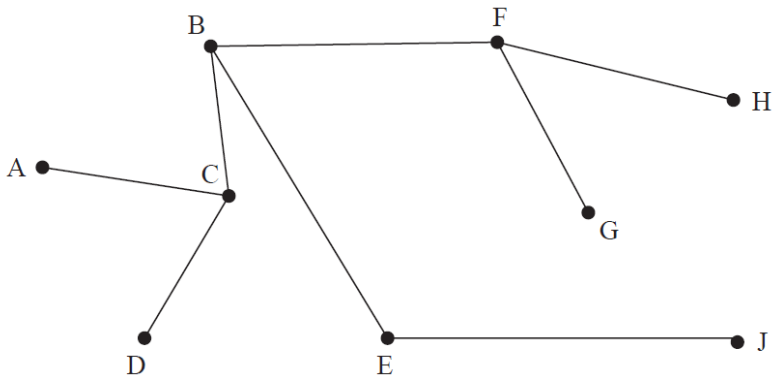
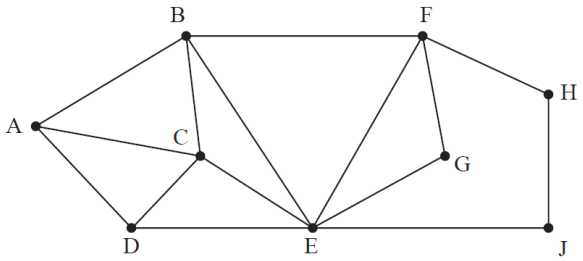
Question Number	Scheme	Marks
	b1A1: First eight values placed correctly (the boxed **and** underlined values). This mark cannot be awarded if you see **any** repeated values or more than ten values placed in containers (even if the first eight items have been placed correctly) **b2A1:** cso – no additional or repeated values (dependent on both previous marks)	
	c1M1: Quick sort, pivot, p, chosen (must be choosing middle left or right – choosing first/last item as the pivot is M0). After the first pass the list must read (values less than the pivot), pivot, (values greater than the pivot). If sorting into descending order then M1 only (even if the list is reversed at the end of the sort). This mark can be scored if one number only is either missing or incorrect or an additional number is added to the list **c1A1:** First two passes correct and next pivots chosen correctly for third pass (but third pass does not need to be attempted or correct) **c2A1:** cso (correct solution only – all previous marks in this part must have been awarded) – if middle right then either a fifth pass **or** a 'sort complete' statement (e.g. 'sorted', 'complete', etc. but not just underlining the fourth pass) is required after the fourth pass. If middle left then a fifth pass (with the value of 9) is required (but no 'sort complete' statement is required)	
	d1M1: Choosing middle right pivot (choosing middle left '12' is M0) **and** an attempt at discarding/retaining half the list (condone if retaining the wrong half of the list or if retaining 1 – 6) **d1A1:** First and second passes correct i.e. selecting the 6^{th} item in the first pass **and** using 1^{st} to 5^{th} items in the second pass (must not be using the 6^{th} item for the second pass) and then correctly selecting the 3^{rd} item (the 8) in the second pass and rejecting the 1^{st} to 3^{rd} items **d2A1:** cao - search completed correctly (so rejecting the 12 in the third pass) together with 'found'. Condone candidates who say that after the 12 in the third pass has been rejected the only value left is the 9 so it has been found. It must be clear that the 9 has been 'found' and not just stated as the final value	
	In (d) candidates must be using a correct ordered list (4 5 8 9 12 13 15 17 20 28) – if it is clear that the candidates are not using this list then M0. With regards to using the original (unsorted) list the 6^{th} value is 13 too so what the candidates do next will most likely indicate if the correct list is being used (e.g. if the next pivot is 15 then M0) Candidates who have sorted the list into descending order can earn full marks in (d) – scheme above applies in the same way for descending – must be choosing middle right (the 12) not middle left (the 13) for M1 28 20 17 15 13 12 9 8 5 4 $\left\lceil \frac{1+10}{2} \right\rceil = 6$ 12 – reject 28 – 12 $\left\lceil \frac{7+10}{2} \right\rceil = 9$ 5 – reject 5 – 4 $\left\lceil \frac{7+8}{2} \right\rceil = 8$ 8 – reject 8 $\lceil 7 \rceil = 7$ 9 – found	
2.(a)	e.g. A – B – F – H – J	B1 **(1)**
(b)	A – B – C – D – E – G – F – H – J is not an example of a tour on T as although it contains every vertex it does not return to A	B1 **(1)**

Question Number	Scheme	Marks
(c)	Kruskal: AC(9), BE(11), BF(12), not EF(14), FG(15), FH(17), not EG(18), EJ(20), $\left\{\begin{matrix}\text{not HJ (21)}\\ \text{BC (21)}\end{matrix}\right\}$, not CE(23), not AB(24), CD(25) (not DE, AD)	M1 A1 A1 **(3)**
(d)		B1 **(1)**
(e)	130 (km)	B1 **(1)**
		7 marks

Notes for Question 2

a1B1: Any correct example of a path (so no vertex appearing more than once) from A to J
b1B1: No with a correct reason i.e. must mention that a tour must begin and start at the same vertex, e.g. the route given does not finish at A scores B1
c1M1: Kruskal's algorithm - first four arcs (AC, BE, BF, FG) correctly chosen **and** at least one rejection seen at some point (the rejection need not be correct or at the correct time)
c1A1: All arcs in tree selected correctly in the correct order (AC, BE, BF, FG, FH, EJ, BC, CD) with no additional arcs included in MST
c2A1: cso - including all rejections correct and at the correct time (do not need to see DE and/or AD rejected but if they are rejected then must be after CD has been selected). Note that BC can be included before HJ rejected
d1B1: cao
e1B1: cao (130) – no units required/ignore units even if incorrect

For reference:



3.	e.g.	M1 A1