

Stat 134: Section 9

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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

Should we use the continuity correction here? Why/why not?

Problem 2

Bill, Mary, and Tom have coins with respective probabilities p_1 , p_2 , p_3 of turning up heads. They toss their coins independently at the same times.

- a. What is the probability that the first person to get a head has to toss more than n times? (What distribution does this follow?)
- b. What is the probability that neither Bill nor Tom get a head before Mary?

Ex 3.4.5 in Pitman's Probability

Problem 3: Mean Absolute Deviation

One alternative method of measuring the spread of a distribution is the *mean absolute deviation*. For a random variable X , this is given by $E(|X - \mu|)$, where $\mu = E(X)$.

- a. Let X be the result of a fair standard die. Calculate the mean absolute deviation of X . For comparison, $SD(X) \approx 1.71$.
- b. Use the fact that $Var(|X - \mu|) \geq 0$ for all X to prove that $SD(X) \geq E(|X - \mu|)$, with equality if and only if $|X - \mu|$ is a constant.

Ex 3.3.26 in Pitman's Probability