

## Assignment 3 Example

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**Problem 1:** Fill in the information below based on your data which were generated using your ID number as the seed for the random number generator.

**n = 30**

**theta = 0.8336096**

**The first 10 approximate 95% confidence intervals are:**

**[,1]    [,2]**

**[1,] 0.6999722 0.9666944**

**[2,] 0.6568618 0.9431382**

**[3,] 0.4979767 0.8353566**

**[4,] 0.7926464 1.0073536**

**[5,] 0.6568618 0.9431382**

**[6,] 0.7450226 0.9883107**

**[7,] 0.7926464 1.0073536**

**[8,] 0.6999722 0.9666944**

**[9,] 0.7450226 0.9883107**

**[10,] 0.6153150 0.9180183**

**Do all 10 intervals contain only values between 0 and 1? NO**

Depending on the value of  $\theta$  is it possible that some intervals will not contain only values between 0 and 1? Why or why not?

Answer is .....

The proportion of approximate 95% confidence intervals which contain the true value of  $\theta = 0.8914$

How close is this proportion to 0.95? What are the reasons for this?

Answer is ....

The first ten 15% likelihood intervals (approximate 95% likelihood intervals) are:

	[,1]	[,2]
[1,]	0.6764578	0.9363108
[2,]	0.6367535	0.9146738
[3,]	0.4903719	0.8159170
[4,]	0.7618115	0.9738560
[5,]	0.6367535	0.9146738
[6,]	0.7179737	0.9562090
[7,]	0.7618115	0.9738560
[8,]	0.6764578	0.9363108
[9,]	0.7179737	0.9562090
[10,]	0.5984359	0.8916837

**Do all 10 likelihood intervals contain only values between 0 and 1? YES**

**Depending on the value of  $\theta$  is it possible that some likelihood intervals will not contain only values between 0 and 1? Why or why not?**

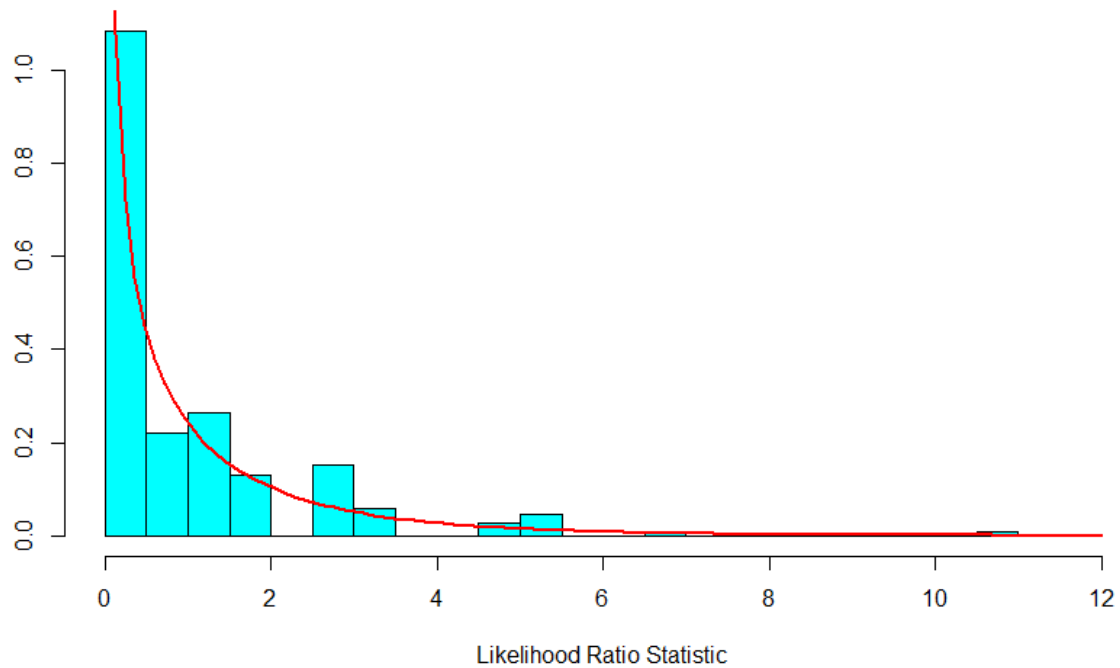
**Answer is ....**

**The proportion of 15% likelihood intervals which contain the true value of  $\theta$   
= 0.9544**

**How close is this proportion to 0.95? What are the reasons for this?**

**Answer is ....**

**Sampling Distribution of Likelihood Ratio Statistic**



**For Binomial data the likelihood ratio statistic is a discrete or continuous random variable?**

**How well does the Chi-squared(1) probability density function agree with the sampling distribution of the likelihood ratio statistic as approximated by the relative frequency histogram?**

**n = 100**

**theta = 0.8336096**

**The first 10 approximate 95% confidence intervals are:**

	<b>[,1]</b>	<b>[,2]</b>
<b>[1,]</b>	<b>0.7446993</b>	<b>0.8953007</b>
<b>[2,]</b>	<b>0.8163075</b>	<b>0.9436925</b>
<b>[3,]</b>	<b>0.7919905</b>	<b>0.9280095</b>
<b>[4,]</b>	<b>0.7563760</b>	<b>0.9036240</b>
<b>[5,]</b>	<b>0.7563760</b>	<b>0.9036240</b>
<b>[6,]</b>	<b>0.6988077</b>	<b>0.8611923</b>
<b>[7,]</b>	<b>0.7331090</b>	<b>0.8868910</b>
<b>[8,]</b>	<b>0.8163075</b>	<b>0.9436925</b>
<b>[9,]</b>	<b>0.7446993</b>	<b>0.8953007</b>
<b>[10,]</b>	<b>0.7331090</b>	<b>0.8868910</b>

**The proportion of approximate 95% confidence intervals which contain the true value of theta = 0.9436**

**How close is this proportion to 0.95? What are the reasons for this?**

**Answer is ....**

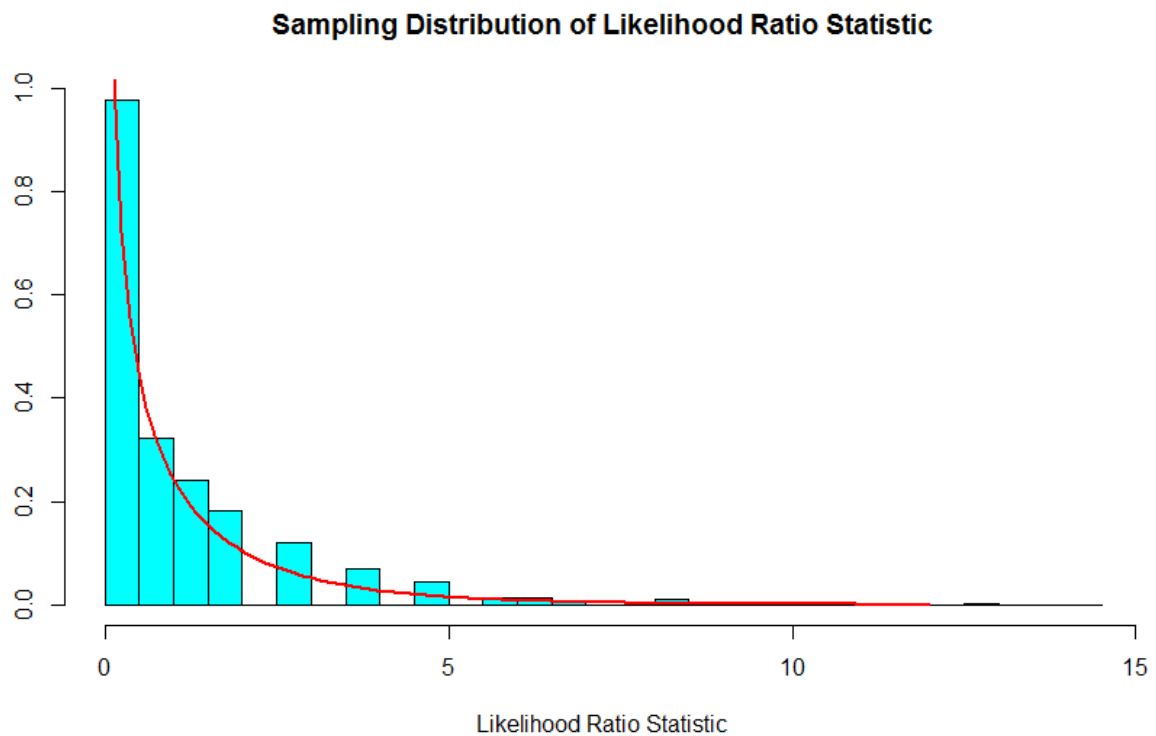
The first ten 15% likelihood intervals (approximate 95% likelihood intervals) to three decimal places are:

	[,1]	[,2]
[1,]	0.7376807	0.8863831
[2,]	0.8074470	0.9335610
[3,]	0.7837396	0.9182707
[4,]	0.7490357	0.8944542
[5,]	0.7490357	0.8944542
[6,]	0.6929403	0.8530908
[7,]	0.7263601	0.8781662
[8,]	0.8074470	0.9335610
[9,]	0.7376807	0.8863831
[10,]	0.7263601	0.8781662

The proportion of 15% likelihood intervals which contain the true value of theta  
= 0.9538

How close is this proportion to 0.95? What are the reasons for this?

Answer is ....



How well does the Chi-squared(1) probability density function agree with the sampling distribution of the likelihood ratio statistic as approximated by the relative frequency histogram?

Answer is ....

Compare the graphs for  $n=30$  and  $n=100$ .

Answer is ....

**Problem 2:** Fill in the information below based on your data which were generated using your ID number as the seed for the random number generator.

**n = 20**

**theta = 8**

**The first 10 approximate 95% confidence intervals are:**

	[,1]	[,2]
[1,]	5.566600	14.252862
[2,]	5.280761	13.520992
[3,]	2.667126	6.828977
[4,]	3.874224	9.919661
[5,]	5.992533	15.343433
[6,]	3.120172	7.988966
[7,]	4.192294	10.734054
[8,]	4.614491	11.815057
[9,]	4.196023	10.743603
[10,]	4.966030	12.715147

**Do all 10 intervals contain only values greater than 0? YES**

**Depending on the value of theta is it possible that some intervals will not contain only values greater than 0? Why or why not?**

**Answer is ....**

**The proportion of approximate 95% confidence intervals which contain the true value of theta = 0.9246**



How close is this proportion to 0.95? What are the reasons for this?

Answer is ....

The first ten 15% likelihood intervals (approximate 95% likelihood intervals) are:

	[,1]	[,2]
[1,]	6.602221	15.849327
[2,]	6.263204	15.035480
[3,]	3.163324	7.593868
[4,]	4.594993	11.030757
[5,]	7.107457	17.062053
[6,]	3.700655	8.883794
[7,]	4.972236	11.936374
[8,]	5.472980	13.138463
[9,]	4.976660	11.946993
[10,]	5.889920	14.139372

Do all your 10 intervals only contain values greater than 0? YES

Depending on the value of theta is it possible that some likelihood intervals will not contain only values greater than 0? Why or why not?

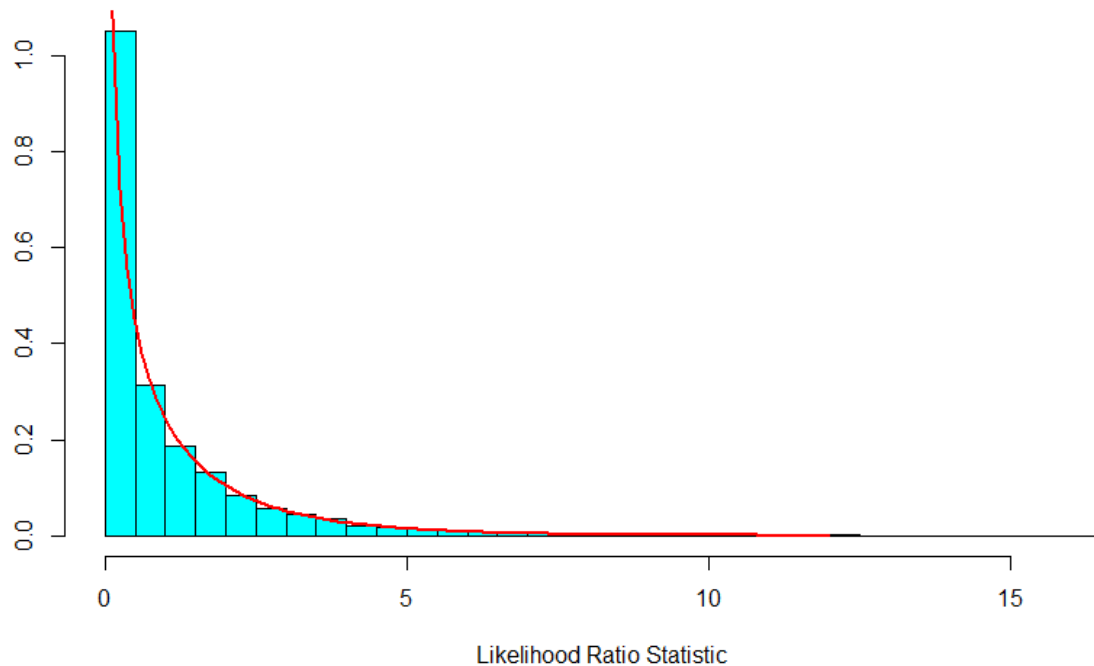
Answer is ....

The proportion of 15% likelihood intervals which contain the true value of theta  
= 0.9942

How close is this proportion to 0.95? What are the reasons for this?

Answer is ....

### Sampling Distribution of Likelihood Ratio Statistic



**For Exponential data the likelihood ratio statistic is a discrete or continuous random variable?**

**Answer is ....**

**How well does the Chi-squared(1) probability density function agree with the sampling distribution of the likelihood ratio statistic as approximate by the relative frequency histogram?**

**Answer is ....**

**Problem 3:** Fill in the information below based on your data which were generated using your ID number as the seed for the random number generator.

**$\mu = 8$**

**$\sigma = 5$**

**The first ten 95% confidence intervals for  $\mu$  are:**

**[,1]    [,2]**

**[1,] 6.244030 10.164982**

**[2,] 6.697515 9.783502**

**[3,] 6.212403 9.020471**

**[4,] 4.624907 9.944456**

**[5,] 7.704320 11.294890**

**[6,] 6.578151 11.437126**

**[7,] 5.346232 9.403112**

**[8,] 5.838531 9.540677**

**[9,] 5.704073 9.729931**

**[10,] 5.110502 9.524473**

**The proportion of 95% confidence intervals which contain the true value of  $\mu$   
= 0.9454**

**How close is this proportion to 0.95? What are the reasons for this?**

**Answer is ....**

The first ten 95% confidence intervals for sigma are:

[,1] [,2]

[1,] 3.708505 6.607207

[2,] 2.918779 5.200203

[3,] 2.655918 4.731881

[4,] 5.031321 8.963985

[5,] 3.396023 6.050478

[6,] 4.595703 8.187871

[7,] 3.837067 6.836258

[8,] 3.501554 6.238495

[9,] 3.807726 6.783983

[10,] 4.174810 7.437994

The proportion of 95% confidence intervals which contain the true value of sigma = 0.9492

How close is this proportion to 0.95? What are the reasons for this?

Answer is ....