BE540 - Introduction to Biostatistics
Computer Illustration
Software: MINITAB

Topic 6 – Estimation

Confidence Interval Estimation for One Population
Normal Distribution and Binomial Distribution

Normal Distribution

1. Setting

The following data set is comprised of birthweights of 48 cases of SIDS. Under the assumption that this is a random sample from a normal probability distribution, you are asked to construct

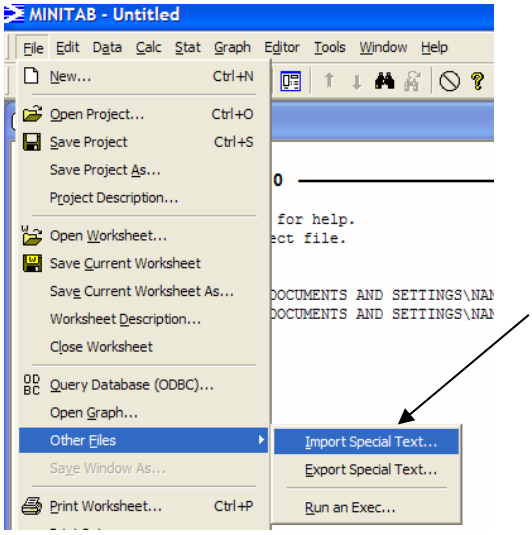
(A) a 95% confidence interval estimate of the population mean birthweight; and

(B) a 90% confidence interval estimate of the population variance.

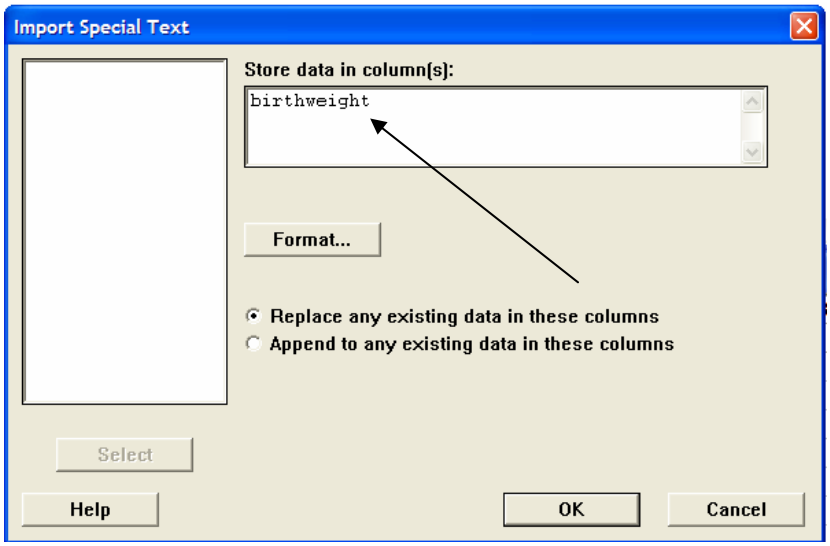
2466	3742	1616	2722	2608	2637
3941	3062	4423	2495	2353	1503
2807	3033	3572	3459	4394	2438
3188	2353	2750	3374	3232	2722
2098	2013	2807	1984	2013	2863
3175	3515	2807	2495	2551	2013
3515	3260	3005	3062	2977	3232
3317	2892	3374	3005	3118	2863

1. Read in the ASCII data 'birth.dat'.

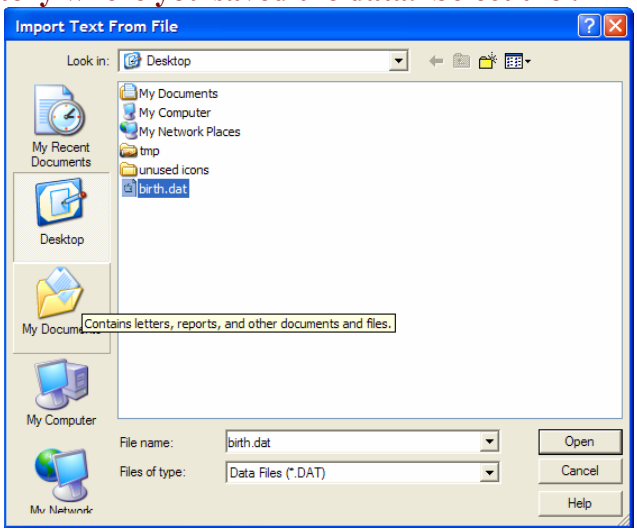
1.
File > Other Files > Import Special Text …



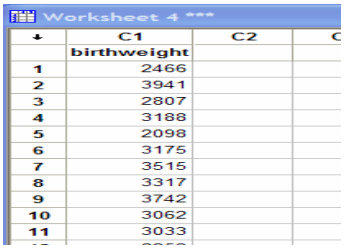
2.
Input variable names: birthweight in the "Import Special Text" frame. Click OK.



3. **Browse to locate the directory where you saved the data. Select the .DAT file "BIRTH". Click OPEN.**



The data set (48 observations) is now imported to MINITAB. You should see the following worksheet:

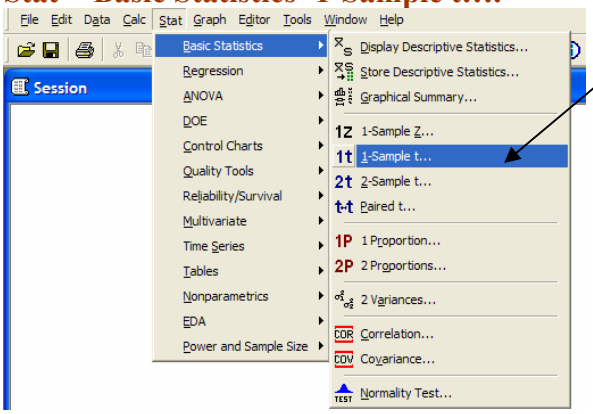


Worksheet 4 ***

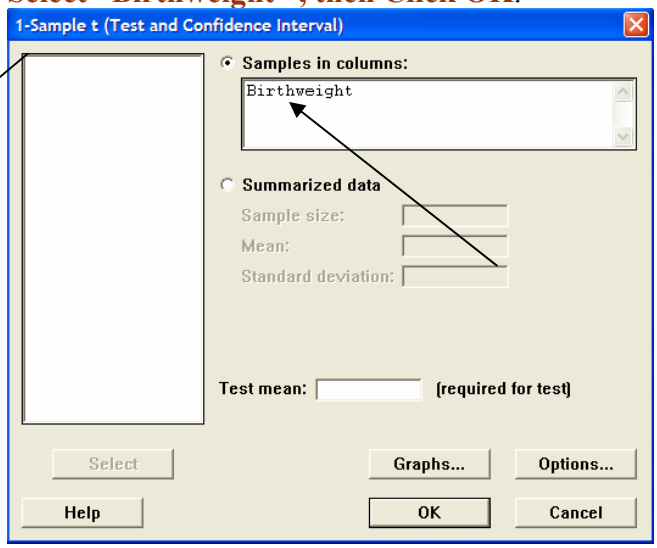
	C1	C2	C
	birthweight		
1	2466		
2	3941		
3	2807		
4	3188		
5	2098		
6	3175		
7	3515		
8	3317		
9	3742		
10	3062		
11	3033		

A. Confidence Interval for the Population Mean μ

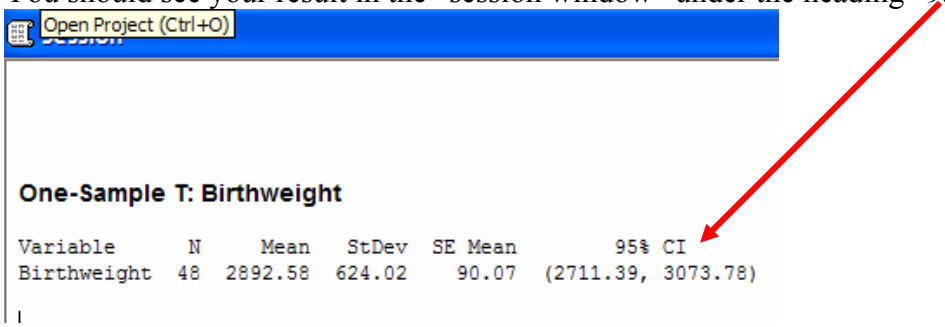
1.
Stat > Basic Statistics>1-Sample t….



2.
Select "Birthweight" , then Click OK.



You should see your result in the "session window" under the heading "95% CI".



B. Confidence Interval for the Population Variance σ^2

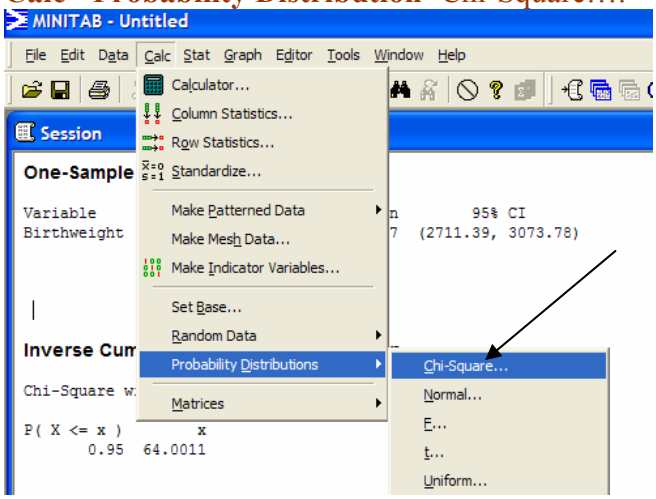
Minitab does not provide this confidence interval for you directly. Here is how to obtain it. Recall the formula.

Lower limit of the (1– α) CI: $\dfrac{(n-1)s^2}{\chi^2_{n-1,1-\alpha/2}}$

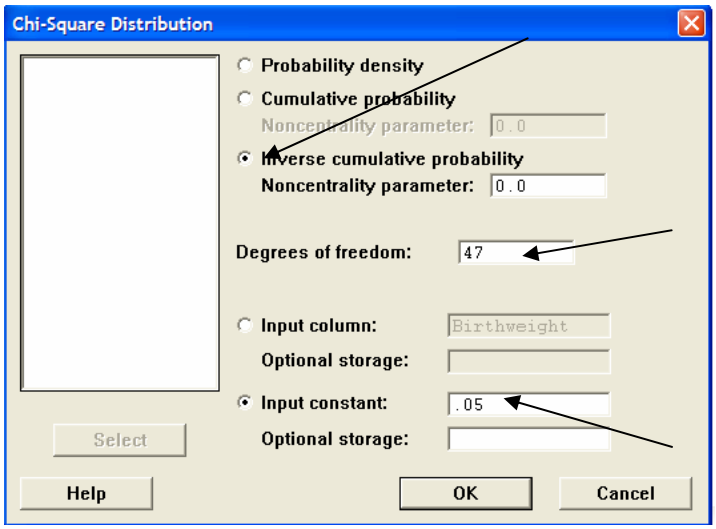
Upper limit of the (1– α) CI: $\dfrac{(n-1)s^2}{\chi^2_{n-1,\alpha/2}}$

Preliminary – From the descriptives used to obtain the confidence interval for μ, we already know s=624.02 and n=48. Thus, we have the point estimate and the degrees of freedom. We use Minitab to find the Chi square percentile values that we need in order to complete the confidence interval calculation.

1.
Calc> Probability Distribution>Chi-Square….

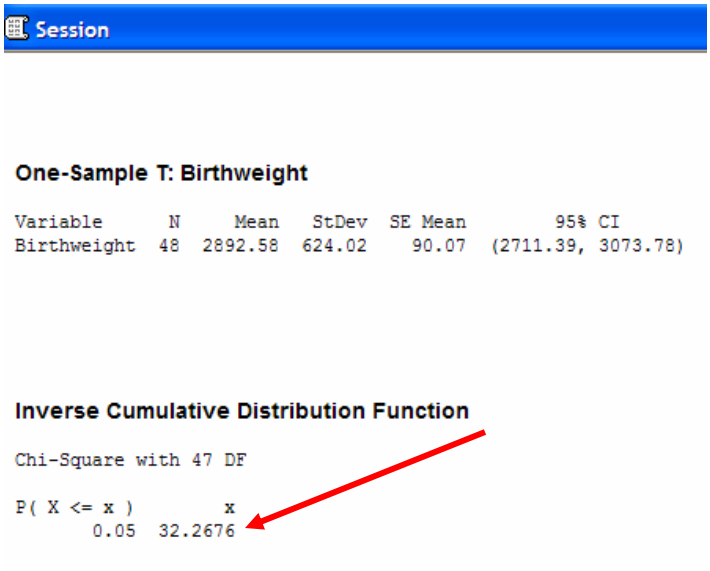


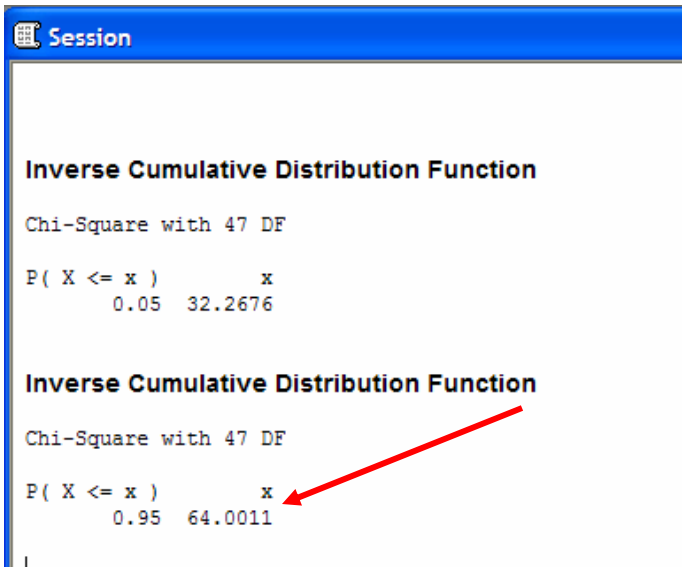
2.
Select "inverse cumulative probability. Enter 47 in "Degree of freedom" enter 0.05 in "input constant" click OK.



3.
The "session" window will show the 5th percentile

4.
Similarly, we can get the 95th percentile.





Substitution yields the 90% confidence interval for σ^2 = (285961.4, 567189.5). To see this, note

$$\text{lower limit} = \frac{(n-1)S^2}{\chi^2_{.95;DF=47}} = \frac{(47)(642.02)^2}{64.0011} = 285,961.4$$

$$\text{upper limit} = \frac{(n-1)S^2}{\chi^2_{.05;DF=47}} = \frac{(47)(642.02)^2}{32.2676} = 567,189.5$$

Binomial Distribution

1. Setting

Large trees growing near power lines can cause power failures during storms when their branches fall on the lines. Power companies spend a great deal of time and money trimming and removing trees to prevent this problem. Researchers are developing hormone and chemical treatments that will stunt or slow tree growth. If the treatment is too severe, however, the tree will die. In one series of laboratory experiments on 216 sycamore trees, 41 trees died.

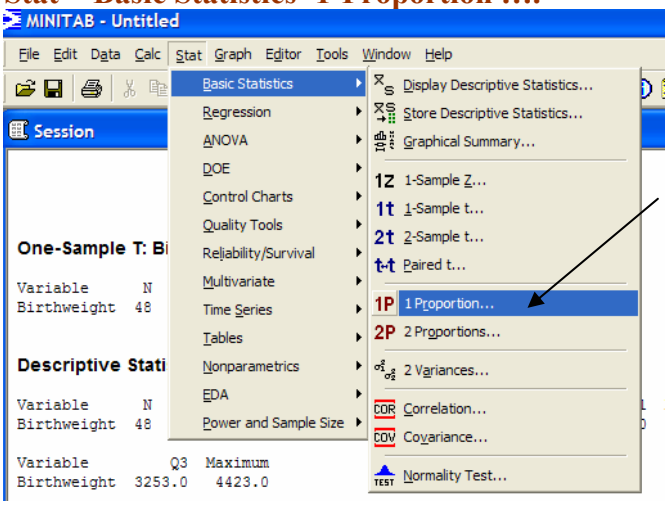
Give a 99% confidence interval for the proportion of sycamore trees that would be expected to die from this particular treatment.

1. Read in data

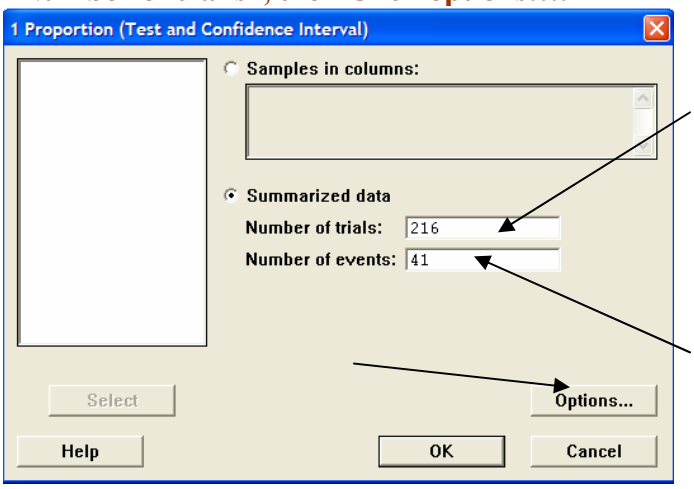
There is no need to read in the data in this setting.

2. Confidence Interval for the binomial parameter π

1.
Stat > Basic Statistics>1-Proportion ….

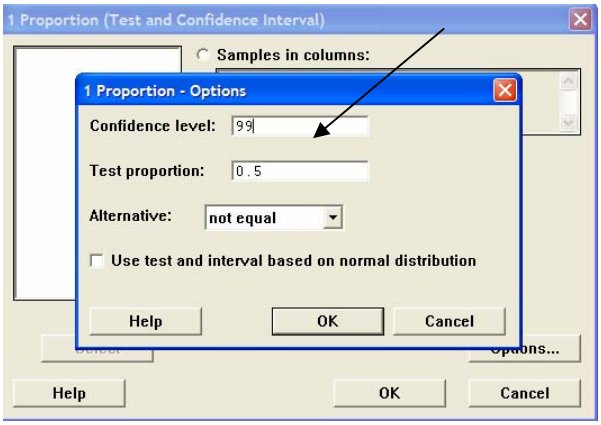


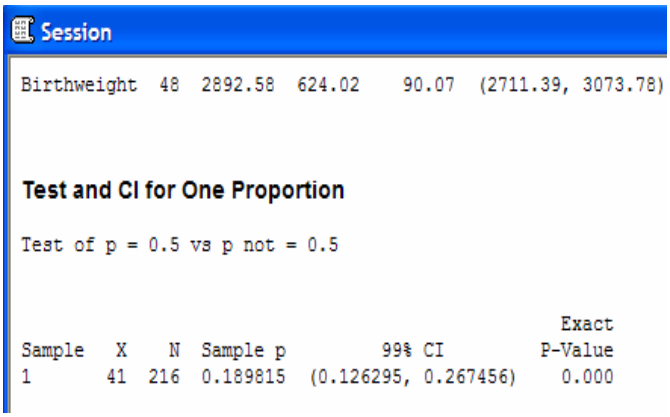
2.
Enter 41 in "Number of event" and 216 in "Number of trails", then Click options….



3.
Enter 99 in "Confidence level" click OK. Last window will appear. Click OK.

4. The result will appear in the "session" window.


1 Proportion (Test and Confidence Interval)
Samples in columns:
1 Proportion - Options
Confidence level: 99
Test proportion: 0.5
Alternative: not equal
Use test and interval based on normal distribution
Help
OK
Cancel
Options...
Help
OK
Cancel


Session
Birthweight 48 2892.58 624.02 90.07 (2711.39, 3073.78)
Test and CI for One Proportion
Test of p = 0.5 vs p not = 0.5
Sample X N Sample p 99% CI Exact P-Value
1 41 216 0.189815 (0.126295, 0.267456) 0.000