2.(a)	Prim: AE, AC, CD; BD, AF; CH, BG	M1 A1 A1 **(3)**
(b)	Weight of MST is 205 (minutes)	B1 **(1)**
(c)	J – G – B – D – C – A – E – F – H – J 28 + 32 + 28 + 27 + 29 + 28 + 36 + 39 + 42 = 289 (minutes)	M1 A1 **(2)**
(d)	The best upper bound is the one starting at J as 289 is less than 291	B1 **(1)**
(e)	The two smallest arcs incident to J are 28 and the min(x, 33) but 28 + 33 + 205 $\neq$ 264	B1
	$205 + 28 + x = 264$	M1
	$x = 31$	A1 **(3)**
		10 marks
	Notes for Question 2	
a1M1:	Prim's – first three arcs correctly chosen in order (AE, AC, CD, …) **or** first four nodes {A, E, C, D, …} correctly chosen in order. If any explicit rejections seen at some point then M1 (max) only. Order of nodes may be seen at the top of a matrix/table {1, -, 3, 4 , 2 , -, -, -}. Starting at any other node can score M1 only for first three arcs chosen correctly	
a1A1:	First five arcs correctly chosen in order (AE, AC, CD, BD, AF, …) **or** all eight nodes {A, E, C, D, B, F, H, G} correctly chosen in order. Order of nodes may be seen at the top of a matrix so for the first two marks accept {1, 5, 3, 4, 2, 6, 8, 7} (**no** missing numbers)	
a2A1:	CSO – all **arcs** correctly **stated** and chosen in the correct order (with no additional arcs). They must be considering arcs for this final mark (do not accept a list of nodes or numbers across the top of the matrix unless the correct list of arcs (in the correct order) is also seen)	
b1B1:	CAO for weight of MST (205) – no units required	
c1M1:	Nearest neighbour starting at J with first five nodes correct (J – G – B – D – C –) Accept arcs JG GB BD DC	
c1A1:	Correct nearest neighbour route (must return to J) (may be listed as arcs JG GB BD DC CA AE EF FH HJ) and correct length (289)	
d1B1:	Accept any wording indicating that the answer from (c) is smaller than 291 and therefore the better upper bound An indication that 289 is the minimum (of 291 and 289) – this mark is dependent on the correct value in (c) so accept an answer of the form 'the one starting at J (or the route with weight 289) as it is the least'	
e1B1:	Correct justification that the two smallest arcs incident to J are 28 and x - may calculate that the two smallest arcs must be 28 and 31 and then state that as no other arc has length 31, this must be the value of x	
e1M1:	Forming the equation: weight of MST from (b) + 28 + x = 264	
e1A1:	CAO for x	