



# Cambridge International AS & A Level

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**INFORMATION TECHNOLOGY**

**9626/13**

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 **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	<p><b>Three</b> from:</p> <ul style="list-style-type: none"> <li>• Data consists of raw figures/characters/numbers (which require processing for interpretation) (1)</li> <li>• Data does not have any meaning/context (1)</li> <li>• Information is data that has been given meaning/context (1)</li> <li>• Information is data that has been processed (1)</li> </ul> <p><b>One</b> mark for any example.</p> <p>Example must cover BOTH data and information (1)</p>	<b>4</b>

Question	Answer	Marks
2	<p><b>Four</b> from:</p> <ul style="list-style-type: none"> <li>• <b>File size</b> is smaller (1)</li> <li>• Takes up less <b>storage</b> (space) (1)</li> <li>• Text format doesn't need to buy a licence/software (1)</li> <li>• As the file size is smaller the processing time is shorter/less processing power is required (1)</li> <li>• Does not need to be opened by a WP package (1)</li> <li>• Can be opened by more applications (1)</li> <li>• Data can be exchanged between different computers/operating systems (1)</li> <li>• Word processing software has different versions and one version may not open documents produced by a different version (1)</li> </ul>	<b>4</b>

Question	Answer	Marks
3(a)	<p><b>Three</b> from:</p> <ul style="list-style-type: none"> <li>• Whether a computer will <b>repair</b> itself if an error occurs (1)</li> <li>• Whether a computer can continue to operate even if one (or more) of its components has failed (1st)</li> <li>• without affecting the operation of the system/without downtime (award once only) (1)</li> <li>• Whether a computer's operating <b>quality</b> can <b>reduce</b>, but does <b>not fail</b> completely (1)</li> <li>• Whether when a hardware component/processor fails, <b>another takes over/elements are hot swappable</b> (1st)</li> <li>• without affecting the operation of the system/without downtime (award once only) (1)</li> <li>• Whether computers have two different instances/installations/versions of software (1st)</li> <li>• if there is a problem with the first instance/installation/version, the other version is automatically run (1)</li> <li>• this (characteristic) does not apply to mainframes (1)</li> </ul>	<b>3</b>
3(b)	<p><b>Two</b> from:</p> <ul style="list-style-type: none"> <li>• Computers generate heat/become overheated (1).</li> <li>• When a computer overheats, it will address this issue (1).</li> <li>• Overheating of mainframes and supercomputers is a problem (1st)</li> <li>• due to the quality and quantity of processors generating a lot of heat (1)</li> <li>• hence the need for cooling systems (1)</li> <li>• Air cooling systems have been used but uses up a lot of power/are very expensive to build and operate (1)</li> <li>• Water cooling systems are more cost-effective/more efficient (1)</li> <li>• in removing any excess heat (1)</li> <li>• Many data centres are now being built in cooler parts of the world (1)</li> </ul>	<b>2</b>
3(c)	<p><b>Three</b> from:</p> <ul style="list-style-type: none"> <li>• The amount of data that has to be <b>processed</b> is very large (1st)</li> <li>• <b>as</b> countries tend to have a lot of people (1)</li> <li>• The amount of data is <b>increasing</b> (1st)</li> <li>• <b>as</b> each census produces more data (to add to what already exists)/world populations are rising (1)</li> <li>• All data needs to be processed in a <b>short period of time</b> (1st)</li> <li>• and mainframes have a high speed of processing data (1)</li> <li>• (As more data is added), more powerful machines are needed (1st)</li> <li>• and mainframes are <b>easily</b> scalable (1)</li> <li>• Mainframes are very reliable (1st)</li> </ul> <p><b>MAX two marks if answers are all only first marks.</b></p>	<b>3</b>

Question	Answer	Marks
4(a)	<p><b>Three matched pairs</b> from:</p> <ul style="list-style-type: none"> <li>• Might enter an account number with 9 or 11 digits/less than/more than 10 (1st)</li> <li>• <b>Length check</b> to make sure that the account number is exactly 10 characters (1)</li> <li>• Might enter a wrong <b>digit</b> (1st)</li> <li>• Use a <b>check digit</b> which creates a new digit by performing a calculation on individual digits of the account number and appending the resulting digit (1)</li> <li>• Might omit one of the account numbers (1st)</li> <li>• <b>Presence check</b> would make sure account numbers are entered. (1)</li> </ul>	<b>6</b>
4(b)	<p><b>Three</b> from:</p> <ul style="list-style-type: none"> <li>• A key number would be calculated (1)</li> <li>• All the account numbers/numbers in the account number would be added together (1st)</li> <li>• To create a single number (1)</li> <li>• The data/file would be transmitted along with the hash total/key number (1)</li> <li>• The hash total is recalculated once received (1)</li> <li>• The original hash total is compared with the new one (1)</li> <li>• If they do not match an error has been made (1)</li> </ul> <p><b>One</b> from:</p> <ul style="list-style-type: none"> <li>• A control total checks fields that are used for calculations whereas a hash total is used for fields that hold information (1)</li> <li>• The field holds data, and will not be used for calculations (1)</li> </ul>	<b>4</b>

Question	Answer	Marks
5(a)	<p><b>Two</b> from:</p> <ul style="list-style-type: none"> <li>Two <b>readings/measurements</b> need to be taken (using the sensor) (1)</li> <li>Can correct slope/offset errors (1)</li> <li>Best used where readings are linear (1)</li> <li>Reading taken at the low end of the range and the high end of the range (1)</li> <li>Readings taken by a check/reference instrument/uses (previously) known readings (1)</li> <li>Value for offset is calculated (1st)</li> <li>by comparing to reference readings/known readings (1)</li> </ul>	<b>2</b>
5(b)	<p><b>Two</b> from:</p> <ul style="list-style-type: none"> <li>Uses many/more than two <b>readings/measurements</b> (from the sensor) (1)</li> <li>Readings taken at a high value, a middle value and a low value (1)</li> <li>Best used where readings form a curve/non linear (1)</li> <li>Readings taken by a check/reference instrument/uses (previously) known readings (1)</li> <li>The calibration <b>cannot</b> be carried out by just adding an offset value/by allowing for the slope (1)</li> <li>To calibrate the sensor the algorithm needs to include 'curve fitting' (1)</li> <li>Uses <b>a formula</b> to calculate the correction (1)</li> <li>Uses a quadratic function such as <math>y = ax^2 + bx + c</math> (1st)</li> <li>where <math>y</math> is the reading from the standardised sensor/actual value <math>x</math> is the reading from the sensor needing calibration (1)</li> </ul>	<b>2</b>

Question	Answer	Marks
6	<p><b>Four</b> from:</p> <ul style="list-style-type: none"> <li>Simple query is on one field (1)</li> <li>Complex query is on more than one field (1)</li> <li>Complex query can use Boolean operators (1)</li> <li>One mark for TWO examples of Boolean operators: AND, OR, NOT (1)</li> <li>Simple query use a single criterion only (1)</li> <li>Complex query uses more than one criterion (1)</li> </ul>	<b>4</b>

Question	Answer	Marks
7(a)	<b>Two</b> from: <ul style="list-style-type: none"><li>• Fade in occurs <b>at the beginning</b> of a sound clip when the sound gradually <b>gets louder</b> (1)</li><li>• Fade out occurs <b>towards/at the end</b> of a sound clip when the sound gradually <b>gets softer</b> (1)</li><li>• Volume stops increasing when the required sound level is reached (1)</li><li>• Sound disappears altogether (1)</li></ul>	<b>2</b>
7(b)	<b>Two</b> from: <ul style="list-style-type: none"><li>• Lossless compression retains the quality of the original/does not reduce the quality of the audio file (1)</li><li>• Data is not lost (1)</li><li>• When lossless compression software sees a repeated sequence of bits it replaces the repeated sequences with a character (1st)</li><li>• which indicates what is being repeated and how many times (1)</li></ul>	<b>2</b>
7(c)	<b>Two</b> from: <ul style="list-style-type: none"><li>• Removes some of the audio file's data (1)</li><li>• Reduces the quality of the audio file (1)</li><li>• Removes sounds at very low and high frequencies (which are outside the range of human hearing) (1)</li><li>• Creates <b>smaller</b> file sizes <b>than</b> lossless compression (1)</li><li>• Once this data has been removed from the files it can never be replaced (1)</li></ul>	<b>2</b>

Question	Answer	Marks
8	<p><b>Six</b> from:</p> <ul style="list-style-type: none"> <li>Immediately before/after/inside count <math>\leftarrow</math> 0 box insert total <math>\leftarrow</math> 0 (1)</li> <li>Immediately before/after/inside total <math>\leftarrow</math> total + number box insert count <math>\leftarrow</math> count + 1 (1)</li> <li>average <math>\leftarrow</math> total/number should be changed to average <math>\leftarrow</math> total/10 (1)</li> </ul> <p><b>OR</b></p> <ul style="list-style-type: none"> <li>average <math>\leftarrow</math> total/count (1)</li> <li>yes/no should be reversed (1)</li> </ul> <p><b>OR</b></p> <ul style="list-style-type: none"> <li>count=10 changed to count&lt;10 (1)</li> <li>Loop line should return to flowchart <b>above</b> Input number box (where drawn on the flowchart, no need to delete the original line or add arrow heads) (1)</li> <li>Print/output average should be included <b>after</b> average <math>\leftarrow</math> total/10 box (1)</li> <li>Stop box/end should be included at end of flowchart (1)</li> <li>Add instructions to input box (1)</li> </ul>	6

Question	Answer	Marks
9	<pre> INPUT X, Y W←X/Y Z=INT(W) IF W=Z   THEN     PRINT/OUTPUT Y, " (e.g.)is a factor of ",X   ELSE     PRINT/OUTPUT Y, " (e.g.)is not a factor of ",X ENDIF </pre> <p><b>Eight</b> from:</p> <ul style="list-style-type: none"> <li>INPUT X (1) Y (1)</li> <li>Correct IF statement (1)</li> <li>IF and ENDIF indented correctly (1)</li> <li>Use of THEN (1)</li> <li>Valid output statement (1) with both commas (1) with speech marks (1)</li> <li>Use of ELSE (1)</li> <li>THEN and ELSE indented correctly (1)</li> <li>Valid output statement after ELSE (1) Commas between values and text in second statement text within speech marks (1)</li> <li>Correct use of ENDIF (1)</li> <li>No further code after ENDIF statement (1)</li> </ul>	8



Question	Answer	Marks
10	<p><b>Eight from:</b></p> <ul style="list-style-type: none"> <li>• (This) custom written software is created for a defined/this purpose/running a payroll/commissioned by an individual company/business (1)</li> <li>• Does not need to be adapted for use (1)</li> <li>• (Any) settings built into the software can be changed (1st)</li> <li>• if the software doesn't initially meet the manager's requirements (1)</li> <li>• such as ability to copy software on to several devices (1)</li> <li>• Software will have/Programmer can ensure the software will have all the features that are required (1)</li> <li>• Software will be/Programmer will ensure that it is compatible with the existing system and software (1)</li> <li>• Custom written software will not have any unnecessary/distracting features/bloat ware (1)</li> <li>• The company will own the copyright of the custom written software (1st)</li> <li>• so can sell it to others (1)</li> <li>• Usually takes up less storage space than off-the-shelf software (1st)</li> <li>• so less expensive media/data storage costs (1)</li> </ul> <p><b>Max 6 marks for just bullet points</b></p>	8

Question	Answer	Marks
11	<p><b>Eight from:</b></p> <ul style="list-style-type: none"> <li>• Weather forecasting used to involve several weather forecasters and days of calculations (1st)</li> <li>• today one model can manage the task (1)</li> <li>• Computer models help forecasters to make <b>more reliable</b> predictions (1)</li> <li>• Models can be used to <b>predict future</b> patterns (of weather) (1)</li> <li>• <b>More complex</b> models create <b>more accurate</b> forecasts (1st)</li> <li>• which allow forecasts further into the future (1)</li> <li>• Human weather forecasters are still needed to evaluate the results (1)</li> <li>• Weather forecasting requires the <b>use of a lot of data</b> (1)</li> <li>• To be effective models must consider <b>many</b> variables (1st)</li> <li>• such as (TWO Variables identified): atmospheric pressure, humidity, rainfall, temperature, wind speed, wind direction (1)</li> <li>• as well as calculations such as (ONE of): vertical air motions, temperature changes, moisture processes (1)</li> <li>• A lot of computing power is needed to run a computer model so supercomputers have to be/are used (1)</li> <li>• <b>Supercomputers</b> are (very) expensive (so makes the process an expensive one) (1)</li> <li>• Models can be used to compare current conditions with previous similar conditions/shown trends over a period of time (1)</li> </ul> <p><b>Max 6 marks for just bullet points</b></p>	8