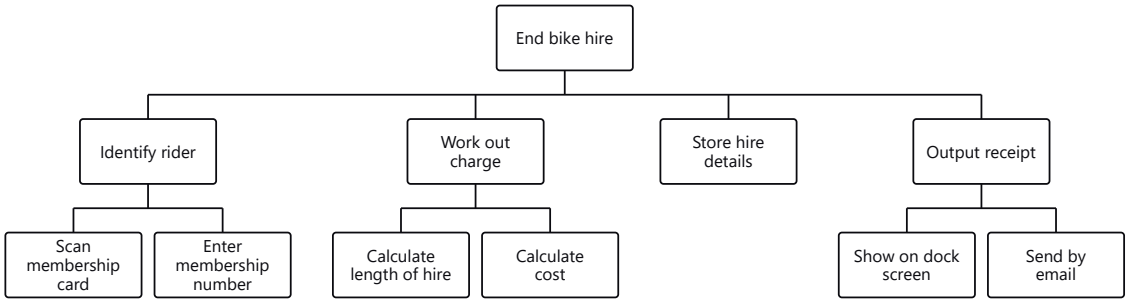
MODULE K ALGORITHM DESIGN · K3

Structure diagrams: mark scheme

21 marks · Cambridge 0478 syllabus 7.1 (design stage: structure diagrams), 7.2(a) (every computer system is made up of sub-systems, which are made up of further sub-systems), 7.2(b) (decomposing a problem into inputs, processes, outputs and storage), 7.2(c) (structure diagrams as a method to design and construct a solution)

How to use. One mark per creditworthy point up to the maximum shown. **/** separates alternative words; **//** separates alternative answers. Words in (brackets) are not needed for the mark. Credit any other valid answer that shows the same understanding.

QUESTION	ANSWER	MARKS	GUIDANCE
1(a) 0478 7.2(a), 7.2(c)	Shows how a system is broken down into sub-systems: True Top box represents the whole system: True Uses the decision symbol: False A sub-system can be broken down into further sub-systems: True	**4**	One mark per correct row. A row with both boxes ticked scores 0. (The decision symbol is a flowchart symbol.)
2(a) 0478 7.1	Design	**1**	Do not accept analysis / coding / testing.
2(b) 0478 7.2(a), 7.2(c)	Any two from: How a system / problem is broken down / decomposed into sub-systems // the component parts of a problem The sub-systems arranged in levels / a hierarchy, with the whole system at the top How each sub-system is broken down into further / smaller sub-systems on the level below How the sub-systems are linked // which sub-system each smaller part belongs to	**2**	max 2. Credit any other valid answer. Do not accept "the order of the steps" / "the decisions" / "the flow of the algorithm" (these describe a flowchart).
3(a) 0478 7.2(a)	Decide action	**1**	Do not accept "Greenhouse system".
3(b) 0478 7.2(b)	Read soil moisture sensor: Input Compare readings with target values: Process Switch water pump on or off: Output Store target values: Storage	**4**	One mark per correct row. A row with more than one box ticked scores 0.
3(c) 0478 7.2(c)	Add a new box / sub-system for sending the text message // alert Join it with a line below Control devices // join it with a line below Greenhouse system as a new (output) sub-system	**2**	One mark per bullet. Second mark: placed as an output. Do not accept it below Take readings or Keep records. An extra box to check if it is too hot may also be added.

QUESTION	ANSWER	MARKS	GUIDANCE
4(a) 0478 7.2(b), 7.2(c)	One mark for a hierarchical structure: sub-systems joined by lines below End bike hire, with a further level below at least one of them One mark for suitable names for the four sub-systems: identify rider, work out charge, store hire details, output receipt One mark for sub-systems for scanning the membership card **and** entering the membership number (below identify rider) One mark for sub-systems for calculating the length of the hire **and** calculating the cost (below work out charge) One mark for sub-systems for showing the receipt on the dock screen **and** sending it by email (below output receipt)	**5**	One mark per bullet. Accept Input / Process / Storage / Output as the names of the four sub-systems. Store hire details may have further sub-systems below it. Sub-systems may be in any order within a level. A flowchart (steps in sequence, decision symbols) is not a structure diagram: 0 marks.
4(a) Example answer			
5(a) 0478 7.2(a)	One mark for: the system is divided into smaller sub-systems, each doing one part of the task, with an example // e.g. ending a hire is made up of identifying the rider, working out the charge, storing the details and outputting a receipt One mark for: each sub-system can itself be divided into further / smaller sub-systems, with an example // e.g. identifying the rider is made up of scanning a card and entering a membership number	**2**	max 1 if no example from the bike hire system is given. Accept examples from the candidate's own diagram in Question 4 if they match the description.

Total: 21 marks