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STAT 211: Statistics for Business I

Semester 171, Quiz 3, Sunday December 17, 2017

Name: ID #:

Q.No.1: - (4+1 = 5 points) Suppose a survey of 550 executives is taken in an effort to determine what qualities are most important for an effective CEP to possess. The survey participates are offered several qualities as options, one of which is communicator. 132 of the survey respondents select communicator as the most important quality for an effective CEO.

(a) Use these data to construct a 99% confidence interval to estimate the population proportion of the executives who believe that 'communicator' is the most important quality of an effective CEO.

(b) Interpret the confidence interval you formed in (a).

Q.No.2: - (4+2+4 = 10 points) To evaluate the effectiveness of a new type of plant food developed for tomatoes, an experiment was conducted in which a random sample of 52 seedlings was obtained from a large greenhouse having thousands of seedlings. Each of the 52 plants received 75 grams of this new type of plant food each week for 10 weeks. The number of tomatoes produced by each plant was recorded yielding the following results:

Sample mean = 30.25 Sample standard deviation = 3.891

(a) Assuming that the seedlings chosen are taken from a population which is normally distributed, determine a 95% confidence interval estimate for the average number of tomatoes that would have been produced by all the seedlings in the greenhouse if they have received 75 grams of the new plant food, once a week for 10 weeks.

(b) The greenhouse is currently using a plant food called “super-Grow”. The average number of tomatoes produced by seedlings in the greenhouse with “Super-Grow” is 32. Based on the interval in (a), should the greenhouse switch to the new plant food? (Yes or No). Why?

(c) A researcher has started with a new sample and a given degree of confidence that the average number of tomatoes the seedlings produced on the new plant food is between “34.39136 and 36.38864”. Suppose the sample size and standard deviation are the same as given above. What alpha did the researcher use in the construction of this statement?

Q.No.3: - (10 points) The following data show the sugar content (as percent of weight) of several national brands of children's and adults cereals:

Children's Cereals	35.34	44.75	45.88	36.92	36.84
Adults' Cereals	25.10	24.45	16.21	14.91	33.80

Assuming equal population variances Calculate and interpret a 90% confidence interval for the difference between mean sugar content of children and adults' cereals.

Some Useful Formulas:

Sample mean: $\overline{X} = \frac{\sum X}{n}$; **Sample variance:** $s^2 = \frac{1}{n-1}\sum\left(X - \overline{X}\right)^2 = \frac{1}{n-1}\left[\sum X^2 - \frac{\left(\sum X\right)^2}{n}\right]$

Confidence Interval	Remarks
$\bar{x} \pm Z_{\frac{\alpha}{2}} \frac{\sigma}{\sqrt{n}}$	$n \geq \left(\frac{\sigma\, Z_{\frac{\alpha}{2}}}{e}\right)^2$
$\bar{x} \pm t_{\frac{\alpha}{2},v} \frac{s}{\sqrt{n}}$	$v = n - 1$
$(\bar{x}_1 - \bar{x}_2) \pm Z_{\frac{\alpha}{2}} \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$	
$(\bar{x}_1 - \bar{x}_2) \pm t_{\frac{\alpha}{2},v} s_p \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$	$v = n_1 + n_2 - 2$ and $s_p = \sqrt{\frac{(n_1-1)s_1^2 + (n_2-1)s_2^2}{n_1+n_2-2}}$
$(\bar{x}_1 - \bar{x}_2) \pm t_{\frac{\alpha}{2},v} \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$	$v = \frac{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)^2}{\frac{(s_1^2/n_1)^2}{n_1-1} + \frac{(s_2^2/n_2)^2}{n_2-1}}$
$\overline{D} \pm t_{\frac{\alpha}{2},v} \frac{s_D}{\sqrt{n}}$	$v = n - 1$
$p \pm Z_{\frac{\alpha}{2}} \sqrt{\frac{p(1-p)}{n}}$	$n \geq \left(\frac{Z_{\frac{\alpha}{2}}}{e}\right)^2 [p(1-p)]$
$(p_1 - p_2) \pm Z_{\frac{\alpha}{2}} \sqrt{\frac{p_1(1-p_1)}{n_1} + \frac{p_2(1-p_2)}{n_2}}$	