149. Key: B

Let N denote the number of accidents, which is binomial with parameters $\frac{1}{4}$ and 3 and thus has mean $3\left(\frac{1}{4}\right)=\frac{3}{4}$ and variance $3\left(\frac{1}{4}\right)\left(\frac{3}{4}\right)=\frac{9}{16}$.

Let X_i denote the unreimbursed loss due to the i^{th} accident, which is 0.3 times an exponentially distributed random variable with mean 0.8 and therefore variance $(0.8)^2 = 0.64$. Thus, X_i has mean 0.8(0.3) = 0.24 and variance $0.64(0.3)^2 = 0.0576$.

Let X denote the total unreimbursed loss due to the N accidents.

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.

$$\begin{aligned}
\text{Var}(X) &= \text{Var}\left[\text{E}(X \mid N)\right] + \text{E}\left[\text{Var}(X \mid N)\right] \\
&= \text{Var}\left[\text{E}(X_1 + \ldots + X_N)\right] + \text{E}\left[\text{Var}(X_1 + \ldots + X_N)\right] \\
&= \text{Var}\left[N\text{E}(X_1)\right] + \text{E}\left[N\text{Var}(X_1)\right] \\
&= \text{Var}(0.24N) + \text{E}(0.0576N) \\
&= (0.24)^2\,\text{Var}(N) + 0.0576\text{E}(N) \\
&= 0.0576\left(\frac{9}{16}\right) + 0.0576\left(\frac{3}{4}\right) = 0.0756.
\end{aligned}$$