Brief solutions to selected problems

5.3.1 $\bar{x} = 211$, $\sigma = 90$, $n = 50$, $\sqrt{50} = 7.0711$.

$\mu_{\bar{x}} = 211$, $\sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{90}{\sqrt{50}} = 12.7279$.

5.3.2 $\bar{x} = 180$, $\sigma = 43$, $n = 43$, $\sqrt{60} = 7.7460$,

$\sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{43}{\sqrt{60}} = 5.5513$.

a) $P(170 < \bar{x} < 195) = P(\dfrac{170-180}{5.5513} < z < \dfrac{195-180}{5.5513}) = P(-1.8 < z < 2.7)$

$= P(z < 2.7) - P(z < -1.8) = 0.9965 - 0.0359 = 0.9606.$

b) $P(\bar{x} < 175) = P(z < -0.9) = 0.1841$.

c) $P(\bar{x} > 190) = P(z > 1.8) = P(z < -1.8) = 0.0359$.

5.3.3 $\mu = 5.7$, $\sigma = 1$, $n = 9$, $\sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{1}{\sqrt{9}} = \dfrac{1}{3}$.

a) $P(\bar{x} > 6) = P(z > 3[6 - 5.7]) = P(z > 0.9) = P(z < -0.9) = 0.1841$.

b) $P(5 < \bar{x} < 6) = P(-2.1 < z < 0.9)$

$= P(z < 0.9) - P(z < -2.1) = 0.8159 - 0.0179 = 0.798$.

c) $P(\bar{x} < 5.2) = P(z < -1.5) = 0.0668$.

5.3.4 $\mu = 5.4$ *days*, $\sigma = 2.8$ *days*, $n = 9$, $\sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{2.8}{7} = 0.4$.

a) $P(\bar{x} > 6) = P(z > \dfrac{6-5.4}{0.4}) = P(z > 1.5) = P(z < -1.5) = 0.0556$.

b) $P(4 < \bar{x} < 6) = P(-3.5 < z < 1.5)$

$= P(z < 1.5) - P(z < -3.5) = 0.9332 - 0.0002 = 0.933$.

c) $P(4.5 < \bar{x} < 5.5) = P(-2.25 < z < 0.25)$

$= P(z < 0.25) - P(z < -2.25) = 0.5987 - 0.0122 = 0.5865$.

5.3.4 $\mu = 9.7$, $\sigma = 6$, $n = 40$, $\sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}} = \dfrac{6}{\sqrt{40}} = 0.948683$.

a) $P(\bar{x} > 11) = P(z > \dfrac{11-9.7}{0.948683}) = P(z > 1.37) = P(z < -1.37) = 0.0853$.

b) $P(\bar{x} \le 7.5) = P(z < \dfrac{7.5-9.7}{0.948683}) = P(z < -2.32) = 0.0102$.

c) $P(7 < \bar{x} < 10.5) = P(-2.85 < z < 0.84)$

$= P(z < 0.84) - P(z < -2.85) = 0.7995 - 0.0022 = 0.7993$.

6.2.1 $\bar{x} = 90$, $\sigma = 10$, $n = 49$, $z_{0.95} = 1.645$, $z_{0.975} = 1.96$ $z_{0.995} = 2.58$.

$$\mu = \bar{x} \pm z_{0.95} \frac{\sigma}{\sqrt{n}} = 90 \pm 1.645 \frac{10}{7} = 90 \pm 2.35 = (98.65,\ 92.35).$$

(87.2, 92.8) , (86.32, 93.68) .

6.2.2 $\bar{x} = 5.98$, $\sigma = 3.5$, $n = 16$, $z_{0.95} = 1.645$, $z_{0.975} = 1.96$ $z_{0.995} = 2.58$.

$$\mu = \bar{x} \pm z_{0.95} \frac{\sigma}{\sqrt{n}} = 5.98 \pm 1.645 \frac{3.5}{4} = 5.98 \pm 1.43938 = (4.54063,\ 7.41938).$$

(4.265, 7.695) , (3.7225, 8.2375) .

6.2.3 $\bar{x} = 8.25$, $\sigma = 3$, $n = 64$, $z_{0.95} = 1.645$, $z_{0.975} = 1.96$ $z_{0.995} = 2.58$.

$$\mu = \bar{x} \pm z_{0.95} \frac{\sigma}{\sqrt{n}} = 8.25 \pm 1.645 \frac{3}{8} = 8.25 \pm 0.616875 = (7.63312,\ 8.86688).$$

(4.265, 7.695) , (7.2825, 9.2175) .

6.2.4 $\bar{x} = 125$, $\sigma = 15$, $n = 100$, $z_{0.95} = 1.645$, $z_{0.975} = 1.96$ $z_{0.995} = 2.58$.

$$\mu = \bar{x} \pm z_{0.95} \frac{\sigma}{\sqrt{n}} = 125 \pm 1.645 \frac{15}{10} = 125 \pm 2.4675 = (122.533,\ 127.468).$$

(122.06, 127.94) , (121.13, 128.87) .

6.2.5 $\bar{x} = 1747.6$, $\sigma = 350$, $n = 16$, $z_{0.95} = 1.645$, $z_{0.975} = 1.96$ $z_{0.995} = 2.58$.

$$\mu = \bar{x} \pm z_{0.95} \frac{\sigma}{\sqrt{n}} = 1747.6 \pm 1.645 \frac{350}{4} = 1747.6 \pm 143.938 = (1603.66,\ 1891.54).$$

(1576.1, 1919.1) , (1521.85, 1973.35) .

6.3.1

c.c.	0.95	0.99	0.9	0.95
s.s.	15	24	8	30
r.c.	2.1448	2.8073	1.8946	2.0452

6.3.2 a) $\bar{x} = 1.00667$, b) $s = 0.0680196$, $n = 6$,

c) $s_{\bar{x}} = \frac{s}{\sqrt{n}} = \frac{0.0680196}{\sqrt{6}} = 0.02776899$

d) $\mu = \bar{x} \pm t_{5,0.975} \frac{s}{\sqrt{n}} = 1.00667 \pm 2.5706 \frac{0.0680196}{2.44949}$

$= 1.006677 \pm 0.0713827 = (0.935287,\ 1.07805).$

e) $t_{5,0.975} \frac{s}{\sqrt{n}} = 2.5706.$

f) *In repeated sampling 95% of the intervals computed will include the population mean* μ .

g) *We are 95% confident that the population mean* μ *will be between* (0.935287, 1.07805) .

6.3.4 $\bar{x} = 119$, $s = 2.1$, $n = 10$.

a) $s_{\bar{x}} = \frac{s}{\sqrt{n}} = \frac{2.1}{\sqrt{10}} = \frac{2.1}{3.16228} = 0.664078.$

b) $\mu = \bar{x} \pm t_{0.995,9} \dfrac{s}{\sqrt{n}} = 119 \pm (3.2498)(0.664078)$

$= 119 \pm 2.15812 = (116.842,\quad 121.158)$.

c) $E = t_{0.995,9} \dfrac{s}{\sqrt{n}} = (3.2498)(0.664078) = 2.15812$.

d) *The distribution of the population is normal.*

6.3.5 $\bar{x} = 17.5$ *pounds* , $s = 12$ *pounds* , $n = 16$

$t_{0.95,15} = 1.7531$, $t_{0.975,15} = 2.1314$, $t_{0.995,15} = 2.9467$.

$\mu = \bar{x} \pm t_{0.95,15} \dfrac{s}{\sqrt{n}} = 17.5 \pm (1.7531)(3) = 17.5 \pm 5.2593$

$= (66.2407,\quad 76.7593)$.

$\mu = \bar{x} \pm t_{0.975,15} \dfrac{s}{\sqrt{n}} = 17.5 \pm (2.1314)(3) = 17.5 \pm 6.3942$

$= (65.1058,\quad 77.8942)$.

$\mu = \bar{x} \pm t_{0.995,15} \dfrac{s}{\sqrt{n}} = 17.5 \pm (2.9467)(3) = 17.5 \pm 8.8401$

$= (62.6599,\quad 80.3401)$.

6.3.6 $\bar{x} = 0.015625$, $s = 0.0112183$, $n = 16$, $t_{0.975,15} = 2.1314$.

$\mu = \bar{x} \pm t_{0.975,15} \dfrac{s}{\sqrt{n}} = 0.015625 \pm (2.1314)(0.0028046)$

$= 0.015625 \pm 0.0059777 = (0.0096473,\quad 0.0216027)$.

6.5.1 X = 166, n = 947, p.e.= $\hat{p} = 0.1753$, $1 - \hat{p} = 0.8247$, r.c.= $Z_{0.95} = 1.645$,

s.e.= $\sqrt{\dfrac{\hat{p}(1-\hat{p})}{n}}$ =0.01236; 90% c.i. = p = 0.1753 ± 0.0203 = (0.155, 0.1956)

6.5.2 n = 1229, p.e.= $\hat{p} = 0.5$, $1 - \hat{p} = 0.5$, r.c.= $Z_{0.975} = 1.96$,

s.e.= $\sqrt{\dfrac{\hat{p}(1-\hat{p})}{n}}$ =0.01426; 95% c.i. = p = 0.5 ± 0.02795 = (0.47205, 0.52795)

6.5.3 n = 86, p.e.= $\hat{p} = 0.128$, $1 - \hat{p} = 0.872$, r.c.= $Z_{0.995} = 2.58$,

s.e.= $\sqrt{\dfrac{\hat{p}(1-\hat{p})}{n}}$ =0.03603; 99% c.i. = p = 0.128 ± 0.09296 = (0.03504, 0..22096)

6.5.4 X = 88, n = 125, p.e.= $\hat{p} = 0.704$, $1 - \hat{p} = 0.296$, r.c.= $Z_{0.975} = 1.96$,

s.e.= $\sqrt{\dfrac{\hat{p}(1-\hat{p})}{n}}$ =0.04083; 95% c.i. = p = 0.704 ± 0.08 = (0.624, 0.784)