Stat 134: Section 4

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Note: You may leave your answers in terms of Φ or Φ^{-1} as necessary, where $\Phi(x) = \int_{-\infty}^{x} \frac{1}{\sqrt{2\pi}} e^{-z^2/2} dz$, and Φ^{-1} is the inverse of Φ.

Problem 1

Let H be the number of heads in 400 tosses of a fair coin. Find normal approximations to

a. $P(190 \leq H \leq 210)$

b. $P(210 \leq H \leq 220)$

c. $P(H = 200)$

d. $P(H = 210)$

Ex 2.2.1 in Pitman's Probability

Problem 2

A fair coin is tossed repeatedly. Consider the following two possible outcomes: (i) 55 or more heads in the first 100 tosses, or (ii) 220 or more heads in the first 400 tosses.

a. Without calculation, say which of these outcomes is more likely. Why?

b. Confirm your answer to (a) by calculation.

Ex 2.2.3 in Pitman's Probability

Problem 3: Confidence Intervals

A pollster wishes to know the percentage p of people in a population who intend to vote for a particular candidate. How large must a random sample with replacement be in order to be at least 95% sure that the sample percentage is within one percentage point of p?
Ex 2.2.13 in Pitman's Probability

How does the term $\sqrt{p(1-p)}$ vary with p? When is it maximized?

Problem 4

An airline knows that over the long run, 90% of passengers who reserve seats show up for their flight. On a particular flight with 300 seats, the airline accepts 324 reservations.

a. Assuming that passengers show up independently of each other, what is the chance that the flight will be overbooked?

b. Suppose that people tend to travel in groups. Would that increase or decrease the probability of overbooking? Explain your answer.

c. Redo the calculations in part (a), assuming now that passengers always travel in pairs. Is this consistent with your answer to part (b)?

Ex 2.2.9 in Pitman's Probability

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