Network traversal and shortest paths

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

What you will practise

• Graphs and networks

• Exploring and travelling problems

• Shortest path problems

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

An Euler trail uses each edge once; a Hamiltonian path visits each vertex once. These answer different travel questions.

In a connected undirected graph, an Euler circuit requires all vertex degrees even; an open Euler trail has exactly two odd vertices. Dijkstra’s algorithm finds shortest routes with non-negative weights.

Worked example

A connected undirected graph has degrees 2, 2, 3, 3. Does it have an Euler trail or circuit?

Exactly two vertices have odd degree

these are the trail endpoints.

Answer: An open Euler trail, no Euler circuit.

Try it yourself

Name: _____ Date: _____

1. A connected undirected graph has degrees 4, 2, 2, 2, 2. What Euler traversal exists?

2. A graph has 4 odd vertices. Can it have an Euler trail?

Answers and explanations

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

1. An Euler circuit.

All degrees are even and the graph is connected.

2. No.

An undirected Euler trail requires 0 or 2 odd vertices.

Curriculum reference: General Mathematics Units 3–4 — Graphs and networks; General Mathematics Units 3–4 — Exploring and travelling problems; General Mathematics Units 3–4 — Shortest path problems

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