Chapter 10 Notes

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Question 1

Most casts formed...

Problem 1. State the null and alternative hypothesis

$$H_0 : \mu_1 = \mu_2$$

$$H_A : \mu_1 < \mu_2$$

Problem 2. Calculate the test statistic

$$Z = \frac{\bar{x_1} - \bar{x_2} - \Delta_0}{\sqrt{\sqrt{\frac{\sigma_1^2}{n_1}} + \sqrt{\frac{\sigma_2^2}{n_2}}}}$$

$$\frac{210.6 - 225.1 - 0}{\sqrt{\frac{416.16}{16} - \frac{96.04}{25}}}$$

$$= \frac{-14.6}{5.46} = -2.67$$

3. Find the rejection region

$\alpha = .05$, so

Reject H_0 if $z \leqslant -1.6449$

Problem 4. Give the decision Reject H_0. the samples do have enough evidence, at the $\alpha = 5\%$level, to conclude that mean is lower for plaster

Problem 5. p-value = .0038

Question 2

A new advertising program..

Problem 1. State the null and alternative hypothesis

$$H_0 : \mu_1 = \mu_2$$

$$H_A : \mu_1 \neq \mu 2$$

Problem 2. Calculate the test statistic

Using

$$Z = \frac{\bar{x_1} - \bar{x_2} - \Delta_0}{\sqrt{\frac{\sigma_1^2}{n_1}} + \sqrt{\frac{\sigma_2^2}{n_2}}}$$

We have

$$\frac{20.3 - 14.8 - 0}{\sqrt{\frac{6.2^2}{27}} + \sqrt{\frac{4.9^2}{27}}}$$

Question 3

Problem 1 state the null and alt

Problem 2. Calculate the test statistic ***Using the formula***

$$Z = \frac{\bar{x_1} - \bar{x_2} - \Delta_0}{\sqrt{\frac{\sigma_1^2}{n_1}} + \sqrt{\frac{\sigma_2^2}{n_2}}}$$

We have

$$\frac{20.3 - 14.8 - 0}{\sqrt{\frac{6.2^2}{27}} + \sqrt{\frac{4.9^2}{27}}}$$

$$= 3.62$$

Problem 3. Find the rejection region

$$\frac{\alpha}{2} = .005$$

$$RR = \pm 2.5758$$

So, we reject if

$$Z \leqslant -2.5758$$

$$Z \geqslant 2.5758$$

Problem 4 Give the conclusion

Reject H_0 the samples do have enough eidence at the $\alpha = 1\%$ level to conclude mean ride times differ

Problem 5. Find the p-value

$$\text{p-value} < .0002 + .0002$$

$$\text{p-value} < .0004$$

p-value is smaller than alpha, so we reject (always reject if p-value is smaller)

Question 4

A consumer organization conducted...

Problem 1. calculate a 99% confidence interval to estimate the difference between the mean power output ratings for the two brands.

We can use the formula from chapter 8 if we wanted

$$\bar{x} \pm Z \cdot \frac{\sigma_1}{\sqrt{n_1}}$$

instead, we'll use

$$(\bar{x_1} - \bar{x_2}) \pm \left(Z \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}} \right)$$

so, we have

$$(101.36 - 98.79) \pm \left(1.96 \cdot \sqrt{\frac{3.90}{21} + \frac{1.56}{16}} \right)$$

$$2.57 \pm 1.04$$

We are 95% confidence that

$$1.53 < \mu_1 - \mu_2 < 3.61$$

Note:-

When you have 2 positives on both sides, you know that μ_1 is bigger,

We can say that,

μ_1 exceeds μ_2 by....
... as little as 1.53
... as much as 3.61

Problem 2. Is there evidence to suggest that the mean power-output ratings for the two brands differ?

Reject H_0 because 0 is not in the confidence interval

Note:-

Using C.I. to perform a test tonly works for 2-sided H_A

The level of confidence used for the interval has to match with the α used to test the level of significance

Question 5

chicks and feed problem

Problem 1.

$$H_0 : \mu_! = \mu_2$$

$$H_A : \mu_1 > \mu_2$$

Problem 2.

$$S_p^2 = \frac{(20-1)(42.73) + (20-1)(50.80)}{(20+20-2)}$$

$$= 2203.246$$

$$T = \frac{402.95 - 366.30 - 0}{\sqrt{2203.246(\frac{1}{20} + \frac{1}{20})}}$$

$$= 2.47$$

Problem 3.

$$df = 20 + 20 - 2 = 38$$

So, we have

$$t_{38,0.05} = 1.6973$$

Problem 4.

$$0.005 < \text{p-value} < 0.01$$

p-value is smaller than our α so we reject the null hypothesis

Problem 5.

Using the formula

$$(\bar{x_1} - \bar{x_2}) \pm \left(t_{df,\alpha} \cdot \sqrt{\frac{1}{n_1} + \frac{1}{n_2}} \right)$$

$$(36.65) \pm (2.0423 \cdot 14.84)$$

$$= 36.65 \pm 30.3$$

So, we are 95% confident that

$$6.35 < \mu_1 - \mu_2 < 66.95$$

So, μ_1 exceeds μ_2 by
as little as 6.35
as much as 66.95

Note:-

Remember that working with C.I always means it is two sided

Note:-

Final exam is in Cole Hall Room 100

Question 6

At a particular university, a random sample ...

Population 1 : All males at the university

Population 2 : All females at the university

p_1 = % of males liking beer

p_2 = % of females liking beer

Problem 1.

$$H_0 : p_1 = p_2$$
$$H_A : p_1 \neq p_2$$

Note:-

there is an equivelent way to write this:

$$p_1 - p_2 = 0$$
$$p_1 - p_2 \neq 0$$

Problem 2.

$$Z = \frac{\hat{p_1} - \hat{p_2}}{\sqrt{p_c(1 - \hat{\ })\hat{(}\frac{1}{n_1} + \frac{1}{n_2}p)}}$$

$$\hat{p_1} = \frac{60}{150} = .40$$

$$\hat{p_2} = \frac{63}{180} = .35$$