Problem 1: Sincich 6.1

a. For $\alpha = .10$, $\alpha/2 = .10/2 = .05$. $z_{\alpha/2} = z_{.05}$ is the z-score with .05 of the area to the right of it. The area between 0 and $z_{.05}$ is $.5 - .05 = .4500$. Using Table IV, Appendix B, $z_{.05} = 1.645$.

b. For $\alpha = .01$, $\alpha/2 = .01/2 = .005$. $z_{\alpha/2} = z_{.005}$ is the z-score with .005 of the area to the right of it. The area between 0 and $z_{.005}$ is $.5 - .005 = .4950$. Using Table IV, Appendix B, $z_{.005} = 2.575$.

c. For $\alpha = .05$, $\alpha/2 = .05/2 = .025$. $z_{\alpha/2} = z_{.025}$ is the z-score with .025 of the area to the right of it. The area between 0 and $z_{.025}$ is $.5 - .025 = .4750$. Using Table IV, Appendix B, $z_{.025} = 1.96$.

d. For $\alpha = .20$, $\alpha/2 = .20/2 = .10$. $z_{\alpha/2} = z_{.10}$ is the z-score with .10 of the area to the right of it. The area between 0 and $z_{.10}$ is $.5 - .10 = .4000$. Using Table IV, Appendix B, $z_{.10} = 1.28$.

Problem 2: Sincich 6.4

a. For confidence coefficient .95, $\alpha = .05$ and $\alpha/2 = .05/2 = .025$. From Table IV, Appendix B, $z_{.025} = 1.96$. The confidence interval is:

$$\bar{x} \pm z_{.025}\frac{s}{\sqrt{n}} \Rightarrow 25.9 \pm 1.96\frac{2.7}{\sqrt{90}} \Rightarrow 25.9 \pm .56 \Rightarrow (25.34, 26.46)$$

b. For confidence coefficient .90, $\alpha = .10$ and $\alpha/2 = .10/2 = .05$. From Table IV, Appendix B, $z_{.05} = 1.645$. The confidence interval is:

$$\bar{x} \pm z_{.05}\frac{s}{\sqrt{n}} \Rightarrow 25.9 \pm 1.645\frac{2.7}{\sqrt{90}} \Rightarrow 25.9 \pm .47 \Rightarrow (25.43, 26.37)$$

c. For confidence coefficient .99, $\alpha = .01$ and $\alpha/2 = .01/2 = .005$. From Table IV, Appendix B, $z_{.005} = 2.58$. The confidence interval is:

$$\bar{x} \pm z_{.005}\frac{s}{\sqrt{n}} \Rightarrow 25.9 \pm 2.58\frac{2.7}{\sqrt{90}} \Rightarrow 25.9 \pm .73 \Rightarrow (25.17, 26.63)$$

Problem 3: Sincich, 6.9

Yes. As long as the sample size is sufficiently large, the Central Limit Theorem says the distribution of is approximately normal regardless of the original distribution.

Problem 4: Sincich, 6.14

a. (1.6711, 2.1989)
b. With 95% confidence, the mean wear-out failure time of all used colored display panels is between 1.67 years and 2.20 years
c. 95%

Problem 5: Sincich, 6.17

a. The mean 2011 salary of all 500 CEOs
b. (Minitab; everyone will get a different sample)
c. Here is the Minitab output:

Descriptive Statistics: Sample

Variable	N	N*	Mean	SE Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Sample	49	1	9.63	1.27	8.87	0.04	3.84	6.36	14.84	38.94

The sample mean in my sample is 9.63 (everyone will get a different answer here).

d. Here is the output:

Descriptive Statistics: 1-Year Pay ($mil)

Variable	N	N*	Mean	SE Mean	StDev	Minimum	Q1	Median	Q3	Maximum
1-Year Pay ($mil)	478	57	9.247	0.450	9.842	0.000	3.413	6.100	11.346	101.965

We can see StDev = 9.842

e. My sample size is n=49 since there is one missing value. My 99% confidence interval for the population mean is

$(9.63) \pm (2.576)\ (9.842) / \sqrt{(49)} = 9.63 \pm 3.62 = (6.01, 13.25)$

f. With 99% confidence the mean salary of all 500 CEOs is in the range (6.01, 13.25).

g. The true mean is 9.247. This is in the confidence interval. (This will happen for 99% of all confidence intervals)

Problem 6: Sincich 6.27

First, we must compute $\overline{x}$ and s.

$$\overline{x}=\frac{\sum x}{n}=\frac{30}{6}=5$$

$$s^2=\frac{\sum x^2-\frac{\left(\sum x\right)^2}{n}}{n-1}=\frac{176-\frac{(30)^2}{6}}{6-1}=\frac{26}{5}=5.2$$

$$s=\sqrt{5.2}=2.2804$$

a. For confidence coefficient .90, $\alpha=1-.90=.10$ and $\alpha/2=.10/2=.05$. From Table V, Appendix B, with df $=n-1=6-1=5$, $t_{.05}=2.015$. The 90% confidence interval is:

$$\overline{x}\pm t_{0.5}\frac{s}{\sqrt{n}}\Rightarrow 5\pm 2.015\frac{2.2804}{\sqrt{6}}\Rightarrow 5\pm 1.88\Rightarrow (3.12, 6.88)$$

b. For confidence coefficient .95, $\alpha=1-.95=.05$ and $\alpha/2=.05/2=.025$. From Table V, Appendix B, with df $=n-1=6-1=5$, $t_{.025}=2.571$. The 95% confidence interval is:

$$\overline{x}\pm t_{.025}\frac{s}{\sqrt{n}}\Rightarrow 5\pm 2.571\frac{2.2804}{\sqrt{6}}\Rightarrow 5\pm 2.39\Rightarrow (2.61, 7.39)$$

c. For confidence coefficient .99, $\alpha=1-.99=.01$ and $\alpha/2=.01/2=.005$. From Table V, Appendix B, with df $=n-1=6-1=5$, $t_{.005}=4.032$. The 99% confidence interval is:

$$\overline{x}\pm t_{.005}\frac{s}{\sqrt{n}}\Rightarrow 5\pm 4.032\frac{2.2804}{\sqrt{6}}\Rightarrow 5\pm 3.75\Rightarrow (1.25, 8.75)$$

d. a) For confidence coefficient .90, $\alpha=1-.90=.10$ and $\alpha/2=.10/2=.05$. From Table V, Appendix B, with df $=n-1=25-1=24$, $t_{.05}=1.711$. The 90% confidence interval is:

$$\overline{x}\pm t_{.05}\frac{s}{\sqrt{n}}\Rightarrow 5\pm 1.711\frac{2.2804}{\sqrt{25}}\Rightarrow 5\pm .78\Rightarrow (4.22, 5.78)$$

b) For confidence coefficient .95, $\alpha=1-.95=.05$ and $\alpha/2=.05/2=.025$. From Table V, Appendix B, with df $=n-1=25-1=24$, $t_{.025}=2.064$. The 95% confidence interval is:

$$\overline{x}\pm t_{.025}\frac{s}{\sqrt{n}}\Rightarrow 5\pm 2.064\frac{2.2804}{\sqrt{25}}\Rightarrow 5\pm .94\Rightarrow (4.06, 5.94)$$

c) For confidence coefficient .99, $\alpha=1-.99=.01$ and $\alpha/2=.01/2=.005$. From Table V, Appendix B, with df $=n-1=25-1=24$, $t_{.005}=2.797$. The 99% confidence interval is:

$$\overline{x}\pm t_{.005}\frac{s}{\sqrt{n}}\Rightarrow 5\pm 2.797\frac{2.2804}{\sqrt{25}}\Rightarrow 5\pm 1.28\Rightarrow (3.72, 6.28)$$

Increasing the sample size decreases the width of the confidence interval.

Problem 7: Sincich, 6.32

a. $(3.8) \pm (1.729)\ (1.2) / \sqrt{(20)} = 3.8 \pm 0.5 = (3.3, 4.3)$
b. With 90% confidence, the mean LOS for all hospitals in the state is between 3.3 and 4.3 days.
c. If we were to sample another 20 hospitals from the same state and construct a confidence interval in the same way, then there would be a 90% chance that the new interval would contain the true population mean.

Problem 8

a. The body temperatures of all humans.
b. Minitab output:

One-Sample T: Temp

Variable	N	Mean	StDev	SE Mean	95% CI
Temp	130	98.2492	0.7332	0.0643	(98.1220, 98.3765)

c. We have independent samples from the population (i.e., that our sample is unbiased).
d. It is somewhat surprising that 98.6 is not in the confidence interval. However, not every confidence interval contains its parameter: 5% of all 95% confidence intervals do not contain their parameters.