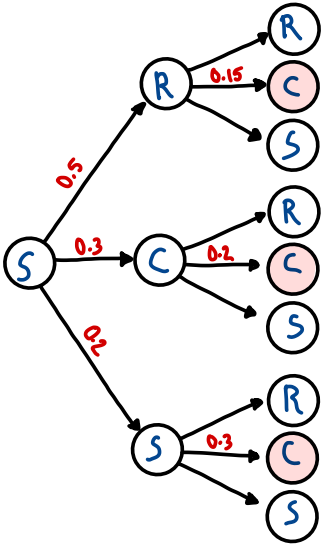

$$P(X_{m+m} = j \mid X_0 = i) =$$

$$\sum_{k \in S} P(X_{m+m} = j, X_m = k \mid X_0 = i) =$$

$$\sum_{k \in S} P(X_{m+m} = j \mid X_m = k, X_0 = i) P(X_m = k \mid X_0 = i) =$$

Markov property

$$\sum_{k \in S} P(X_{m+m} = j \mid X_m = k) P(X_m = k \mid X_0 = i)$$

$$\sum_{k \in S} p_{ik}^{m} \, p_{kj}^{m}$$

$$P(A, B \mid C) = P(A \mid B, C) \, P(B \mid C)$$

$$P(A \mid B, C) = \frac{P(A, B, C)}{P(B, C)}$$

$$P(B \mid C) = \frac{P(B, C)}{P(C)}$$

$$P(A, B \mid C) = \frac{P(A, B, C)}{P(C)}$$

$$P(A \mid B, C) = \frac{P(A, B \mid C) \, P(C)}{P(B \mid C) \, P(C)}$$

In matrix notation:

$$P^{m+m} = P^{m} \, P^{m}$$