

QUANTITATIVE METHODS

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LAB 10

Confidence Intervals

Confidence Intervals – Large Samples

Example 1

Find a 95% confidence interval for the mean volume of Pepsi cans if a sample of 36 cans yielded a sample mean of 354 ml with standard deviation 2 ml.

Make the usual heading (cells A1:A3) and labeling sheet 1 “Example 1”.

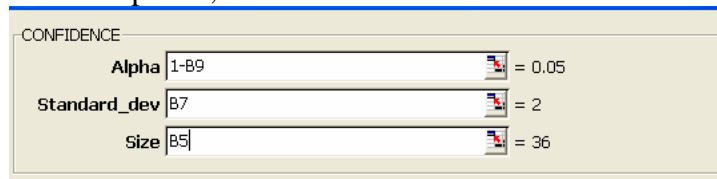
In cell A5 write “Assumptions: n =”, in cell A6 “Sample Mean =”, and in cell A7 “Sample St. Dev =”. Fill in the corresponding information in cells B5:B7 and the units in cells C5:C6.

In cell A9 write “c =” and in cell A10 write “E =”. Write 95% in cell B9. We saw in class that the

maximum error tolerance E is given by $E = z_c \frac{s}{\sqrt{n}}$. Excel has the command CONFIDENCE for

calculating E . Go to cell B10 and go in FUNCTIONS – STATISTICAL – CONFIDENCE.

Fill in the appropriate information, using cell references. Note: For ALPHA, we use $1 - c$, so the dialogue box, once completed, should look like this:



CONFIDENCE

Alpha 1-B9 = 0.05

Standard_dev B7 = 2

Size B5 = 36

Let us construct the confidence interval $\bar{x} - E < \mu < \bar{x} + E$.

In cell A13 write: “95% confidence interval:” in bold. In cell C13, evaluate $\bar{x} - E$ by making reference to the appropriate cells. Write “ml” in cell D13 and “to” in cell E13. Evaluate $\bar{x} + E$ in cell F13 and write “ml” in cell G13.

Your results should look like this (with appropriate adjustment of column widths):

4							
5	Assumptions: n =	36	≥	30			
6	Sample Mean =	354	ml				
7	Sample St. Dev =	2	ml				
8							
9	c =	95%					
10	E =	0.6533					
11							
12							
13	95% confidence interval:	353.35	ml	to	354.65	ml	

Example 2

A random sample of smokers were asked at what age they started smoking. The results are given on the worksheet “Data – Age Smokers Started” from my web site. Construct a 99% confidence interval for the mean age at which smokers started smoking.

Go to Sheet 2, relabeling it “Example 2” and make the usual heading. Write “Age (years)” in cell A5 and copy the sample in cells A6:A80, and repeat what you did in example 1. The only difference is that you have to get Excel to calculate the Sample size (with the function COUNT), the Sample Mean and the Sample St. Dev.

Repeat the same thing as in Example 1 on Sheet 2. You should obtain:

5	Age (years)							
6	17	Assumptions: n =	85	≥	30			
7	12	Sample Mean =	20.0	years				
8	20	Sample St. Dev =	7.31	years				
9	25							
10	25	c =	99%					
11	28	E =	2.041					
12	13							
13	17	99% confidence interval:	17.95	years	to	22.03	years	
14	24							
15	13							
16	15							
17	22							
18	39							
19	13							
20	14							
21	11							

Confidence Intervals – Small Samples

Example 3

Find a 95% confidence interval for the mean volume of Pepsi cans if a sample of 16 cans yielded a sample mean of 354 ml with standard deviation 2 ml.

Go to Sheet 3 and label it appropriately.

In cell A5 write “Assumptions: Population normally distributed”, in cell A6 “n =”, in cell A7 “Sample Mean =”, and in cell A8 “Sample St. Dev =”. Fill in the corresponding information in cells B6:B8 and the units in cells C7:C8.

In cell A10 write “c =”, in cell A11 write “ t_c =” and in cell A12 write “E =”. Write 95% in cell B10. To find t_c , we use the function TINV where for probability we have $1 - c$ and degrees of freedom $n - 1$. To calculate E we use the formula $E = t_c \frac{s}{\sqrt{n}}$.

In cell A15 write: “95% confidence interval:” in bold. In cell C15, evaluate $\bar{x} - E$ by making reference to the appropriate cells. Write “ml” in cell D15 and “to” in cell E15. Evaluate $\bar{x} + E$ in cell F15 and write “ml” in cell G15.

Your results should look like this:

5	Assumptions: Population is normally distributed				
6	n =	16			
7	Sample Mean =	354 ml			
8	Sample St. Dev =	2 ml			
9					
10	c =	95%			
11	t_c =	2.131			
12	E =	1.066			
13					
14					
15	95% confidence interval:	352.9 ml	to	355.1 ml	
16					
17					

