

STEP III, 2002 Q13

- 13** A continuous random variable is said to have an exponential distribution with parameter λ if its density function is $f(t) = \lambda e^{-\lambda t}$ ($0 \leq t < \infty$). If X_1 and X_2 , which are independent random variables, have exponential distributions with parameters λ_1 and λ_2 respectively, find an expression for the probability that either X_1 or X_2 (or both) is less than x . Prove that if X is the random variable whose value is the lesser of the values of X_1 and X_2 , then X also has an exponential distribution.

Route A and Route B buses run from my house to my college. The time between buses on each route has an exponential distribution and the mean time between buses is 15 minutes for Route A and 30 minutes for Route B. The timings of the buses on the two routes are independent. If I emerge from my house one day to see a Route A bus and a Route B bus just leaving the stop, show that the median wait for the next bus to my college will be approximately 7 minutes.



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