Transition, Leslie and population models

Learn and practise | Free preview

A sample from this topic. The complete topic collection contains three different resources and worked solutions.

Read the worked example, then show each step in the practice questions. A scientific, statistical or financial calculator, or suitable spreadsheet, can support these calculations. Record the formula, inputs and interpretation.

What you will practise

• Transition matrices

Useful starting skills: Relevant General Mathematics Units 1–2 arithmetic, algebra, statistics, matrices and networks.

A state column can contain categories or age classes. Transition matrices preserve totals in closed probability models, whereas Leslie matrices may include births and deaths.

Use $S_{n+1}=TS_n+B$ when a fixed restocking or removal vector is added after transition. State the timing and check whether resulting counts are meaningful.

Worked example

Leslie matrix $L=[[0, 2], [0.5, 0]]$, $S_0=(100, 40)$. Find next population.

Births $2\times40=80$

survivors $0.5\times100=50$.

Answer: (80, 50).

Try it yourself

Name: _____ Date: _____

1. For T=[[0.8, 0.2], [0.2, 0.8]], S_0=(70, 30), find S_1.

2. For that T, find equilibrium proportions.

Answers and explanations

Check the method as well as the final answer. An alternative correct method is also valid.

1. (62, 38).

$0.8\times70+0.2\times30=62$; the other component 38.

2. (0.5, 0.5).

Solve $p=0.8\,p+0.2(1-p)$.

Curriculum reference: General Mathematics Units 3–4 — Transition matrices

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