



# **Cambridge International AS & A Level**

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**INFORMATION TECHNOLOGY**

**9626/12**

Paper 1 Theory

**October/November 2023**

**MARK SCHEME**

Maximum Mark: 70

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**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 2023 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

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This document consists of **10** printed pages.

**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 descriptors 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.

Question	Answer	Marks
1	<p><b>Max five from:</b></p> <ul style="list-style-type: none"> <li>Verification (only) checks the data is <b>copied correctly</b> (1)</li> <li>Validation checks/ensures that data <b>conforms to a set of rules/is sensible/reasonable</b> (1)</li> <li>(Although copied correctly) the original data may have errors in it which could be picked up using validation (checks) (1)</li> <li>(Although fitting the rules) the copied data may have been copied incorrectly, which would have been picked up by using verification (checks) (1)</li> <li>Both checks are needed to cover mistakes that the other would not identify (1)</li> </ul> <p><b>Max four from:</b></p> <ul style="list-style-type: none"> <li>(In record 1) 13/06/2019 has been copied incorrectly (as 13/06/2020) this would have been found using verification//example of verification (1)</li> <li>Validation checks would not have picked up the error <b>in record 1/identified error</b> as it is in the correct format and length (1)</li> <li>(In record 3) <b>Validation/length check</b> would have checked that the ID number was of the correct length//identified that the ID number had too many digits/was too long (1)</li> <li>(In record 4) <b>Validation/a range check</b> on the Rate_of_pay field would have accepted only values <b>between 15 and 50</b> (1)</li> <li>(In record 4) <b>Validation/Limit check</b> accepting only values <b>equal to and below 50</b> would have identified the error in record 4 (1)</li> <li>In record(s) 3/4 the data has been copied correctly so verification would not have picked up this error (1)</li> <li>Format check can be used on date joined field to check that it is dd/mm/yyyy (1)</li> </ul>	6

Question	Answer	Marks
2(a)	<p><b>MAX two from:</b></p> <ul style="list-style-type: none"> <li>A mainframe computer can have hundreds of (processor) cores (1)</li> <li>All cores share//has one Operating System (1)</li> <li>Mainframes use parallel processing (1)</li> <li>Can process a large number of small tasks <b>at the same time</b> (1)</li> </ul> <p><b>MAX two from:</b></p> <ul style="list-style-type: none"> <li>Supercomputers can have <b>more than 100 000</b> (processing) cores (1)</li> <li>Supercomputers use <b>massively parallel processing</b> (1)</li> <li>Each/Processor core(s) each has their own operating system (1)</li> <li>Supercomputers use more than one GPU (1)</li> </ul>	3

Question	Answer	Marks
2(b)	<p><b>Four</b> from:</p> <ul style="list-style-type: none"> <li>• Many (types of) variables are collected (1)</li> <li>• Complex <b>calculations</b> carried out (1)</li> <li>• Identifies TWO items measured by sensors <b>for this purpose</b> (1)</li> <li>• Large quantity of data is collected/handled/processed (for each variable) (1)</li> <li>• Shows the (historical) trends of different variables <b>over several decades/long</b> period of time (1)</li> <li>• (Complex) mathematical formulae are used to describe how the different parts of a climate system interact (1)</li> <li>• Computer <b>models</b> are used to describe <b>how the climate will change</b> (1)</li> <li>• Supercomputer <b>models</b> will include several (scientific) rules (1)</li> <li>• <b>Model</b> include so many uncertainties//are so complex that there is no known exact solution//answer is a “best guess” (1)</li> </ul>	4

Question	Answer	Marks
3(a)	<p><b>Two</b> from:</p> <ul style="list-style-type: none"> <li>• User <b>types</b> in text/instructions//command must be <b>typed in</b>//is a text based interface (1)</li> <li>• Prompt appears in screen (after which command is typed in) (1)</li> <li>• Requires fewer resources than GUI (1)</li> <li>• Requires a <b>keyboard and screen</b> (1)</li> </ul>	2
3(b)	<p><b>Two</b> from:</p> <ul style="list-style-type: none"> <li>• User <b>moves</b> body/identified body part (to communicate with computer//give instructions) (1)</li> <li>• Requires a camera/sensors (to detect the movements) (1)</li> <li>• Computer matches body movements it has stored (in a database) (1)</li> <li>• (Stored) body movements relate <b>to</b> (specific) <b>commands</b> (1)</li> <li>• One mark for any identified body movement (1) e.g. finger pointing, head nodding, hand waving/raising, eyes rolling/blinking</li> </ul>	2
3(c)	<p><b>Two</b> from:</p> <ul style="list-style-type: none"> <li>• User uses their <b>voice/spoken word</b> (to communicate with the computer/give instructions) (1)</li> <li>• Speech recognition software is used to recognise speech (1)</li> <li>• Computer matches speech it has stored (in a database) (1)</li> <li>• Speech is converted into commands//example of command <b>and</b> action that follows (1)</li> <li>• Requires a microphone (1)</li> </ul>	2

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
4(a)	<p><b>Two</b> from:</p> <ul style="list-style-type: none"> <li>• Touch sensor is used for measuring fluid levels (1<sup>st</sup>)</li> <li>• such as the cooling water/coolant level of the reactor (1)</li> <li>• A capacitive touch sensor measures the capacitance between two conductors separated by an insulating plate (1<sup>st</sup>)</li> <li>• One of the conductors will be the fluid (whose level is being measured) (1)</li> <li>• Detects when the fluid is touching <b>the conductor</b> (1)</li> </ul>	2
4(b)	<p><b>Max Two</b> from</p> <ul style="list-style-type: none"> <li>• Used to detect (presence/movement of) <b>humans/living beings</b> (1)</li> <li>• Human bodies emit heat/thermal energy (1)</li> <li>• By detecting heat/radiation (from heat) (1)</li> </ul> <p><b>OR</b></p> <p><b>Max Two</b> from</p> <ul style="list-style-type: none"> <li>• Used to detect <u>movement</u> (1)</li> <li>• (Infrared) beams can be beamed across (e.g.) the entrance to the room (1)</li> <li>• The infrared sensor detects the beam/detects if it is broken (1)</li> </ul>	2

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
5	<p><b>Five</b> from:</p> <ul style="list-style-type: none"> <li>• Questionnaire needs to be written/produced/tested (1)</li> <li>• The Electoral Register is a single document//already gathered//immediately available (1)</li> <li>• Electoral Register data is already <b>collated/processed</b>(1)</li> <li>• Data from questionnaires may take <u>time to collate/process</u> (1)</li> <li>• May take <b>too long to distribute</b> questionnaires (1)</li> <li>• She may not have the <b>time/resources</b> available to send questionnaire to everybody/so many people (Award concept of saving time/resources if answer states how time/resources is saved) (1)</li> <li>• She will only need to make one trip to the council office (1)</li> <li>• It may be cheaper to make one trip to the council office rather than pay transport costs to the various parts of town (1)</li> <li>• Electoral Register only lists family members older than voting age//who are allowed to vote/does not include children (1)</li> <li>• Electoral register only holds limited information: name, address, age, gender (two of) (1)</li> <li>• Questionnaires would <b>gather</b> information about the whole family (including younger children) (1)</li> <li>• Questionnaires can ask specific/qualitative/open ended questions (1)</li> <li>• If using questionnaires, need to hire (e.g.) <b>data entry clerks</b> (which would increase costs) (1)</li> </ul>	5

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
6(a)	<p><b>Four</b> from:</p> <p>A general statement of impact:</p> <ul style="list-style-type: none"> <li>• Inability to find information due to inability to access search engines (or other example of cause. Example must be more than “cannot access the web”) (1)</li> <li>• Tasks take longer to complete, which wastes time (1)</li> </ul> <p>Up to four marks for four effects and explanations.</p> <p>Areas include:</p> <p><b>Reduced health care, e.g.</b></p> <ul style="list-style-type: none"> <li>• Inability to get onto a waiting list as cannot access doctor’s website (1)</li> <li>• Not aware of imminent health risks as do not have access to a national news service (1)</li> </ul> <p><b>Reduced ability to work remotely, e.g.</b></p> <ul style="list-style-type: none"> <li>• Unable to have face-to-face communication over the web, and so cannot work remotely (1)</li> </ul> <p><b>Impact on education, e.g.</b></p> <ul style="list-style-type: none"> <li>• Cannot access online learning resources, and so quality of education is lower than could be (1)</li> <li>• Unable to do wider research and so will lack wider understanding of the topic (1)</li> </ul> <p><b>Impact on purchasing, e.g.</b></p> <ul style="list-style-type: none"> <li>• Inability to compare prices of products as cannot access search engines (1)</li> <li>• Inability to check on availability of products as can not access search engines (1)</li> </ul> <p><b>Other areas include, but are not limited to:</b></p> <ul style="list-style-type: none"> <li>• Impact of limited access to online facilities, banking</li> <li>• Impact of limited access to communication</li> <li>• Impact of limited access to mental health</li> <li>• Impact of limited access to online entertainment</li> </ul>	4
6(b)	<p><b>Three</b> from:</p> <ul style="list-style-type: none"> <li>• Build/improve access to the internet/faster broadband (in rural areas) (1)</li> <li>• (Governments/industry can) <b>provide/improve</b> the needed/broadband infrastructure (for fast broadband in rural areas) (1)</li> <li>• Government provides incentives/subsidise to industry to build infrastructure (1)</li> <li>• Government investigates alternative means of distribution (1)</li> <li>• Create cyber/internet cafes (in rural areas) (1)</li> <li>• Deliver access <b>using satellite technology</b> (1)</li> </ul>	3

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
7	<p><b>Five</b> from:</p> <ul style="list-style-type: none"> <li>• She doesn't have to spend time <b>responding to the prompt/typing in the pass mark</b>, (1st)</li> <li>• which Louisa would have to with a dynamic parameter query (1)</li> <li>• because the pass mark is hard coded (1)</li> <li>• <b>The pass mark is always the same/fixed so there is no need</b> for a dynamic parameter query//to type in the (same) number (1)</li> <li>• Louisa would need greater technical knowledge to <b>set up</b> a dynamic parameter query (rather than a static parameter query) (1)</li> <li>• It would have taken Louisa longer <b>to set up</b> a dynamic parameter query (1)</li> <li>• Louisa would have been more likely to have made mistakes <b>setting up</b> a dynamic parameter query (1)</li> <li>• There is an increased chance of entering the <b>wrong number</b> as the pass mark, as she must enter it <b>every time</b> (1)</li> </ul>	5

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
8	<p><b>Eight</b> from:</p> <ul style="list-style-type: none"> <li>• Files created in one software package are sometimes difficult to use/open in other software (1st)</li> <li>• particularly if the packages are incompatible (1)</li> <li>• Generic file formats are compatible with different software packages (1)</li> <li>• When transferring a file to <b>a different computer/device</b> it might not load properly (1st)</li> <li>• since generic file formats are needed to enable different operating systems to read the file/because the particular file format will not operate on that OS (1)</li> <li>• Two marks plus extensions for two examples of the use of generic file types (for a total of 4 marks).</li> </ul> <p>e.g.</p> <ul style="list-style-type: none"> <li>• Word processing files should be saved as a .txt file type (1st)</li> <li>• so that database software can understand it (1)</li> <li>• Database files should be saved/exported as a .csv/.txt/.rtf file type (1<sup>st</sup>)</li> <li>• so that word processing software can understand it (1)</li> </ul> <p><b>Max 6 marks for just bullet points</b></p>	8

Question	Answer	Marks
9	<p><b>Max Eight:</b></p> <pre> count ← 0 smallest ← 1000 <b>largest</b> ← 0 WHILE count &lt; 10     INPUT base, height     CALL (must NOT have arrow, or colon) (1) parallelogram     (<b>base, height</b>) (may award as FT if error in CALL or in     wrong place)         IF area &lt; smallest             THEN                 <b>smallest</b> ← area             ELSE                 (appears here even if the THEN statement is not                 completed/is wrong)                     IF area &gt; largest                         THEN                             (appears here (IF test may be wrong))                                 largest ← area                             ENDIF                     IF and ENDIF indented correctly                         ENDIF                         count ← count + 1 (if present)                         count ← count + 1 (if within while statement but not                         if within IF statement (unless in both) (allow FT for                         structure from previous mark point))                     ENDWHILE                     PRINT/OUTPUT smallest (1) largest                     (Do not accept OUTPUT smallest and largest)                     ANY PRINT/OUTPUT statement as final statement </pre>	8

Question	Answer	Marks
10(a)	<p><b>Two</b> marks for an explained reason:</p> <p>e.g.</p> <ul style="list-style-type: none"> <li>• To remove unwanted/unnecessary parts at start/end (1) to make it less boring (1)</li> <li>• To shorten the length (1) because it is too long//to reduce file size (1)</li> <li>• To bring video and audio into synch (1) so that video looks more natural (1)</li> <li>• To make it more exciting (1) by removing boring introduction (1)</li> </ul>	2

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
10(b)	<p><b>Two</b> marks for an explained reason:</p> <p>e.g.</p> <ul style="list-style-type: none"> <li>• What has been said is shown on the screen//can be read (1) so that nothing is missed (1)</li> <li>• Viewers of a video may have hearing difficulties (1) so subtitles help them understand what is being said (1)</li> <li>• There may be a lot of background noise where the video is being watched (1) so that nothing is missed (1)</li> <li>• Video may be being viewed in a quiet area (1) where having the audio on would bother other people (1)</li> <li>• People watching the video might speak a different language//accent//be muttering (1) so subtitles in other languages can be provided (accept subtitles could be presented in the same language, so words can be read) (1)</li> </ul>	<b>2</b>
10(c)	<p><b>Two</b> marks for an explained reason:</p> <p>e.g.</p> <ul style="list-style-type: none"> <li>• It can invoke an emotional response from the viewer (1) to increase engagement/enjoyment (1)</li> <li>• To grab audience attention (1) by making the video more interesting (1)</li> <li>• A narrator can provide further content (1) to drive home the emotion/mood//can clarify a video (1)</li> <li>• To add sound effect (1) can heighten the impact of (e.g.) explosions/speeding cars (1) to add authenticity/context/reality (1)</li> <li>• To add a clear soundtrack (1) without background noise (1)</li> </ul>	<b>2</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
11	<p><b>Eight</b> from:</p> <p>One mark for a description of encryption (e.g. data scrambled/converted to ciphertext) (1)</p> <p><b>Benefits MAX 6</b></p> <ul style="list-style-type: none"> <li>• When data is sent across the internet in an encrypted form it cannot be understood/has no meaning/makes no sense (1<sup>st</sup>)</li> <li>• for third parties// unauthorised people//people who don't have a decryption key (1)</li> <li>• and so is of no use (1)</li> <li>• Keeps (personal) data (more) secure/protects data//makes web browsing more secure (1)</li> <li>• Even if data is transferred to many devices/platforms it is still protected (1)</li> <li>• Enables IT departments/businesses to comply with data protection regulations (1)</li> <li>• Reduces the <b>benefits of/motivation to</b> hack(ing)/commit(ing a) crime (1)</li> <li>• Identification of TWO items of data that could be protected (DNA “banking information” – this is TV. Other examples from banking may be correct. (1)</li> </ul> <p><b>Drawbacks MAX 6</b></p> <ul style="list-style-type: none"> <li>• It requires additional processing power to process encrypted data (1)</li> <li>• It takes <b>longer</b> to <b>transmit</b> encrypted data (1)</li> <li>• It takes <b>longer</b> to <b>open/decrypt</b> encrypted data (1)</li> <li>• The client/browser and server must send messages to each other <b>several times</b> before any data is transmitted (1<sup>st</sup>)</li> <li>• increasing the time it takes to load a web page (1)</li> <li>• It uses <b>extra</b> storage space for the client/the server (increasing costs) (1)</li> <li>• If the <b>private</b> key is lost, it is extremely difficult to recover the data//data may be lost permanently (1<sup>st</sup>)</li> <li>• data can be recovered by the reissuing of the digital certificate but takes time (1)</li> <li>• Makes it difficult for authorities to monitor criminal activities (1)</li> </ul> <p><b>Max 6 marks for just bullet points</b></p>	<b>8</b>