Shortest/longest paths

6 questions | 12 marks

Equivalent correct methods earn the corresponding marks.

1. P→Q→S weighs $4+8$ and P→R→S weighs $7+2$. Which is shorter? [2 marks]

The alternatives total 12 and 9.

Choose 9.

Answer: P→R→S, weight 9.

2. Edges are A→B (8), A→C (3), C→B (2), B→D (4), C→D (9). Find the shortest A-to-D path. [2 marks]

The paths total 12, 9 and 12.

The via-C-and-B path is smallest.

Answer: A→C→B→D, weight 9.

3. In that same acyclic network, find a longest A-to-D path. [2 marks]

The three path totals are 12, 9 and 12.

Two paths tie for the maximum.

Answer: A→B→D or A→C→D, each weight 12.

4. A route takes 18 min; a direct one-edge route takes 20 min. Which is faster? [2 marks]

Compare times rather than edge counts.

It saves 2 min.

Answer: The 18-minute route.

5. Can a route using a closed road be the shortest feasible route? [2 marks]

Remove the closed edge from the model.

Recalculate with the permitted edges.

Answer: No.

6. A→B has weight 2 and B→A weight 3. Is there a longest A-to-A walk when repetition is allowed? [2 marks]

One circuit totals 5.

Repeating it n times gives $5n$, with no upper bound.

Answer: No finite maximum.