IMPORTANT NOTE

The following is an open-book, open-note assignment. Collaboration is not allowed. Please show all your work, as no credit will be given for unsupported answers. Feel free to e-mail me with questions at nega_ginge@yahoo.com. You can also try calling me on my cell phone (504) 450-7184, but your call may not go through due to Katrina-related problems with phones in the (504) area code. You can either e-mail your solutions to me at the e-mail address above or send them by snail mail to

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If you do use snail mail, please make sure that your solution to Assignment 1 is post-marked by October 5, 2005.

Good luck!

Assignment 1 (Due Wednesday, October 5, 2005)

(1) (a) Work Exercise 1.8, p. 14 in our textbook using the "usual" approximate methods. (See attached.)

(b) Find the exact p-value and an exact 95% CI (π).

(2) Suppose that in a small pilot study with only 10 subjects, 4 women with dysmenorrhea reported greater relief with the standard and 6 preferred the new analgesic.

(a) Find the exact p-value.
(b) Find an exact 95% CI(π).
(c) Compare the CI's you obtained in 1(b) and 2(b) above. Comment.

(3) Work Exercise 1.9, p. 14 in our textbook. (See attached.) Follow the hint provided by Agresti, using the "usual" method for finding an approximate 95% CI (π).

Note: In many cases, sample size calculations are based on approximate methods for finding CI's or performing hypothesis tests. Since the selected sample size is usually only a "best guess" anyway, the N calculated using the approximate method should be adequate if you ultimately apply the exact method instead. Some sophisticated and expensive packages (e.g., StatXact) provide methods for finding sample sizes for both approximate and exact methods.

the outcome y equals $(5/6)^{y-1}(1/6)$, for $y = 1, 2, 3, \ldots$. (This is called the *geometric distribution.*)

1.8. A sample of women suffering from dysmenorrhea have been taking an analgesic designed to diminish the effects. A new analgesic is claimed to provide greater relief. After trying the new analgesic, 40 women reported greater relief with the standard analgesic, and 60 reported greater relief with the new one.

a. Test the hypothesis that the probability of greater relief with the standard analgesic is the same as the probability of greater relief with the new analgesic. Report and interpret the P-value for the two-sided alternative.

b. Construct and interpret a 95% confidence interval for the probability of greater relief with the new analgesic.

1.9. Refer to the previous problem. The researchers wanted a sufficiently large sample to be able to estimate the probability of preferring the new analgesic to within .08, with confidence .95. If the true probability is .75, how large a sample is needed to achieve this accuracy? (*Hint:* How large should N be so that a 95% confidence interval has plus and minus term equal to .08?)

1.10. *Newsweek* magazine (March 27, 1989) reported results of a poll about religious beliefs, conducted by the Gallup Organization. Of 750 American adults, 24% believed in reincarnation. Treating this as a random sample, construct and interpret a 95% confidence interval for the true proportion of American adults believing in reincarnation.

1.11. A criminologist wants to estimate the proportion of U.S. citizens who live in a home in which firearms are available. The 1991 General Social Survey asked respondents, "Do you have in your home any guns or revolvers?" Of the respondents, 393 answered "yes" and 583 answered "no." Construct a 90% confidence interval for the true proportion of "yes." Interpret.

1.12. If Y is a variate and c is a positive constant, then the standard deviation of the distribution of cY equals $c\sigma(Y)$. Suppose Y is a binomial variate, and let $p = Y/N$. Show that $\sigma(p) = \sqrt{\pi(1-\pi)/N}$. Explain why it is easier to get a close estimate of π when it is near 0 or 1 than when it is near $\frac{1}{2}$.

1.13. A variate has a Poisson distribution, with unknown parameter μ. The sole observation equals 0.

a. Find and plot the likelihood function over the space of potential values for μ.

b. What is the ML estimate of μ? (Recall: The ML estimate of μ equals the sample mean.)

1.14. Using calculus, it is easier to derive the maximum of the log of the likelihood function, $L = \log l$, than the likelihood function l itself. Both functions have maximum at the same value, so it is sufficient to do either.

a. Calculate the log likelihood $L(\pi)$ for the binomial distribution (1.2.2).

b. One can usually determine the point at which the maximum of a log likelihood L occurs by solving the *likelihood equation.* This is the equation resulting from differentiating L with respect to the parameter, and setting