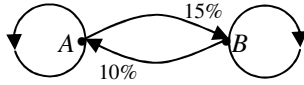


Questions 1, 2, 3 and 4 are related

1. In an isolated country town each household does the weekly shopping at either Centre A or Centre B. A transition diagram is shown below. Complete the equivalent transition matrix.



this week

$$\begin{matrix} A & B \\ \begin{bmatrix} - & - \\ - & - \end{bmatrix} & \begin{matrix} A \\ B \end{matrix} \end{matrix} \text{ next week}$$

2. This week 65% of the households shop at Centre A. (i) What is the percentage of the households expected to be shopping at Centre B two weeks later? (ii) In the long term, what is the percentage of households expected to be shopping at Centre B?

3. What was the percentage of the households shopping at Centre B two weeks ago?

4. When was Centre B first opened for business?

5. Suppose you wear a fresh pair of socks one day, there is a 60% chance you wear the same pair the next day. If you do not wear a fresh pair one day, there is a 10% chance you do not wear a fresh pair the next day. (i) Complete the transition matrix below. (ii) Find the chance you wear a fresh pair on the fifth day, given you do not wear a fresh pair on the first day. (iii) Find the chance you wear a fresh pair in the long term.

$$\begin{bmatrix} - & - \\ 0.6 & - \end{bmatrix}$$

6. Suppose you wear a fresh pair of socks one day, there is a 60% chance you wear the same pair the next day. If you do not wear a fresh pair one day, there is a 10% chance you do not wear a fresh pair the next day. On the  $n^{\text{th}}$  day the chance you wear a fresh pair differs from the chance in the long term by less than 1%, given you do not wear a fresh pair on the first day. Find  $n$ .

7. Suppose you wear a fresh pair of socks one day, there is a  $p\%$  chance you wear the same pair the next day. If you do not wear a fresh pair one day, there is a 10% chance you do not wear a fresh pair the next day. Find  $p$  if the chance you wear a fresh pair in the long term is 80%.

8. Suppose you wear a fresh pair of socks one day, there is a 40% chance you wear the same pair the next day. If you do not wear a fresh pair one day, there is a  $q\%$  chance you do not wear a fresh pair the next day. Find  $q$  such that there is a 30% chance you wear a fresh pair on the third day, given you do not wear a fresh pair on the first day.

Numerical, algebraic and worded answers.

1.  $\begin{bmatrix} 0.85 & 0.10 \\ 0.15 & 0.90 \end{bmatrix}$

3. 15.6%

5. (i)  $\begin{bmatrix} 0.4 & 0.9 \\ 0.6 & 0.1 \end{bmatrix}$  (ii) 56.25% (iii) 60%

7. 22.5

2. (i) 45.9% (ii) 60%

4. 3 weeks ago

6.  $n \geq 7$

8. 78.31