



This activity introduces the terms used when working with networks, and gives students practice in using them.

Suitability and Time

Level 3 (Advanced)

1–2 hours

Resources and equipment

Student information sheet, slideshow (optional)

Key mathematical language

Network, graph, edge, vertex, node degree, directed, undirected, weighted, path, cycle, connected, adjacency matrix, distance matrix.

Notes on the activity

The slideshow and student sheets define the terms used when working with networks.

The worksheet gives some short questions which can be used to check student understanding of the terms.

Students are then asked to use the internet to find information from which they can draw a local road network diagram.

Maps and distances (and estimated times) can be found using the AA Route Planner at www.theaa.com/travelwatch/planner_main.jsp.

During the activity

The students can be asked to work on the activities independently or in pairs, and should be encouraged to discuss their findings.

Points for discussion

Students should discuss why the sum of the orders of the vertices is even.

Students should be encouraged to look for the patterns in the adjacency and distance matrices, and explain why these occur.

Extensions

Students can be asked to investigate the effect on the adjacency matrix of a directed graph.

Answers

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Graph	Number of edges	Even nodes	Odd nodes
A	7	Q, R, S	P, T
B	7	W, X, Y	V, Z
C	8	R, S, V, W	T, U

2a Adjacency matrix

	B	G	W	O	D	S
B	0	1	0	0	0	1
G	1	0	1	0	0	1
W	0	1	0	1	0	0
O	0	0	1	0	1	0
D	0	0	0	1	0	1
S	1	1	0	0	1	0

b Distance matrix

	B	G	W	O	D	S
B	0	35	0	0	0	41
G	35	0	29	0	0	35
W	0	29	0	58	0	0
O	0	0	58	0	15	0
D	0	0	0	15	0	37
S	41	35	0	0	37	0

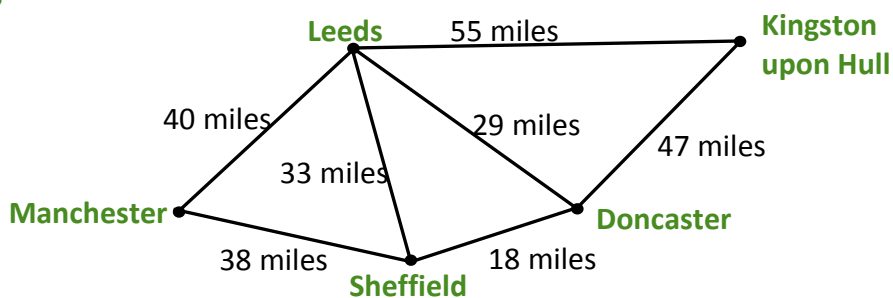
where

B is Bristol
 G is Gloucester
 W is Worcester
 O is Oxford
 D is Didcot
 S is Swindon

c Sketches of any two routes that do not visit any vertex more than once and do not go along any edge more than once (e.g BGWO, GBSDO)

d Any list of nodes that give a path that forms a loop by returning to its starting point (e.g GBSG, GSDOWG, GBSDOWG).

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4a Sketch of road network joining local towns.

b Corresponding adjacency and distance matrices.