Repeated transitions

6 questions | 21 marks

Equivalent correct methods earn the corresponding marks.

1. Use rows (0.8,0.3),(0.2,0.7) and initial (100,0). Find x_2. [3 marks]

First obtain (80,20).

Multiply once more: (64+6,16+14).

Answer: (70,30).

2. For the same matrix, begin at (0,100). Find x_1, x_2. [3 marks]

First multiply the initial state.

Then A is $0.8(30) + 0.3(70) = 45$ and B is 55.

Answer: (30,70), then (45,55).

3. For that matrix, verify that (60,40) is unchanged after two periods. [3 marks]

A: $0.8(60) + 0.3(40) = 60$.

B: $0.2(60) + 0.7(40) = 40$; repeat the same calculation.

Answer: Both predictions are (60,40).

4. A swap matrix has rows (0,1),(1,0). Start at (40,10). Find the states after 5 and 6 periods. [3 marks]

Odd powers swap entries; even powers restore them.

Answer: After 5: (10,40); after 6: (40,10).

5. Use T: (0.8,0.3),(0.2,0.7), and U: (0.6,0.1),(0.4,0.9), with $x_0 = (100, 0)$. [6 marks]

(a) Calculate UTx_0. [3 marks]

$Tx_0 = (80, 20)$, then apply U.

Answer: (50,50).

(b) Calculate TUx_0 and explain the difference. [3 marks]

$Ux_0 = (60, 40)$, which T leaves unchanged.

Answer: (60,40); it reverses the policies.

6. Name two checks after computing $T^{20}x_0$ for a closed 500-person model. [3 marks]

Also check state order and whether the same rule is justified for 20 periods.

Answer: Nonnegative entries and total 500, apart from small rounding error.