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Day 1 Hidden state : Rainy

Day 1 observable state : Shop

Day 2 Hidden state : Sunny

Day 2 observable state : Walk

Day 3 Hidden state : Rainy

Day 3 observable state : Walk

So, I need to find the probablity of :

Rainy ⟶ Sunny ⟶ Rainy

| | |

Shop   Walk   Walk

A Transition Matrix:

$$A = \begin{array}{c} \\ R \\ S \end{array} \begin{array}{cc} R & S \\ \left[\begin{array}{cc} 0.7 & 0.3 \\ 0.4 & 0.6 \end{array} \right] \end{array}$$

Emission Matrix:

$$E = \begin{array}{c} \\ R \\ S \end{array} \begin{array}{ccc} W & Shop & C \\ \left[\begin{array}{ccc} 0.1 & 0.4 & 0.5 \\ 0.6 & 0.3 & 0.1 \end{array} \right] \end{array}$$

Here,

$$\pi = [0.6 \qquad 0.4]$$

So, $P(R) = 0.6$

$P(S) = 0.4$

$P\left(Y = Shop \rightarrow Walk \rightarrow Walk, \; X = Rainy \rightarrow Sunny \rightarrow Rainy \right)$

$= P(x_1 = Rainy) * P(Y_1 = Shop \mid x_1 = Rainy) * P(x_2 = Sunny \mid x_1 = Rainy)$

$* P(Y_2 = Walk \mid x_2 = Sunny) * P(x_3 = Rainy \mid x_2 = Sunny) *$

$P(Y_3 = \cancel{Shop} \; Walk \mid x_3 = Rainy)$

$= 0.6 * 0.4 * 0.3 * 0.6 * 0.4 * 0.1$

$= 0.001728$

<u>Ans!</u>