Solution 12.13.3.59

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Question 59 If $\Pr(A) = \frac{2}{5}$,$\Pr(B) = \frac{3}{10}$ and $\Pr(AB) = \frac{1}{5}$, then $\Pr(A'|B').\Pr(B'|A')$ is equal to

(A) $\frac{5}{6}$

(B) $\frac{5}{7}$

(C) $\frac{25}{42}$

(D) 1

Solution: Using the following equation:

$$\Pr(A|B) = \frac{\Pr(AB)}{\Pr(B)} \tag{1}$$

$$\begin{aligned}
\Pr(A'|B').\Pr(B'|A') &= \frac{\Pr(A'B')}{\Pr(B')}.\frac{\Pr(A'B')}{\Pr(A')} && (2)\\
&= \frac{(\Pr(A'B'))^2}{(1-\Pr(B))(1-\Pr(A))} && (3)\\
&= \frac{(1-\Pr(A+B))^2}{(1-\Pr(B))(1-\Pr(A))} && (4)\\
&= \frac{\left\{1-\left(\frac{2}{5}+\frac{3}{10}-\frac{1}{5}\right)\right\}^2}{\left(1-\frac{3}{10}\right)\left(1-\frac{2}{5}\right)} && (5)\\
&= \frac{\left(\frac{1}{2}\right)^2}{\left(\frac{7}{10}\right)\left(\frac{3}{5}\right)} && (6)\\
&= \frac{25}{42} && (7)
\end{aligned}$$

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