8.1.8 Since the length L is at most 0.2,

$$n \geq 4\left(\frac{t_{0.005,n-1}0.15}{0.2}\right)^2 \quad \textbf{(+5 points)}$$

by 339p of the textbook. Let consider $n > 15$. Then, $t_{0.005,n-1} \leq 3$.

$$n \geq 4(\frac{3 \cdot 0.15}{0.2})^2 = 20.25 \ \textbf{(+5 points)}$$

Thus, when we pick $n = 21$, it would be enough.
For getting more precise interval for n, putting the number $16 \leq n \leq 20$.
If $n = 19$, then

$$n \geq 4(\frac{2.878 \cdot 0.15}{0.2})^2 = 18.636489$$

If $n = 18$, then

$$n \geq 4(\frac{2.898 \cdot 0.15}{0.2})^2 = 18.896409$$

Thus, if $n \geq 19$, it is enough sample size.

8.1.10 If $n = 41$, then

$$n \geq 4(\frac{t_{0.005,40}0.124}{0.05})^2 = 179.88$$

Therefore, an additional sample of 139 glass sheets are required. **(+10 points)**
For getting more precise interval for n, putting the number $165 \leq n \leq 175$.
If $n = 167$, then

$$n \geq 4\left(\frac{t_{0.005,166}0.124}{0.05}\right)^2 = 167.08$$

if $n = 168$, then

$$n \geq 4\left(\frac{t_{0.005,167}0.124}{0.05}\right)^2 = 167.08$$

Therefore, an additional sample of 127 glass sheets are required.

8.1.14 Note that $z_{0.05} = 1.645$. THus, we have

$$c = \overline{x} - \frac{z_{0.05}\sigma}{\sqrt{n}} = 11.80 - \frac{1.645 \cdot 2.0}{\sqrt{19}} = 11.045.$$

8.1.16 We note that $n = 16$, $\overline{x} = 6.861$, and $s = 0.440$. Since s is a sample standard deviation, not a "known" standard deviation, we use t statistic to evaluate the confidence level. Since $7.054 - 6.861 = 0.193$, we have

$$t = \frac{0.193 \cdot \sqrt{n}}{s} = \frac{0.193 \cdot \sqrt{16}}{0.440} = 1.75.$$

Since $n = 16$, the degree of freedom is 15. From t-table, $t_{15,0.05} = 1.753$. As this is two side interval, confidence level is 0.90.

8.2.4

(a) The z-statistic is

$$z = \frac{\sqrt{n}(\bar{x} - \mu_0)}{\sigma} = -2.36$$

The alternative hypothesis is $H_A : \mu \neq 90.0$, so that the p-value is

$$p\text{-value} = 2 \times \Phi(-2.36) = 0.0182$$

(b) The z-statistic is

$$z = \frac{\sqrt{n}(\bar{x} - \mu_0)}{\sigma} = 2.14$$

The alternative hypothesis is $H_A : \mu > 86.0$, so that the p-value is

$$p\text{-value} = 1 - \Phi(2.14) = 0.0162$$

8.2.10

(a) The experimenter accepts the null hypothesis with $\alpha = 0.10$ when

$$z \geq -z_{0.10} = -1.282$$

as the alternative hypothesis is $H_A : \mu < 420.0$.

(b) The experimenter rejects the null hypothesis with $\alpha = 0.01$ when

$$z < -z_{0.01} = -2.326$$

(a) The z-statistic is

$$z = \frac{\sqrt{n}(\bar{x} - \mu_0)}{\sigma} = -2.32$$

The null hypothesis is rejected with $\alpha = 0.10$ and accepted with $\alpha = 0.01$.

(b) The alternative hypothesis is $H_A : \mu < 420.0$, so that the p-value is

$$p\text{-value} = \Phi(-2.32) = 0.0102$$

8.2.18 Consider (one sample two-sided t) test $H_0 : \mu = 1.1$ vs $H_A : \mu \neq 1$. From the given data, we know that $n = 125$ and $\bar{x} = 1.111$ and $s = 0.053$ **(+5 points)**
And we have

$$t = \frac{\sqrt{n}(\bar{x} - \mu)}{s} = 2.223 > t_{\alpha/2,124} = 1.979\textbf{(+5 points)}.$$

This is also an evidence that we can reject H_0. Thus, there is an evidence that the manufacturing process needs adjusting.

- You need to use $\alpha = 0.05$. If not, **(−5 points)**.
- (Instead of calculating the critical point,) You can use p-value approach to get full credit.

$$2P\left(T_{124} \geq t = \frac{\sqrt{n}(\bar{x} - \mu)}{s} = 2.223\right) = 0.028 < 0.05\textbf{(+5 points)}$$

8.2.24 Consider (one sample one-sided t) test

$$H_0 : \mu \leq 70 \quad \text{vs} \quad H_A : \mu > 70.\textbf{(+5 points)}$$

The t-statistic is given by

$$t = \frac{\sqrt{25}(71.97 - 70)}{7.44} = 1.324.$$

And we have

$$\text{P-value} = P(t_{24} > 1.324) = 0.099.$$

There is some evidence to conclude that the components have an average weight larger than 70.

- Even if your hypothesis setting is wrong, you can get partial credit.
- If you conduct the test correctly, you also get **(+5 points)**.