6.30. (a) mean = 1200 hours

(b) 由 s = 100 (hours)，易知 $\hat{s} = \sqrt{\frac{n}{n-1} s^2} = \sqrt{\frac{10}{9} \times 100^2} = 105.4$ (hours)

6.33 (a) 取 $Z = \frac{\bar{X}-\mu}{\sigma/\sqrt{n}}$，则有 $P(-z \le Z \le z) = 99\% \Rightarrow \Phi(z) = \frac{1+99\%}{2} = 0.995 \Rightarrow z = 2.58$

故 $P(-2.58 \le \frac{\bar{X}-\mu}{\sigma/\sqrt{n}} \le 2.58) = 99\% \Rightarrow P(\bar{X} - 2.58 \cdot \frac{\sigma}{\sqrt{n}} \le \mu \le \bar{X} + 2.58 \cdot \frac{\sigma}{\sqrt{n}}) = 99\%$

由 $n=250$, $\bar{X} = 0.72642$, $\sigma = 0.00058$，知 $\mu = \bar{X} \pm 2.58 \frac{\sigma}{\sqrt{n}} = 0.72642 \pm 0.0000946$ (inchs)

(b) 同理，取 $\Phi(z) = \frac{1+98\%}{2} = 0.99$，得 $z = 2.33$

故 $\mu = \bar{X} \pm 2.33 \frac{\sigma}{\sqrt{n}} = 0.72642 \pm 2.33 \times \frac{0.00058}{\sqrt{250}} = 0.72642 \pm 0.0000855$ (inchs)

(c) $\Phi(z) = \frac{1+95\%}{2} = 0.975 \Rightarrow z = 1.96$

故 $\mu = \bar{X} \pm 1.96 \frac{\sigma}{\sqrt{n}} = 0.72642 \pm 1.96 \times \frac{0.00058}{\sqrt{250}} = 0.72642 \pm 0.0000719$ (inchs)

(d) $\Phi(z) = \frac{1+90\%}{2} = 0.95 \Rightarrow z = 1.64$

故 $\mu = \bar{X} \pm 1.64 \frac{\sigma}{\sqrt{n}} = 0.72642 \pm 1.64 \times \frac{0.00058}{\sqrt{250}} = 0.72642 \pm 0.0000602$ (inchs)

6.35. (a) $\Phi(z) = \frac{95\%+1}{2} = 0.975 \Rightarrow z = 1.96$

又 $\mu = \bar{x} \pm 1.96 \cdot \frac{\sigma}{\sqrt{n}} = \bar{x} \pm \frac{1.96 \times 100}{\sqrt{n}}$，要使 $\frac{1.96 \times 100}{\sqrt{n}} \le 20$，有 $n \ge \left(\frac{1.96 \times 100}{20}\right)^2 = 96.04$，

故至少需要97台.

(b) $\Phi(z) = \frac{1+90\%}{2} = 0.95 \Rightarrow z = 1.64$，则 $n \ge \left(\frac{1.64 \times 100}{20}\right)^2 = 67.24$，至少需要68台.

(c) $\Phi(z) = \frac{1+99\%}{2} = 0.995 \Rightarrow z = 2.58$，则 $n \ge \left(\frac{2.58 \times 100}{20}\right)^2 = 166.41$，至少需要167台.

(d) $\Phi(z) = \frac{1+99.73\%}{2} = 0.99865 \Rightarrow z = 3.00$，则 $n \ge \left(\frac{3 \times 100}{20}\right)^2 = 225$，至少需要225台

6.39 先计算 $\bar{x} = \frac{0.28+0.3+0.27+0.33+0.31}{5} = 0.298$，$\hat{s} = \sqrt{\frac{\sum(x-\bar{x})^2}{n-1}} = 0.02387$，$n = 5$，$\nu = n-1 = 4$

(a) 记 $T = \frac{\bar{x}-\mu}{\hat{s}/\sqrt{n}}$，则 $P(-c \le T \le c) = F_\nu(c) - F_\nu(-c) = 2F_\nu(c) - 1 = 95\% \Rightarrow F_\nu(c) = \frac{1+95\%}{2} = 0.975$

由此知 $c = 2.78$，故 $\frac{c \cdot \hat{s}}{\sqrt{n}} = \frac{2.78 \times 0.02387}{\sqrt{5}} = 0.0297$

故 $\mu = \bar{x} \pm c \cdot \frac{\hat{s}}{\sqrt{n}} = 0.298 \pm 0.0297$ (s)

(b) $F_\nu(c) = \frac{1+99\%}{2} = 0.995 \Rightarrow c = 4.60$，则 $\frac{c \cdot \hat{s}}{\sqrt{n}} = \frac{4.60 \times 0.02387}{\sqrt{5}} = 0.0491$

故 $\mu = \bar{x} \pm c \frac{\hat{s}}{\sqrt{n}} = 0.298 \pm 0.0491$ (s)

6.41. (a) 已知 $n=60$，$p = 70\%$，取 $T = \frac{\bar{x}-\mu}{\sigma/\sqrt{n}} = \frac{\bar{x}-p}{\sqrt{\frac{p(1-p)}{n}}}$，要使 $P(-c \le T \le c) = 95\%$，有 $\Phi(c) = \frac{1+95\%}{2} = 0.975$

即 $c = 1.96$，由此知 $p = \bar{x} \pm c \cdot \sqrt{\frac{p(1-p)}{n}}$

现求 $c \cdot \sqrt{\frac{p(1-p)}{n}} \le 5\%$，则 $n \ge \frac{c^2 \cdot p(1-p)}{(5\%)^2} = \frac{1.96^2 \times 0.7 \times 0.3}{(5\%)^2} = 322.69$，至少需要323颗.

(b) 同理，$\Phi(c) = \frac{1+99\%}{2} = 0.995 \Rightarrow c = 2.58$

要使 $c \cdot \sqrt{\frac{p(1-p)}{n}} \le 5\%$，则 $n \ge \frac{2.58^2 \times 0.7 \times 0.3}{(5\%)^2} = 559.137$，至少需要560颗.

(c) $\Phi(c) = \frac{1+99.73\%}{2} = 0.99865 \Rightarrow c = 3.00$，故 $n \ge \frac{3^2 \times 0.7 \times 0.3}{(5\%)^2} = 756$，至少需要756颗.

6.46 记 $T=\dfrac{\bar{X}-\sigma}{\sigma_S}$，其中 $\sigma_S=\dfrac{\sigma}{\sqrt{2n}}$，$\bar{X}=1800$，$n=100$

(a) $P(-c\le T\le c)=95\%\Rightarrow \Phi(c)=\dfrac{1+95\%}{2}=0.975\Rightarrow c=1.96$

又 $\sigma=\bar{X}\pm c\cdot\sigma_S=\bar{x}\pm\dfrac{c\cdot\sigma}{\sqrt{2n}}=1800\pm1.96\times\dfrac{1800}{\sqrt{2\times100}}=1800\pm249$ (lb)

(b) $\Phi(c)=\dfrac{1+99\%}{2}=0.995\Rightarrow c=2.58$

$\sigma=\bar{X}\pm c\cdot\dfrac{\sigma}{\sqrt{2n}}=1800\pm2.58\times\dfrac{1800}{\sqrt{2\times100}}=1800\pm328$ (lb)

(c) $\Phi(c)=\dfrac{1+99.73\%}{2}=0.99865\Rightarrow c=3.00$

$\sigma=\bar{X}\pm c\cdot\dfrac{\sigma}{\sqrt{2n}}=1800\pm3.00\times\dfrac{1800}{\sqrt{2\times100}}=1800\pm382$ (lb)

6.57. 令 $L=f(x_1,k)f(x_2,k)\cdots f(x_n,k)$

$L=(k+1)^n\cdot x_1^k x_2^k\cdots x_n^k$

$\Rightarrow \ln L=n\ln(k+1)+k\ln(x_1x_2\cdots x_n)$

$\Rightarrow \dfrac{1}{L}\cdot\dfrac{\partial L}{\partial k}=\dfrac{n}{k+1}+\ln(x_1\cdot x_2\cdots x_n)$

取 $\dfrac{\partial L}{\partial k}=0$，有 $\dfrac{n}{k+1}+\ln(x_1x_2\cdots x_n)=0$

故 $k=-1-\dfrac{n}{\ln(x_1x_2\cdots x_n)}$