1. Consider Ex. 2, p.296 Lay. The stochastic matrix for this problem is

\[
P = \begin{pmatrix}
0.50 & 0.25 & 0.25 \\
0.25 & 0.50 & 0.25 \\
0.25 & 0.25 & 0.50
\end{pmatrix}
\]

(a) Type \( P^2 \) to calculate \( P^2 \).
(b) Use \( P \) and \( P^2 \) to answer the following questions. Suppose an animal chooses food #1 on the initial trial. What is the probability that the animal will:
(i) choose food #2 on the next trial?
(ii) choose food #2 on the second trial after the initial trial?
(iii) choose food #3 on the second trial after the initial trial?
(c) Type \( I = \text{eye}(3) \), \( \text{rref}(P-I) \) to calculate the reduced echelon form of \( P - I \). Record this and use it to write the general solution \( x \) to the system \( (P - I)x = 0 \). Also choose a nonzero value for the free variable and write a particular solution \( w \). To calculate the steady state vector \( q \) for \( P \) enter your solution \( w \) and type \( q = w / \text{sum}(w) \). Explain why \( q \) is a probability vector and verify that \( q \) satisfies \( Pq = q \).

2. Ex.4, p.296, Lay. Also answer the following question. In the long run what is the probability that the weather will be good on any given day? (Show all calculations.)

3. Ex.21, p.297, Lay. In part (a) to compute the steady state vector write \( R = \text{rref}(P - \text{eye}(4)) \) Then

\[
w = [-R(1 : 3, 4); 1], \quad q = w / \text{sum}(w).
\]