MODULE M PROGRAMMING · M23

Functions and return values: mark scheme

22 marks · Cambridge 0478 syllabus 8.1.6(a) (what is meant by procedures, functions and parameters), 8.1.6(b) (define and use procedures and functions), with 8.1.7 (MOD, DIV), 7.8 (identify and correct errors) and 7.9 (write algorithms) used in context

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. Algorithm answers must be in pseudocode; program code scores 0. Marks are for the features listed, not for one exact algorithm. Ignore minor slips in case and spacing. Accept `<-` or `=` for assignment. Do not accept English ("is more than") or maths symbols (≥, ≤) in place of operators. Credit any other valid answer that shows the same understanding.

QUESTION	ANSWER	MARKS	GUIDANCE
1(a) 0478 8.1.6(a)	One mark for each correct row: • run using `CALL`, as a complete statement: Procedure • header states the data type of the value sent back: Function • defined once and used many times: Both	**3**	More than one tick in a row: 0 for that row.
2(a) 0478 8.1.6(b)	• INTEGER	**1**	Accept integer / whole number. Do not accept REAL, number or numeric.
2(b) 0478 8.1.6(b)	• 60	**1**	Working: 3 × 4 = 12 pages; 12 × 5 = 60. Accept 60 cents. Do not accept $60 or 0.6 on its own (the function returns cents).
2(c) 0478 8.1.6(b)	• two function calls with arguments in the correct order: `PrintCost(2, 5)` and `PrintCost(4, 3)` • results added and assigned to `OrderTotal` (without `CALL`) Example: `OrderTotal ← PrintCost(2, 5) + PrintCost(4, 3)`	**2**	(Value 50 + 60 = 110.) Arguments swapped (`PrintCost(5, 2)`) do not match the parameters Pages, Copies: no first mark, second mark can still be awarded. Use of `CALL`: max 1. Do not accept `OrderTotal ← 110` (no function used) or two statements.
3(a) 0478 8.1.6(b) / 8.1.7	One mark for each correct row: • `BoxesNeeded(16)`: 2 • `BoxesNeeded(17)`: 3 • `BoxesNeeded(5)`: 1	**3**	Working: DIV(16, 8) = 2, MOD(16, 8) = 0 so no extra box; DIV(17, 8) = 2, MOD(17, 8) = 1 so 2 + 1 = 3; DIV(5, 8) = 0, MOD(5, 8) = 5 so 0 + 1 = 1.

QUESTION	ANSWER	MARKS	GUIDANCE
3(b) 0478 8.1.6(b)	One mark for each correct output: • 20: Use a trolley • 16: Carry by hand	**2**	Working: `BoxesNeeded(20)` returns 3 and 3 > 2 is TRUE; `BoxesNeeded(16)` returns 2 and 2 > 2 is FALSE. Ignore quotation marks. Do not accept the number of boxes (3 // 2) as the output.
4(a) 0478 8.1.6(b) / 7.8	One mark for each error identified and corrected: • Line 01: `RETURNS REAL // FUNCTION MeanReading(First : INTEGER, Second : INTEGER, Third : INTEGER) RETURNS REAL` • Line 04: `RETURN Mean` • Line 07: `Result ← MeanReading(4, 9, 8)`	**3**	The line number and the correction are both needed for each mark. Line 04: accept `RETURN (First + Second + Third) / 3`; do not accept any line that still uses OUTPUT instead of RETURN. Line 07: the function call must be kept, without `CALL`, and its value assigned to `Result`. Do not accept changing line 02 to INTEGER (the mean may not be a whole number). Do not accept changing line 08 only (e.g. calling the function inside the OUTPUT): the algorithm must store the mean in `Result`.
4(b) 0478 8.1.6(b)	• Mean reading is 7	**1**	Working: (4 + 9 + 8) / 3 = 21 / 3 = 7. Accept 7.0. Ignore quotation marks. Accept 7 // 7.0 on its own.

QUESTION	ANSWER	MARKS	GUIDANCE

5(a)
0478 8.1.6(b) / 7.9
	One mark per bullet point. Max 6.
	• `FUNCTION IsComfortable` with a parameter given the data type REAL ...
	• ... `RETURNS BOOLEAN` in the header and `ENDFUNCTION`
	• correct check of both limits inside the function: `(Temp >= 18.0) AND (Temp <= 24.0)`
	• `RETURN TRUE` when comfortable and `RETURN FALSE` otherwise
	• `INPUT` of the room temperature in the main algorithm
	• function used in an expression (not with `CALL`) with the input value as the argument ...
	• ... `IF` using the returned value to output `"Comfortable"` and `"Adjust heating"` in the correct cases, with `ENDIF`
	Example:
	`FUNCTION IsComfortable(Temp : REAL)`
	`RETURNS BOOLEAN`
	`  IF (Temp >= 18.0) AND (Temp <= 24.0)`
	`  THEN`
	`  RETURN TRUE`
	`  ELSE`
	`  RETURN FALSE`
	`  ENDIF`
	`ENDFUNCTION`
	
	`INPUT RoomTemp`
	`IF IsComfortable(RoomTemp) = TRUE`
	`  THEN`
	`  OUTPUT "Comfortable"`
	`  ELSE`
	`  OUTPUT "Adjust heating"`
	`ENDIF`
		6	Accept `RETURN (Temp >= 18.0) AND (Temp <= 24.0)` for the check and RETURN marks. Accept 18 / 24 for 18.0 / 24.0. Temperatures are real, so `> 17`, `< 25`, `> 18` or `< 24` lose the check mark; each side must be a full comparison. Accept `IF IsComfortable(RoomTemp)` (no `= TRUE`), or assigning the returned value to a variable first. Do not award the RETURN mark for OUTPUT inside the function. A parameter overwritten by an INPUT inside the function does not get the first mark. Do not penalise declaring variables, or the function written after the main algorithm. Program code (e.g. Python) scores 0.

Total: 22 marks