HW 3 SET 6

9.5 Prob 9

$\sigma = 6$ $z_{\alpha/2} = 1.65$

$E_{error} = 1$

$$E = z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$$

$$\left(\frac{1.65 \cdot 6}{1}\right)^2 = \boxed{98.01}$$

$$\frac{E}{z_{\alpha/2}} = \frac{\sigma}{\sqrt{n}}$$

$$\frac{z_{\alpha/2}}{E} = \frac{\sqrt{n}}{\sigma}$$

$$\left(\frac{z_{\alpha/2} \cdot \sigma}{E}\right)^2 = n$$

Section 9.5 prob 11

$\sigma = 30$ 90%

$E = 9$ $z_{\alpha/2} = 1.65$

$$n = \left(\frac{30 \cdot 1.65}{9}\right)^2 = 30.25 \text{ lunches} \rightarrow 31$$

Section 9.3 prob 9

$n = 1000$ $\hat{p} = \frac{650}{1000}$ $\hat{p} = .65$ 90%

a) $\hat{p} = 0.65$

b) $z_{\alpha/2} = 1.65$

$$\hat{p} \pm z_{\alpha/2}\left(\frac{\hat{p}(1-\hat{p})}{n}\right)^{1/2}$$

$$1.65\left(\frac{.65(1-.65)}{1000}\right)^{1/2} = 0.0249$$

$0.65 + 0.0249 = 0.675$

$0.65 - 0.0249 = 0.625$

$(0.625, 0.675)$

$(62.5, 67.5)$

Section 9.6 prob 7

$\hat{p} = \frac{110}{400} = 0.275$ $\quad 99\% \Rightarrow 2.58$

$n = 400$

a) $0.275 \pm 2.58\left(\frac{0.275(1-0.275)}{400}\right)^{1/2} = \boxed{(0.218, 0.333)}$

$= \boxed{(87.2, 133.2)}$

b) No, we are 99% certain that at most 33% of customers have excessive outlets

9.3 prob 13

$n = 120 \qquad \hat{p} = \frac{57}{120} = 0.475$

a) $95\% \rightarrow 1.96$

$$0.475 \pm 1.96 \left(\frac{0.475(1-0.475)}{120} \right)^{\frac{1}{2}}$$

$$(0.386, 0.564)$$

b) Yes, the maximum rate in this interval is 56.4 %. The 2010 ownership rate is 66.5%

9.3 prob 15

$\hat{p} = \frac{21}{200} = 0.105$

95% = 1.96

a)

$0.105 \pm 1.96\left(\frac{0.105(1-0.105)}{200}\right)^{\frac{1}{2}} \rightarrow (0.0625, 0.148)$

b) Yes, the lowest error rate with 95% confidence is 6.25%

9.3 prob 16

$z_{\frac{\alpha}{2}} = 1.96$

$n = \frac{(1.96)^2 \cdot (0.33)(0.66)}{(0.03)^2}$ $E = 0.03$

$\hat{p} = 0.33$

$\hat{q} = 0.66$

$n = 929.667 \rightarrow 930$

9.3 prob 18

80% CI $\rightarrow 1.28$ $\quad E = 0.1$

$\hat{p} = 0.5$

$$n = \frac{(1.28)^2(0.5)(0.5)}{0.1^2} = 40.96 \rightarrow 41$$

HW 3 SET 5

9.1 Prob 25

a) $\alpha = 0.05$ 95%
$z_{\frac{\alpha}{2}} = 1.96$

b) $\alpha = .01$
$z_{\alpha/2} = 2.58$

c) $\alpha = 0.1$ $z_{\frac{\alpha}{2}} = 1.65$

9.1 # 27

a) 98% $\frac{\alpha}{2} = 0.01$
$z_{\frac{\alpha}{2}} = 2.33$

b) 94% $\frac{\alpha}{2} = 0.06$ $z_{\frac{\alpha}{2}} = 1.88$

c) 92% $\frac{\alpha}{2} = 0.04$ $z_{\frac{\alpha}{2}} = 1.75$

9.1 #29

$s = 64 \quad n = 90 \quad \bar{x} = 250 \quad 95\%$

$z_{\frac{\alpha}{2}} = 1.96$

$250 \pm 1.96\left(\frac{64}{\sqrt{90}}\right)$

$(236.777, 263.223)$

9.1 prob 31

$n = 40 \quad \bar{x} = 5 \quad s = 1 \quad 90\% \rightarrow z_{\alpha/2} = 1.65$

$5 \pm 1.65\left(\frac{1}{\sqrt{40}}\right) = (4.739, 5.261)$

9.1 prob 33

$n = 50 \quad \bar{x} = 5000 \quad 99\% \rightarrow z_{\alpha/2} = 2.58$

$s = 100$

$5000 \pm 2.58\left(\frac{100}{\sqrt{50}}\right) = (4964, 5036)$

9.1 prob 35

$\bar{x} = 30{,}000$ $\quad 98\% \rightarrow z_{\frac{\alpha}{2}} = 2.33$

$s = 1950$ $\quad n = 35$

$$30{,}000 \pm 2.33\left(\frac{1950}{\sqrt{35}}\right) = (29\,232, 30\,768)$$

9.1 #37 $n = 50$ $\quad \bar{x} = 9.6$ $\quad s = 3.1$

$99\% \rightarrow 2.58$

$$9.6 \pm 2.58\left(\frac{3.1}{\sqrt{50}}\right) = (8.47, 10.73)$$

9.2 #15 and #17

a) $\alpha = 0.05$, $n = 12$

$df = 11$

$t_{\frac{\alpha}{2}} = 2.201$

b) $\alpha = 0.01$, $n = 18$

$df = 17$

$t_{\alpha/2} = 2.898$

c) $\alpha = 0.10$, $n = 22$

$df = 21$

$t_{\alpha/2} = 1.721$

9.2 # 19

$n = 15 \rightarrow df = 14$

$s = 8.683$

$\bar{x} = 80.37$

80% $\rightarrow \frac{\alpha}{2} = 0.1$

$t_{\alpha/2} = 1.345$

$$80.37 \pm 1.345\left(\frac{8.683}{\sqrt{15}}\right) = (77.355, 83.385)$$

```
import pandas as pd

numbers = [83.9, 87.4, 65.2, 86, 73.1, 80.3, 92.7, 87.5, 69.3, 77.5, 91.9, 71.1, 79.1, 72.4, 88.2]
df = pd.DataFrame(numbers)
df
```

✓ 0.6s 🖷 Open 'df' in Data Wrangler

	# 0
0	83.9
1	87.4
2	65.2
3	86.0
4	73.1
5	80.3
6	92.7
7	87.5
8	69.3
9	77.5

15 rows x 1 cols 10 per page « ‹ Page 1 of 2 › »

```
print("Sample Mean: " + str(df.mean()[0]) + "\nSample Deviation: " + str(df.std()[0]))
```

✓ 0.0s

```
Sample Mean: 80.37333333333332
Sample Deviation: 8.683026683187862
```

9.2 Prob 21

$n = 15 \quad df = 14$

$\bar{X} = 6.4$ $\quad 95\% \rightarrow \frac{\alpha}{2} = 0.025$

$t_{\frac{\alpha}{2}} = 2.145$

$s = 1.4$

$$6.4 \pm 2.145\left(\frac{1.4}{\sqrt{15}}\right)$$

$$(5.625, 7.175)$$

We are 95% confident that the average amount of time that a parent will stay in the hospital after abdominal surgery is between 5.6 days and 7.2 days

9.2 #23

$n = 15 \quad df = 14$

$\bar{x} = 115$

$s = 30$

$90\% \rightarrow \alpha/2 = 0.05$

$t_{\alpha/2} = 1.761$

$$115 \pm 1.761\left(\frac{30}{\sqrt{15}}\right) = (101.359, 128.641)$$

We are 90% confident that the average price of a hotel room in the summer is between \$101.4 and \$128.6