

148. Key: C

Let N denote the number of hurricanes, which is Poisson distributed with mean and variance 4.

Let X_i denote the loss due to the i^{th} hurricane, which is exponentially distributed with mean 1,000 and therefore variance $(1,000)^2 = 1,000,000$.

Let X denote the total loss due to the N hurricanes.

This problem can be solved using the conditional variance formula. Note that independence is used to write the variance of a sum as the sum of the variances.

$$\begin{aligned}\text{Var}(X) &= \text{Var} [E(X | N)] + E[\text{Var}(X | N)] \\ &= \text{Var} [E(X_1 + \dots + X_N)] + E[\text{Var}(X_1 + \dots + X_N)] \\ &= \text{Var} [NE(X_1)] + E[N\text{Var}(X_1)] \\ &= \text{Var}(1,000N) + E(1,000,000N) \\ &= 1,000^2 \text{Var}(N) + 1,000,000E(N) \\ &= 1,000,000(4) + 1,000,000(4) = 8,000,000\end{aligned}$$