MODULE O ROBUST PROGRAMS · O7

Choosing test data: mark scheme

21 marks · Cambridge 0478 syllabus 7.6 (suggest and apply suitable test data: normal, abnormal, extreme, boundary) and 7.8 (identify errors in given algorithms and suggest ways of correcting these errors)

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. Test data must be an actual value; a description such as "a number between 1 and 20" does not score. Corrections should be in pseudocode; ignore minor slips (e.g. missing `THEN`) as long as the logic is clear. Credit any other valid answer that shows the same understanding.

QUESTION	ANSWER	MARKS	GUIDANCE
1(a) 0478 7.6	Data that is within the acceptable range / that should be accepted (by the program)	**1**	Do not accept an example on its own.
1(b) 0478 7.6	Extreme: the largest / smallest acceptable value (one value, which is accepted) Boundary: the largest / smallest acceptable value **and** the corresponding smallest / largest rejected value // a pair of values, one accepted and one (just outside the range) rejected	**2**	Accept a correct example used to support each point, e.g. range 1 to 100: extreme 100 // boundary 100 and 101. Do not accept "boundary data is at the edge of the range" on its own: the rejected value is needed.
2(a) 0478 7.6	One mark per correct row (type **and** accept/reject both correct): 4: normal, accept 9: extreme, accept 15: abnormal, reject four: abnormal, reject 0: abnormal, reject	**5**	Row 2 (9): accept extreme / boundary / normal (9 is the largest acceptable value, so it is also within the normal range). Row 5 (0): accept abnormal / boundary (0 is the rejected value that pairs with 1). Rows 3 and 4: do not accept boundary or extreme. Accept "accepted / valid" and "rejected / invalid / error message".
3(a) 0478 7.6	8 … accepted / hire booked 9 … rejected / error message output / asked to enter again	**2**	Each mark needs the value **and** its expected outcome. The outcome must be what **should** happen by the rule (8 accepted), not what this algorithm does. Do not credit values for the lower limit (1 and 0).

QUESTION	ANSWER	MARKS	GUIDANCE
3(b) 0478 7.6, 7.8	8 is rejected // "Invalid: enter 1 to 8" is output for 8 and the hire length is asked for again (9 is correctly rejected) This shows there is an error at the upper limit // 8 should be accepted // the conditions on line 05 / line 09 are wrong	**2**	FT from (a) only for the value 8. If (a) gave only lower-limit values, accept an answer that correctly describes 8 being rejected. Do not accept "the program crashes".
3(c) 0478 7.8	One mark for each line identified **and** corrected: Line 05 // `IF Hours < 1 OR Hours > 8` Line 09 // `UNTIL Hours >= 1 AND Hours <= 8`	**2**	Line 05: accept `Hours >= 9` // `8 < Hours`. Line 09: accept `Hours < 9` // `Hours > 0` for the first condition. The line number alone, or the correction alone with no way of telling which line it replaces, scores 0. Do not accept ≥ or ≤ symbols.
4(a) 0478 7.6	Extreme: a password of exactly 10 characters // exactly 16 characters, e.g. `TreeHouse1` // `QuietLake2025xyz` Reason: it is the shortest / longest length that should be accepted Abnormal: a password of 9 or fewer // 17 or more characters, e.g. `TreeHouse` // an empty password Reason: it is outside the range 10 to 16 characters / too short / too long, so it should be rejected	**4**	Count the characters; any characters may be used. Each reason mark must match its example. A reason with no correct example scores 0. Accept a clearly stated length with an example of that length. A length alone with no password (e.g. "10 characters") does not score the example mark.
5(a) 0478 7.6	Any three from: All three values are normal data // it only checks that data in the range is accepted Extreme data should be tested, e.g. 1 // 20 (to check the limits are accepted) Boundary data should be tested, e.g. 20 and 21 // 1 and 0 Abnormal data should be tested, e.g. 35 // −4 // ten (to check it is rejected) Errors at the limits of the range / in the validation would not be found	**3**	max 3. Mark points 2 to 4 each need a correct example for that type. Boundary needs the pair (one accepted, one rejected value). A single value of 1 or 20 credits mark point 2; a single value of 0 or 21 credits mark point 4.

Total: 21 marks