Problem set 8

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Instructions: Here is our eighth set of practice problems.

Practice problems

(1) Suppose that you are working for a team that is developing a new vaccine. The vaccine is in the advanced stages of a clinical trial, in which you are monitoring the effectiveness of the vaccine in a sample of people.

Your elderly cousin, who is not participating in the trial, is excited about the possibility of getting vaccinated, so that she can go to the grocery store more often. She asks you "So, how effective is the vaccine?"

Is she asking about the sample, or about the population?

answer: The population

(2) Suppose that a box contains N tickets, of which a proportion of 0.2 are printed with 1's. If you independently sample 60 tickets out of the box, what is the standard error of your resulting estimate of the proportion of tickets in the box that are 1's? Does this depend on the total number of tickets in the box?

answer: ≈ 0.0516*; no!*

(3) A team of researchers independently sample 30 subjects from a town, and find that 8 of them are very risk averse. Unbeknownst to the researchers, the town consists of 622 people, of whom 147 are extremely risk averse. What is the proportion of people in the town that are very risk averse?

answer: $^{147}/_{622}$

(4) A team of researchers independently sample 30 subjects from a town, and find that 8 of them are very risk averse. Unbeknownst to the researchers, the town consists of 622 people, of whom 147 are extremely risk averse. What do the researchers estimate to be the proportion of people in the town that are very risk averse?

answer: $^{8}/_{30}$

(5) A team of researchers independently sample 30 subjects from a town, and find that 8 of them are very risk averse. Unbeknownst to the researchers, the town consists of 622 people, of whom 147 are extremely risk averse. What is the standard error of the sample proportion of people in the town that are very risk averse?

answer: $\sqrt{\frac{(147/622)(1-147/622)}{30}}$

(6) A team of researchers independently sample 30 subjects from a town, and find that 8 of them are very risk averse. Unbeknownst to the researchers, the town consists of 622 people, of whom 147 are extremely risk averse. What do the researchers estimate to be the standard error of the sample proportion of people in the town that are very risk averse?

answer: $\sqrt{\frac{(8/30)(1-8/30)}{30}}$

(7) You have a jar containing some chocolate chip and some oatmeal cookies. You will randomly draw out one cookie. If this is chocolate chip, you will estimate the proportion of chocolate chip cookies in the jar to be 1. If not, you will estimate this proportion to be 0. Is your estimate an unbiased estimator for the unknown proportion of cookies in the jar?

answer: Yes.

(8) Is your estimate in the previous problem a consistent estimator for the unknown proportion of cookies in the jar?

answer: No.

(9) You will independently survey 80 financial advisors. What (approximately) is the probability that the sample proportion of advisors that recomment buying AAPL is within 2.5 standard errors of the true proportion?

answer: ≈ 0.9876

(10) You will independently survey 80 financial advisors. What (approximately) is the probability that the true proportion of advisors that recomment buying AAPL is within 2.5 standard errors of the sample proportion?

answer: ≈ 0.9876

(11) Suppose that you independently sample 40 cookies out of a jar, and find that 13 of them are chocolate chip. What are the endpoints of a 95% confidence interval for the proportion of chocolate chip cookies in the jar? A 90% interval?

answer: $[0.1799, 0.4701]$*;* $[0.2032, 0.4468]$

(12) An accounting firm independently samples 40 of 232 clients. They find that a 90% confidence interval for the proportion that are likely to be audited is [0.11, 0.23]. True or false: the probability that the true proportion is between 0.11 and 0.23 is 0.9.

answer: False