MATH1001 Homework Solution

Chapter 6

6.2.3

$\bar{y}$ = 9.520; s = 1.429; SE = $1.429/\sqrt{5}$ = 0.6391 ≈ 0.64 gm/kg.

6.2.7

(a) the SE; (b) the SD; (c) the SE

6.3.5

(a) $\bar{y}$ = 28.7; s = 4.6; SE = $4.6/\sqrt{6}$ = 1.88 ≈ 1.9 μg/ml.

28.7 ± (2.571)(1.9)

(23.8,33.6) or 23.8 < μ < 33.6 μg/ml.

(b) μ = mean blood serum concentration of Gentamicin (1.5 hours after injection of 10 mg/kg body weight) in healthy three-year-old female Suffolk sheep.

(c) No. The "95%" refers to the percentage (in a meta-experiment) of confidence intervals that would contain μ. Since the width of a confidence interval depends on n, the percentage of observations contained in the confidence interval also depends on n, and would be very small if n were large.

6.3.14

6.21 ± (2.042)($1.84/\sqrt{36}$)

(5.58,6.84) or 5.58 < μ < 6.84 μg/dl.

6.3.19

1 - 0.025 = 0.975. In Table 3, z = 1.96 corresponds to an area of 0.975. (A t distribution with df = ∞ is a normal distribution.)

6.3.20

1 - 0.0025 = 0.9975. In Table 3, an area of 0.9975 corresponds to z = 2.81. A t distribution with df = ∞ is a normal distribution; thus, $t_{0.0025}$ = 2.81 when df = ∞.

6.4.1

(a) Guessed SD = 20 kg; n must satisfy the inequality

$$\frac{20}{\sqrt{n}} \le 5$$

so n = 16.

(b) n must satisfy the inequality

$$\frac{40}{\sqrt{n}} \leq 5$$

so n = 64. The required sample size does not double, but rather is four times as large.

6.4.3

Guessed SD = 1.2 cm. The desired SE is 0.2 cm, so n must satisfy

$$\frac{1.2}{\sqrt{n}} \leq 0.2$$

which yields $n \geq 36$.

6.4.4

Guessed SD = 80 g

(a) The desired SE is 20 g, so n must satisfy

$$\frac{80}{\sqrt{n}} \leq 20$$

which yields $n \geq 16$.

(b) The desired SE is 15 g, so n must satisfy

$$\frac{80}{\sqrt{n}} \leq 15$$

which yields $n \geq 28.4$, so n = 29.

6.5.5

(a) $\bar{y} = 5.68$; s = 1.54; n = 9.

The 90% confidence interval for μ is

$$5.68 \pm 1.860\left(\frac{1.54}{\sqrt{9}}\right)$$

(4.73,6.63) or $4.73 < \mu < 6.63\sqrt{\text{cm}}$.

(b) We are 90% confident that the average square root of the diameters of all American Sycamore trees in the population is between 4.73 and $6.63\sqrt{\text{cm}}$.

6.6.2

$SE_1 = \frac{44.2}{\sqrt{10}} = 13.977$; $SE_2 = \frac{28.7}{\sqrt{10}} = 9.076$.

$\sqrt{13.977^2 + 9.076^2} = 16.7$.

6.6.6

$\mathrm{SE}_{(\bar{Y}_1\text{-}\bar{Y}_2)} = \sqrt{\mathrm{SE}_1^2 + \mathrm{SE}_2^2} = \sqrt{0.5^2 + 0.7^2} = 0.86.$

6.6.9

$\sqrt{5.5^2 + 8.6^2} = 10.2.$

6.7.2

Let 1 denote dark and let 2 denote photoperiod.

$$\mathrm{SE}_{(\bar{Y}_1\text{-}\bar{Y}_2)} = \sqrt{\frac{13^2}{4} + \frac{13^2}{4}} = 9.192.$$

(a) (92 - 115) ± (2.447)(9.192) (df = 6)

(-45.5,-0.5) or $-45.5 < \mu_1 - \mu_2 < -0.5$ nmol/gm.

(b) (92 - 115) ± (1.943)(9.192) (df = 6)

(-40.9,-5.1) or $-40.9 < \mu_1 - \mu_2 < -5.1$ nmol/gm.

6.7.4

(a) Let 1 denote biofeedback and let 2 denote control.

$$\mathrm{SE}_{(\bar{Y}_1\text{-}\bar{Y}_2)} = \sqrt{1.34^2 + 1.30^2} = 1.867.$$

(13.8 - 4.0) ± (1.977)(1.867) (using df = 140)

(6.1,13.5) or $6.1 < \mu_1 - \mu_2 < 13.5$ mm Hg.

(b) We are 95% confident that the population mean reduction in systolic blood pressure for those who receive training for eight weeks (μ_1) is larger than that for others (μ_2) by an amount that might be as small as 6.1 mm Hg or as large as 13.5 mm Hg.

6.7.5

No. The confidence interval found in Exercise 6.7.3 is valid even if the distributions are not normal, because the sample sizes are large.

6.7.9

We are 97.5% confident that the population mean drop in systolic blood pressure of adults placed on a diet rich in fruits and vegetables for eight weeks (μ_1) is larger than that for adults placed on a standard diet (μ_2) by an amount that might be as small as 0.9 mm Hg or as large as 4.7 mm Hg.