

Stat 134: Section 9

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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 $\text{Var}(X)$?
- b. What is the Central Limit Theorem?

Problem 1

Suppose that in a particular application requiring a single battery, the mean lifetime of a battery is 4 weeks, with an SD of 1 week. The battery is replaced with a new one when it dies, and so on. Assume battery lifetimes are independent. Approximate the chance that more than 26 replacements will have to be made in a two year period, starting with a fresh battery and not counting that one as a replacement.

Ex 3.3.23 in Pitman's Probability

Problem 2

Recall the chopsticks example from Section 8: suppose we have n unique pairs of chopsticks in a drawer (so $2n$ sticks in total). We grab k pairs of these at random from the drawer and try to make matching pairs from this pile of $2k$ chopsticks. Let X represent the number of matching pairs. Find $\text{Var}(X)$.

Problem 3

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