Stat 134: Indicator Review

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Conceptual Review

a. How do we choose indicators?

b. Suppose X is the sum of n identical indicators I_j's. What is Var(X)?

Problem 1

In a bin, there are r red balls and b blue balls. Suppose I take the balls out, one by one (i.e. without replacement), until there are no more red balls in the bin. Let X denote the number of balls taken out. Find:

a. $\mathbb{E}(X)$;

b. Var(X).

Problem 2

Suppose you order f cups of fruit tea and m cups of milk tea, along with f servings of lychee jelly and m servings of boba to add to the drinks. Ideally, you would like fruit tea with lychee jelly and milk tea with boba, but the boba shop adds one purchased topping per drink randomly. Let X be the number of ideal drinks you get in the end. Find:

a. $\mathbb{E}(X)$;

b. $\text{Var}(X)$.

Problem 3

A p-coin is a coin that lands heads with probability p. Flip a p-coin n times. A "run" is a maximal sequence of consecutive flips that are all the same. For example, the sequence $HTHHHTTH$ with $n = 8$ has five runs, namely H, T, HHH, TT, H. Let X denote the number of runs in these n flips. Find $\mathbb{E}(X)$.