MITx: 6.041x Introduction to Probability - The Science of Uncertainty

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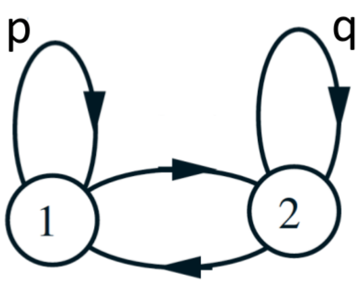
Exercise: Convergence

(5/5 points)

Consider the following transition probability graph, where $0 \leq p \leq 1$ and $0 \leq q \leq 1$:



1. Give the values of p and q for which you know for sure that $r_{12}(n)$ will never converge to a constant when n goes to infinity.

0

$p =$ **Answer:** 0

0

$q =$ **Answer:** 0

2. For each of the following pairs of (p, q), would it be guaranteed that $r_{11}(n)$ converges to zero as n goes to infinity?

- $p = 0.99$, $q = 1$

  Yes **Answer:** Yes

- $p = 0$, $q = 0$

  No **Answer:** No

- $p = 1$, $q = 1$

  No **Answer:** No

Answer:

1. If $p = q = 0$, then $r_{12}(n) = 1$ for all odd n and $r_{12}(n) = 0$ for all even n.

2.
   -

Yes. Eventually the chain will jump to 2 and stay there forever. Hence, the probability of ending up in state 1 after n transitions will converge to 0 as n goes to infinity.

- No. As stated in part (1), there is no convergence in this scenario since $r_{11}(n)$ will alternate between 0 and 1.
- No. Given that we start in state 1, we will stay in state 1 forever. Hence, $r_{11}(n) = 1$ for all n.

You have used 1 of 1 submissions