

Homework #9 Solutions

①

Problem 7.26 Let μ = mean price of corn sold in Oct

$$\bar{x} = 2.08 \quad SE_{\bar{x}} = 0.176 \quad n = 22$$

So the 95% CI for μ is

$$2.08 \pm (2.030)(0.176)$$

$$\Rightarrow 2.08 \pm 0.366$$

$$\Rightarrow (1.714, 2.446)$$

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_0 = true mean difference in vitamin C levels

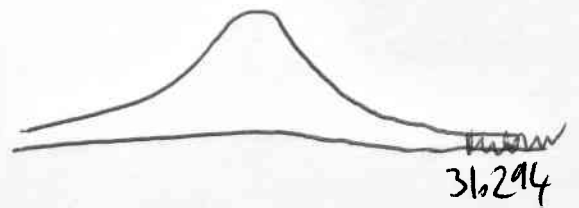
Then appropriate hypotheses to test would be

$H_0: \mu_0 \leq 0$ (ie "Before" - "after" is negative or zero meaning vitamin C level did not change)

$H_A: \mu_0 > 0$ (ie the vitamin C level "before" was higher than "after")

$$t = \frac{\bar{X}}{s/\sqrt{n}} = \frac{55}{3.94/\sqrt{5}} = 31.294 \quad df = 5 - 1 = 4$$

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



$$0.610 < 31.294$$

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

Since P-value is so small reject H_0 . ie vitamin C is lost in the process.

Problem 7.34

3

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

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

$$\begin{aligned} \text{So } s &= \sqrt{\frac{175.02 - 6(5.367)^2}{6-1}} & SE_{\bar{x}} &= \frac{s}{\sqrt{n}} = \frac{.665}{\sqrt{6}} = .272 \\ &= .665 \end{aligned}$$

(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

(4)

Let μ_1 = mean vitamin E level immediately after baking

μ_2 = mean vitamin E level three days after baking

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

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

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

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

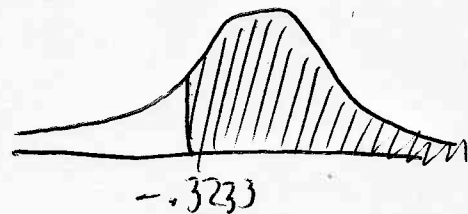
$$H_0: \mu_1 - \mu_2 \leq 0 \quad (\text{c does not lose vitamin E})$$

$$H_A: \mu_1 - \mu_2 > 0 \quad (\text{does lose vitamin E})$$

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

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

$$P\text{value} = P(T > -0.3233)$$



5

$$0.5 < P\text{value} < 0.75$$

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

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

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

$$95.3 - 95.85 \pm 6.314 \sqrt{\frac{0.9849^2}{2} + \frac{2.1920^2}{2}}$$

$$-0.55 \pm 6.314 (1.67007)$$

$$(-11.288, 10.188)$$

Problem 7.69

First let μ_1 = mean ego strength of low fitness people

μ_2 = mean ego strength of high fitness people

$$\bar{X}_1 = 4.64$$

$$s_1 = 0.6902$$

$$\bar{X}_2 = 6.43$$

$$s_2 = 0.4304$$

(a)

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

$H_A: \mu_1 - \mu_2 \neq 0$ (there is a difference)
 $df = \min(14, 14) - 1 = 13$

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

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

$$4.221 < 8.231$$

$$.0005 > P(T > 8.231)$$

$\Rightarrow .001 > P \text{ value} \Rightarrow$ reject H_0 . i.e. there is difference in mean ^{strength} ~~eg~~

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 7.7B

(7)

Let μ_1 = mean level of calories in beef hot dogs

μ_2 = mean level of calories in poultry hot dogs

$$\bar{x}_1 = 156.85$$

$$s_1 = 22.6420$$

$$\bar{x}_2 = 122.47$$

$$s_2 = 25.4831$$

$$n_1 = 20$$

$$n_2 = 17$$

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

$$\bar{x}_1 - \bar{x}_2 \pm t^* \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$
$$\Rightarrow 156.85 - 122.47 \pm (2.120) \sqrt{\frac{22.6420^2}{20} + \frac{25.4831^2}{17}}$$

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

$$\Rightarrow (17.442, 51.317)$$