

Gambler's Ruin : $N = 4, p = 0.6$

MatrixForm[P]

$$\begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0.4 & 0 & 0.6 & 0 & 0 \\ 0 & 0.4 & 0 & 0.6 & 0 \\ 0 & 0 & 0.4 & 0 & 0.6 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

P5 = MatrixPower[P, 5]; MatrixForm[P5]

$$\begin{pmatrix} 1. & 0. & 0. & 0. & 0. \\ 0.54208 & 0. & 0.13824 & 0. & 0.31968 \\ 0.2368 & 0.09216 & 0. & 0.13824 & 0.5328 \\ 0.09472 & 0. & 0.09216 & 0. & 0.81312 \\ 0. & 0. & 0. & 0. & 1. \end{pmatrix}$$

P12 = MatrixPower[P, 12]; MatrixForm[P12]

$$\begin{pmatrix} 1. & 0. & 0. & 0. & 0. \\ 0.579911 & 0.0061153 & 0. & 0.00917294 & 0.4048 \\ 0.303929 & 0. & 0.0122306 & 0. & 0.68384 \\ 0.119941 & 0.00407686 & 0. & 0.0061153 & 0.869867 \\ 0. & 0. & 0. & 0. & 1. \end{pmatrix}$$

P21 = MatrixPower[P, 21]; MatrixForm[P21]

$$\begin{pmatrix} 1. & 0. & 0. & 0. & 0. \\ 0.584496 & 0. & 0.00038955 & 0. & 0.415115 \\ 0.307493 & 0.0002597 & 0. & 0.00038955 & 0.691858 \\ 0.122997 & 0. & 0.0002597 & 0. & 0.876743 \\ 0. & 0. & 0. & 0. & 1. \end{pmatrix}$$