Transition matrices and long-run patterns

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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. Show the mathematical steps. A calculator, graphing tool or CAS may be used to check results where useful.

What you will practise

• Matrices

Useful starting skills: Year 10 algebra, percentages, statistical displays, geometry and trigonometry.

A column transition matrix T uses each column to describe where people in one current state move next. Then $S_{n+1}=TS_n$.

Check that probability columns sum to 1. A stable state satisfies TS=S, but a sequence need not converge for every possible transition matrix.

Worked example

T=[[0.8, 0.3], [0.2, 0.7]], S_0=[[50], [50]]. Find S_1.

New first state=0.8×50+0.3×50

second=0.2×50+0.7×50.

Answer: [[55], [45]].

Try it yourself

Name: _____ Date: _____

1. For T=[[0.9, 0.4], [0.1, 0.6]], explain entry 0.4.

2. Use that T with S_0=(100, 0) to find S_1.

Answers and explanations

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

1. 40% of state 2 moves to state 1 per step.

Columns are origins and rows are destinations.

2. (90, 10).

Multiply T by the state column.

Curriculum reference: General Mathematics Units 1–2 — Matrices

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