Sample Markov Problems. Note Rows & columns must be switched to be in the same format as we use.

1. Let A be a matrix in which each row represents sales from one of a company's retail stores and each column represents an item sold in the store.

	Item 1	Item 2	Item 3	Item 4	
Store 1	7	8	10	3	
Store 2	4	11	15	6	= A
Store 3	2	8	9	10	

	Rev.		Profit	
	2		1	
	4		2	
Let B =	3	2		be the matrix in which the
	8		5	

columns represent revenue (Rev.) and profit per item (in collars) and throws represent the four items of the matrix A. Find the total revenue at the store 3.

a. 86 b. 143c. 145d. 67 e. 150

2. The state of the weather on any day is described as good, fair or bad. Suppose that

the probability of having a **fair** day after a **good** day = $\frac{1}{3}$

the probability of having a **bad** day after a **good** day = $\frac{1}{6}$

the probability of having a **good** day after a **fair** day = $\frac{1}{4}$

the probability of having a **bad** day after a **fair** day = $\frac{1}{4}$

the probability of having a **good** day after a **bad** day = $\frac{1}{6}$

the probability of having a **fair** day after a **bad** day = $\frac{1}{3}$

If Monday of next week is good what is the probability that Wednesday of next week will be fair?

a. $\frac{7}{18}$ b. $\frac{13}{36}$ c. $\frac{1}{4}$ d. $\frac{1}{2}$ e. $\frac{1}{3}$

3. The equilibrium state vector for the regular transition matrix

$$P = \begin{array}{c c} & \begin{array}{ccc} A & B & C \end{array} \\ \begin{array}{c} A \\ B \\ C \end{array} & \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ \frac{2}{3} & 0 & \frac{1}{3} \end{bmatrix} \end{array}$$ is given by:

a. $\begin{bmatrix} \frac{3}{5} & \frac{1}{5} & \frac{1}{5} \end{bmatrix}$ b. $\begin{bmatrix} \frac{1}{5} & \frac{1}{5} & \frac{3}{5} \end{bmatrix}$ c. $\begin{bmatrix} \frac{2}{7} & \frac{3}{7} & \frac{2}{7} \end{bmatrix}$

d. $\begin{bmatrix} \frac{2}{7} & \frac{2}{7} & \frac{3}{7} \end{bmatrix}$ e. none of these

4. John Doe and Joe Bloggs make a series of bets of $1 (until one goes broke) on the outcome of tossing a fair coin. If John has $20 what is the least amount Joe must have to be 95% sure that his opponent will go broke?

a. $380   b. $220   c. $180   d. $100   e. $55

5. If $P = \begin{bmatrix} \frac{1}{2} & \frac{1}{4} & \frac{1}{4} \\ 1 & 0 & 0 \\ 0 & \frac{1}{2} & \frac{1}{2} \end{bmatrix}$, find the state vector after 2 transitions if the initial state is state 3.

a. $\left[\frac{1}{2} \;\; \frac{1}{4} \;\; \frac{1}{4}\right]$ b. $\left[\frac{3}{8} \;\; \frac{1}{4} \;\; \frac{3}{8}\right]$ c. $\left[\frac{1}{4} \;\; \frac{1}{2} \;\; \frac{1}{4}\right]$

d. $\left[0 \;\; \frac{1}{2} \;\; \frac{1}{2}\right]$ a. $\left[\frac{1}{2} \;\; \frac{1}{8} \;\; \frac{3}{8}\right]$

6. If a singer is in good voice for one performance, then 80% of the time she is in good voice for the next performance. However, if she is in poor voice for one performance, then 90% of the time she is in good voice for the next performance. On a weekend in which she starts out in good voice, there are evening performances on Friday and Saturday, and matinees on Saturday and Sunday. what is the probability that she will be in poor voice for the Sunday matinee?

a. .182   b. .2   c. .8   d. .82 e. .280

7. Let $P = \begin{bmatrix} 0 & 1 & 0 \\ \frac{1}{4} & \frac{1}{2} & \frac{1}{4} \\ \frac{2}{3} & \frac{1}{3} & 0 \end{bmatrix}$ be the transition matrix for a Markov chain. Then the Markov chain is:

a. Absorbing but not regular
b. Regular but not absorbing
c. Regular and absorbing
d. Neither regular nor absorbing
e. None of the above

8. A player bets the same amount of money on each flip of a fair coin. He has decided to play until he has lost or tripled his money. What is the probability that he will triple his money?

a. $\frac{1}{2}$ b. $\frac{1}{3}$ c. $\frac{1}{4}$ d. $\frac{3}{4}$ e. $\frac{2}{3}$

Answers:

1. b 2. a 3. d 4. a 5. a 6. a 7. b 8. b