7.1

a) $\bar{x} \pm 2.81 \frac{\sigma}{\sqrt{n}}$

$\Phi(2.81) = 0.9975$

$\Phi(-2.81) = 0.0025$

$CL = 0.9975 - 0.0025 = \boxed{0.9950}$

b) $\bar{x} \pm 1.44 \frac{\sigma}{\sqrt{n}}$

$\Phi(1.44) = 0.9251$

$\Phi(-1.44) = 0.0749$

$CL = 0.9251 - 0.0749 = \boxed{0.8502}$

c) $CL = 0.9970$

$\Phi(z_{\frac{\alpha}{2}}) - [1 - \Phi(z_{\alpha/2})] = 0.9970$

$\Phi(z_{\alpha/2}) = 0.9985$

$\boxed{z_{\alpha/2} = 2.96}$

d) $CL = 0.75$

$\Phi(z_{\alpha/2}) = 0.875$

$\boxed{z_{\alpha/2} = 1.15}$

7.2 (114.4, 115.6) (114.1, 115.9)

a) $z_{\alpha/2}\frac{\sigma}{\sqrt{n}} = \frac{115.6 - 114.4}{2} = 0.6$, $z_{\alpha/2}\frac{\sigma}{\sqrt{n}} = \frac{115.9 - 114.1}{2} = 0.6$

$\bar{x} = 115.0$ $\bar{x} = 115.0$

$\boxed{\bar{x} = 115.0}$

b) (114.4, 115.6) has CL of 90%

(114.1, 115.9) has CL of 99%.

This because the later has a larger interval, hence a lagers critical value, and infering a bigger confidence interval.

7.5 $\sigma = 0.75$

a) If $\bar{x} = 4.85$ $n = 20$. $CL = 95\%$.

$\Phi(z_{\alpha/2}) = \frac{1.95}{2} = 0.975$

$z_{\alpha/2} = 1.96$

$CI = \bar{x} \pm z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$

$= 4.85 \pm 1.96 \cdot \frac{0.75}{\sqrt{20}}$

$\boxed{= 4.85 \pm 0.3287}$ $\boxed{(4.5213, 5.1787)}$

b) If $\bar{x} = 4.56$, $n = 16$, $CL = 98\%$

$\Phi(z_{\alpha/2}) = \frac{1.98}{2} = 0.99$

$z_{\alpha/2} = 2.33$

$CI = 4.56 \pm 2.33 \frac{0.75}{\sqrt{16}}$

$\boxed{= 4.56 \pm 0.4369 \quad (4.1231, 4.9969)}$

c) $CL = 0.95$, $w = 0.4$

$\Phi(z_{\alpha/2}) = 0.975$

$z_{\alpha/2} = 1.96$

$n = \left(2 \frac{\sigma}{w} \cdot z_{\alpha/2}\right)^2$

$n = \left(2 \cdot \frac{0.75}{0.4} \cdot 1.96\right)^2$

$n = 54.0225$

$\boxed{n \geq 55}$

d) $CL = 0.99$, $w = 0.2 \cdot 2 = 0.4$

$\Phi(z_{\alpha/2}) = 0.995$

$z_{\alpha/2} = 2.58$

$n = \left(2 \cdot \frac{0.75}{0.4} \cdot 2.58\right)^2$

$n = 93.6056$

$\boxed{n \geq 94}$

7.20 $n = 4722$. $\hat{p} = 15\%$, $CL = 0.99$

$\Phi(z_{\alpha/2}) = 0.995$

$z_{\alpha/2} = 2.58$

$$\tilde{p} = \frac{\hat{p} + z_{\alpha/2}^2/2n}{1 + z_{\alpha/2}^2/n} = 0.1505$$

$$z_{\alpha/2}\frac{\sqrt{\hat{p}\hat{q}/n + z_{\alpha/2}^2/4n^2}}{1 + z_{\alpha/2}^2/n} = 0.0134$$

$$\boxed{CI: (0.1371, 0.1639)}$$

7.49 (c) $n = 18$ $df = 17$

$\bar{x} = 38.6611$

$s = 8.4732$ 98% CI, $\alpha = 0.02$

$t_{0.01,17} = 2.567$

The interval is

$$38.6611 \pm 2.567 \cdot \frac{8.47}{\sqrt{18}} = \boxed{(33.5363\,,\ 43.7859)}$$

7.50 $n=5$, 95% CI $(229.764, 233.504)$.

$$\bar{X} = \frac{229.764+233.504}{2} = 231.634$$

$$\frac{W}{2} = 233.504 - 229.764 = 1.87$$

$$t_{0.025,4} = 2.776$$

$$1.87 = 2.776 \cdot \frac{S}{\sqrt{5}}$$

$$S = 1.5063$$

For 99% CI. $\alpha = 0.01$

$$t_{0.005,4} = 4.604$$

The interval is $231.634 \pm 4.604 \frac{1.5063}{\sqrt{5}} = \boxed{(228.533, 234.735)}$