Travelling salesman: lower bounds

Answers

Further Maths topic practice

This topic online

Q	Answer	Marks
1	115	2
2	130 km	3
3	**a)** Removing the deleted vertex from any tour leaves a path through all the other vertices, which is a spanning tree of them, so it is at least the RMST weight; the two tour arcs at the deleted vertex are at least the two least arcs from it. **b)** 152 ≤ L ≤ 179: the best lower bound is the largest, the best upper bound is the smallest.	4
4	**a)** BD, DC, CF, DE; weight 101 miles **b)** 183 miles	5
5	**a)** 158 km **b)** 177 km **c)** 177 km, the larger	6
6	**a)** A - E - B - F - D - C - A, 211 minutes **b)** 166 minutes **c)** 166 ≤ T ≤ 211	6
7	**a)** 201 km **b)** F - A - C - D - E - B - F **c)** It is a tour of length 201, equal to a lower bound, so it is an optimal tour (201 km).	7
8	**a)** 136 + x **b)** 89 + x **c)** 136 + x, since it is larger for every x **d)** 136 + x ≤ L ≤ 143 + x	7
9	**a)** A - D - B - G - F - C - E - A, 185 km **b)** 140 km **c)** 148 km **d)** 148 ≤ L ≤ 185	9
10	**a)** AD = 36, AF = 51, BF = 39, CF = 34 **b)** 87 **c)** 92 **d)** 92 (9200 m), the larger	8
11	**a)** 98 km **b)** 81 + x for x < 44; 125 for x ≥ 44 **c)** A - B - F - C - E - D - A, 141 km **d)** x = 39; 120 ≤ L ≤ 141	10
12	**a)** AD, AE, DC, EG, GH, AF; lower bound 204 miles **b)** 204 miles, the largest **c)** A - D - E - G - H - F - B - C - A, 258 miles **d)** 204 ≤ L ≤ 258 **e)** 198 < 204, the lower bound, and no route can be shorter than a lower bound.	11

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

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