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CAMBRIDGE
International Education

Cambridge International AS & A Level

COMPUTER SCIENCE **9618/31**

Paper 3 Advanced Theory **October/November 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 October/November 2025 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

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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.

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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.

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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 standard isation 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
	Incorrect
	To indicate where a key word/phrase/code is missing.
	Not relevant or used to separate parts of an answer.
	Indicates a part of the answer that is incorrect.
Highlighter	To draw attention to a particular aspect or to indicate where parts of an answer have been combined.
	Too vague.
	Repetition
	No examples or not enough.

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Annotation	Meaning
BOD	Benefit of Doubt.
NAQ	Not Answered Question.
SEEN	Indicates that work or a page has been seen including blank answer spaces and blank pages.
FT	Follow through.
I	Ignore

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Question	Answer	Marks	Guidance
1(a)(i)	`DECLARE Member1 : ClubMember`	**1**	

1(a)(ii)	**One** mark for each correct answer
	
	Example answer
	`Member1.Code ← 984632`
	`Member1.FeesPaid ← TRUE`
		2	

1(b)(i)	**One** mark per mark point (**Max 2**) MP1 `TYPE Activity=` MP2 `(Badminton, Football, Golf, Snooker, Swimming, Tennis)` Example answer `TYPE Activity = (Badminton, Football, Golf, Snooker, Swimming, Tennis)`	**2**	
1(b)(ii)	`DECLARE Choice : Activity`	**1**	

Question	Answer	Marks	Guidance
2(a)	**One** mark per mark point (**Max 2**) MP1 Correct mantissa MP2 Correct exponent **Mantissa** 0 1 1 1 0 1 0 1 1 0 1 0 **Exponent** 1 0 0 1	**2**	

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Question	Answer	Marks	Guidance
2(b)	**One** mark per mark point (**Max 4**) MP1 correct **method** to find the binary number MP2 additional working towards binary number MP3 correct **use** of exponent MP4 correct answer in the space provided **Two** from: e.g. 76.1875 = 64+8+4+0.125+0.0625 (0)1001100.0011 –76.1875 = –128+32+16+2+1+0.5+0.25+0.0625 10110011.11 01 **One** mark movement of binary point by 7 places // 1.011001111 01 x 2^7 **One** mark **Mantissa**: 1 0 1 1 0 0 1 1 1 1 0 1 **Exponent**: 0 1 1 1	**4**	

Question	Answer	Marks	Guidance
3(a)	**One** mark per mark point (**Max 2**) MP1 Protocols set a standard for communication // Protocols establish a standard set of rules for communication MP2 Protocols enable compatibility between devices from different manufacturers/platforms MP3 Two devices wouldn't be able to communicate/send messages to each other if they were using different protocols	**2**	

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Question	Answer	Marks	Guidance
3(b)	**One** mark for a protocol and **one** mark for a description (**Max 4**) Example answers: SMTP [1] a protocol used to send emails **between mail servers** // a protocol used to send emails **from a computer to a mail server** [1] IMAP [1] allows users to access/read their emails **from any device without removing** the message from the mail server // **synchronises** emails **on any device** [1]	**4**	
3(c)	**Two** marks for each description mark as 2 x 2 (**Max 4**) Example answers: Packets checked at receiving end / on arrival [1] … if packets arrive damaged or don't arrive at all, a re-send request is sent [1] Packets routed through different paths / sent individually [1] … if a route is blocked, the packet is sent through a different route to ensure it arrives [1] If the packet's hop count is exceeded [1] … the packet will be retired, which can generate a re-send request [1]	**4**	

Question	Answer	Marks	Guidance
4(a)	**One** mark per scheduling routine (**Max 2**) from: • Round robin • Shortest job first • First come first served • Shortest remaining time	**2**	

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Question	Answer	Marks	Guidance
4(b)	**One** mark for identification and one mark for a description (**Max 4**) **Two** from: Provision of a User Interface // Provision of a Graphical User Interface [1] Allows the user to interact with the computer in a more intuitive way // Icons and menus are used to control devices by simply 'pointing and clicking' [1] Use of device drivers [1] Makes it easier to control peripherals such as printers within the operating system of the computer rather than on the separate device itself [1] Device mapping [1] Different devices (physical and virtual) are easy to identify on the network, check their status, or use [1] The user interacts only with the Application / top layer (of the TCP/IP protocol suite) [1] leaving the lower layers and their complexities hidden from the user [1]	**4**	

Question	Answer	Marks	Guidance
5(a)	**Two** from**:** • Name of certificate holder // Subject • Serial number • Version number • Expiration date // Start date // Validity (not before/not after) • Certificate holder's public key // Subject public key • Subject digital signature • Certificate Issuer // Digital signature of CA	**2**	

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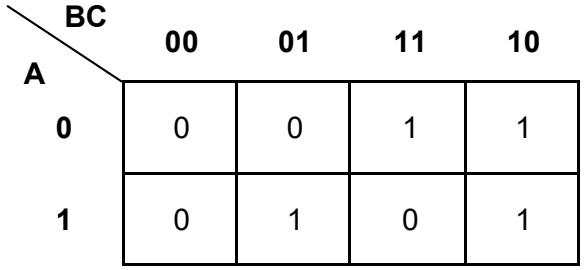
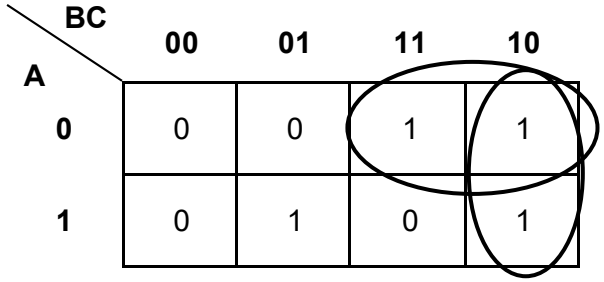
Question	Answer	Marks	Guidance
5(b)	**One** mark per mark point (**Max 3**) MP1 A digital certificate provides a public key MP2 … which validates the **private key** used to create the digital signature MP3 It makes a digital signature virtually impossible to spoof // Provides evidence of signer identity that the document was not altered and the signatures are valid MP4 Non repudiation.	**3**	

Question	Answer	Marks	Guidance
6(a)	**One** mark for working, (all four columns P, Q, R and S) **One** mark for first four rows of column Z **One** mark for second four rows of column Z	**3**	

			Working space				
A	**B**	**C**	**P**	**Q**	**R**	**S**	**Z**
0	0	0	1	1	1	1	0
0	0	1	1	0	1	0	0
0	1	0	1	1	1	1	1
0	1	1	1	0	1	1	1
1	0	0	0	1	1	1	0
1	0	1	0	0	0	1	0
1	1	0	0	1	1	1	1
1	1	1	0	0	1	1	1

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Question	Answer	Marks	Guidance
6(b)(i)	**Two** marks if no errors present **One** mark if only one error present 	**2**	
6(b)(ii)	**One** mark for each correct loop **(Max 2)** 	**2**	
6(b)(iii)	**One** mark for each mark point (**Max 2**) • One correct Boolean term with a + / OR sign • All Boolean terms and operators correct and no other terms present $\bar{A}.B + B.\bar{C} + A.\bar{B}.C$	**2**	

Question	Answer	Marks	Guidance
7(a)	**One** from: • A* algorithm • Dijkstra's algorithm	**1**	

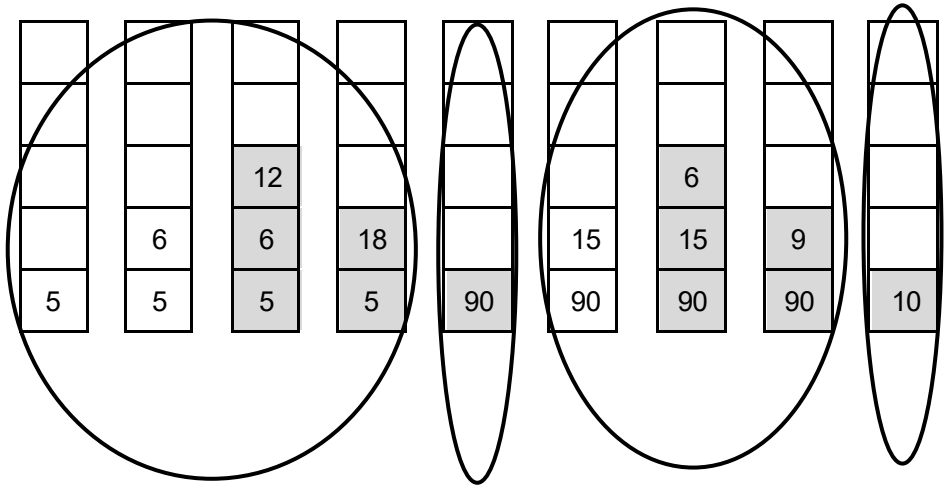
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Question	Answer	Marks	Guidance
7(b)	**One** mark for each mark point (**Max 5**) MP1 Deep learning is a branch of machine learning MP2 It makes use of artificial neural networks MP3 … to work in a similar manner to the human/biological brain // … neural networks can be trained to process data MP4 It is a structure consisting of many **interconnected** layers MP5 … input, hidden and output // the input layer feeds the first hidden layer, the last hidden layer feeds the output MP6 … gradually breaking down and analysing the data to find (hidden) patterns MP7 Deep leaning's feature extraction/learning involves how to detect features/categories from data MP8 … and can involve different types of supervision MP9 It works well with large data sets MP10 Deep learning uses back propagation of errors to adjust parameters/weightings to refine its results / improve its accuracy.	**5**	

Question	Answer	Marks	Guidance
8(a)	**One** mark per mark point (**Max 2**) MP1 To convert the high-level source code / program into a sequence of tokens MP2 … that can be sent to the parser for syntax analysis MP3 To create a symbol table MP4 To remove the unnecessary white space and comments from the code	**2**	
8(b)	**One** mark `2 6 -` **One** mark `13 7 + * 5 /` Complete answer `2 6 - 13 7 + * 5 /`	**2**	

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Question	Answer	Marks	Guidance
8(c)	**One** mark per ring (**Max 4**) 	**4**	

Question	Answer	Marks	Guidance

9(a)(i)	**One** mark for each correctly completed line (**Max 5**)
	`FUNCTION Pop() RETURNS STRING`
	`  DECLARE DataItem : STRING`
	`  DataItem ← ""`
	`  IF Top > -1 // Top >= Base THEN`
	`  DataItem ← StackArray[Top]`
	`  Top ← Top - 1`
	`  ELSE`
	`  DataItem ← "You cannot remove data; the stack is empty"`
	`  ENDIF`
	`  RETURN DataItem // StackArray[Top + 1]`
	`ENDFUNCTION`
		5	

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Question	Answer	Marks	Guidance
9(a)(ii)	`OUTPUT "The data removed from the stack is ", Pop()`	**1**	
9(b)	**One** mark per mark point (**Max 3**) MP1 A recursive algorithm must call itself / have a general case MP2 It must have a base case / have a stopping condition MP3 It must change its state and move towards the base case	**3**	

Question	Answer	Marks	Guidance
10	**One** mark per mark point (**Max 2**) MP1 Exception handling is a process that responds to unwanted / unexpected events when a program runs MP2 … to prevent the program / computer from stopping unexpectedly **One** mark for example (**Max 1**) MP3 Programming errors MP4 User errors MP5 Hardware failure // losing connection to a device such as a printer	**3**	

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>11(a)</td><td>
One mark per mark point (Max 6)
MP1 <code>LDM #100</code> seen
MP2 Correct use of <code>STO</code> with labelled address (constant or answer)
MP3 Correct use of <code>LDD 632</code>
MP4 Correct use of <code>SUB</code> with labelled address (constant)
<table>
<tr><th>Opcode</th><th>Operand</th></tr>
<tr><td>LDM</td><td>#100</td></tr>
<tr><td>STO</td><td>Constant</td></tr>
<tr><td>LDD</td><td>632</td></tr>
<tr><td>SUB</td><td>Constant</td></tr>
<tr><td>STO</td><td>Answer</td></tr>
</table>
MP5 Storing <code>100</code> at a labelled address away from the code
MP6 Labelling both addresses away from the code.
<table>
<tr><th>Label</th><th>Contents</th></tr>
<tr><td>Constant:</td><td>100</td></tr>
<tr><td>Answer:</td><td></td></tr>
</table>
</td><td>6</td><td></td></tr>
<tr><td>11(b)</td><td>–55</td><td>1</td><td></td></tr>
</table>

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