STAT 301 HW3 due Wed Sept 30

You may work with one partner on this assignment, submitting one report with both names, provided that both students contribute substantially to the work. Word-processed reports are preferred to hand-written ones.

Baseball Big Bang?

A reader wrote in to the "Ask Marilyn" column in *Parade* magazine to say that his grandfather told him that in 3/4 of all baseball games, the winning team scores more runs in one inning than the losing team scores in the entire game. (This phenomenon is known as a "big bang.") Marilyn responded that this proportion seemed to be too high to be believable. Let π denote the proportion of all Major League Baseball games in which a "big bang" occurs.

a) Restate the grandfather's assertion as the null hypothesis, in symbols and in words.

The grandfather asserts that 75% of all MLB games have a big bang. (H_0: $\pi = .75$)

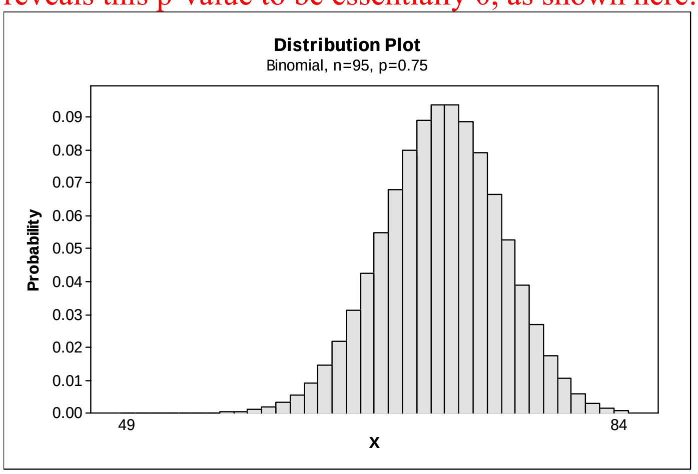
b) Report Marilyn's response as an alternative hypothesis, in symbols and in words.

Marilyn responds that the proportion of games with a big bang is less than .75. (H_a: $\pi < .75$)

To investigate this claim, I randomly selected one week of the 2006 Major League Baseball season, which turned out to be July 31 – August 6, 2006. Then I examined the 95 games played that week to determine which had a big bang and which did not. Of these 95 games in the sample, 47 contained a big bang.

c) Calculate (exactly, using the binomial distribution) the relevant *p*-value. Also write a sentence or two interpreting this p-value.

The p-value is $\Pr(X \leq 47)$, where X has a binomial distribution with $n = 95$ and $\pi = .75$. Minitab reveals this p-value to be essentially 0, as shown here:



This p-value says that if the grandfather's claim were true (that 75% of all games have a big bang), then it would be almost impossible for a random sample of 95 games to have 47 or fewer with a big bang.

d) Based on this p-value, would you say that the sample data provide strong evidence to support Marilyn's contention that the proportion cited by the grandfather is too high to be the actual value? Explain. Also indicate what test decision you would reach at the $\alpha = .01$ level.

Yes, the very small p-value indicates that the data provide overwhelming evidence that the proportion of MLB games with a big bang is less than .75. Because the p-value is less than 01, we reject H_0 and therefore reject the grandfather's claim.

e) Determine a 95% confidence interval (using Minitab) for the population parameter. Also write a sentence interpreting what this interval says.

Minitab reports this 95% confidence interval to be (.391, .599), as shown in the following output:

Test and CI for One Proportion

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Sample    X    N  Sample p        95% CI
1        47   95  0.494737  (0.390532, 0.599279)
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We are 95% confident that between 39.1% and 59.9% of all MLB games have a big bang.

f) Now determine a 99% confidence interval. Comment on how it differs from the 95% interval.

Minitab reports this 99% confidence interval to be (.360, .630). This interval is wider than the 95% confidence interval.

g) Are these confidence intervals consistent with your test decision concerning the grandfather's claim? Explain briefly.

Yes. We overwhelmingly rejected the grandfather's claim that the proportion (of MLB games with a big bang) is .75. Notice that .75 does not appear in either confidence interval. In fact, neither CI comes close to the value .75.