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STAT 3093 ASSIGNMENT # 7

Q1. Ex 24, pg 506

$$CI = \bar{x} - \bar{y} \pm t_{\alpha/2,v}\sqrt{\frac{s_1^2}{m} + \frac{s_2^2}{n}}$$

$$v = \frac{\left(\frac{s_1^2}{m} + \frac{s_2^2}{n}\right)^2}{\frac{(s_1^2/m)^2}{m-1} + \frac{(s_2^2/n)^2}{n-1}} = \frac{\left(\frac{5.5^2}{28} + \frac{7.8^2}{31}\right)^2}{\frac{(5.5^2/28^2)}{28-1} \frac{(7.8^2/31)^2}{31-1}} = 53.95$$

round down → $v = 53$

$\alpha = 0.1$, $t_{\alpha/2,v} = 1.67$

$$CI = 91.5 - 88.3 \pm 1.67\sqrt{\frac{5.5^2}{28} + \frac{7.8^2}{31}}$$

$= (0.280, 6.12)$ For a 90% confidence Interval, it suggests a difference.

For 95% CI, $\alpha = 0.05$, $t_{\alpha/2,v} = 2.01$

$CI = (-0.299, 6.70)$

no difference is suggested at CI level of 95 %.

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Q2: EX 28, PG 507

$H_0: \mu_1 = \mu_2$ μ_1 = mean for cola
$H_a: \mu_1 - \mu_2 > 0$ μ_2 = mean for strawberry.

$$t = \frac{\bar{X} + \bar{Y} - \Delta_0}{\sqrt{\frac{s_1^2}{m} + \frac{s_2^2}{n}}} = \frac{554 - 540 - 0}{\sqrt{\frac{15^2}{15} + \frac{21^2}{15}}} = 2.10$$

$$df: \ v = \frac{\left(\frac{s_1^2}{m} + \frac{s_2^2}{n}\right)^2}{\frac{(s_1/m)^2}{m-1} \ \frac{(s_2/n)^2}{n-1}} = 25$$

tail area = 0.977

P-value = 1 - tail area = 0.0229

The evidence shows that cola has a higher compression strength if one chooses to use a signifigance level $\alpha > 0.0229$.

The neccessarry assumptions are that the compression strength of both types of drink are normally distributed.

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Q3: Ex 38 b, c ; Pg 5Ø9

b) No, it is neccessary to have the sample standard deviations as well.

c) $$S_p^2 = \frac{m-1}{m+n-2} s_1^2 + \frac{n-1}{m+n-2} s_2^2$$

$$= \frac{15-1}{15+19-2} 19.5^2 + \frac{19-1}{15+19-2} 15.37^2 = 299.24$$

$$t = \frac{\bar{x} - \bar{y} - (\mu_1 - \mu_2)}{\sqrt{S_p^2\left(\frac{1}{m} + \frac{1}{n}\right)}} = \frac{3Ø.47 - 26.53}{\sqrt{299.24\left(\frac{1}{15} + \frac{1}{19}\right)}} = Ø.659$$

$H_Ø = \mu_1 - \mu_2 = Ø$
$H_a = \mu_1 - \mu_2 > Ø$

tail area $= Ø.742$ using $df = m - n - 2$

$P = 1 - Ø.742 = Ø.257$

The evidence does not allow us to regect the null hypothesis, which states that there is no difference between the time consumers look at the products, unless a signifigance of $> Ø.257$ is acceptable.

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Q4: Ex 42 b, c pg 517

b) $\bar{d} = 167.21$

$s_d = 228.21$

$$t = \frac{\bar{d} - \Delta_0}{s_d / \sqrt{n}} = \frac{167.21 - 0}{228.21 / \sqrt{14}} = 2.74$$

tail area = 0.9916

for 2 tailed t test ($H_a: \mu_D \neq \Delta_0$)

$P = 2(1 - \text{tail area}) = 0.0168$

the P value indicates the null hypothesis could be rejected at $\alpha = 0.05$ but not at $\alpha = 0.01$.

c) Incorrect method

$$t = \frac{\bar{d} - \Delta_0}{\sqrt{\frac{s_1^2}{m} + \frac{s_2^2}{n}}} = \frac{167.21 - 0}{\sqrt{\frac{351.97^2}{14} + \frac{234.042^2}{14}}} = 1.48$$

$P = 2(1 - \text{tail area}) = 0.163$

If the procedure was used incorrectly we'd fail to reject null hypothesis when maybe we should have.

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STAT 3093

ASSIGNMENT # 1

Q5: Ex 50, Pg 525

$$\hat{p}_1 = \frac{104}{207} = 0.5024$$

$$\hat{p}_2 = \frac{109}{213} = 0.517$$

$$\hat{p} = \frac{m}{m+n}\hat{p}_1 + \frac{n}{m+n}\hat{p}_2 = \frac{207}{207+213}\cdot\frac{104}{207} + \frac{213}{207+213}\cdot\frac{109}{213}$$

$$= 0.507$$

$$z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}(1-\hat{p})\left(\frac{1}{m}+\frac{1}{n}\right)}} = \frac{0.502 - 0.517}{\sqrt{0.507(1-0.507)\left(\frac{1}{207}+\frac{1}{213}\right)}} = -0.191$$

$H_a: p_1 - p_2 < 0$

$P = \Phi(z) = 0.424$

The null hypothesis cannot be regected at a signifigance level $\alpha = 0.10$. The data does not support the researcher's hypothesis at this signifigance level.