

58. Solution: E

Let  $X_J$ ,  $X_K$ , and  $X_L$  represent annual losses for cities J, K, and L, respectively. Then  $X = X_J + X_K + X_L$  and due to independence

$$\begin{aligned}M(t) &= E\left[e^{xt}\right] = E\left[e^{(x_J+x_K+x_L)t}\right] = E\left[e^{x_Jt}\right]E\left[e^{x_Kt}\right]E\left[e^{x_Lt}\right] \\ &= M_J(t) M_K(t) M_L(t) = (1 - 2t)^{-3} (1 - 2t)^{-2.5} (1 - 2t)^{-4.5} = (1 - 2t)^{-10}\end{aligned}$$

Therefore,

$$M'(t) = 20(1 - 2t)^{-11}$$

$$M''(t) = 440(1 - 2t)^{-12}$$

$$M'''(t) = 10,560(1 - 2t)^{-13}$$

$$E[X^3] = M'''(0) = 10,560$$