42. Solution: D

Let

I_A = Event that Company A makes a claim

I_B = Event that Company B makes a claim

X_A = Expense paid to Company A if claims are made

X_B = Expense paid to Company B if claims are made

Then we want to find

$$\begin{aligned}
&\Pr\left\{\left[I_A^C \cap I_B\right] \cup \left[\left(I_A \cap I_B\right) \cap \left(X_A < X_B\right)\right]\right\} \\
&\quad = \Pr\left[I_A^C \cap I_B\right] + \Pr\left[\left(I_A \cap I_B\right) \cap \left(X_A < X_B\right)\right] \\
&\quad = \Pr\left[I_A^C\right]\Pr\left[I_B\right] + \Pr\left[I_A\right]\Pr\left[I_B\right]\Pr\left[X_A < X_B\right] \qquad \text{(independence)} \\
&\quad = (0.60)(0.30) + (0.40)(0.30)\Pr\left[X_B - X_A \geq 0\right] \\
&\quad = 0.18 + 0.12\Pr\left[X_B - X_A \geq 0\right]
\end{aligned}$$

Now $X_B - X_A$ is a linear combination of independent normal random variables. Therefore, $X_B - X_A$ is also a normal random variable with mean

$$M = E\left[X_B - X_A\right] = E\left[X_B\right] - E\left[X_A\right] = 9,000 - 10,000 = -1,000$$

and standard deviation $\sigma = \sqrt{\operatorname{Var}(X_B) + \operatorname{Var}(X_A)} = \sqrt{(2000)^2 + (2000)^2} = 2000\sqrt{2}$

It follows that

$$\begin{aligned}
\Pr\left[X_B - X_A \geq 0\right] &= \Pr\left[Z \geq \frac{1000}{2000\sqrt{2}}\right] \qquad (Z \text{ is standard normal}) \\
&= \Pr\left[Z \geq \frac{1}{2\sqrt{2}}\right] \\
&= 1 - \Pr\left[Z < \frac{1}{2\sqrt{2}}\right] \\
&= 1 - \Pr\left[Z < 0.354\right] \\
&= 1 - 0.638 = 0.362
\end{aligned}$$

Finally,

$$\begin{aligned}
\Pr\left\{\left[I_A^C \cap I_B\right] \cup \left[\left(I_A \cap I_B\right) \cap \left(X_A < X_B\right)\right]\right\} &= 0.18 + (0.12)(0.362) \\
&= 0.223
\end{aligned}$$