CAMBRIDGE
International Education

Cambridge IGCSE™

COMPUTER SCIENCE **0478/12**

Paper 1 Theory **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.

© Cambridge University Press & Assessment 2025

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.

© Cambridge University Press & Assessment 2025

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.

© Cambridge University Press & Assessment 2025

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 point
	Incorrect point
	Unclear response
FT	Follow through
REP	Repetition
I	Ignore
BOD	Benefit of doubt given
NBOD	Benefit of doubt not given
TV	Content of response too vague
NAQ	Not answered question

© Cambridge University Press & Assessment 2025

Annotation	Meaning
	Omission
	Section not relevant
	Section incorrect
Highlighter	Information copied from the text
	Page or response seen by examiner

Annotation guidance:

/ separates alternative words or phrases within a marking point
// separates alternative answers within a marking point
Underline 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.

© Cambridge University Press & Assessment 2025

Question	Answer	Marks
1(a)	Any **one** from: • ROM • Cache	**1**
1(b)	Any **one** from: • It is volatile storage // Data is lost when the power is turned off. • It needs to be **regularly** replaced by other data // The data **regularly** changes // Data needs to be **constantly** updated	**1**
1(c)	• 10011 • 11100110	**2**
1(d)	• 0011 0101 • 1000 1010 1101	**2**
1(e)	**One** mark for each correct nibble (MAX 2) **One** mark for a correct method of working e.g. showing carries. 1 1 0 1 1 0 0 1 0 1 + 0 1 1 1 0 0 0 0 **1 1 0 1 0 1 0 1**	**3**
1(f)	Any **two** from: • The **result** is greater than 255 // The **result** is too large. • Cannot be stored in **8 bits** // Cannot be stored in the number of bits available for the **register**	**2**
1(g)	**One** mark for a correct working method e.g. flip and add **One** mark for correct answer 11101010	**2**

© Cambridge University Press & Assessment 2025

Question	Answer	Marks
2(a)	A	**1**
2(b)(i)	3	**1**
2(b)(ii)	2	**1**
2(c)(i)	32 bits are used to represent **each/a/one** colour in the image // 2^{32} (approx. 4.3 billion) different colours can be used/are available for the image	**1**
2(c)(ii)	Any **two** from: • The size of the image **file** increases. • … as the number of bits used to represent/store a colour has increased	**2**
2(d)	Any **three** from: • The size of the file is reduced without **permanently** removing any data. • A compression algorithm is used. • … such as Run length encoding/RLE. • Repeating **pixels** are grouped/identified … // **Patterns** are identified … • … and stored with the number of times they are repeated. • … and indexed	**3**

© Cambridge University Press & Assessment 2025

Question	Answer	Marks
3(a)	Any **two** from: • It is easier to debug. • Less likely to make errors. • The program is machine independent/portable	**2**
3(b)(i)	**One** mark for each correct term in the correct place. • whole code • executing • all • line by line • error A compiler translates the **whole code** at once before **executing** it. A compiler produces an error report that displays **all** errors. An interpreter translates and executes the code **line by line**. An interpreter stops execution when an **error** is found and continues once it is corrected.	**5**

© Cambridge University Press & Assessment 2025

Question	Answer	Marks
3(b)(ii)	**One** mark for each correct function. **One** mark for each correct matching role description. Examples: • Code editor • Allows the programmer to write/change the program. • Run-time environment • Allows the user to run the code and see the output. • Error **diagnostics** • Features that can be used to find errors in the code • Auto-completion • A programmer starts to type a command word, and the IDE suggests **option** for completing it. • Auto-correction • If a programmer **misspells** a command word it is changed to the correct spelling • Prettyprint • The **command words**/**identifiers** are given different colours	**4**
3(c)(i)	Any **one** from: • Inkjet • Laser	**1**

© Cambridge University Press & Assessment 2025

Question	Answer	Marks
3(c)(ii)	**One** mark from: • Serial • Parallel **One** mark from: • Half-duplex • Full-duplex • Simplex Any **four** from (for descriptions matching transmission types given): **serial** • Serial would send bits in order // serial uses only one wire. • … so won't be skewed // less likely to have errors • Serial transmission speed would be adequate. **parallel** • Parallel would transmit data faster. • … as multiple bits are sent at the **same time** // … as multiple wires are used. • For parallel, chance of **skewing/errors** would be low as **short distance** transmission only required. **half/full duplex** • To allow data to be sent in both directions • … so any interrupts/notifications for errors can be sent back to the computer. **simplex** • Data **only** needs to be sent one direction // Data transmission doesn't need to be two-way. • … as the printer may not need to send errors back to the computer	**6**

© Cambridge University Press & Assessment 2025

Question	Answer	Marks
3(c)(iii)	• A parity bit is added to each **byte.** • … to make the number of 1s/0s even // that will be 1 if the number of 1s/0s is odd // that will be 0 if the number of 1s/0s is even. • The number of 1s/0s in each byte is counted **after transmission.** • If any bytes have an odd number of 1s/0s an error is detected	**4**

Question	Answer	Marks
4(a)	**One** mark for each correct component or description	**6**

Component	Description
Control unit // CU	It sends signals to all the components in the CPU to manage the flow of data through the CPU.
Arithmetic and logic unit // ALU	It carries out all the arithmetic and logic operations in the CPU.
Cache	**It stores frequently used data/instructions**
Program counter (PC)	**It stores the address of the next instruction to be fetched**
Clock	It controls the number of fetch-decode-execute (FDE) cycles that are performed per second.
Memory data register // MDR	It stores data immediately before it is transmitted to RAM and immediately after it is received from RAM.

© Cambridge University Press & Assessment 2025

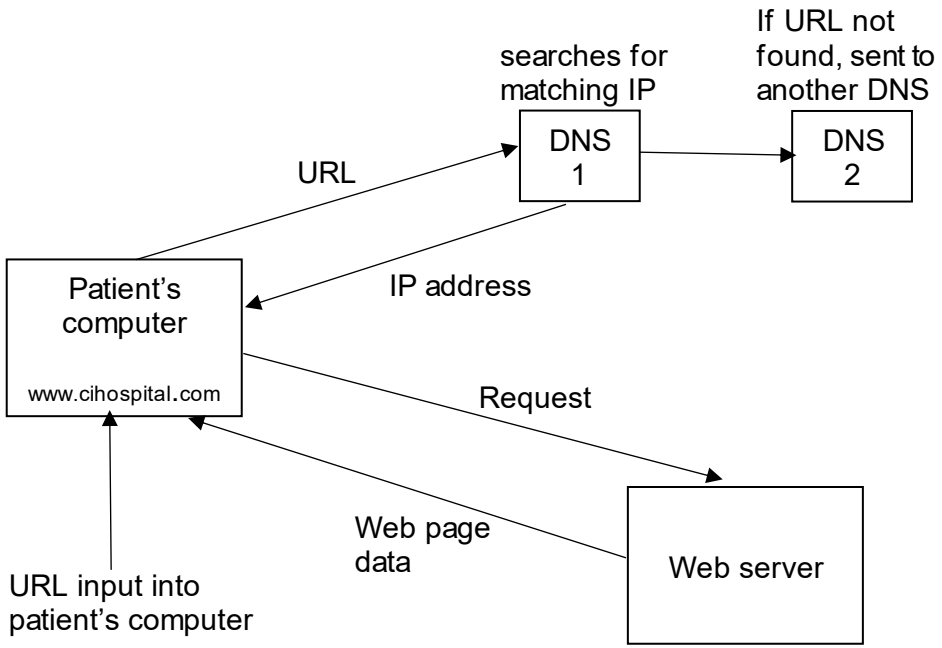
Question	Answer	Marks
4(b)	**Two** from: • An embedded system is designed to perform a dedicated/limited/single function // computer can be used to perform many different functions. • An embedded system has **dedicated** hardware // computer has hardware that can be used by other devices. • An embedded system has software that is not easily updated/reprogrammed // software can easily be updated/reprogrammed on the computer. • An embedded system has a microprocessor // A computer has a CPU. • An embedded system can be part of/built into a larger device // A computer is normally standalone	**2**

Question	Answer	Marks
5(a)	**Three** from: • The inference engine is used … • … to **decide** which questions to ask the user … • … based on the **previous** data input. • Symptoms input are located in/compared to knowledge base. • … then applies the rule base to the knowledge base (to decide the diagnosis)	**3**
5(b)(i)	Any **two** from: Examples: • Sensors • Microprocessors • Actuators	**2**

© Cambridge University Press & Assessment 2025

Question	Answer	Marks
5(b)(ii)	Any **four** from: Examples: • a doctor doesn't need to **travel** to the hospital to do the surgery. • … so it can be done by any specialist/doctor in the world. • … so it can be done immediately without needing to wait for travel time // reduces the waiting time for the patient. • … so the doctor may be better at the surgery as they won't be tired from travel. • … so travel costs are saved. • Surgery with robots enhances precision/accuracy. • … so a smaller incision can be made. • … so the recovery time may be shorter. • … as the components used to enter the body can be much smaller than a human hand. • … so the surgery is safer/ more hygienic // by example e.g. can stop the doctor needing to be near an infectious patient. • The surgery may have a higher rate of success	**4**
5(b)(iii)	**Two** from (one for a point and one for the matching expansion): Examples: • The internet connection could be lost/delayed … • … so the surgery may not be able to continue. • The robot will be expensive to buy/maintain … • … this money could have been spent on other causes. • The robot could be hacked …. • … and endanger the patient's life. • Data could be corrupted in transmission … • … changing the nature of the instruction for the robot. • The robot's hardware could malfunction … • … so the surgery cannot continue	**2**

© Cambridge University Press & Assessment 2025

Question	Answer	Marks
5(c)(i)	**One** mark for each correct part of the diagram. The diagram: • Web browser identified as software used to **send** URL/requests or **receives** IP address/web page data • URL/domain sent to DNS • DNS **searches** for **matching** IP address • If not found sent to another DNS • IP address sent from DNS to patient's computer • Request sent from patient's computer to **web server** (for web page) • Web page/HTML data sent from web server to patient's computer  	**6**

Question	Answer	Marks
5(c)(ii)	Any **six** from: • Encrypted connection established … • … using asymmetric encryption • … to make any data sent meaningless • The **web browser** asks the **web server** to identify itself. • … by sending its digital certificate. • The digital certificate is authenticated/validated by the **web browser**. • If the certificate is authenticated/valid, the connection is secure/the transaction can begin. • If the certificate is not authenticated/invalid, the connection is not secure/the transaction is cancelled/rejected/user is notified	**6**

© Cambridge University Press & Assessment 2025