8.60)

$\mu = 477600$

$\frac{\sum_{i=1}^{5}(x-\mu)^2}{n} = \frac{1}{4}\{(395000-477600)^2 + (521000-477600)^2 + (483000-477600)^2 + (479000-477600)^2 + (510000-477600)^2\}$

$= 2446800000.$

8.221

$X \sim N(174.5, 6.9^2)$.

$\mu = 174.5, \quad \sigma = 6.9$

Sample $n=25$, $\bar{X} \sim N(174.5, (\frac{6.9}{\sqrt{25}})^2)$

(a) $\bar{X} \sim N(174.5, (\frac{6.9}{5})^2)$

$\mu = 174.5, \quad S = 1.38$

(b) $P(172.5 \le \bar{x} \le 175.8)$

$\approx P(172.45 \le \bar{x} \le 175.85)$

$\Rightarrow P\left(\frac{172.45-174.5}{1.38} < z < \frac{175.85-174.5}{1.38}\right)$

$= P(-1.486 < z < 0.978)$

$= 0.8365 - 0.06875$

$= 0.76775$

$0.76775 \times 200 = 153.55$

$\approx 154.$

(c) $P(\bar{x} < 172.0) \approx P(\bar{x} < 171.95)$

$= P(z < \frac{171.95-174.5}{1.38}) = P(z < -1.848)$

$\approx P(z < -1.85) = 0.0322$

$0.0322 \times 200 = 6.44 \quad \approx 6$

8.24

$X \sim N(40, 2^2)$, $n = 36$.

$\bar{X} \sim N(40, (\frac{2}{6})^2) = N(40, (\frac{1}{3})^2)$

$P(36\bar{x} > 1458)$

$\Rightarrow P(\bar{x} > 40.5) = P(z > \frac{40.5-40}{\frac{1}{3}})$

$= P(z > 1.5) = 1 - 0.9332$

$= 0.0668.$

8.231

(a) $\mu = (4 \times 0.2) + (5 \times 0.4) + (6 \times 0.3) + (7 \times 0.1) = 0.8 + 1.8 + 0.42.$

$= 5.3.$

$\sigma^2 = E(x^2) - \{E(x)\}^2$

$= 28.9 - 28.09$

$= 0.81$

(b) $\mu = 5.3, \quad S^2 = \frac{\sigma^2}{n} = 0.0225.$

(c) $\bar{X} \sim N(5.3, 0.0225)$

$P(\bar{x} < 5.5) = P(z < \frac{0.2}{\sqrt{0.0225}})$.

$= P(z < 1.3333)$

$= 0.90905.$

8.72 $X \sim N(20, 3^2)$

$\bar{X} \sim N(20, \frac{9}{n})$

$P(19.9 < \bar{X} < 20.1)$

$= P(\frac{19.9-20}{3/\sqrt{n}} < z < \frac{20.1-20}{3/\sqrt{n}})$.

$= P(-\frac{\sqrt{n}}{30} < z < \frac{\sqrt{n}}{30}) = 0.95.$

$= P(0 < z < \frac{\sqrt{n}}{30}) = 0.475$

$P(z < \sqrt{n}/30) = 0.975 = P(z < 1.96)$

$n \approx 3457.$

$\therefore 3457.$

8.32 $\bar{X}_A \sim N(4.5, 1^2)$

$\bar{X}_B \sim N(4.7, 1^2)$

$\bar{X}_B - \bar{X}_A \sim N(4.7-4.5, \frac{1}{18})$

$P(\bar{X}_B - \bar{X}_A \geq 0.2) = P(Z \geq 0.2 \times \sqrt{18})$

$= P(Z \geq 0.849) = 1 - P(Z < 0.849)$

$\Rightarrow 1 - 0.8023 = 0.1977$

8.44)

(a) $t_{0.025, 14} = 2.145$

(b) $-t_{0.10, 10} = -1.372$

(c) $t_{0.995, 7} = -3.499$

8.45)

(a) $P(T < 2.365), V = 7$

$= 1 - 0.025 = 0.975$

(b) $V = 24$, $P(T > 1.318) = 0.10$

(c) $V = 12$, $P(-1.356 < T < 2.179) =$

$1 - (0.1 + 0.025) = 1 - 0.125 = 0.875$

(d) $P(T > -2.567) = 1 - P(T < -2.567)$

$= 1 - 0.01 = 0.99$ $(\because V = 10)$

8.47) $n = 24$, $V = 23$.

(a) $P(-2.069 < T < k) = 0.965$

$\Rightarrow 1 - (0.025 + 0.01) \Rightarrow k = 2.5$

(b) $P(k < T < 2.807) = 0.095$

$= 1 - (0.005 + 0.90)$

$k = 1.319$

(c) $P(-k < T < k) = 0.90$.

$= 1 - (0.05 + 0.05)$ $\therefore k = 1.714$.

8.40)

(a) $P(X^2 > \chi_\alpha^2) = 0.01$ $V = 21$.

$\chi_\alpha^2 = 38.932$.

(b) $P(X^2 < \chi_\alpha^2) = 0.95$ $V = 6$.

$\chi_\alpha^2 = 12.592$

(c) $P(\chi_\alpha^2 < X^2 < 23.209)$

$= 0.015$, $V = 10$

$= P(X^2 > \chi_\alpha^2) - P(X^2 > 23.209)$

$= P(X^2 > \chi_\alpha^2) = 0.025$

$\chi_\alpha^2 = 20.483$

8.41) $n = 25$, $V = 24$, $\sigma^2 = 6$.

$X^2 = \frac{(n-1)S^2}{\sigma^2}$

(a) $P(S^2 > 9.1)$ $P(X^2 > \frac{24 \times 9.1}{6})$

$= P(X^2 > 36.4) = 0.05$

(b) $P(3.462 < S^2 < 10.745)$

$= P(4 \times 3.462 < X^2 < 4 \times 10.745)$

$= P(13.848 < X^2 < 42.98)$

$= 0.95 - 0.01 = 0.94$.

8.51)

(a) $f_{0.05}$ $V_1 = 7$, $V_2 = 15$

$f_{0.05}(7, 15) = 2.71$

(b) $f_{0.05}(15, 7) = 3.51$

(c) $f_{0.01}(24, 19) = 2.92$

(d) $f_{0.95}(19, 24) = \frac{1}{f_{0.05}(24, 19)} = \frac{1}{2.11}$

$= 0.4739$

8.59)

$n_1 = 8$, $V_1 = n-1 = 7$.

$n_2 = 12$, $V_2 = n-1 = 11$.

$\sigma_1 = \sigma_2 = \sigma$.

$$F = \left(\frac{S_1^2 \sigma_2^2}{S_2^2 \sigma_1^2}\right) = \frac{S_1^2}{S_2^2} \sim f_\alpha(7, 11)$$

$$P(S_1^2/S_2^2 < 4.89) = P(F < 4.89)$$

$$= 1 - P(F \geq 4.89) = 1 - 0.01$$

$$= 0.99$$

8.64) $n_1 = 25$, $V_1 = 24$.

$n_2 = 31$ $V_2 = 30$.

$\sigma_1^2 = 10$, $\sigma_2^2 = 15$.

$$F = \frac{S_1^2 \sigma_2^2}{S_2^2 \sigma_1^2} = \frac{S_1^2 \cdot 15}{S_2^2 \cdot 10} = 1.26 \times \frac{3}{2}.$$

$$= 1.89$$

$$P(S_1^2/S_2^2 > 1.26) = P(F > 1.89)$$

$$= 0.05.$$