

Cambridge IGCSE™

COMPUTER SCIENCE**0478/23**

Paper 2 Algorithms, Programming and Logic

May/June 2025

MARK SCHEME

Maximum Mark: 75

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the May/June 2025 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

This document consists of **23** printed pages.

PUBLISHED**Generic Marking Principles**

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptions for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Annotations guidance for centres

Examiners use a system of annotations as a shorthand for communicating their marking decisions to one another. Examiners are trained during the standardisation process on how and when to use annotations. The purpose of annotations is to inform the standardisation and monitoring processes and guide the supervising examiners when they are checking the work of examiners within their team. The meaning of annotations and how they are used is specific to each component and is understood by all examiners who mark the component.

We publish annotations in our mark schemes to help centres understand the annotations they may see on copies of scripts. Note that there may not be a direct correlation between the number of annotations on a script and the mark awarded. Similarly, the use of an annotation may not be an indication of the quality of the response.

The annotations listed below were available to examiners marking this component in this series.

Annotations

Annotation	Meaning
	Correct point
	Incorrect point
	Follow through
	Repetition
	Ignore
	Benefit of doubt given
	Content of response too vague
	Not answered question
	Omission
	Section not relevant

Annotation	Meaning
	Section incorrect
Highlighter	Highlights part of the answer or shows structure of complex answers
SEEN	Page or response seen by examiner
A2	AO2 mark
A3	AO3 mark
NE	Not enough
R1	Required item one
R2	Required item two
R3	Required item three
 1	Correct awarding one mark
 2	Correct awarding two marks
 3	Correct awarding three marks
 4	Correct awarding four marks
 5	Correct awarding five marks
 6	Correct awarding six marks
 7	Correct awarding seven marks
 8	Correct awarding eight marks
 9	Correct awarding nine marks

Mark scheme abbreviations

/	separates alternative words / phrases within a marking point
//	separates alternative answers within a marking point
<u>underline</u>	actual word given must be used by candidate (grammatical variants accepted)
max	indicates the maximum number of marks that can be awarded
()	the word / phrase in brackets is not required, but sets the context

Note: No marks are awarded for using brand names of software packages or hardware.

Question	Answer	Marks
1(a)	One mark per mark point MP1 input Weight MP2 correct check for Weight = -1 MP3 correct check for Weight between 16.2 and 17.2 inclusive MP4 correct increment for PassCount MP5 correct increment for RejectCount MP6 output PassCount and RejectCount <pre> graph TD START([START]) --> InitPass[PassCount ← 0] InitPass --> InitReject[RejectCount ← 0] InitReject --> InputWeight[/INPUT Weight/] InputWeight --> IsWeightMinus1{IS Weight = -1?} IsWeightMinus1 -- Yes --> OutputPass[/OUTPUT PassCount/] OutputPass --> OutputReject[/OUTPUT RejectCount/] OutputReject --> Stop([STOP]) IsWeightMinus1 -- NO --> IsWeightRange{IS Weight >= 16.2 AND Weight <= 17.2?} IsWeightRange -- Yes --> IncPass[PassCount ← PassCount + 1] IncPass --> LoopJoin(()) IsWeightRange -- No --> IncReject[RejectCount ← RejectCount + 1] IncReject --> LoopJoin LoopJoin --> InputWeight </pre>	6

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Question	Answer	Marks
1(b)	One mark per mark point, max four MP1 Initialise a new variable at the start of the flowchart to total the biscuit weights. MP2 Near the point where PassCount is incremented/after the yes for the weight decision box, add a new process (box) MP3 ... to add the weight of the current biscuit to the running total weight. MP4 Outside the loop, calculate the average weight as total weight divided by number of biscuits that passed (PassCount) MP5 Output the average weight, outside the loop.	4

Question	Answer	Marks
2	One mark for each correct line, max three Use of arithmetic operator 355 DIV 10 355 / 10 355 MOD 10 5 355 35 35.5	3

Question	Answer	Marks
3(a)	One mark per mark point - Line 02 / DECLARE Index : CHAR should be DECLARE Index : INTEGER - Line 07 / Stop ← FALSE should be Stop ← TRUE - Line 08 / FOR Index ← 1 TO 50 should be FOR Index ← 1 TO 999 // FOR Index ← 1 TO 1000 - 1 - Line 17 / NEXT Stop should be ENDWHILE	4
3(b)(i)	One mark per mark point MP1 Two integer parameters in PROCEDURE line MP2 Correct index assigned to Hold ← Values[Index1] MP3 Array element correctly assigned to new array element (Index2 to Index1) MP4 Value in Hold assigned to correct array element (Index2). For example, <pre>PROCEDURE Swap(Index1 : INTEGER, Index2 : INTEGER) DECLARE Hold : REAL Hold ← Values[Index1] Values[Index1] ← Values[Index2] Values[Index2] ← Hold ENDPROCEDURE</pre>	4

Question	Answer	Marks
3(b)(ii)	One mark per mark point MP1 Correct call command and use of Swap for procedure name MP2 Two parameters referring to the correct indices of array elements to be swapped, as shown in the original algorithm. Index + 1 and Index. For example, CALL Swap (Index + 1, Index)	2
3(c)	One mark per mark point MP1 Global variables can be used throughout the program and its procedures // The memory used by the variables is not recovered until the program terminates. MP2 The variable declared in part 3(b)(i) is a local variable <u>and</u> can only be used in that procedure // The memory used by a local variable is recovered at the end of the procedure.	2

Question	Answer	Marks
4(a)(i)	Range (check)	1
4(a)(ii)	One mark per correct piece of test data, max two One mark per correct reason, max two Abnormal test data: 150 (any non-integer or any value outside the range 10 and 95) Reason: This data is out of range so should be rejected Extreme test data: 10 // 95 Reason: This is the smallest data entry that will be accepted // This is the largest data entry that will be accepted.	4
4(b)(i)	Length (check)	1

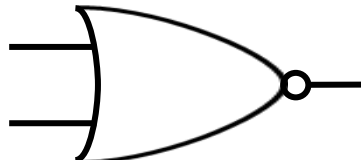
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Question	Answer	Marks
4(b)(ii)	One mark per mark point, max five MP1 Appropriate condition-controlled loop MP2 Password input to a variable MP3 Use of LENGTH function to find password length MP4 Selection statement to check password length is at least 12 MP5 Error message if length incorrect inside loop MP6 Correct loop termination for password of correct length. For example, <pre>// Variable declarations are not required for this question REPEAT INPUT Password IF LENGTH>Password) < 12 THEN OUTPUT "Password too short, please try again" ENDIF UNTIL LENGTH>Password) >= 12</pre>	5

Question	Answer	Marks																											
5(a)	Four marks for all eight data types correct Three marks for six or seven data types correct Two marks for four or five data types correct One mark for two or three data types correct <table> <tr> <th>Field</th><th>Data type</th><th>Description</th></tr> <tr> <td>ID</td><td>text // integer</td><td>unique identifier</td></tr> <tr> <td>Name</td><td>text</td><td>component name</td></tr> <tr> <td>Description</td><td>text</td><td>component description</td></tr> <tr> <td>Price</td><td>real</td><td>selling price of component to 2 decimal places</td></tr> <tr> <td>NumberAvailable</td><td>integer</td><td>number in stock</td></tr> <tr> <td>MinimumLevel</td><td>integer</td><td>level at which the component is reordered</td></tr> <tr> <td>ReOrdered</td><td>Boolean</td><td>whether or not the component has been reordered</td></tr> <tr> <td>DateOrdered</td><td>date/time</td><td>the last date the component was reordered</td></tr> </table>	Field	Data type	Description	ID	text // integer	unique identifier	Name	text	component name	Description	text	component description	Price	real	selling price of component to 2 decimal places	NumberAvailable	integer	number in stock	MinimumLevel	integer	level at which the component is reordered	ReOrdered	Boolean	whether or not the component has been reordered	DateOrdered	date/time	the last date the component was reordered	4
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Question	Answer	Marks
5(b)	One mark per mark point MP1 All correct fields in SELECT in any order MP2 Correct table name in FROM: COMPONENT MP3 Correct field in WHERE: ReOrdered (=) MP4 Correct criterion in WHERE: (=) TRUE Correct code: SELECT ID, Name, DateOrdered FROM COMPONENT WHERE ReOrdered = TRUE ;	4

Question	Answer	Marks																																																																																																																																																																																				
6(a)	One mark per mark point MP1 Correct Word and Letter columns MP2 Correct Index column MP3 Correct Store(1, 3, 4, 6, 8) columns (consonants) MP4 Correct Store(2, 5, 7) columns (vowels) MP5 Correct OUTPUT Column <table><tr><td></td><td></td><td></td><td colspan="8">Store[]</td><td></td></tr><tr><td>Word</td><td>Index</td><td>Letter</td><td>[1]</td><td>[2]</td><td>[3]</td><td>[4]</td><td>[5]</td><td>[6]</td><td>[7]</td><td>[8]</td><td>OUTPUT</td></tr><tr><td>COMPUTER</td><td>1</td><td>C</td><td>C</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td>2</td><td>O</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td>3</td><td>M</td><td></td><td></td><td>M</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td>4</td><td>P</td><td></td><td></td><td></td><td>P</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td>5</td><td>U</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td>6</td><td>T</td><td></td><td></td><td></td><td></td><td></td><td>T</td><td></td><td></td><td></td></tr><tr><td></td><td>7</td><td>E</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td>8</td><td>R</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>R</td><td></td></tr><tr><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>C</td></tr><tr><td></td><td>2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>M</td></tr><tr><td></td><td>4</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>P</td></tr><tr><td></td><td>5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>				Store[]									Word	Index	Letter	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	OUTPUT	COMPUTER	1	C	C										2	O											3	M			M								4	P				P							5	U											6	T						T					7	E											8	R								R			1										C		2												3										M		4										P		5											5
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Question	Answer												Marks															
6(a)		6										T																
		7																										
		8										R																
6(b)	One mark per mark point, max three MP1 Each letter of a word is checked to see if it is A, E, I, O or U / a vowel MP2 Vowels are changed to the null string using a case statement MP3 Each letter or null string is individually stored in an array MP4 All consonants are output.												3															
7(a)	One mark for the logic gate and one mark for the truth table NOR Logic gate symbol:  Truth table: <table><tr><th>A</th><th>B</th><th>Z</th></tr><tr><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>0</td></tr></table>												A	B	Z	0	0	1	0	1	0	1	0	0	1	1	0	2
A	B	Z																										
0	0	1																										
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Question	Answer	Marks
7(b)(i)	One mark per mark point, max two directly from the problem MP1 NOT L AND (M OR S) MP2 OR NOT L AND M AND S Or One mark per mark point, max two with some simplification from the problem MP3 NOT L AND MP4 (M OR S OR (M AND S)) Or One mark per mark point, max two with more simplification from the problem MP5 NOT L AND MP6 (M OR S) Example answers: (A $\Rightarrow$) NOT L AND (M OR S) OR NOT L AND M AND S // (A $\Rightarrow$) NOT L AND (M OR S OR (M AND S)) // (A $\Rightarrow$) NOT L AND (M OR S)	2

Question	Answer	Marks																																				
7(b)(ii)	Four marks for eight correct outputs Three marks for six or seven correct outputs Two marks for four or five correct outputs One mark for two or three correct outputs <table><tr><th>L</th><th>M</th><th>S</th><th>A</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>1</td><td>0</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td></tr></table>	L	M	S	A	0	0	0	0	0	0	1	1	0	1	0	1	0	1	1	1	1	0	0	0	1	0	1	0	1	1	0	0	1	1	1	0	4
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Question	Answer	Marks
8	Marks are available for: • AO2 (maximum 9 marks) • AO3 (maximum 6 marks) Data Structures required with names as given in the scenario: Arrays or lists <u>Video[]</u>, <u>Results[]</u> Requirements (techniques) R1 initialises arrays, displays menu and allows choice, then proceeds based on valid choice, (nested iteration, input, output, selection, validation). R2 enters data and stores into array at first available location. The code allows for additional data to be input, as required. (counting, selection, input, storage, iteration if selected). R3 finds specific data based on user input and outputs results. Appropriate output messages, including if video not found. Program continues until stopped by user. (input, output, linear search, iteration).	15

Question	Answer	Marks
	Example 15-mark answer in pseudocode <pre> //Array and variable declarations not required in responses //Initialisation of Video array FOR Index1 ← 1 TO 10000 FOR Index2 ← 1 TO 4 Video[Index1, Index2] ← "" Next Index2 NEXT Index1 //Display of menu choices REPEAT OUTPUT "Enter 1 to input data for a new video, 2 to search for a video title, or 3 to stop" //Input menu choice with validation of input REPEAT INPUT Answer IF Answer <> 1 AND Answer <> 2 AND Answer <> 3 THEN OUTPUT "You must input 1, 2 or 3, please try again" ENDIF UNTIL Answer = 1 OR Answer = 2 OR Answer = 3 //User chooses to input data for a new video title IF Answer = 1 THEN Store ← 1 //Finding the next available space in the array REPEAT IF Video[Store, 1] <> "" THEN Store ← Store + 1 ENDIF UNTIL Video[Store, 1] = "" //Data entry and storage until user says no more needed REPEAT OUTPUT "Enter the title" INPUT Video[Store, 1] OUTPUT "Enter the format (4K for 4K, BD for Blu-ray, DV for DVD, DG for Digital)" INPUT Video[Store, 2] OUTPUT "Enter the year of release" INPUT Video[Store, 3] </pre>	

Question	Answer	Marks
	<pre> OUTPUT "Enter the storage code" INPUT Video[Store, 4] Store ← Store + 1 OUTPUT "Another video (Y or N)?" INPUT Another UNTIL Another = 'N' OR Another = 'n' ENDIF //User chooses to search for a video title IF Answer = 2 THEN REPEAT //Initialisation of Results array FOR Index1 ← 1 TO 20 FOR Index2 ← 1 TO 4 Results[Index1, Index2] ← "" NEXT Index2 NEXT Index1 //User inputs their search criterion OUTPUT "State the title of the video you want" INPUT Title Search ← 1 Store ← 1 //Searching for the title REPEAT //If found, data copied to Results array IF Video[Search, 1] = Title THEN FOR Index1 ← 1 TO 4 Results[Store, Index1] ← Video[Search, Index1] NEXT Index1 //Search and Store indexes incremented Search ← Search + 1 Store ← Store + 1 ELSE //Search index incremented Search ← Search + 1 ENDIF REPEAT UNTIL ENDIF </pre>	

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Question	Answer	Marks
	<pre> //Search ends when no more data in Video array, //or end of Video array reached. UNTIL Video[Search, 1] = "" OR Search = 10000 //Outputting only results found from Results array IF Results[1, 1] <> "" THEN OUTPUT "The results: " FOR Index1 ← 1 TO Store - 1 FOR Index2 ← 1 TO 4 OUTPUT Results[Index1, Index2] NEXT Index2 NEXT Index1 ELSE //Feedback to user if item not found OUTPUT "Item not found" ENDIF //Another search offered OUTPUT "Another search (Y or N)?" INPUT Another UNTIL Another = 'N' OR Another = 'n' ENDIF UNTIL Answer = 3 </pre>	

Marking Instructions in italics			
AO2: Apply knowledge and understanding of the principles and concepts of computer science to a given context, including the analysis and design of computational or programming problems			
0	1–3	4–6	7–9
No creditable response.	At least one programming technique has been used. Any use of selection, iteration, counting, totalling, input and output.	Some programming techniques used are appropriate to the problem. More than one technique seen applied to the scenario, check the list of techniques needed.	The range of programming techniques used is appropriate to the problem. All criteria stated for the scenario have been covered by the use of appropriate programming techniques, check the list of techniques needed.
	Some data has been stored but not appropriately. Any use of variables or arrays or other language dependent data structures e.g. Python lists.	Some of the data structures chosen are appropriate and store some of the data required. More than one data structure used to store data required by the scenario.	The data structures chosen are appropriate and store all the data required. The data structures used store all the data required by the scenario.

Marking Instructions in italics			
AO3: Provide solutions to problems by: evaluating computer systems making reasoned judgements presenting conclusions			
0	1–2	3–4	5–6
No creditable response.	Program seen without relevant comments.	Program seen with some relevant comment(s).	The program has been fully commented
	Some identifier names used are appropriate. Some of the data structures used have meaningful names.	The majority of identifiers used are appropriately named. Most of the data structures used have meaningful names.	Suitable identifiers with names meaningful to their purpose have been used throughout. All of the data structures used have meaningful names.
	The solution is illogical.	The solution contains parts that may be illogical.	The program is in a logical order.
	The solution is inaccurate in many places. Solution contains few lines of code with errors that attempt to perform a task given in the scenario.	The solution contains parts that are inaccurate. Solution contains lines of code with some errors that logically perform tasks given in the scenario. Ignore minor syntax errors.	The solution is accurate. Solution logically performs all the tasks given in the scenario. Ignore minor syntax errors.
	The solution attempts at least one of the requirements. Solution contains lines of code that attempt at least one task given in the scenario.	The solution attempts to meet most of the requirements. Solution contains lines of code that attempts most tasks given in the scenario.	The solution meets all the requirements given in the question. Solution performs all the tasks given in the scenario.