Stat 134: Section 10

Adam Lucas

October 2nd, 2019

Conceptual Review

Please discuss these short questions with those around you in section. These problems are intended to highlight concepts from lecture that will be relevant for today's problems.

a. What is the formula for the variance of a sum of indicators?

b. Give the formula for the variance of a sample sum and for the variance of a sample mean.

Problem 1

Suppose the IQ scores of a million individuals have a mean of 100 and an SD of 10.

a. Without any further assumptions, find a bound for the proportion of individuals with an IQ over 130.

b. Now find a smaller upper bound, assuming the distribution is symmetric about 100.

c. Now suppose the scores follow a Normal curve. Find the proportion of individuals with an IQ over 130.

Ex 3.3.13 in Pitman's Probability

Problem 2

Take a random permutation of the integers 1, 2, . . . , n. Let us say that the integers i and j with $i \neq j$ are switched if the integer i occupies the jth position in the random permutation and the integer j the ith position. Let X be the number of switches. Find E(X).

Problem 3

There are c chocolate chip cookies, o oatmeal raisin cookies, and p peanut butter cookies in a jar. You draw cookies from the jar without replacement until you get 3 chocolate chip cookies. Let X be the number of cookies until you get your 3rd chocolate chip cookie. Find Var(X).