## Source task and conventions

Read Figure 21.2 in the declared state order $(A, B, C)$.

## Conventional solution and proof

The figure's centre state is $A$. Its outgoing probabilities to $B$ and $C$ are both $1/2$; each of $B, C$ returns to $A$ with probability one. With rows as current states and columns as next states,

$$P = \begin{pmatrix} 0 & 1/2 & 1/2 \\ 1 & 0 & 0 \\ 1 & 0 & 0 \end{pmatrix}.$$

Every row sums to one, and each positive entry corresponds to its labelled directed arrow. The stationary row vector is $(1/2, 1/4, 1/4)$: the $B, C$ balance equations each give one half of the $A$ mass, and normalization fixes it. The chain has period two, so a stationary distribution does not imply ordinary convergence from every starting state.

## Structural or analytic derivation

The row-stochastic convention gives column-distribution evolution $p_{t+1} = P^\top p_t$. Stating this convention prevents transposition errors when the figure is converted into a matrix.

## Comparative cost and preferred method