One Proportion Z-Test Practice

Example #1: ***Benford's law and fraud***

When the accounting firm AJL and Associates audits a company's financial records for fraud, they often use a test based on Benford's law. Benford's law states that the distribution of first digits in many real-life sources of data is not uniform. In fact, when there is no fraud, about 30.1% of the numbers in financial records begin with the digit 1. If the proportion of first digits that are 1 is significantly different from 0.301 in a random sample of records, AJL and Associates does a much more thorough investigation of the company. Suppose that a random sample of 300 expenses from a company's financial records results in only 68 expenses that begin with the digit 1. Should AJL and Associates do a more thorough investigation of this company? Justify your answer.

Example #2a: ***Benford's law and fraud***

(a) Find and interpret a confidence interval for the proportion of all expenses that begin with the digit 1 for the company in the previous Alternate Example.

(b) Does your interval from part (a) lead to the same conclusion as the significance test? Explain.

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Example #3: ***Spinning Heads?***

When a fair coin is flipped, we all know that the probability the coin lands on "heads" is 0.50. However, what if a coin is spun? According to the article "Euro coin accused of unfair flipping" in the *New Scientist* (January 4, 2002), two Polish math professors and their students spun a Belgian euro coin 250 times. It landed "heads" 140 times. One of the professors concluded that the coin was minted asymmetrically. A representative from the Belgian mint said the result was just chance.

Problem:

(a) State the hypotheses we are interested in testing.

(b) Assuming the conditions for inference are met, what values of $\hat{p}$ would lead to a rejection of H_0 at the 5% significance level? Explain how you obtained your answer.

(c) Based on your answer to part (b) and the results of the study, what conclusion would you draw?

(d) Suppose that the actual probability of heads when spinning a Belgian euro coin is p = 0.55. What is the probability that a Type II error will be committed when using the results of 250 spins? That is, what is the probability that $\hat{p}$ does not fall in the rejection region from part (c) when p really equals 0.55?

(e) Based on your answer to part (d), what is the probability that you find convincing evidence that $p \neq 0.5$ when spinning a coin 250 times, assuming that p really equals 0.55?