inkMaths

ANSWER BOOK

Route inspection

Decision Mathematics 1 · Year FM

6 questions · 20 marks

NAVY EDITION

SECTION A · Warm-up

A1 Every visit to a node uses one edge to arrive and one to leave, so a closed trail uses the [2] edges at each node in pairs. A node of odd order would have an edge left over with no partner, so no such trail exists unless every node has even order.

A2 AB with DE: 5 + 9 = 14. AD with BE: 9 + 9 = 18. AE with [3] BD: 13 + 7 = 20. Four odd nodes always give exactly three pairings, which is why the specification caps the number at four.

SECTION B · Standard

B1 The cheapest pairing costs 14, so the route is 55 + 14 = 69. The [4] repeated stretches are AB and the shortest D to E path, which is DC and CE. Every other edge is walked exactly once.

B2 An open route leaves two odd nodes unpaired, one at each end. To minimise the [4] repetition, pair the two odd nodes with the cheapest connection and leave the others: pairing A with B costs 5, leaving D and E as the endpoints. The route is 55 + 5 = 60, starting at D and finishing at E, or the other way round.

B3 Two odd nodes may not be joined directly, and even when they are, a route through [3] other nodes may be shorter. Repeating the edges of a shortest path raises the order of the two odd ends by one each and raises the intermediate nodes by two, leaving them even. Repeating an edge between two even nodes would make both odd, adding to the problem instead of solving it.

SECTION C · Stretch

C1 PQ + RS = 6 + 7 = 13. PR + QS = 9 + 5 = 14. PS + QR = [4] 11 + 8 = 19. The cheapest is 13, giving a route of 80 + 13 = 93. The second pairing costs only one more, so a small error in any of those four shortest paths would change the answer: they are worth checking before committing.

