

Stat 134: Section 10

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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

In Bernoulli (p) trials let V_n be the number of trials required to produce either n successes or n failures, whichever comes first. Find the distribution of V_n .

Ex 3.4.14 in Pitman's Probability

Problem 4

Suppose X , Y , and Z are independent Poisson random variables, with parameters μ_X , μ_Y , μ_Z respectively. Find:

- $P(X + Y = 4)$
- $\mathbb{E}((X + Y + Z)^2)$
- $P(\max\{X, Y, Z\} > k)$, for $k = 0, 1, 2, \dots$

Hint: Recall the equation $\text{Var}(X) = \mathbb{E}(X^2) - (\mathbb{E}(X))^2$.

From Ex 3.5.11 in Pitman's Probability