

Place **ANSWERS ONLY** in the boxes.

ANSWER IN FRACTION FORM WHEN APPLICABLE.

Given the following transition matrix;

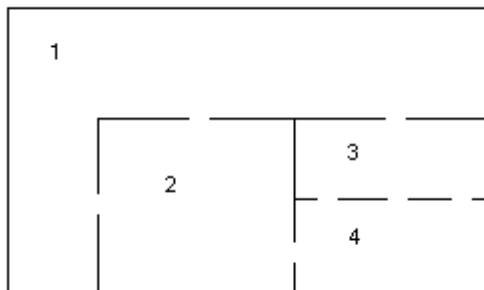
$$P = \begin{matrix} & \begin{matrix} s1 & s2 \end{matrix} \\ \begin{matrix} s1 \\ s2 \end{matrix} & \begin{bmatrix} .4 & .6 \\ .8 & .2 \end{bmatrix} \end{matrix}$$

1) Find the probability of moving from state 1 to state 2 in one observation.

2) Find the initial probability distribution if the system is initially in state 2.

3) If the system is initially in state 2, then find the probability distribution after 3 observations.

4) Find the fixed probability vector (t)



If a mouse is placed into the enclosure to the left, it moves as follows; If the mouse is in any particular room, it can either stay in the room or go out of any of the room's doors, each option having the same probability. For example, if it is in room 2, it is more likely to go to room 1 than anything else because there are two doors.

5) Find the transition matrix that goes with this system.

6) If the mouse is in room 1, find the probability that it moves to room 3 in the next observation?

7) If the mouse is in room 3, find the probability that it moves to room 4 in the next observation?

8) If the mouse starts in room 1, which room will it most likely be in two observations?

9a) If the mouse starts in room 1, in which room is it most likely to be after 20 observations?  
(it is a close call)

b) Find the probability of it being in that room (4 decimal places).

(Problems 10 and 11) Is the Markov chain whose transition matrix is given regular? Answer YES or NO.

10)

$$\begin{bmatrix} .3 & .7 \\ 1 & 0 \end{bmatrix}$$

11)

$$\begin{bmatrix} 1 & 0 \\ .2 & .8 \end{bmatrix}$$

12) Bacteribeef and Rotgut industries are two rival meat suppliers (and they are the only two in an area).

In that area each month, 15% of Bacteribeef's customers switch to Rotgut,  
and 40% of Rotgut's customers switch to Bacteribeef.

(Let Bacteribeef be state 1 and Rotgut be state 2)

a) Find the transition matrix for the system.

b) Find the fixed probability vector (t) (fraction form)

c) What portion of the area's market will Rotgut eventually hold? (fraction)