148. $\text{Var}(X) = \text{Var}[E(X|Y)] + E[\text{Var}(X|Y)]$

$X \sim \text{Exp}(\text{mean}=1000)$ $\quad Y \sim \text{Poisson}(\text{mean}=4)$

$\text{Var}[E(X|Y)]$

$E(X|Y) = E(X_1 + X_2 + \cdots + X_Y)$

$= Y \cdot E(X)$ $\quad E(X) = 1000$

$= Y \cdot 1000$

$\text{Var}(1000 \cdot Y)$

$= 1000^2 \text{Var}(Y)$ $\quad \text{Var}(Y) = 4$

$= 1000^2 \cdot 4 = 4{,}000{,}000$

$E[\text{Var}(X|Y)]$

$\text{Var}(X|Y) = \text{Var}(X_1 + X_2 + \cdots + X_Y)$

$= Y \cdot \text{Var}(X)$ $\quad \text{Var}(X) = 1000^2$

$= Y \cdot 1000^2$

$E(1000^2 \cdot Y)$

$= 1000^2 E(Y)$ $\quad E(Y) = 4$

$= 1000^2 \cdot 4 = 4{,}000{,}000$

$\text{Var}(X) = \text{Var}[E(X|Y)] + E[\text{Var}(X|Y)]$

$= 4{,}000{,}000 + 4{,}000{,}000$

$= 8{,}000{,}000 \Rightarrow$ C