Minimum spanning trees

Answers

Further Maths topic practice

This topic online

Q	Answer	Marks
1	**a)** DE add, AC add, BC add, CE add, AB reject, BD reject, DF add **b)** 32	4
2	**a)** GE, ED, DB, DC, CA, DF **b)** 70 m	4
3	**a)** AD, AB, BC, CE, EF **b)** 90 miles	4
4	**a)** Network drawn with arcs AB 32, AD 28, AE 25, BC 30, BE 22, CE 27, CF 34, DE 24, DG 36, EF 29, EG 31, FG 26 **b)** BE add, DE add, AE add, FG add, CE add, AD reject, EF add **c)** 153 km	6
5	**a)** D, F, A, B, C, E, G (arcs DF, DA, FB, BC, CE, EG) **b)** 206 minutes **c)** No: every weight is different, so there is only one minimum spanning tree. Kruskal adds the same arcs, possibly in a different order.	6
6	**a)** AD add, BC add, CF add, AB add, BE add (AB, BE, DE in any order: the third of these is rejected) **b)** £26000 **c)** 3	5
7	**a)** CD, DF, CB, BA, DE, EH, FG **b)** CD, DF, BC, EH, AB, DE, FG **c)** 127 m **d)** Prim always joins a vertex not yet in the tree, so it can never close a cycle; Kruskal takes arcs in order of size anywhere in the network, so an arc may join two vertices that are already connected.	7
8	**a)** AC, CD, AB, DE, EF; weight 61 **b)** $0 < x < 12$ **c)** $49 + x$	6
9	**a)** ST add, PR add, QR add, SU add, PQ reject, TU reject, RS add, TV add **b)** 18.2 km **c)** QS, ST, PR, QR, SU, TV; 18.8 km	7
10	**a)** AD, DF, AB, BC, CE; 24.9 km **b)** £460650 **c)** For example: a tree has no spare links, so one broken cable cuts off every village beyond it; or some roads may be hard to dig up.	7
11	**a)** AB, BC, CD, DE, EG, DF **b)** 105 m **c)** DH, FH, BC, CH, EG, AB, DE; 108 m	8
12	**a)** $0 < k < 30$ **b)** $106 + k$ **c)** A, D, B, C, F, E; 136 km	7

Full worked solutions, written out by hand, are on the solutions sheet for this topic.

Free for classroom and home use: print, photocopy and share. Not for resale or re-hosting.