Homework #9 Solutions

Problem 7.26

Let μ = mean price of corn sold in Oct

$\bar{X} = 2.08$ $SE_{\bar{X}} = .176$ $n = 22$

So the 95% CI for μ is

$2.08 \pm (2.080)(.176)$

$\Rightarrow 2.08 \pm .366$

$\Rightarrow (1.714, 2.446)$

Problem 7.31

First set things up in terms of differences "Before" − "After". So we have a sample of 5 differences

53, 52, 57, 52, 61

the sample mean of these is 55

the sample standard deviation of these is 3.94

②

To test whether vitamin C is reduced by the process we need to check whether the vitamin C levels are higher "Before" than "after".

Let μ_D = true mean difference in vitamin C levels

Then appropriate hypotheses to test would be

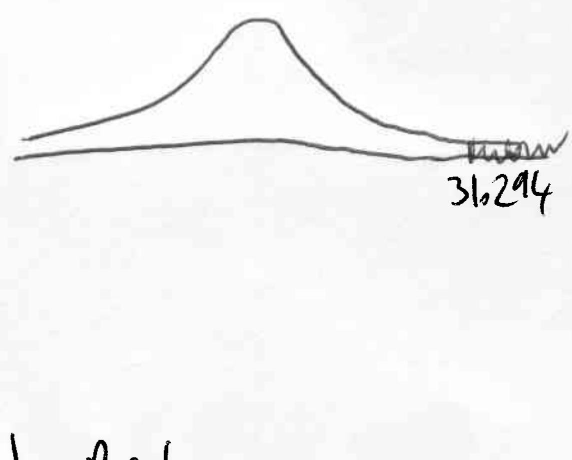
$H_0: \mu_D \leq 0$ (ie "Before" - "after" is negative or zero meaning vitamin C level did not change)

$H_A: \mu_D > 0$ (ie the vitamin C level "before" was higher than "after")

$$t = \frac{\bar{X}}{s/\sqrt{n}} = \frac{55}{3.94/\sqrt{5}} = 31.294$$

$df = 5-1 = 4$

the P-value is $P(T > 31.294)$



from table

$8.610 < 31.294$

$.0005 > P(T > 31.294) = \text{Pvalue}$

Since Pvalue is so small reject H_0. ie vitamin C is lost in the process.

Problem 7.34

(a) $\bar{X} = \frac{5.6+5.1+4.6+4.8+5.7+6.4}{6} = 5.367$

$\sum X_i^2 = 5.6^2+5.1^2+\cdots+6.4^2 = 175.02$

So $s = \sqrt{\frac{175.02-6(5.367)^2}{6-1}}$ $\quad SE_{\bar{X}} = \frac{s}{\sqrt{n}} = \frac{.665}{\sqrt{6}} = .272$

$= .665$

(b) Let μ = mean phosphate level in patients blood

$n = 6 \Rightarrow df = n-1 = 6-1 = 5$

Then a 90% CI for μ is

$5.367 \pm (2.015)(.272)$

$\Rightarrow 5.367 \pm .548$

$\Rightarrow (4.819, 5.915)$

Problem 7.62

Let μ_1 = mean vitamin E level immediately after baking

μ_2 = mean vitamin E level three days after baking

(a) $\bar{X}_1 = \frac{94.6+96.0}{2} = 95.3$

$\bar{X}_2 = \frac{97.4+94.3}{2} = 95.85$

$s_1 = \sqrt{\frac{(94.6-95.3)^2 + (96.0-95.3)^2}{2-1}} = .9899 \text{ (4dp)}$

$s_2 = \sqrt{\frac{(97.4-95.85)^2 + (94.3-95.85)^2}{2-1}} = 2.1920 \text{ (4dp)}$

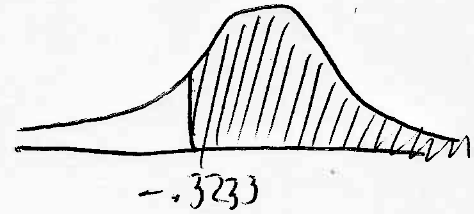
$H_0: \mu_1 - \mu_2 \leq 0$ (ie does not lose vitamin E)

$H_A: \mu_1 - \mu_2 > 0$ (does lose vitamin E)

$df = \min(2,2) - 1 = 1$

$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} = \frac{95.3 - 95.85}{\sqrt{\frac{.9899^2}{2} + \frac{2.1920^2}{2}}} = -.3233 \text{ (4dp)}$

P value = $P(T > -.3233)$



$0.5 < \text{Pvalue} < .75$

Can not reject null hypothesis. ie vitamin E level does not decrease after 3 days

b) A 90% CI for the amount of vitamin E lost (ie for $\mu_1 - \mu_2$) is given by

$$\bar{X}_1 - \bar{X}_2 \pm t^* \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$

$$95.3 - 95.85 \pm 6.314 \sqrt{\frac{.9899^2}{2} + \frac{2.1920^2}{2}}$$

$$-.55 \pm 6.314 \, (1.7007)$$

$$(-11.288 \, , \, 10.188)$$

Problem 7.69

First let μ_1 = mean ego strength of low fitness people

μ_2 = mean ego strength of high fitness people

$\bar{X}_1 = 4.64$ $\qquad$ $s_1 = .6902$

$\bar{x}_2 = 6.43$ $\qquad$ $s_2 = .4304$

(a) ⑥

$H_0: \mu_1 - \mu_2 = 0$ (ie no difference between fitness level groups)

$H_A: \mu_1 - \mu_2 \neq 0$ (there is a difference)

$df = \min(14, 14) - 1 = 13$

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} = \frac{4.64 - 6.43}{\sqrt{\frac{.6902^2}{14} + \frac{.4304^2}{14}}} = -8.231$$

$$P\text{ value} = 2P(T > |-8.231|) = 2P(T > 8.231)$$

$4.221 < 8.231$

$.0005 > P(T > 8.231)$

$\Rightarrow .001 > P\text{value} \Rightarrow$ reject H_0. ie there is difference in mean ego strength

b) Yes because it is unlikely that a set of volunteers from college faculty members is really representative of the entire population of middle aged men.

Problem 7.78

Let μ_1 = mean level of calories in beef hot dogs

μ_2 = mean level of calories in poultry hot dogs

$\bar{X}_1 = 156.85$ $\quad$ $s_1 = 22.6420$

$\bar{X}_2 = 122.47$ $\quad$ $s_2 = 25.4831$

$n_1 = 20$ $\quad$ $n_2 = 17$

(a) A 95% CI for $\mu_1 - \mu_2$ is given by

$$\bar{X}_1 - \bar{X}_2 \pm t^* \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$

$$\Rightarrow 156.85 - 122.47 \pm (2.120)\sqrt{\frac{22.6420^2}{20} + \frac{25.4831^2}{17}}$$

$$\Rightarrow 34.38 \pm (7.989)(2.120)$$

$$\Rightarrow (17.442, 51.317)$$