STAT 328

Lab 2 Solutions

6.1

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{200}{\sqrt{100}} = \frac{200}{10} = \$20$$

6.2

2 std dev = 2(\$20) = \$40

6.3

2 std dev = \$40

6.15

$\bar{x} = 11.8$

$\sigma = 3.2$

$n = 114$

$z^* = 2.575$

$\bar{x} \pm z \cdot \sigma/\sqrt{n}$

$11.8 \pm (2.575)(3.2/\sqrt{114})$

$11.8 \pm .8$

$(11.0, 12.6)$

6.17

$\bar{x} = 17529$

$\sigma = 1900$

$n = 15$

$z^* = 1.96$

$17529 \pm (1.96)(1900/\sqrt{15})$

17529 ± 962

$(16567, 18491)$

6.18

$$n = \left(\frac{z^* \sigma}{m}\right)^2$$

$$= \left(\frac{2.575 \cdot 3.2}{1}\right)^2$$

$$= 68$$

6.20

$$n = \left(\frac{1.96 * 1900}{500}\right)^2$$

$$= 56$$

6.91 (b)

$\bar{x} = 30.4$

$\sigma = 7$

$n = 10$

$30.4 \pm (1.96)(7/\sqrt{10})$

30.4 ± 4.34

$(26.06, 34.74)$

Extra

$\bar{x} \pm z\sigma\sqrt{1 + \frac{1}{n}}$

$30.4 \pm (1.96)(7)(\sqrt{1 + \frac{1}{10}}$

30.4 ± 14.39

$(16.01, 44.79)$

6.31

(a) $z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} = \frac{28.6 - 31}{9.6/\sqrt{40}} = -1.58$

(b) p-value $= 2 \times P(Z < -1.58) = 2 \times .0571 = .1142$
There is not strong evidence to suggest that Cleveland's average is different than the national average.

6.32

$H_0: \mu = 31$ vs. $H_a: \mu < 31$

The p-value is 0.0571. There is some evidence now to suggest Cleveland has an average lower than the national average.

The test statistic acts as the evidence against the null hypothesis and in favor of the alternative. The sample may provide different evidence for different hypothesis.

6.33

You must state what you want the evidence to support before you take the sample, not after.

6.45

a) $H_0: \mu = 1250$
$H_a: \mu < 1250$

b) $H_0: \mu = 32$
$H_a: \mu > 32$

c) $H_0: \mu = 5$
$H_a: \mu \neq 5$

6.54

a) $z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} = \frac{135.2 - 115}{30/\sqrt{20}} = 3.01$

p-value : $P(z > 3.01) = .0013$
There is strong evidence to suggest the older students have better study attitudes.

6.63

(a) $\bar{x} = 104.13$
$\sigma = 9$
$n = 12$
$z^* = 1.96$

$104.13 \pm (1.96)(9/\sqrt{12})$
104.13 ± 5.09
$(99.03, 109.22)$

(b) $H_0: \mu = 105$ vs $H_a: \mu \neq 105$
Since we are 95% confident that μ is between 99.03 and 109.22 we cannot conclude the null is false.

6.91

(c) Yes, because 25 is not in the interval we can conclude that the average odor threshold of beginning students is higher.

7.1

a) $\sigma_{\bar{x}} = \frac{80}{\sqrt{10}} = 25.3$

b) 9

7.2

2.086

2.660

7.3 $\bar{x} = 531$

$s/\sqrt{n} = 26.18$

$t = 2.262$

$531 \pm (2.262)(26.18)$

531 ± 59.22

$(471.78, 590.22)$

Extra

$s = 82.79$

$531 \pm (2.262)(82.79)\sqrt{1 + \frac{1}{10}}$

531 ± 196.41

$(334.59, 727.41)$

7.4

larger - by increasing the confidence level, you are decrease the tail probability. Hence the confidence coefficient will be larger.

$t = 3.250$

$531 \pm (3.250)(26.18)$
531 ± 85.09
$(445.91, 616.09)$

7.5

$H_0: \mu = 500$ vs. $H_a: \mu > 500$

$$t = \frac{\bar{X} - \mu}{s/\sqrt{n}} = \frac{531 - 500}{26.18} = 1.18$$

$.10 < \text{p-value} < .15$

There is not strong evidence to suggest the mean rent is greater than \$500.

7.10

$\bar{X} = 55$ $\quad H_0: \mu = 0$
$S = 3.937$ $\quad H_a: \mu > 0$
$n = 5$
$s/\sqrt{n} = 1.76$ $\quad t = \frac{55 - 0}{1.76} = 31.25$

p-value: < 0.0005
There is strong evidence to suggest that cooking reduces the level of vitamin C.

7.11

$55 \pm (2.776)(1.76)$

55 ± 4.89

$(50.11, 59.89)$

7.23

(b) $\bar{x} = 21484.8$

$s/\sqrt{n} = 1015.87$

$t = 2.093$

$21484.8 \pm (2.093)(1015.87)$

21484.8 ± 2126.22

$(19358.58, 23611.02)$

Extra

$\bar{x} \pm t \cdot s\sqrt{1 + 1/n}$

$21484.8 \pm (2.093)(4543.09)(\sqrt{1 + 1/20})$

21484.8 ± 9743.51

$(11741.29, 31228.31)$

7.25

No, the sample does not give good evidence that the average earnings of white female hourly workers is greater than \$20,000.

7.65

$H_0: \mu_1 - \mu_2 = 0$ vs. $H_a: \mu_1 - \mu_2 > 0$

$$t = \frac{\bar{x}_1 - \bar{x}_2 - (\mu_1 - \mu_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} = \frac{48.71 - 21.80 - 0}{\sqrt{\frac{1.53^2}{2} + \frac{.77^2}{2}}}$$

7.65 (cont)

$t = 22.2$

$df = 1$

$.01 < \text{p-value} < .02$

There is evidence to suggest Vitamin C decreases days after baking

(b) $26.91 \pm (6.314)\sqrt{1.47}$

26.91 ± 7.65

$(19.26, 34.56)$

7.83

(a) 12.71

(b) 4.303

(c) With the pooled procedure, it is easier to see a significant result in sample data.

7.84

(a) $2 * ME = 30.86$

(b) 10.448

The unpooled interval has a larger width than the pooled interval.

Extra

$\bar{X} \pm t \cdot s/\sqrt{n}$

a) The correct t critical value with 39 df is 1.685. This is not given on the table in your book. It is appropriate to use 1.687 (df=30) or 1.684 (df=40)

$.761 \pm (1.685)(.041)$

$.761 \pm .069$

$(.692, .830)$

b) $\bar{x} \pm t \cdot s \cdot \sqrt{1 + \frac{1}{n}}$

$.761 \pm (1.685)(.256)\left(\sqrt{1 + \frac{1}{40}}\right)$

$.761 \pm .437$

$(.324, 1.198)$