



Cambridge International AS & A Level

INFORMATION TECHNOLOGY

9626/12

Paper 1 Theory

March 2021

MARK SCHEME

Maximum Mark: 90

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 March 2021 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **11** 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)	<table border="1"> <tr> <td data-bbox="320 248 1233 349">There are two types of hardware: application hardware and system hardware.</td> <td data-bbox="1233 248 1310 349"></td> </tr> <tr> <td data-bbox="320 349 1233 450">Hardware consists of the programs used to direct the operation of a computer.</td> <td data-bbox="1233 349 1310 450"></td> </tr> <tr> <td data-bbox="320 450 1233 551">Hardware is the collection of physical components that constitute a computer system.</td> <td data-bbox="1233 450 1310 551">✓</td> </tr> <tr> <td data-bbox="320 551 1233 611">A device driver is an example of an item of hardware.</td> <td data-bbox="1233 551 1310 611"></td> </tr> </table>	There are two types of hardware: application hardware and system hardware.		Hardware consists of the programs used to direct the operation of a computer.		Hardware is the collection of physical components that constitute a computer system.	✓	A device driver is an example of an item of hardware.		1
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Hardware consists of the programs used to direct the operation of a computer.										
Hardware is the collection of physical components that constitute a computer system.	✓									
A device driver is an example of an item of hardware.										
1(b)	<table border="1"> <tr> <td data-bbox="320 640 1233 712">A hard disk drive allows quicker access to data than RAM.</td> <td data-bbox="1233 640 1310 712"></td> </tr> <tr> <td data-bbox="320 712 1233 781">RAM is portable and very easy to move from device to device.</td> <td data-bbox="1233 712 1310 781"></td> </tr> <tr> <td data-bbox="320 781 1233 842">RAM stores active program data.</td> <td data-bbox="1233 781 1310 842">✓</td> </tr> <tr> <td data-bbox="320 842 1233 936">Per unit of memory, RAM is far cheaper to buy than a hard disk drive.</td> <td data-bbox="1233 842 1310 936"></td> </tr> </table>	A hard disk drive allows quicker access to data than RAM.		RAM is portable and very easy to move from device to device.		RAM stores active program data.	✓	Per unit of memory, RAM is far cheaper to buy than a hard disk drive.		1
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RAM is portable and very easy to move from device to device.										
RAM stores active program data.	✓									
Per unit of memory, RAM is far cheaper to buy than a hard disk drive.										
1(c)(i)	<p>Four from:</p> <p>Max two from:</p> <p>Comprises memory, control unit and arithmetic logic unit (must have at least two) Tends to be contained on an integrated circuit chip called a microprocessor</p> <p>Max three from:</p> <p>Control unit retrieves/fetches instructions from the computer's main memory... ...interprets/decodes instructions... ...carries out/executes instructions All input data are transferred via CPU's memory/registers Memory/registers store instructions as well as data Data is stored in the CPU memory whilst a calculation or instruction is being carried out. Input data are transferred to the arithmetic and logic unit for processing ALU: Arithmetic unit makes use of the four basic arithmetic functions (i.e., addition, subtraction, multiplication, and division) ALU: Logic unit uses certain logic operations such as comparisons, selections and matching</p>	4								

Question	Answer	Marks
1(c)(ii)	<p>Motherboard – two from: The main printed circuit board of a computer Connects the main components of a computer Contains mass storage interfaces Contains serial and parallel ports Contains USB ports Contains network port Contains <u>expansion</u> slots Contains controllers required to control standard peripheral devices Contains the connectors for attaching additional boards Contains the BIOS chip/chipset Contains means of plugging in/socket for CPU Contains RAM slots</p> <p>Sound card – two from: An expansion board that enables a computer to manipulate and output audio Enables the computer to output sound through speakers connected to the board Enables the computer to receive sound input from a microphone Enables the computer to manipulate sound stored on a disk Nearly all sound cards support MIDI, a standard for representing music electronically</p>	4

Question	Answer	Marks								
2(a)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td data-bbox="320 1167 1233 1261">It is easier for users with physical disabilities to use a keyboard or mouse than make gestures.</td> <td data-bbox="1233 1167 1310 1261"></td> </tr> <tr> <td data-bbox="320 1261 1233 1355">It is easier to enter text with a gesture-based interface than with a command line interface.</td> <td data-bbox="1233 1261 1310 1355"></td> </tr> <tr> <td data-bbox="320 1355 1233 1449">Gestures are more accurately interpreted than mouse clicks.</td> <td data-bbox="1233 1355 1310 1449"></td> </tr> <tr> <td data-bbox="320 1449 1233 1543">Some gestures may be unintentional but still initiate a reaction from the device.</td> <td data-bbox="1233 1449 1310 1543" style="text-align: center;">✓</td> </tr> </table>	It is easier for users with physical disabilities to use a keyboard or mouse than make gestures.		It is easier to enter text with a gesture-based interface than with a command line interface.		Gestures are more accurately interpreted than mouse clicks.		Some gestures may be unintentional but still initiate a reaction from the device.	✓	1
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2(b)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td data-bbox="320 1588 1233 1682">Dialogue interfaces are more difficult to use than command line interfaces.</td> <td data-bbox="1233 1588 1310 1682"></td> </tr> <tr> <td data-bbox="320 1682 1233 1776">A dialogue interface uses less memory than a command line interface.</td> <td data-bbox="1233 1682 1310 1776"></td> </tr> <tr> <td data-bbox="320 1776 1233 1870">A dialogue interface may not operate reliably if there is background noise.</td> <td data-bbox="1233 1776 1310 1870" style="text-align: center;">✓</td> </tr> <tr> <td data-bbox="320 1870 1233 1964">Dialogue interfaces have unlimited vocabularies.</td> <td data-bbox="1233 1870 1310 1964"></td> </tr> </table>	Dialogue interfaces are more difficult to use than command line interfaces.		A dialogue interface uses less memory than a command line interface.		A dialogue interface may not operate reliably if there is background noise.	✓	Dialogue interfaces have unlimited vocabularies.		1
Dialogue interfaces are more difficult to use than command line interfaces.										
A dialogue interface uses less memory than a command line interface.										
A dialogue interface may not operate reliably if there is background noise.	✓									
Dialogue interfaces have unlimited vocabularies.										

Question	Answer	Marks
2(c)	<p>Eight from:</p> <p>Advantages With a CLI the processing speed tends to be faster than GUI A CLI uses less memory/resource... ...as it doesn't need to store WIMP features CLI doesn't require graphics software or a high-resolution monitor CLI is less likely to change over time whereas GUIs tend to change regularly, meaning less need to learn how to use a new system CLI users only need to utilise a keyboard to navigate the interface, often resulting in faster performance Taking a hand off the keyboard to move the mouse is slower than using a CLI for many users</p> <p>Disadvantages CLI requires the user to have to learn many commands unlike GUI CLI commands can be slower to input particularly for inexperienced users... ...long lines of text need to be entered rather than a few clicks of a mouse CLI commands are more difficult to edit With a CLI it is more difficult to view different items on one screen when multitasking A CLI is often very basic and can be more of a strain on a user's vision More likely to make mistakes typing commands</p> <p>At least two of each required to obtain full marks Must be a proper evaluation to obtain full marks Max. six marks if bullets/list of points Must have expansions or direct comparisons to be a proper evaluation</p>	8

Question	Answer	Marks
3(a)	CD ROM, hard copy text book, printed magazine (any two)	1
3(b)	<p>Two from:</p> <p>It contains data that doesn't change You cannot add data to a printed newspaper There is a fixed amount of information in a printed newspaper Printed newspaper tends to go out of date quickly</p>	2

Question	Answer	Marks
4(a)(i)	<p>Two from:</p> <p>No validation check would pick up that the 11 has become 12 12/11/1992 would pass a format check as it is still dd/mm/yyyy 12/11/1992 would pass individual range checks as 12 is still less than or equal to 12/less than 13 and more than 0</p>	2
4(a)(ii)	Visual check to compare the data in the database to the original source	1

Question	Answer	Marks
4(b)	<p>Two from:</p> <p>Length check on Membership number to make sure it is 5 characters in length</p> <p>Range check on Membership fee to make sure it is between 10 and 50</p>	2

Question	Answer	Marks
5	<p>Seven from:</p> <p>Advantages Once the program is already compiled into machine language, there is no translation software that the user has to keep up to date Compiled software can run faster than interpreted software Compiling a program is a much quicker process than interpreting Compilers also improve security for programmers... ...by making it much harder to copy Joan's code</p> <p>Disadvantages Can only be used on one operating system... ...Joan's target audience will have different computers and operating systems... ... Will need to use an interpreter if she wishes to share the software It is slow/more difficult to debug the program... ...the whole program needs to be compiled again after an error is corrected It uses up more memory than an interpreter... ...as the whole program has to be loaded Once compiled, any changes to the original high-level code will require the program to be compiled again</p> <p>At least one of each required to obtain full marks Must be a proper evaluation to obtain full marks Max. five marks if bullets/list of points Must have expansions or direct comparisons to be a proper evaluation</p>	7

Question	Answer	Marks
6	<p>Eight from:</p> <p>Access to fast broadband can be better for those people living in urban areas than for those living in rural areas/poor for than those living in rural areas</p> <p>Without access to fast broadband people in rural areas are less likely to be up to date with the latest internet technologies</p> <p>Buying televisions/personal computers/smartphones can be more expensive in rural areas</p> <p>People with a higher level of education may find mobile phones/computers easier to use than those with a lower level of education</p> <p>Richer people are more/poorer people less able to afford the latest versions of televisions/personal computers/smartphones computers</p> <p>Older people can find mobile phones/computers harder to use than younger people</p> <p>Young people have grown up with the technology/older people may feel they are too old/unwilling to learn about new technology</p> <p>The quality of connection to the Internet may be poorer in underdeveloped countries</p> <p>The price of connection to the internet may be prohibitive in underdeveloped countries</p> <p>People may have access to televisions/personal computers/smartphones computers but choose not to use them for reasons of e-safety/privacy</p> <p>There may be a lack of broadband infrastructure/5G in rural areas/underdeveloped countries</p> <p>Underdeveloped countries may have lower-performance computers</p> <p>Disabilities of some users may inhibit the use of smartphones/computers</p>	8

Question	Answer	Marks
7	<p>Four from:</p> <p>The internet is an international network of networks of computers/the physical connection between networks of computers</p> <p>The World Wide Web is the general term for accessing information over the internet/information accessed using the internet</p> <p>The World Wide Web is a system of internet servers that support specially formatted documents</p> <p>The World Wide Web is an information-sharing model that is built on top of the internet</p> <p>The World Wide Web uses the HTTP(S) protocol, which is only one of the many protocols used in the internet to transmit data</p>	4

Question	Answer	Marks
8	<p>Five from:</p> <p>Provides past, present and prediction information</p> <p>Helps in decision making</p> <p>Management information systems are used to create reports on aspects such as sales, revenue and production</p> <p>Management information systems reports can include charts on aspects such as sales, revenue and production</p> <p>These reports are provided at regular intervals to managers at all levels to help them evaluate their companies' performance</p> <p>Can compare daily/weekly/monthly reports to previous reports</p> <p>Managers are able to spot trends, such as revenue growth or reduction</p>	5

Question	Answer	Marks
9	<p>Six from:</p> <p>A mobile phone network allows mobile phones to connect/transmit data through cell towers/base stations...</p> <p>...and is divided into thousands of overlapping geographic areas/cells</p> <p>A typical cellular network can be thought of as a mesh of hexagonal cells</p> <p>Each cell has its own base station at the centre</p> <p>The base stations provide the cell with the network coverage which can be used for transmission of voice, data and other types of content</p> <p>The cells slightly overlap at the edges to ensure that users always remain within range of a base station</p> <p>RF signals are transmitted by an individual phone to a base station</p> <p>RF signals are then re-transmitted from the base station to another base station/mobile phone</p> <p>Transmitting and receiving are done over different frequencies</p> <p>Base stations are connected to one another via central switching centres</p> <p>The central switching centres track calls and transfer them from one base station to another as callers move between cells</p> <p>A mobile phone is a two-way radio containing both a low-power transmitter and a receiver</p> <p>A cell typically uses a different set of frequencies from neighbouring cells</p>	6

Question	Answer	Marks
10	<p>Six from:</p> <p>An information processing system which has to respond to inputs instantaneously...</p> <p>...quickly enough so as to be able to control an output properly</p> <p>Real-time processing systems have to be programmed very carefully to ensure that no input events are missed</p> <p>Controlling a car park barrier has to deal with input events continuously</p> <p>A car park barrier system will be providing input data to the computer using light sensors/inductive loops/pressure sensor</p> <p>Is not effective with very large volumes of data...</p> <p>...but control systems/car park barrier systems usually have small amount of data to deal with so not a problem</p> <p>Car park barrier system must react to the approach of a car immediately...</p> <p>...other types of processing might cause drivers to be frustrated/queues to form</p> <p>Requires complex and expensive operating system</p> <p>Real-time systems are not easy to develop</p> <p>Must be a proper analysis to obtain full marks Max. five marks if bullets/list of points Must have expansions to be a proper analysis</p>	6

Question	Answer	Marks
11	<p>Four from:</p> <p>There is a field in the database called Examdate which contains the date of an exam</p> <p>The query is being used within a calculated field</p> <p>If the date in Examdate is after today's date, 'not yet' would be displayed</p> <p>If the date in Examdate is equal to today's date, 'today's the day' would be displayed</p> <p>If the date in Examdate is before today's date /otherwise, 'you've missed it' would be displayed</p>	4

Question	Answer	Marks
12(a)(i)	<p>Two from:</p> <p>A cell is a specific location within a spreadsheet and is defined by the intersection of a row and column</p> <p>Cells are often referenced by a letter and number combination</p> <p>For example, J11 is the cell containing the value 32</p> <p>Must have an example to gain both marks</p>	2

Question	Answer	Marks
12(a)(ii)	<p>Two from:</p> <p>Rows run horizontally in a worksheet Each row is identified by a number in the row heading Row 13 is highlighted in the spreadsheet and contains the values 24, 51, 18, 12 and 26</p> <p>Must have an example to gain both marks</p>	2
12(a)(iii)	<p>Two from:</p> <p>Columns run vertically in a spreadsheet Each column is identified by a letter in the column heading Column J is highlighted in the spreadsheet and contains the values 32, 45, 18, 29 and 42</p> <p>Must have an example to gain both marks</p>	2
12(a)(iv)	<p>Two from:</p> <p>A worksheet or sheet is a single page in a spreadsheet Each worksheet has a name and by default the worksheets are named Sheet1 etc. In this example, they are named Data/Outgoings/Income</p> <p>Must have an example to gain both marks</p>	2
12(b)	<p>Six from:</p> <p>Household bill calculations can be performed more quickly/more easily/recalculated automatically ‘What if...?’ questions can be asked without redoing all the calculation each time prices change Models provide quick answers to events that may take months to actually happen Graphs that are produced to show finances over time will automatically change (as new values are added/old values altered) Graphs of outgoings/income can be produced automatically/more quickly/no manual method is required Quantities can be entered more accurately because of computer-based validation Conditional formatting allows you to highlight certain values that match specific criteria... ... such as seeing at a glance whether outgoings are greater/less than income Absolute and relative cell referencing make sure you only increment the parts of a formula you need to... ...and allow you to change prices/costs of individual items to see the effect</p>	6

Question	Answer	Marks
13	<p>Eight from:</p> <p>Indexed sequential access is a mixture of sequential access and direct/random access</p> <p>With sequential access, records can be accessed sequentially in the order they were entered</p> <p>With sequential access, records are read one by one until a match is found</p> <p><i>Indexed sequential</i></p> <p>A set of hash tables known as indexes contain "pointers" into the records/index value is generated</p> <p>The index is a pointer to whereabouts on the disk the record is stored</p> <p>Individual records can be retrieved without having to search the entire file</p> <p>Data is organised into records which consist of fixed length fields</p> <p>Records can be found randomly using an index</p> <p>Indexes can be searched quickly, thereby allowing the database to access only the records it needs</p> <p>Searches use an index which will narrow down the records/data to be searched</p> <p>Then that section of the file is searched sequentially to find the record required</p> <p><i>Example</i></p> <p>An index table would contain all the letters of the alphabet in sequence and the corresponding part of the disk where names beginning with those letters can be found</p> <p>For names beginning with P the part of the file containing all the As to Os can be ignored/ the disk is accessed where the Ps begin</p> <p>All the records beginning with P still have to be read one by one until Patel is found</p>	8