Department of Mathematics and Statistics KFUPM
STAT 319-03, Term 151, Quiz#5, Time: 45 mins

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Q.No.1:- Based on random sample of size 11 from a normal population (with known σ), one has calculated the 99% confidence interval for the population mean and obtained the result $(62.5, 86.9)$. Using this result, find

a) a point estimate of the population mean μ.

b) a 90% confidence interval for μ.

Q.No.2:- Two methods, A and B, are used to train service agents who make repairs to telephone broadcast equipment. For a random sample of 15 repairs involving agents with Method A training, the amount of time required for the repair is recorded. For a random sample of 13 repairs involving agents with Method B training, the amount of time required for the repair is recorded. A summary of the recorded data is provided below:

Method	n	$\bar{X}$	s
A	15	1.84	1.84
B	13	2.55	1.51

a) Do we have sufficient evidence to infer that Method A is in fact faster? Use = 0.05. Report the p-value of the test. [Assume equal variances.]

b) Construct a 95% confidence interval for the average difference $(\mu_A - \mu_B)$ in the time it takes to make the repair.

Q.No.3:- A market research firm is interested in determining the proportion of households that are watching a particular sporting event. To accomplish this task, it plans on using a telephone poll of randomly chosen households.

a) How large a sample is needed if the company wants to be 90 percent certain that its estimate is correct to within ±0.02?

Suppose there is a sample whose size is the answer in part (a). If 23 percent of the sample were watching the sporting event

b) Using the p – value approach, do you think that the percentage of is the households that are watching a particular sporting event is less than 24 percent?

c) Construct and interpret a 98 percent confidence interval for the proportion of households that are watching a particular sporting event.

Confidence Interval	Test Statistic
$\bar{x} \pm Z_{\frac{\alpha}{2}} \frac{\sigma}{\sqrt{n}}$ and $n \geq \left(\frac{\sigma Z_{\frac{\alpha}{2}}}{e}\right)^2$	$Z = \frac{\bar{x}-\mu_0}{\sigma/\sqrt{n}}$
$\bar{x} \pm t_{\frac{\alpha}{2},n-1} \frac{s}{\sqrt{n}}$	$T = \frac{\bar{x}-\mu_0}{s/\sqrt{n}}$
$(\bar{x}_1 - \bar{x}_2) \pm Z_{\frac{\alpha}{2}} \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$	$Z = \frac{(\bar{x}_1-\bar{x}_2)-d_0}{\sqrt{\frac{\sigma_1^2}{n_1}+\frac{\sigma_2^2}{n_2}}}$
$(\bar{x}_1 - \bar{x}_2) \pm t_{\frac{\alpha}{2},n_1+n_1-2} s_p \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$	$T = \frac{(\bar{x}_1-\bar{x}_2)-d_0}{s_p\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}}$ where $s_p = \sqrt{\frac{(n_1-1)s_1^2+(n_2-1)s_2^2}{n_1+n_2-2}}$
$(\bar{x}_1 - \bar{x}_2) \pm t_{\frac{\alpha}{2},v} \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$	$T = \frac{(\bar{x}_1-\bar{x}_2)-d_0}{\sqrt{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}}}$ where $v = \frac{\left(\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}\right)^2}{\frac{(s_1^2/n_1)^2}{n_1-1}+\frac{(s_2^2/n_2)^2}{n_2-1}}$
$\bar{d} \pm t_{\frac{\alpha}{2},n-1} \frac{s_d}{\sqrt{n}}$	$T = \frac{\bar{d}-d_0}{s_d/\sqrt{n}}$
$\hat{p} \pm Z_{\frac{\alpha}{2}} \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$ and $n \geq \frac{Z_{\frac{\alpha}{2}}^2[\hat{p}(1-\hat{p})]}{e^2}$	$Z = \frac{\hat{p}-p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}}$
$(\hat{p}_1 - \hat{p}_2) \pm Z_{\frac{\alpha}{2}} \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$	$Z = \frac{\hat{p}_1-\hat{p}_2}{\sqrt{\hat{p}(1-\hat{p})\left[\frac{1}{n_1}+\frac{1}{n_2}\right]}}$ where $\hat{p} = \frac{x_1+x_2}{n_1+n_2} = \frac{n_1\hat{p}_1+n_2\hat{p}_2}{n_1+n_2}$