



# Cambridge International AS & A Level

---

**INFORMATION TECHNOLOGY**

**9626/12**

Paper 1 Theory

**May/June 2023**

MARK SCHEME

Maximum Mark: 70

---

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

---

This document consists of **9** 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(a)	<p><b>Five from:</b></p> <ul style="list-style-type: none"> <li>• It would now be used for a different purpose to that for which it was originally collected (1)</li> <li>• Electoral register <b>only</b> shows adults (accept does not show children) (1)</li> <li>• Only shows people who are registered to vote (1)</li> <li>• The data on the electoral register might be out of date//not have been updated (1) ...</li> <li>... people on the electoral register might no longer live in the area (1)</li> <li>... people new to the area might not be included (1)</li> <li>... new homes may have been built (1)</li> <li>... people may have died (1)</li> <li>• Not all people who live at the same address are from the same family (1)</li> </ul>	<b>5</b>
1(b)	<p><b>Award ONE mark for ANY indirect data source:</b></p> <p><b>e.g.</b></p> <ul style="list-style-type: none"> <li>• Businesses collecting personal information when used by third parties (1)</li> <li>• Census (data) (1)</li> <li>• A newspaper (1)</li> <li>• An encyclopedia (1)</li> <li>• Medical records (1)</li> <li>• Museum archive (1)</li> </ul>	<b>1</b>

Question	Answer	Marks
2	<p><b>Five from:</b></p> <ul style="list-style-type: none"> <li>• One mark for a description of encryption (1)</li> <li>• Often called secret key encryption (1)</li> <li>• Uses a <b>single/the same</b> key (to decrypt/encrypt the data) (1)</li> <li>• Any awareness that it is a <b>private</b> key (1)</li> <li>• This (private/secret) key <b>must be shared</b> between the sender and the receiver (1)</li> <li>• The encryption key is sent to the <b>recipient</b> (1)</li> </ul>	<b>5</b>

Question	Answer	Marks
3	<p><b>Five from:</b></p> <p><b>MAX three if only batch processing OR online processing discussed.</b></p> <ul style="list-style-type: none"> <li>• Data is <b>grouped</b> into batches (in batch processing) (1)</li> <li>• With online processing, data is processed as quickly as possible (1)</li> <li>• With batch processing there is a delay between the collection of data and the actual processing (1)</li> <li>• With batch processing, the data is entered and processed altogether in one batch by the computer (1)</li> <li>• With online processing the user tends to be in direct communication with a central computer (1)</li> <li>• Online systems require more hardware/input devices/workstations than batch processing systems (1)</li> <li>• Batch processing uses very little processing time compared to online processing (1)</li> <li>• In online processing errors are revealed immediately (1)</li> <li>• (whereas) Errors in batch processing errors are revealed much later/only when processing takes place/overnight/when batch process is complete (1)</li> <li>• Batch processing can be done when the system is not busy//scheduled to a specific time (1)</li> <li>• (whereas) online processing has to be active for the whole day (1)</li> <li>• For batch processing, data is only accurate at the time of processing (1)</li> <li>• (whereas) online processing, the data is accurate all the time.</li> </ul>	5

Question	Answer	Marks
4	<p><b>Eight from:</b></p> <ul style="list-style-type: none"> <li>• (because) It is sensitive information about yourself (1)</li> <li>• an example of personal data that could be given (1) plus how this would be detrimental//how used to (e.g.) gain (your) trust (1)</li> </ul> <p><b>Fraudsters</b> could use the data to: e.g.</p> <ul style="list-style-type: none"> <li>• commit identity theft (1) to (e.g.) buy products (may exemplify) (1)</li> <li>• get past bank security (1st) withdraw large sums of money from bank accounts (1) (for this second mark accept any situation where identity could be proven by details shared online – credit card/inheritance etc)</li> <li>• By sharing (e.g.) phone number may lead to phishing (1)</li> </ul> <p><b>Burglars</b> could use the data to e.g.</p> <ul style="list-style-type: none"> <li>• target homes of people who announce they are going on away from their home (holiday etc) (1)</li> </ul> <p><b>Employers</b> could e.g.</p> <ul style="list-style-type: none"> <li>• use comments about politics/religion/their current job//embarrassing photos to decide on future job opportunities (accept any example of an area of opinion, but must be at least one stated) (1)</li> </ul> <p><b>Insurers/employers</b> could e.g.</p> <ul style="list-style-type: none"> <li>• make decisions based on evidence of risky/dangerous activities (may exemplify about decisions) (1)</li> </ul> <p><b>Max. six marks if bullet list of points</b></p>	8

Question	Answer	Marks
5	<p><b>Five from:</b></p> <p><b>Four max from:</b></p> <ul style="list-style-type: none"> <li>• A device driver is a piece of (system) software (1)</li> <li>• It operates/controls a device attached to the computer (1)</li> <li>• Allows communication between printer and computer (1)</li> <li>• A device driver tells the operating system/application software how to communicate with a hardware device (1)</li> <li>• A printer driver acts as an interface between the operating system/application software and the printer (1)</li> <li>• When a document is to be printed the application tells the printer driver and the printer driver tells the printer (1)</li> <li>• The user appears to have control of the device (1)</li> <li>• Upon installation it detects and identifies the peripheral device (1)</li> <li>• Handles the translation of requests between a device and the computer (1)</li> <li>• Defines where outgoing data must be stored before it can be sent (1)</li> </ul> <p><b>Two max from:</b></p> <ul style="list-style-type: none"> <li>• Without the required (printer) driver the printer fails to work (1)</li> <li>• The software used by a computer tends to be created by different companies to those that manufacture printers (1)</li> <li>• Computers (may) use software which uses a different type of language/instruction set to the printer (1)</li> <li>• The printer driver is needed to convert the language/instruction set so that the software is able to communicate with the hardware (1)</li> </ul>	5

Question	Answer	Marks
6(a)	<p>Infrared</p> <ul style="list-style-type: none"> <li>• Detects heat (1)</li> <li>• Turns infrared electromagnetic waves into an electrical signal (1)</li> </ul> <p>e.g.</p> <ul style="list-style-type: none"> <li>• Used in a burglar alarm – accept any reasonable use (1)</li> </ul> <p>Ultrasonic</p> <ul style="list-style-type: none"> <li>• Detects sound (1)</li> <li>• Turns sound waves into an electrical signal (1)</li> </ul> <p>e.g.</p> <ul style="list-style-type: none"> <li>• It is used in automated car parking//reversing system (1)</li> <li>• Measure distance (1)</li> </ul>	4

Question	Answer	Marks
6(b)	<p><b>Advantages MAX five from</b></p> <ul style="list-style-type: none"> <li>• Increased employment for technicians needed to maintain the systems//maintenance (1) and programmers to program the systems (1) (May also be used as a disadvantage - Award ONCE only)</li> <li>• Data is processed <b>more</b> quickly (1)</li> <li>• <b>Reaction times</b> of control technologies is much faster (1)</li> <li>• Computer-controlled traffic lights tend to create fewer traffic jams (1)</li> <li>• Computer-controlled car park barriers lead to fewer/shorter queues (at car park entrances) (1)</li> <li>• Any indication of reduced day to day costs (may be exemplified – e.g. ‘no need to pay anyone to do the job’) (1)</li> <li>• System can operate 24 hours a day//the whole/all day//continuously ... (1) ... without needing to pay overtime (1)</li> <li>• The <b>readings/inputs</b> taken by computers are more reliable/accurate than human readings ... (1) ... the number of car park spaces are more accurately calculated (1)</li> </ul> <p><b>Disadvantages MAX five from</b></p> <ul style="list-style-type: none"> <li>• Has increased unemployment for <b>car park attendants</b> (1) (Converse answer may also be given as an advantage – Award ONCE only)</li> <li>• The number of new jobs created tends to be far fewer than the number of old jobs lost (1)</li> <li>• (Control systems) can be expensive to install/purchase (1)</li> <li>• A <b>computer-controlled</b> system will not be able to function if there is a problem with the computer/power outage ... (1)</li> <li>• ... leading to possible chaos at traffic lights/traffic jams (1)</li> <li>• ... causing longer queues at car park entrances (1)</li> <li>• Computer <b>maintenance</b> costs can be expensive (1)</li> <li>• <b>Sensors</b> can deteriorate after a period of time //suffer wear and tear (1) ... whereas this would not be a problem with car park attendants (1)</li> </ul> <p><b>Max. six marks if uses a bulleted list.</b></p>	<b>8</b>

Question	Answer	Marks
7	<p><b>Five</b> from:</p> <ul style="list-style-type: none"> <li>• Different socioeconomic levels imply differing levels of (disposable) income (1)</li> <li>• Different incomes/socioeconomic groups impact on what people can buy/access/afford (1) such as ‘things’ ... (must be an extension linked to technology) (1) such as acquisition of skills/paying for training (1)</li> <li>• This impacts on what people can commit to renting (1)</li> <li>• New equipment is costly (1)</li> <li>• Old equipment is not as advanced (1)</li> <li>• People from lower socioeconomic groups tend to have lower digital skills (1)</li> <li>• No/reduced incentive for companies to develop cheaper systems ... (1) ... because the profits would be lower (1)</li> <li>• No/reduced incentive to provide infrastructure to poor areas .... (1) ... because reduced demand in the area (1)</li> </ul>	<b>5</b>

Question	Answer	Marks
8(a)	<p><b>Four</b> from:</p> <ul style="list-style-type: none"> <li>• One mark for identification of any three forms (1)</li> <li>• A method of organising data tables (1)</li> <li>• Attempts to avoid data loss (1)</li> <li>• Attempts to avoid <b>data</b> redundancy//<b>data</b> duplication (1)</li> <li>• Attempts to improve/improves data base efficiency (1)</li> <li>• Breaks data <b>from</b> non-atomic structure <b>to</b> atomic//description of atomisation (takes an example of non-atomic data and states how it becomes atomic) (1)</li> <li>• Breaks data into smaller/other units/tables of data (1)</li> <li>• The units/tables are related to each other (may exemplify) (1)</li> <li>• Only related data is stored in a table (1)</li> <li>• It is an iterative process// It is a multi-step/stage process (1) ... (where) each step/stage improves the efficiency of the database (may be given as a standalone mark) (1)</li> </ul>	<b>4</b>
8(b)	<p><b>Six</b> from:</p> <ul style="list-style-type: none"> <li>• Searching a large database is <b>quicker</b> to locate records (1)</li> <li>• A relational database <b>does not have</b> duplicated/redundant data (1)</li> <li>• Uses <b>reduced</b> storage space (DNA ‘memory’) (1)</li> <li>• When data in one field of a table is modified the data in the corresponding field//related field is <b>updated</b> (1)</li> <li>• Integrity constraints ensure that table relationships are/<b>remain valid</b> (1)</li> <li>• It is <b>easier to maintain</b> security of data (1)</li> <li>• Use of related tables <b>reduces need</b> for (as much) data entry (1)</li> <li>• <b>Reduced chance</b> of data entry errors (1)</li> <li>• <b>Easier</b> for users to produce reports (1)</li> </ul>	<b>6</b>



Question	Answer	Marks
9	<p><b>Eight from:</b></p> <ul style="list-style-type: none"> <li>• Identification of three of: knowledge <b>base</b>, explanation system, knowledge base editor, inference <b>engine</b>, user interface, rules <b>base</b> (1)</li> <li>• Inference engine is able to find possible diagnoses by using a form of reasoning (1)</li> <li>• The inference engine uses the data or facts in the knowledge base to reason through the symptoms (1)</li> <li>• (User interface/expert) system asks questions/for symptoms about the illness (1)</li> <li>• <b>Answers//symptoms/required data</b> are typed in (1)</li> <li>• Inference engine compares symptoms to those in the knowledge base (1)</li> <li>• Any awareness of use of IF...THEN... rules/comparisons//rules base consists of IF...THEN rules... (If and THEN both used in the answer) (1)</li> <li>• Searches the inference rules to find one where the IF statement is known to be true (1)</li> <li>• If answer not found, further questions are asked (1)</li> <li>• When such a rule is found, the inference engine uses the 'THEN' part ... (1) ... to find the illness (1)</li> <li>• <b>Possible/suggested/a range of</b> diagnoses are output (to user interface) (1)</li> <li>• Explanation system produces reasons for suggestions/diagnoses (1)</li> <li>• Reasons for suggestions output using the user interface (1)</li> <li>• Doctor can choose to use or reject answer (1)</li> </ul>	8

Question	Answer	Marks
10	<p><b>Six marks available</b></p> <pre> count ←0 smallest←1000 WHILE count &lt; 6     INPUT number     IF number &lt; smallest     THEN         smallest ← number     ENDIF     count← count+1 ENDWHILE PRINT smallest </pre>	6