Chapter 9 / **Example 10**

Transition matrices

Dockless bicycle company Mathbike hires bicycles in a city through a mobile phone app. Users can unlock a bicycle with their smartphone, ride it to their destination then lock the bicycle. Mathbike divides the city into three zones: Inner (I), Outer (O), and Central business district (C). By tracking their bicycles with GPS over several weeks, the company finds that at the end of each day:

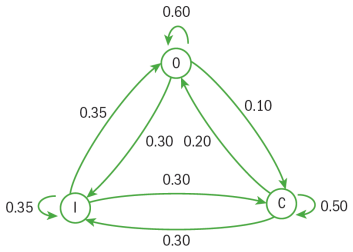
- 50% of the bicycles rented in zone C remained in zone C, 30% were left in Zone I, and 20% were left in Zone O
- 60% of the bicycles rented in zone O remained in zone O, 30% were left in zone I, and 10% were left in zone C.
- 35% of bicycles rented in zone I remained in zone I, 35% were left in zone O, and 30% were left in zone C.

a Show this information in a transition state diagram.

b Show this information in a transition matrix.

c Determine the probability that after three days, a bicycle that started in C is now in O.

The transition state diagram is as shown.

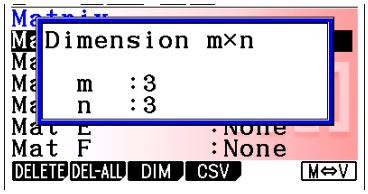


Enter the transition matrix $T = \begin{pmatrix} 0.50 & 0.30 & 0.10 \\ 0.30 & 0.35 & 0.30 \\ 0.20 & 0.35 & 0.60 \end{pmatrix}$.

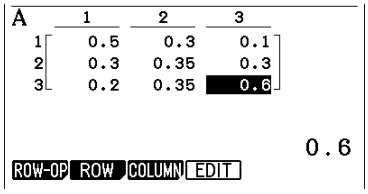
Press MENU 1 RUN·MAT to display the Run-Matrix screen for arithmetical calculations.

Press F3 ▸MAT/VCT F3 DIM.

Change the dimensions of the matrix to 3 × 3 and press EXE.



Enter the values of the elements of the matrix ***A***, using EXE to move through the matrix.



Chapter 9 / **Example 10**

Transition matrices

Calculate A^3.

Press EXIT twice to return to the calculation screen.

Press OPTN F2 MAT/VCT F1 Mat.

Press ALPHA X,θ,T [A].

Press ^ 3 and press EXE.

The probability that a bicycle starting in the central business district at the end of three days is in the outer zone is 0.441.