P427. 2.

(a) Label the laid gears Sample 1 and the hung gears Sample 2. Since both of these samples are large, use equation (6-31) as the test statistic.

1. H_0: $\mu_1 - \mu_2 = 0$.
2. H_a: $\mu_1 - \mu_2 < 0$.
3. The test statistic is

$$Z = \frac{\bar{x}_1 - \bar{x}_2 - 0}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

and the reference distribution is the standard normal distribution. Observed values of Z far below zero will be considered as evidence against H_0.

4. The sample gives

$$z = -4.18$$

5. The observed level of significance is

$$P(\text{a standard normal random variable} < -4.18)$$

which is less than .0002, according to Table B-3. This is very strong evidence that the mean of the laying method is smaller than the mean of the hanging method.

(b) Use equation (6-30). For a 90% two-sided confidence interval, the appropriate z is 1.645 (from Table 6-1).

$$
\begin{aligned}
17.949 - 12.632 \pm 1.645\sqrt{\frac{47.89}{39} + \frac{14.83}{38}} &= 5.317 \pm 2.0927 \\
&= [3.22, 7.41].
\end{aligned}
$$

To make a one-sided 90% one-sided interval, make an 80% two-sided confidence interval, and use the lower endpoint. For a 80% two-sided confidence interval, the appropriate z is 1.28, so the 90% one-sided confidence interval is

$$
\begin{aligned}
5.317 - 1.28\sqrt{\frac{47.89}{39} + \frac{14.83}{38}} &= 5.317 - 1.6283 \\
&= 3.69.
\end{aligned}
$$

(c) Use equation (6-9) with $z = 1.645$. The two-sided confidence interval is

$$
\begin{aligned}
12.632 \pm 1.645\left(\frac{3.85}{\sqrt{38}}\right) &= 12.632 \pm 1.028 \\
&= [11.60, 13.66].
\end{aligned}
$$

P428. 6.

(a) The formulas (6.35), (6.36) and (6.38) are for comparing two means based on two independent samples. Because each bushing was measured twice by each student, there is one paired sample here, not two independent samples.

(b) Compute the differences between students A and B for each bushing, and use equation (6-25). (I took the differences as Student A–Student B.) For 95% confidence, the appropriate t is $t = Q_{15}(.975) = 2.131$, from Table B-4.

$$
\begin{aligned}
-.00009375 \pm 2.131\left(\frac{.0004552929}{\sqrt{16}}\right) &= -.00009375 \pm .0002414191 \\
&= [-0.0003352, .0001477].
\end{aligned}
$$

Since zero is in this interval, there is no evidence of a mean difference between students.

P674. 1 (a) See P140. 3 for the necessary computations. Using equation (9-10),

$$s_{\mathrm{LF}}^2 = \frac{1}{8-2}(26940.69) = 4490.116,$$

so $s_{\mathrm{LF}} = \sqrt{4490.116} = 67.01$, with 6 degrees of freedom associated with it. This measures the baseline variation in molecular weight that would be observed for any fixed pot temperature, assuming that model (9-4) is appropriate.

(b) This is β_1. Use equation (9-17). For 90% confidence, the appropriate t is $t = Q_6(.95) = 1.943$ from Table B-4. The resulting interval is

$$\begin{aligned} & 23.49827 \pm 1.943\frac{67.01}{\sqrt{8469.875}} \\ = \; & 23.49827 \pm 1.414696 \\ = \; & [22.08, 24.91]. \end{aligned}$$

(C) Use equation (9-26). For a 90% one-sided interval, appropriate t is $t = Q_6(.90) = 1.440$ from Table B-4. The resulting lower prediction bound at $x = 212$ is

$$\begin{aligned} & 1807.063 - 1.440(67.01)\sqrt{1 + \frac{1}{8} + \frac{.140625}{8469.875}} \\ = \; & 1807.063 - 102.346 \\ = \; & 1704.72. \end{aligned}$$

The resulting bound for the mean at $x = 250$ is

$$\begin{aligned} & 2699.997 - 1.440(67.01)\sqrt{1 + \frac{1}{8} + \frac{1415.641}{8469.875}} \\ = \; & 2699.997 - 109.6846 \\ = \; & 2590.31. \end{aligned}$$