10. Exercise: Lightbulb burnouts

Exercises due May 13, 2020 05:29 IST *Completed*

Exercise: Lightbulb burnouts

0/1 point (graded)

As in the preceding video, consider three lightbulbs each of which has a lifetime that is an independent exponential random variable with parameter $\lambda = 1$. The variance of the time until all three burn out is:

5/6 ✖ **Answer:** 1.36111

Recall that the variance of an exponential with parameter λ is $1/\lambda^2$.

Solution:

As we discussed, the time until all three lighbulbs burn out is the sum of an exponential random variable with parameter 3λ, an exponential random variable with parameter 2λ, and an exponential random variable with parameter λ. Furthermore, because of the fresh-start property, we argued that these three random variables are independent. Therefore, since $\lambda = 1$, the variance is

$$\frac{1}{3^2} + \frac{1}{2^2} + \frac{1}{1^2} = \frac{49}{36}.$$

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Answers are displayed within the problem

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Useful hint
For the merged poisson process, the calculation of total variance is similar to that of the expectation.
3 new 5

Something tricky?
I entered what I was sure was the answer, given what I know about adding the variances of independent...
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