# stochastic matrix

| | |
|---|---|
| Canonical name | StochasticMatrix |
| Date of creation | 2013-03-22 12:37:29 |
| Last modified on | 2013-03-22 12:37:29 |
| Owner | mathwizard (128) |
| Last modified by | mathwizard (128) |
| Numerical id | 9 |
| Author | mathwizard (128) |
| Entry type | Definition |
| Classification | msc 60G99 |
| Classification | msc 15A51 |
| Related topic | Distribution |
| Related topic | Matrix |
| Defines | doubly stochastic |
| Defines | stochastic matrix |

**Definition** Let $I$ be a finite or countable set, and let $\mathbf{P} = (p_{ij} : i, j \in I)$ be a matrix and let all $p_{ij}$ be nonnegative. We say $\mathbf{P}$ is *stochastic* if

$$\sum_{i \in I} p_{ij} = 1$$

for every $j \in I$. We call $\mathbf{P}$ *doubly stochastic* if, in addition,

$$\sum_{j \in I} p_{ij} = 1$$

for all $i \in I$. Equivalently, $\mathbf{P}$ is stochastic if every column is a distribution, and doubly stochastic if, in addition, every row is a distribution.

Stochastic and doubly stochastic matrices are common in discussions of random processes, particularly Markov chains.