



**MathsNET**

A joined up approach to  
teaching and learning  
mathematics

# The ergodic theorem

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- Explain the meaning of the word ergodic in the context of Markov chains.
- Why can't an ergodic Markov chain have transient states?
- Give a statement of the ergodic theorem ensuring that you define all the terms in the equation.
- Explain how you can calculate the expected return time to a state if you are given the stationary distribution.



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- Explain what is meant by the period of a state in the context of Markov chains.
- What is the greatest common divisor for the following sets of numbers  $\{2, 4, 6, 8\}$ ,  $\{4, 8, 12\}$ ,  $\{4, 5, 8, 12\}$  and  $\{4, 8, 12, 14\}$
- Draw the transition graph for a Markov chain involving 5 states in which every state has a period of 5 and a transition graph for a 5 state Markov chain in which every state has a period of 3.