55.  

a. With \( Y = \# \) of tickets, \( Y \) has approximately a normal distribution with \( \mu = \lambda = 50 \),
\[
\sigma = \sqrt{\lambda} = 7.071,
\]
so \( P(35 \leq Y \leq 70) \approx P\left( \frac{34.5 - 50}{7.071} \leq Z \leq \frac{70.5 - 50}{7.071} \right) = P(-2.19 \leq Z \leq 2.90) = .9838
\]

b. Here \( \mu = 250 \), \( \sigma^2 = 250 \), \( \sigma = 15.811 \), so \( P(225 \leq Y \leq 275) \approx \)
\[
P\left( \frac{224.5 - 250}{15.811} \leq Z \leq \frac{275.5 - 250}{15.811} \right) = P(-1.61 \leq Z \leq 1.61) = .8926
\]

44.

Use a computer to generate samples of sizes \( n = 5, 10, 20, \) and 30 from a Weibull distribution with parameters as given, keeping the number of replications the same, as in problem 43 above. For each sample, calculate the mean. The sampling distribution of \( \overline{X} \) for \( n = 5 \) appears to be normal, so since larger sample sizes will produce distributions that are closer to normal, the others will also appear normal.

To receive full credits, related graphs should be provided.

46.  

\( \mu = 12 \text{ cm} \quad \sigma = .04 \text{ cm} \)

a. \( n = 16 \quad E(\overline{X}) = \mu = 12 \text{ cm} \quad \sigma_{\overline{X}} = \frac{\sigma_{\overline{X}}}{\sqrt{n}} = \frac{.04}{4} = .01 \text{ cm} \)

b. \( n = 64 \quad E(\overline{X}) = \mu = 12 \text{ cm} \quad \sigma_{\overline{X}} = \frac{\sigma_{\overline{X}}}{\sqrt{n}} = \frac{.04}{8} = .005 \text{ cm} \)

c. \( \overline{X} \) is more likely to be within .01 cm of the mean (12 cm) with the second, larger, sample. This is due to the decreased variability of \( \overline{X} \) with a larger sample size.

48.

a. \( \mu_x = \mu = 50 \), \( \sigma_x = \frac{\sigma_x}{\sqrt{n}} = \frac{1}{\sqrt{100}} = .10 \)
\[
P(49.9 \leq \overline{X} \leq 50.1) = P\left( \frac{49.9 - 50}{.10} \leq Z \leq \frac{50.1 - 50}{.10} \right) = P(-1 \leq Z \leq 1) = .6826
\]

b. \( P(49.9 \leq \overline{X} \leq 50.1) = P\left( \frac{49.9 - 49.8}{.10} \leq Z \leq \frac{50.1 - 49.8}{.10} \right) = P(1 \leq Z \leq 3) = .1573
\]
90. 

a. \( \text{Cov}(X, Y + Z) = E[X(Y + Z)] - E(X) \cdot E(Y + Z) \)
   \[= E(XY) + E(XZ) - E(X) \cdot E(Y) - E(X) \cdot E(Z) \]
   \[= E(XY) - E(X) \cdot E(Y) + E(XZ) - E(X) \cdot E(Z) \]
   \[= \text{Cov}(X,Y) + \text{Cov}(X,Z). \]

b. \( \text{Cov}(X_1 + X_2, Y_1 + Y_2) = \text{Cov}(X_1, Y_1) + \text{Cov}(X_1, Y_2) + \text{Cov}(X_2, Y_1) + \text{Cov}(X_2, Y_2) \) (apply a twice)
   \[= 16. \]