## 3c. T-Tests Exercises

### Q1
A random sample of laboratory mice is taken to see if the population mean weight is 25.0 g. The sample yields the following data: 24.2, 25.1, 23.0, 22.8, 24.5 and 23.8. Assume normality.
   a. Test the null hypothesis $H_0$: $\mu$ (mean) = 25 versus $H_1$: $\mu \neq 25$ using a level of significance of $\alpha = 0.10$.
   b. What is the $p$-value associated with the value of the test statistic?

### Q2
A random sample of six recent graduates of a local business school, all accounting majors, revealed salaries $25,000, $21,000, $22,000, $21,000, $23,000 and $26,000 per year. Assume normality and test the null hypothesis $H_0$: $\mu$ = $25,000 versus $H_0$: $\mu \neq$ $25,000 with $\alpha$ = 0.02. State and interpret the $p$-value.

### Q3
An office manager sends 10 randomly selected secretaries to a week-long course to improve their typing speed. The manager times their speed before and after the course to see if the course is worth the lost time and expense. State the appropriate null and alternative hypotheses and test the null hypothesis with $\alpha = 0.025$. State the $p$-value. Find a 95% confidence interval for the mean increase in typing speed.

| Speed after Course | Speed before Course |
|---|---|
| 55 | 50 |
| 46 | 42 |
| 78 | 70 |
| 61 | 63 |
| 52 | 58 |
| 45 | 35 |
| 47 | 46 |
| 57 | 52 |
| 71 | 60 |
| 58 | 49 |

### Q4
Twenty randomly selected patients on a diet to loose weight had their weight recorded before starting the diet and after one month's time on the diet. The weight loss (before minus after) was recorded for each patient as follows:

| 7 | -6 | 3 | 1 | 6 | 4 | 9 | -5 | 9 | 7 |
|---|---|---|---|---|---|---|---|---|---|
| -3 | 7 | -9 | 8 | 6 | -4 | 4 | 9 | -6 | 1 |

State the appropriate null and alternative hypotheses to test the effectiveness of this diet. Use a significance level of $\alpha = 0.05$.

**Q5**

A college professor teaches two sections of the same subject. One section meets at 8 a.m. and the other meets at 10 a.m. with one hour separating the two classes. At examination time she gives identical exams to both classes but is concerned that the 10 a.m. section might have higher scores based on possible information received about the test from individuals in the 8 a.m. section. Test the null hypothesis $H_0$: $\mu_8 = \mu_{10}$ versus $H_1$: $\mu_8 \neq \mu_{10}$ with $\alpha = 0.10$ and state the *p*-value. Assume these test scores resemble two independent random samples from normal populations.

| 8 a.m. Scores | | | 10 a.m. Scores | | |
|---|---|---|---|---|---|
| 98 | 95 | 94 | 100 | 98 | 98 |
| 91 | 90 | 89 | 97 | 96 | 94 |
| 87 | 77 | 76 | 92 | 92 | 89 |
| 75 | 73 | 70 | 86 | 85 | 85 |
| 67 | 67 | 66 | 85 | 82 | 81 |
| 65 | 57 | 56 | 79 | 79 | 78 |
| 55 | 53 | 45 | 78 | 77 | 77 |
| 43 | 39 | | 74 | 72 | 67 |
| | | | 65 | 62 | 56 |
| | | | 56 | 49 | 47 |