Worksheet 9 – Chapter 5 – Confidence Intervals

Name:______________________ Section: ____________________

Use DDXL for the following problems.

1. Bruce Leichtman is president of Leichtman Research Group, Inc. (LRG), which specializes in research and consulting on broadband, media, and entertainment industries. In a recent survey, the company determined the cost of extra high-definition (HD) gear needed to watch television in HD. The costs ranged from $5 a month for a set-top box to $200 for a new satellite receiver. The file titled **HDcosts** contains a sample of the costs of the extras whose purchase is required to watch television in HD.
   a. Produce a 95% confidence interval for the population mean cost of the extras whose purchase would be required to watch television in HD. Be sure to give appropriate conditions.

   Conditions:

   1. Random sample selected from the population – sample stated in problem have to assume random
   2. $\bar{x}$ normally distributed – sample size is 150 which is larger than 30 therefore $\bar{x}$ normally distributed

1-variable t-interval about Population mean…

Count	Mean	Std Dev	df
150	141.986	50.353	149

Confidence Interval

With 95% Confidence, 133.862 < μ < 150.11

   b. Interpret the interval found in part (a).
   We are 95% confident that the population mean cost of the extras whose purchase would be required to watch television in HD lies between $133.862 and $150.11.

   c. Calculate a margin of error for this experiment.

   The equation for a confidence interval for mean is: $\bar{x} \pm t_{\alpha/2}\left(\frac{s}{\sqrt{n}}\right)$

   The margin of error is: $t_{\alpha/2}\left(\frac{s}{\sqrt{n}}\right)$ (what is added and subtracted from the mean to get the upper and lower bound) therefore…

   Margin of error = (150.11 – 141.986) = (141.986 – 133.862) = (150.11-133.862)/2 = 8.124

d. If you were to view the sample used in part (a) to be a pilot sample, how many additional data values would be required to produce a margin of error of 5? Assume the population standard deviation is 50.353.

$$n = \frac{\left(z_{\alpha/2}\right)^2 \sigma^2}{(SE)^2} = \frac{(1.96)^2 (50.353)^2}{(5)^2} = 389.603$$

$n = 390$ total data values

390 – 150 = 240 additional data values needed

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2. Neverslip, Inc., produces belts for industrial use. As part of its continuous process-improvement program, Neverslip has decided to monitor on-time shipments of its products. Suppose a random sample of 140 shipments was taken from shipping records for the last quarter and the shipment was recorded as being either "on time" or "late." The results of the sample are contained in the file **Neverslip.**

a. Using the randomly sampled data, calculate a 90% confidence interval estimate for the true population proportion, p, for on-time shipments for Neverslip. Be sure to give appropriate conditions.

n	140
p-hat	0.886
Std Err	0.0269
z*	1.64

Confidence Interval

With 90% Confidence, 0.841 < p < 0.93

b. Interpret the interval found in part (a).

We are 90% confident that the true proportion for on-time shipments for Neverslip lies between 0.841 and 0.93.

c. What is the margin of error for the confidence interval calculated in part (a).

$$z_{\alpha/2}\left(\sqrt{\frac{\hat{p}\hat{q}}{n}}\right) = 1.645\left(\sqrt{\frac{0.886(1-0.886)}{140}}\right) = 0.0442$$

Also can be found as Question 1:

Margin of error = 0.93 – 0.886 = 0.886 – 0.841 = (0.93 – 0.841)/2 = 0.044

d. One of Neverslip's commitments to its customers is that 95% of all shipments will arrive on time. Based on the confidence interval calculated in part a, is Neverslip meeting its on-time commitment?

No, .95 does not fall in the interval found therefore it is most likely not the value of the population proportion of all on-time ships for Neverslip.