Networks - Practice test 1

16 questions | 40 marks | 55 minutes

Identify, draw and interpret connected networks.

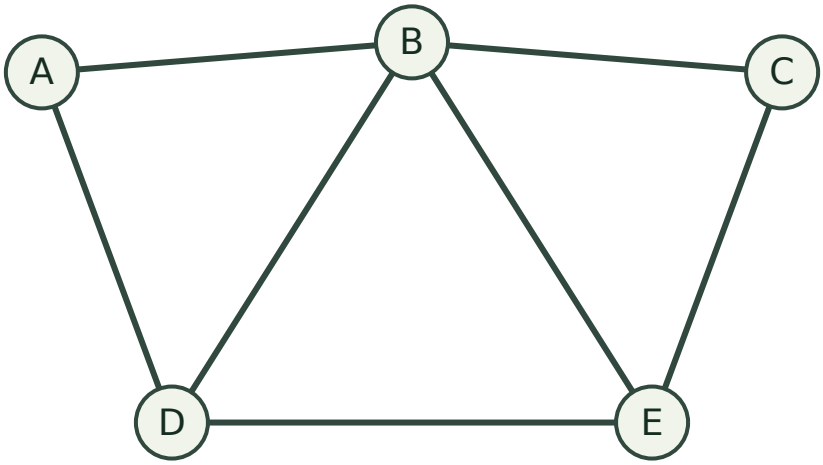
Equivalent correct methods earn the corresponding marks.

1. Define vertices and edges for a network of direct train services. [2 marks]

Match objects to vertices and the specified connection to edges.

Answer: Stations are vertices; direct services are edges.

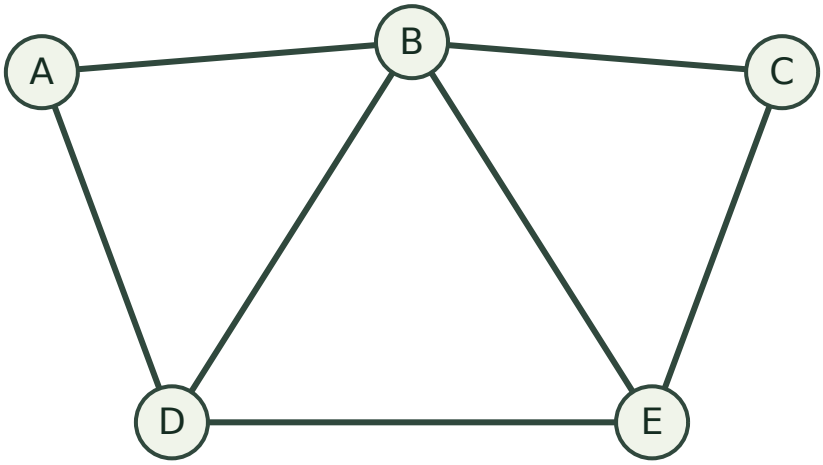
2. Count vertices and edges in the diagram. [2 marks]



Count A-E and list all seven edges once.

Answer: 5 vertices, 7 edges.

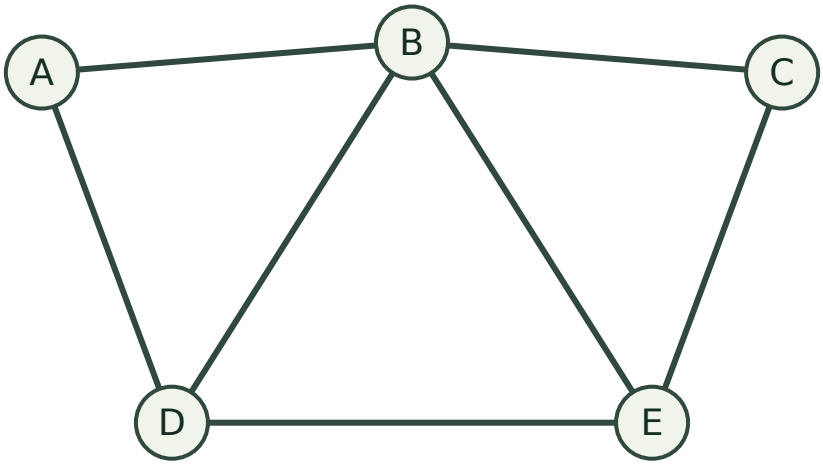
3. List all neighbours of E. [2 marks]



Read BE, CE and DE.

Answer: B, C, D.

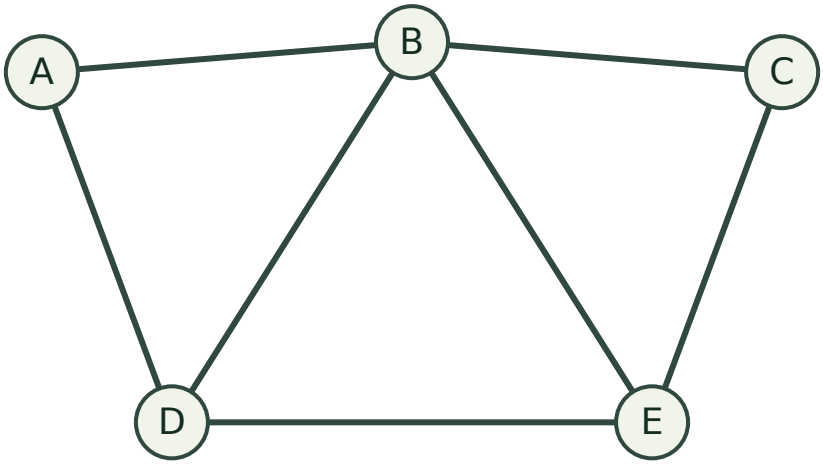
4. Find the degree of each vertex. [3 marks]



Count incident edges at each vertex.

Answer: A2, B4, C2, D3, E3.

5. Use the degree sum to check the edge count. [2 marks]

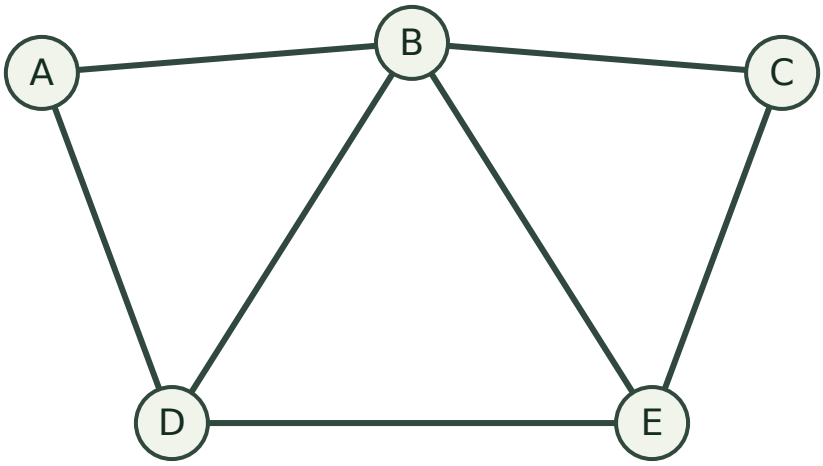


$2+4+2+3+3=14$.

Every edge contributes 2.

Answer: $14 \div 2 = 7$.

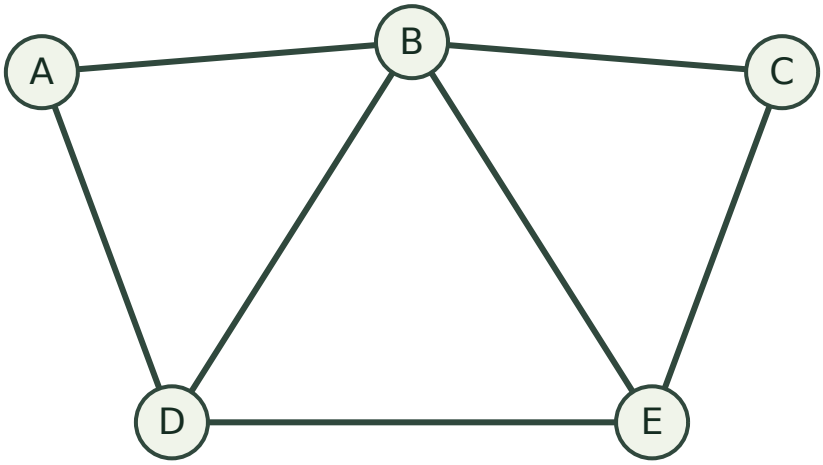
6. Is A-B-E-C a valid route? Explain. [2 marks]



AB, BE and EC are edges.

Answer: Yes.

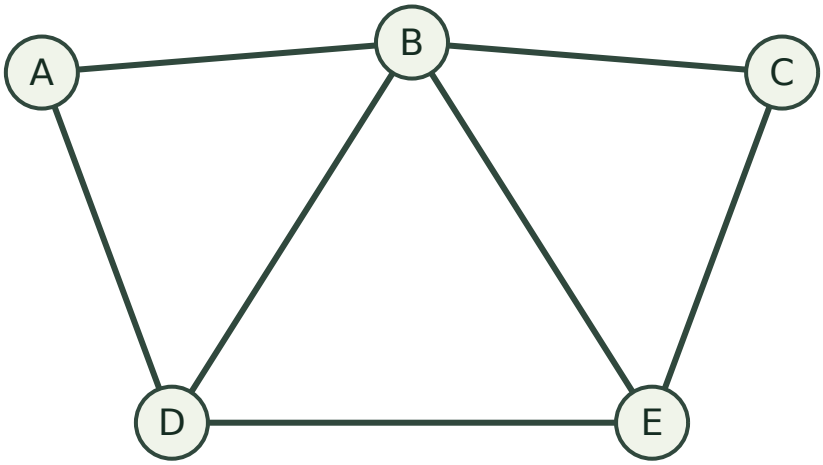
7. How many edges are used by A-D-B-C? [2 marks]



Count AD, DB and BC.

Answer: 3.

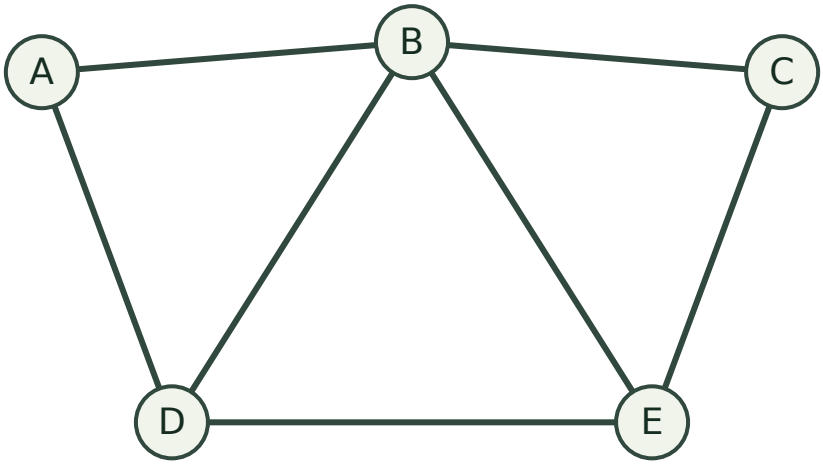
8. Is C directly linked to A? Is it reachable from A? [3 marks]



Distinguish direct adjacency from reachability.

Answer: No direct edge; yes, via A-B-C.

9. Remove BD. Is the resulting network connected? Justify. [3 marks]

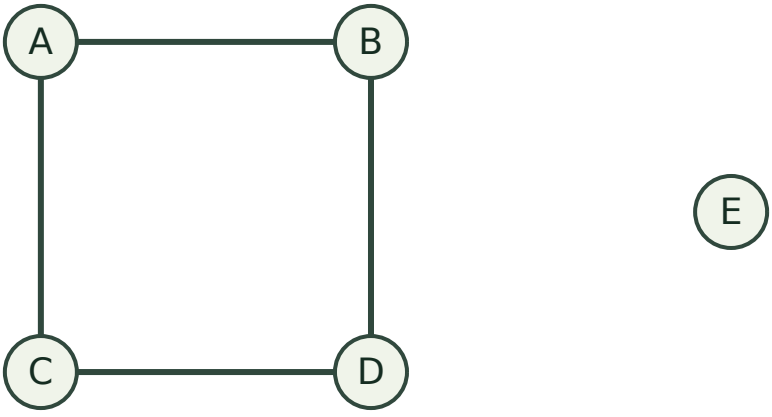


B-A-D or B-E-D still joins the endpoints.

All vertices remain reachable.

Answer: Yes.

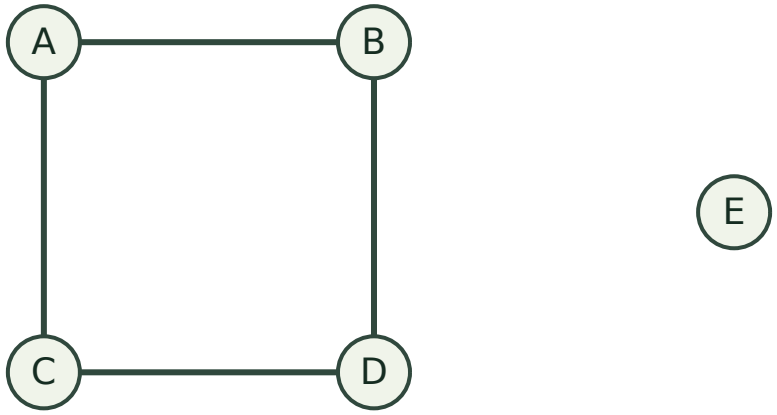
10. Name the components in this diagram. [2 marks]



The square is connected and E is isolated.

Answer: {A,B,C,D} and {E}.

11. Add one edge to make the shown network connected. [2 marks]



Join E to any square vertex.

Answer: For example AE.

12. An undirected network has degrees 1,1,2,2,4. Find the edge count. [2 marks]

$\text{Sum} = 10$; divide by 2.

Answer: 5.

13. Explain why degrees 1,1,1,2 cannot describe an undirected network. [3 marks]

The sum is 5, but it must equal twice an integer.

Answer: Their sum is odd.

14. Draw vertices P,Q,R,S with edges PQ, QR, RS, SP. [3 marks]



Include exactly the four stated links.

Answer: A cycle P-Q-R-S-P.

15. Roads AB, BC, CD form a chain. Which are bridges? [3 marks]

Deleting any link disconnects the chain.

Answer: All three.

16. Roads AB, BC and CD form a chain. Recommend one extra road so access remains after any one road closes. Explain. [4 marks]

It creates a cycle.

A route around any missing edge then remains.

Answer: AD.