The number of workplace injuries, \( N \), occurring in a factory on any given day is Poisson distributed with mean \( \lambda \). The parameter \( \lambda \) is a random variable that is determined by the level of activity in the factory, and is uniformly distributed on the interval \([0, 3]\).

Calculate \( \text{Var}(N) \).

A. \( \lambda \)  
B. \( 2\lambda \)  
C. 0.75  
D. 1.50  
E. 2.25

Solution.

We have

\[
\text{Var}(N) = E(\text{Var}(N|\lambda)) + \text{Var}(E(N|\lambda)) = E(\lambda) + \text{Var}(\lambda) = \\
= \frac{0 + 3}{2} + \frac{(3-0)^2}{12} = \frac{3}{2} + \frac{9}{12} = \frac{3}{2} + \frac{3}{4} = \frac{9}{4} = 2.25.
\]

Answer E.

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