

Question #1

Key: E

$$\begin{aligned} {}_2|q_{30:34} &= {}_2p_{30:34} - {}_3p_{30:34} \\ {}_2p_{30} &= (0.9)(0.8) = 0.72 \\ {}_2p_{34} &= (0.5)(0.4) = 0.20 \\ {}_2p_{30:34} &= (0.72)(0.20) = 0.144 \\ {}_2p_{30:34} &= 0.72 + 0.20 - 0.144 = 0.776 \\ {}_3p_{30} &= (0.72)(0.7) = 0.504 \\ {}_3p_{34} &= (0.20)(0.3) = 0.06 \\ {}_3p_{30:34} &= (0.504)(0.06) = 0.03024 \\ {}_3p_{30:34} &= 0.504 + 0.06 - 0.03024 \\ &= 0.53376 \end{aligned}$$

$$\begin{aligned} {}_2|q_{30:34} &= 0.776 - 0.53376 \\ &= 0.24224 \end{aligned}$$

Alternatively,

$$\begin{aligned} {}_2|q_{30:34} &= {}_2|q_{30} + {}_2|q_{34} - {}_2|q_{30:34} \\ &= {}_2p_{30}q_{32} + {}_2p_{34}q_{36} - {}_2p_{30:34}(1 - p_{32:36}) \\ &= (0.9)(0.8)(0.3) + (0.5)(0.4)(0.7) - (0.9)(0.8)(0.5)(0.4) [1 - (0.7)(0.3)] \\ &= 0.216 + 0.140 - 0.144(0.79) \\ &= 0.24224 \end{aligned}$$

Alternatively,

$$\begin{aligned} {}_2|q_{30:34} &= {}_3q_{30} \times {}_3q_{34} - {}_2q_{30} \times {}_2q_{34} \\ &= (1 - {}_3p_{30})(1 - {}_3p_{34}) - (1 - {}_2p_{30})(1 - {}_2p_{34}) \\ &= (1 - 0.504)(1 - 0.06) - (1 - 0.72)(1 - 0.20) \\ &= 0.24224 \end{aligned}$$

(see first solution for ${}_2p_{30}$, ${}_2p_{34}$, ${}_3p_{30}$, ${}_3p_{34}$)