4.7

4

a

$$\begin{aligned}\mu_X &= \frac{1}{\lambda}\\ 12 &= \frac{1}{\lambda}\\ \lambda &= \frac{1}{12}\end{aligned}$$

b

$$\begin{aligned}P(X \leq m) &= .5\\ 1 - e^{-\frac{1}{12}m} &= .5\\ m &= -12\ln(.5)\\ &= 8.318\end{aligned}$$

c

$$\begin{aligned}\sigma_X^2 &= \frac{1}{\lambda^2}\\ &= 144\\ \sigma_X &= 12\end{aligned}$$

d

$$\begin{aligned}P(X \leq p_{65}) &= .65\\ 1 - e^{-\frac{1}{12}p_{65}} &= .65\\ \lambda &= \frac{1}{12}\\ m &= -12\ln(.35)\\ &= 12.59\end{aligned}$$

4.11

2

N(.08, .0001)

a

$$\frac{20.2}{.2} \leq X$$
$$\frac{X-\mu}{\sigma} = Z$$
$$\Rightarrow$$
$$.7881 \leq Z$$
$$P(X > 20.2) = 1 - .7881 = .2119$$

b

$$10\% \Rightarrow -1.28 = Z$$
$$-1.28 * \sigma + \mu = .0672$$
$$.0672 * 250 = 16.8$$
$$\Rightarrow$$
16.8mm thick

c Yes due to the Central Limit Theorem, one can use normal distribution.

$$z = \frac{.1 - .08}{.01}$$
$$= 2$$
$$\Rightarrow$$
$$P(X > .1)1 - .9772 = .0228$$

6

a

$$\bar{X}\ N(\mu, \frac{\sigma^2}{n}) \vee P(\bar{X} > 1.305)$$
$$\Rightarrow$$
$$\sigma_X = \frac{\sigma^2}{n}$$
$$= \frac{.1}{200 \cdot 5}$$
$$= .00707$$
$$Z = \frac{X - \mu_x}{\sigma_X}$$
$$= \frac{1.305 - 1.3}{.00707}$$
$$= .707$$
$$P(\bar{X} > 1.305) = 1 - .7794$$
$$= .2206$$

b

$$
\begin{aligned}
-.68 &= \frac{X_{25} - \mu_x}{.00707} \\
X_{25} &= 1.29\text{mm}
\end{aligned}
$$

c

$$
\begin{aligned}
.05 &\Rightarrow Z = 1.65 \\
1.65 &= \frac{1.305 - 1.3}{\frac{.1^2}{n}} \\
n &= 1083
\end{aligned}
$$

10

$$
\begin{aligned}
\mu &= np \\
&= 100 * .3 \\
&= 30 \\
\sigma &= \sqrt{\mu(1-p)} \\
&= \sqrt{30 * (1 - .3)} \\
&= 4.58 \\
P(X > 35) &= P(Z > \frac{35 - 30}{4.58}) \\
&= P(Z > 1.2) \\
&= 1 - .8849 \\
&= .1151
\end{aligned}
$$