MATH1001 Homework Solution

Chapter 8

8.2.2

(a) The standard deviation of the nine sample differences is given as 59.3. The standard error is

$$SE_{\bar{D}} = \frac{s_D}{\sqrt{n_D}} = \frac{59.3}{\sqrt{9}} = 19.77.$$

(b) H_0: The mean weight gains on the two diets are the same ($\mu_1 = \mu_2$)
H_A: The mean weight gains on the two diets are different ($\mu_1 \neq \mu_2$)

$t_s = 22.9/19.77 = 1.158$. With df = 8, Table 4 gives $t_{0.20} = 0.889$ and $t_{0.10} = 1.397$. Thus, $0.20 < P\text{-value} < 0.40$ and we do not reject H_0. There is insufficient evidence ($0.20 < P < 0.40$) to conclude that the mean weight gains on the two diets are different.

(c) $22.9 \pm (1.860)(19.77)$
(-13.9,59.7) or $-13.9 < \mu_D < 59.7$ lb.

(d) We are 90% confident that the average steer gains somewhere between 59.7 pounds more and 13.9 pounds less when on Diet 1 than when on Diet 2 (in a 140-day period).

8.2.3

Let 1 denote control and let 2 denote progesterone.

H_0: Progesterone has no effect on cAMP ($\mu_1 = \mu_2$)
H_A: Progesterone has some effect on cAMP ($\mu_1 \neq \mu_2$)

The standard error is

$$SE_{\bar{D}} = \frac{s_D}{\sqrt{n_D}} = \frac{0.40}{\sqrt{4}} = 0.20.$$

The test statistic is

$$t_s = \frac{\bar{d}}{SE_{\bar{D}}} = \frac{0.68}{0.20} = 3.4.$$

To bracket the P-value, we consult Table 4 with df = 4 - 1 = 3. Table 4 gives $t_{0.025} = 3.182$ and $t_{0.02} = 3.482$. Thus, the P-value is bracketed as

$$0.04 < \text{P-value} < 0.05.$$

At significance level $\alpha = 0.10$, we reject H_0 if $P < 0.10$. Since $0.04 < P < 0.05$, we reject H_0. There is sufficient evidence ($0.04 < P < 0.05$) to conclude that progesterone decreases cAMP under these conditions.