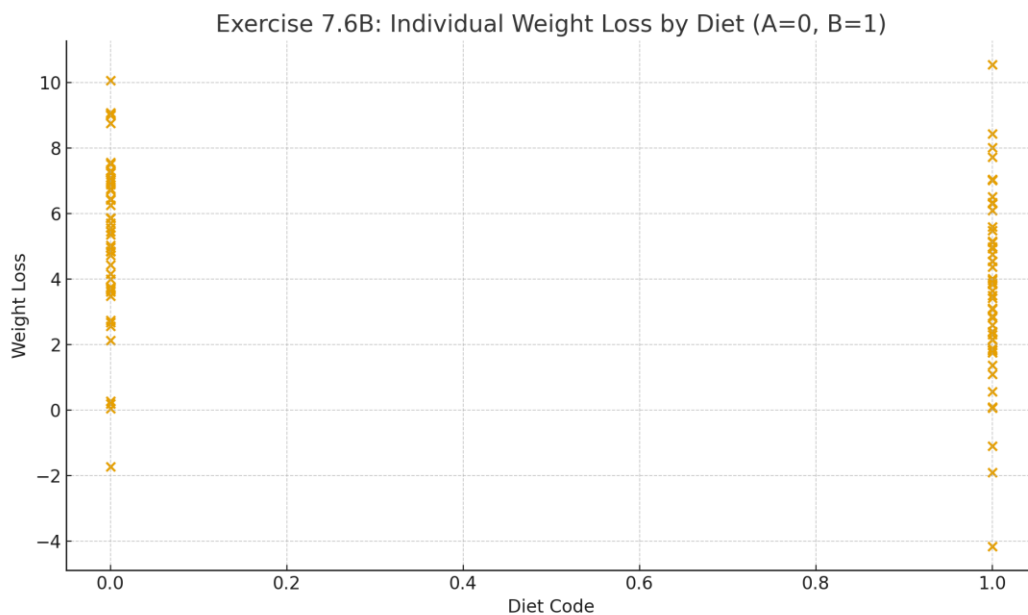
### 3.2 Exercise 7.6B – Independent t-Test (Diet A vs Diet B) + F-test

Equal-variance t-test:  $t = 3.072$  ;  $p(\text{two-tailed}) = 0.00275$

Welch t-test:  $t = 3.072$  ;  $p(\text{two-tailed}) = 0.00276$

F-test for equal variances:  $F = 1.193$  ;  $p(\text{two-tailed}) = 0.53990$  (fail to reject equal variances)

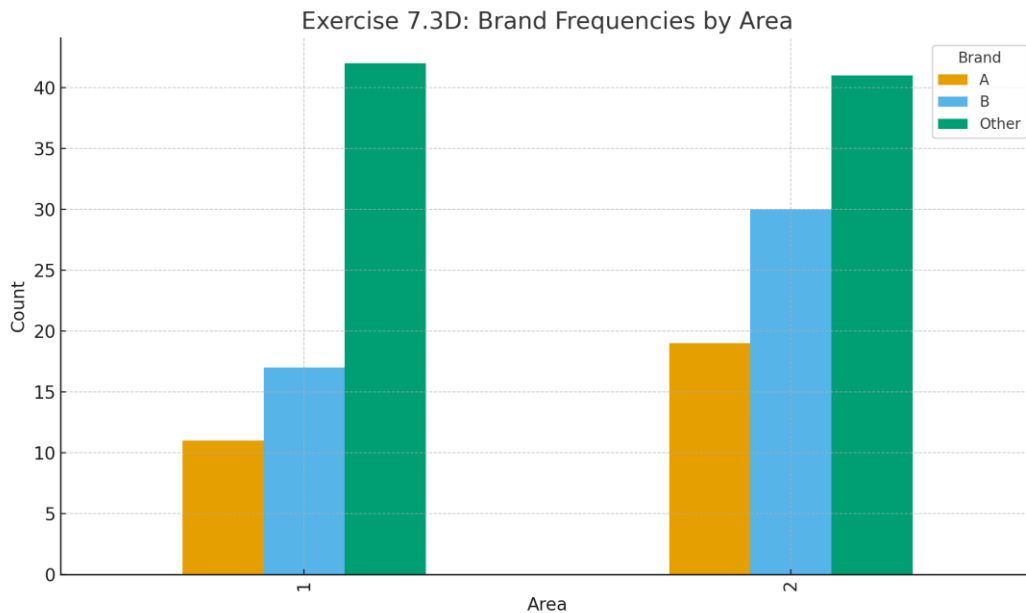
Decision ( $\alpha = 0.05$ ): Reject  $H_0$ . Diet A achieves significantly greater mean weight loss than Diet B.



### 3.3 Exercise 7.3D – Chi-square Test of Independence (Area × Brand)

Chi-square = 3.293 ; df = 2 ; p = 0.19276

Decision ( $\alpha = 0.05$ ): Fail to reject  $H_0$ . No significant association between Area and Brand in this sample.



#### 4. Interpretation (per Unit 7 Inference Notes)

Following the four-step process: (1) State  $H_0$  and  $H_1$ , (2) Set  $\alpha = 0.05$ , (3) Compute the test statistic, (4) Make a decision using the p-value. For 7.4F and 7.6B,  $p < 0.05$  so we reject  $H_0$ ; for 7.3D,  $p > 0.05$  so we fail to reject  $H_0$ . These decisions align with the hypothesis testing framework and acknowledge the risk of Type I/II errors cited in the notes.

#### 5. Reflection

This unit strengthened my ability to link descriptive statistics with inferential testing. The paired and independent t-tests demonstrated how data support decision-making, while the chi-square test showed how to assess relationships between categorical variables. I will apply these methods to cybersecurity analytics (e.g., comparing incident rates pre/post control changes, assessing training impact, and evaluating tool performance).