2. (a) Using the R commands *x=c(649, 832, 418, 530, 384, 899, 755); confint(lm(x∼1),level=0.9)*, we find the 90% CI for the true mean histamine content for all worker bees of this age as (489.9886, 786.2971). In order to make the CI valid, we need to assume that the data are distributed approximately normal.

   (b) False

3. (a) The 80% CI for the mean breaking strength μ is $\bar{X} \pm t_{n-1,\alpha/2} S/\sqrt{n}$, or $210 \pm t_{50-1,0.1/2} 18/\sqrt{50}$, which is calculated as (206.69, 213.31). Since the sample size $n = 50$ is large enough, the normality assumption is not necessary.

   (b) Yes

   (c) No

7. (a) For Poisson(λ) distribution, $\mu = \lambda$. Thus, the 95% CI for λ is the same as the 95% CI for μ. We use the following command:

   x=c(rep(0,4), rep(1,12),rep(2,11),rep(3,14),rep(4,9));
   confint(lm(x∼1),level=0.95)

   to find the CI as (1.888116, 2.591884).

   (b) For Poisson(λ) distribution, $\sigma^2 = \lambda$. Thus, the 95% CI for σ is $(\sqrt{1.888116}, \sqrt{2.591884})$, or (1.374087, 1.609933).

9. (a) To find the 95% confidence interval for the proportion, p, of customers who qualify, we use the following commands:

$$n{=}500;\ phat = 40/n;\ alpha{=}0.05;$$
$$phat\text{-}qnorm(1\text{-}alpha/2)*sqrt(phat*(1\text{-}phat)/n);$$
$$phat{+}qnorm(1\text{-}alpha/2)*sqrt(phat*(1\text{-}phat)/n),$$

   The obtained CI is (0.05622054, 0.1037795).

   (b) In order to make the CI valid, there should be at least 8 customers who qualify and at least 8 customers who do not qualify in the sample, which is satisfied by the data.

10. (a) To find the 95% confidence interval for the proportion, p, of young adult US citizens who drink beer, wine, or hard liquor on a weekly basis, we use the following commands:

$$n{=}1516;\ phat = 985/n;\ alpha{=}0.05;$$
$$phat\text{-}qnorm(1\text{-}alpha/2)*sqrt(phat*(1\text{-}phat)/n);$$
$$phat{+}qnorm(1\text{-}alpha/2)*sqrt(phat*(1\text{-}phat)/n),$$

   The obtained CI is (0.6257221, 0.6737502).

   (b) False

11. (a) To find the 95% confidence interval for the proportion, p, that a randomly selected component lasts more than 350 hours, we use the following commands:

$$n{=}37;\ phat = 24/n;\ alpha{=}0.05;$$
$$phat\text{-}qnorm(1\text{-}alpha/2)*sqrt(phat*(1\text{-}phat)/n);$$
$$phat{+}qnorm(1\text{-}alpha/2)*sqrt(phat*(1\text{-}phat)/n),$$

   The obtained CI is (0.4948251, 0.8024722).

   (b) Assuming that the life spans of the two components in the system are independent, the probability that the system lasts more than 350 hours is p^2. Thus, the 95% CI for the probability that the system lasts more than 350 hours is $(0.4948251^2, 0.8024722^2)$.

18. From (7.3.19), we find the $(1-\alpha)100\%$ CI for σ is

$$\sqrt{\frac{n-1}{\chi^2_{n-1,\alpha/2}}}S < \sigma < \sqrt{\frac{n-1}{\chi^2_{n-1,1-\alpha/2}}}S.$$

Thus, we can write the R commands as

$$n{=}\ 15;\ S = 0.64;\ a = 0.05;$$
$$L = sqrt((n\text{-}1)/qchisq(1\text{-}a/2,\ n\text{-}1))*S;\ U{=}sqrt((n\text{-}1)/qchisq(a/2,\ n\text{-}1))*S;$$

We find the 95% CI for σ as (0.468561, 1.009343). In order to make the CI valid, we need to assume that the population distribution is normal.

1. We use the R command *library(BSDA); nsize(b=0.2, sigma=1.2, conf.level=0.98, type="mu")*; the desired sample size is 195.

2. We use the R command *library(BSDA); nsize(b=4/2, sigma=18, conf.level=0.9, type="mu")*; the desired sample size is 220.

3. (a) We use the R command *library(BSDA); nsize(b=0.1/2, p=9/40, conf.level=0.9, type="pi")*; the desired sample size is 189.

4. (a) We use the R command *library(BSDA); nsize(b=0.03, p=75/193, conf.level=0.95, type="pi")*; the desired sample size is 1015.