Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level

INFORMATION TECHNOLOGY	**9626/31**
Paper 3 Advanced Theory	**May/June 2018**
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 May/June 2018 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

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	**Four** *from:* Open master document/letter Insert (new) merge field at appropriate position *Either:* Insert SKIPIF merge command/skip record if Select merge field 'email' Set comparison to 'is blank'/not present. *Or, if attempt at writing a merge field, max 2:* The mergefield formula is: {SKIPIF {MERGEFIELD email field} = "" } *Marks awarded :* {SKIPIF = "" } {MERGEFIELD email field}	**4**

Question	Answer	Marks
2(a)	**Two** *from:* (The data type is) hard-coded/built-in Cannot be altered/is fixed Have no additional properties.	**2**
2(b)	**Three** *from:* String is a series of characters Number is any number, with or without decimal places Boolean has only two possible values, true or false Undefined is a variable without a value Null is 'nothing' but it is still an object in JavaScript, it is usually empty Symbol has a unique identifier, is static.	**3**

Question	Answer	Marks
3	**Four** *from:* Use a (suitable) name …. that is not a reserved word Declare the variable with 'var' (command word) Declared once only in the script/code Use as global or local variable but not both Initialise the variable with a value Do not use quotes around the variable name.	**4**

Question	Answer	Marks
4(a)	**Four** *from:* The purpose of the software and its intended audience The functions and capabilities of the software to be developed The operational/user environment in which it will/should be used The user interfaces to be used The hardware interfaces that will be needed/hardware requirements The software interfaces/interfaces to other software that will be needed Communication protocols/interfaces The performance levels of the software The structure of the data elements to be used/developed The reliability of the software The security and privacy systems to be used The safety systems/backup protocols/systems/methods to be used The constraints/limitations of the software.	4
4(b)	**Four** *from:* To be part of the contract between the developers and the end user/purchaser/commissioning company To provide a mandate/terms of reference for the design and development of the software/contain all the information to define the function of the new software To provide a list of (testable) design criteria for the software/features to be included in the software To list what the user expects the new software to be able to do To ensure that all mandatory features (e.g. accessibility options) are included To rank the features (required by end user) in order of mandatory, desirable, optional and possible future developments To provide a set of success criteria against which the software can be tested/evaluated.	4
4(c)	**One** *from:* The wrong user may have been chosen so the user requirements are not accurate The user requirements may change during the development cycle/lifetime of the project so the project becomes more complex/'mission creep'.	1

Question	Answer	Marks
5	This question to be marked as a Level of Response. **Level 3 (7–8 marks)** Candidates will discuss in detail, giving both benefits and drawbacks, of the use of the use of satellite technology in global positioning systems (GPS). The information will be relevant, clear, organised and presented in a structured and coherent format. There will be a reasoned conclusion/opinion. Subject specific terminology will be used accurately and appropriately. **Level 2 (4–6 marks)** Candidates will explain the use, giving a benefit and drawback, of the use of satellite technology in global positioning systems (GPS). For the most part, the information will be relevant and presented in a structured and coherent format. There may be a reasoned conclusion/opinion. Subject specific terminology will be used appropriately and for the most part correctly. **Level 1 (1–3 marks)** Candidates will describe, with a least one benefit/ drawback, of the use of the use of satellite technology in global positioning systems (GPS). Answers may be in the form of a list. There will be little or no use of specialist terms. **Level 0 (0 marks):** Response with no valid content. *Answers may make reference to e.g.:* *Benefits include:* Access to satellite signals is available over most of surface of earth unlike signals from terrestrial transmitters Transmission of GPS signals is not dependent on political boundaries Satellite signals are accessible over oceans where terrestrial transmissions are difficult to receive due to the long distances from land Signals are available to anyone who wishes to use them (unless switched off by operator of satellite) Satellites are vandal-proof/ inaccessible to those who would physically attempt to disrupt their function *Drawbacks include:* Requires a large number (c.25 to 35) of satellites to be in orbit to provide adequate coverage of terrain Cannot easily be repaired if malfunctioning Requires at least 3, preferably 4, satellites to be visible to / received by GPS receiver to achieve reliable/accurate positioning Satellite signals are blocked by solid objects/buildings/in tunnels/trees/dense clouds/ snow storms so, in these circumstances, GPS receivers may… …fail to provide locations …may provide erroneous locations.	8

Question	Answer	Marks
6	**Five** *from:* *Choice of CPU:* CPU 1 Reference to CPU 1 running JavaScript faster than CPU 2 Tablets are often used to view web pages Reference to CPU 1 having higher/better score on graphics performance than CPU 2 As tablets are often used to view video/movies Reference to CPU 1 having higher/better score on physics calculation performance than CPU 2 Reference to CPU 1 having a worse/poorer physics calculation performance than its graphics performance …which does not really matter in this context/use As tablets are not used for/do not need to carry out 'heavy'/intensive gaming/complex modelling.	**5**

Question	Answer	Marks
7	**Six** *from:* Accept/parse input from user Check for a (single) space Check that the characters are all alphanumeric/there are no non-alphanumeric characters (apart from the space) Check that all letters are in upper case (Separate and) check the first two characters of outward section/area code are letters …and remainder of outward section/district code is '1 number' or '1 number + 1 letter' (Separate and) check the inward section is in format '1 number + two letters'/check (sector code) is a number followed by two letters (for Unit code) Use of length check to ensure that there are no more than 8 characters and no less than 7.	**6**

Question	Answer	Marks
8	**Eight** *from:* *Advantages:* Eliminates the 'researcher effect'/Hawthorne Effect where the presence of a researcher may affect the observed data May provide a larger sample for analysis Provides access to data that may be inaccessible in any other way e.g. people may be unwilling to discuss/mention details Cost of the research is relatively low compared to other methods of gathering data Documentation may be highly detailed containing vast repositories of data gathered over long periods of time/tracking over time/previous observations/questionnaires Documentation may contain spontaneous comments of recorders e.g. personal feelings/comments/observations/notes that give greater insight into the operations of a company/stock control system *Disadvantages:* Can be subjective/based on views of the researcher Can be time-consuming compared to other methods of gathering data Documents are not usually designed for research purposes so may be difficult to comprehend/follow by researcher Documentation may be incomplete as documents can be misfiled/lost over time Documentation can vary in quality of information Researcher may lose/damage/misplace important documents during the research process *Max 6 for all advantages or all disadvantages.* *1 mark available for a reasoned conclusion/opinion.*	*8*

Question	Answer	Marks
9	**Six** *from:* Information about what is to be drawn/instruction to draw circles/use of (Bezier) curves to draw shape Location of the centre point of the (outer/larger) circle at 400,300 Radius of the (outer/larger) circle as 200 pixels Location of the inner/smaller circle at 500, 300 Radius of the inner/smaller circle as 100 pixels Style/weight of the lines to be drawn Colour(s) of the circle fill(s) Degree of opacity/transparency of the circles.	6

Question	Answer	Marks
10	**Eight** *from:* E.g.: <table><tr><th>Entity</th><th>Attribute</th><th>Data type</th><th>Field size</th></tr><tr><td>Pupil(s)</td><td>Pupil_ID</td><td>As appropriate e.g. integer</td><td></td></tr><tr><td></td><td>Given_name</td><td>Alphanumeric/ Text</td><td></td></tr><tr><td></td><td>Second_given_name</td><td>Alphanumeric/ Text</td><td></td></tr><tr><td></td><td>Family_name</td><td>Alphanumeric/ Text</td><td></td></tr><tr><td></td><td>Date_of_Birth</td><td>Date</td><td></td></tr><tr><td></td><td>Subject_1</td><td>Alphanumeric/ Text</td><td></td></tr><tr><td></td><td>Subject_2</td><td>Alphanumeric/ Text</td><td></td></tr><tr><td></td><td>Subject_3</td><td>Alphanumeric/ Text</td><td></td></tr><tr><td>Teacher(s)</td><td>Teacher_ID</td><td>As appropriate e.g. integer</td><td></td></tr><tr><td></td><td>Given_name</td><td>Alphanumeric/ Text</td><td></td></tr><tr><td></td><td>Family_name</td><td>Alphanumeric/ Text</td><td></td></tr><tr><td></td><td>Room</td><td>As appropriate</td><td></td></tr><tr><td></td><td>Subject_taught</td><td>Alphanumeric/ Text</td><td></td></tr></table> *Marks awarded for:* Both Pupil(s) and Teacher(s) as entities 1 mark Inclusion of ID attribute for Pupils(s) 1 mark Inclusion of ID attribute for Teacher(s) 1 mark Valid pupil(s) attributes+data type+field size max 3 marks Valid teacher attributes+data type+field size max 3 marks	**8**

Question	Answer	Marks
11	**Five** *from:*	**5**

Position in Flowchart	What is happening at the position
A	(Checks) if the DOOR IS CLOSED, if not, goes back to setting temperature/spin speed/start else moves on to B
B	(Checks) if the TEMPERATURE IS SET, if not, goes back to setting temperature/spin speed/start else moves on to C
C	(Checks) if the SPIN SPEED IS SET, if not, goes back to setting temperature/spin speed/start else moves on to load setting and cycle starts
D	(Checks) if the STOP/CANCEL BUTTON IS PRESSED, if so, goes to STOP else moves to E
E	(Checks) if the TIME IS UP, if so goes to STOP else moves back to D

Question	Answer	Marks
12(a)	**Five** *from:* *Max **three** (definition) from:* DNS spoofing is Domain Name System spoofing/Domain Name System cache poisoning Type of computer hacking Corrupt data is placed into cache of resolver of DNS/ISP DNS cache so that an incorrect IP address is returned Network traffic is diverted/redirected to a different computer to that which was requested/to hacker's computer *Max **three** (prevention) from:* DNS server configured to ignore request from other DNS servers that are not directly relevant to the query Use of secure DNS/public key encrypted/digitally signed data to ensure authenticity of DNS requests Performing end-to-end validation of DNS requests with HTTPS Defence is at transport layer.	**5**

Question	Answer	Marks
12(b)	**Five** *from:* *Max **three** (definition) from:* DoS is a Denial of Service attack Where a computer/system is made unavailable by overwhelming the target system with requests for service Requests for service are superfluous/have no purpose other than to disrupt/overload the system Can use many IP addresses/multiple computers/devices to carry out a DoS *Max **three** (prevention) from:* Use of firewall configured to deny incoming packets with IP addresses/ports from identified attackers Use of tools to analyse incoming data to identify 'spoof'/ unwanted/illegitimate requests Use of DNS blackhole/routing to re-route IP addresses intended for attacker to non-existent IP address/server Use of DNS sinkhole to direct traffic to valid IP address for analysis to reject unwanted packets Use of a specialised/commercial 'cleaning/scrubbing' servers/centre to separate out unwanted traffic from legitimate traffic Defence is at application layer.	5
12(c)	**Four** *from:* *Max **three** (definition) from:* ARP spoofing is Address Resolution Protocol spoofing To associate/link MAC address of attacker's device to IP address of e.g. default gateway/another network host Occurs when IP address is resolved to a MAC address So that traffic is directed to attacker instead of intended host/device Data frames may be intercepted and modified/prevent traffic movement *Max **three** (prevention) from:* Use of DHCP server configurations to certify that IP addresses are correctly assigned Use of tools to cross-check ARP resolutions to block incorrect ones Built into switches/network devices Configuring the ARP cache in the OS to ignore requests for updates/hard coding the ARP cache in OS to prevent updates.	4

Question	Answer	Marks
13	**Eight** *from:* Locking the room when not in use …prevents unauthorised access to devices/computers …requires meticulous logging of who has key to room …requires strict adherence by users to rules e.g. no unlocking of doors for others to go in Using swipe cards/ keypads to activate locks …requires extra items e.g. cards/knowledge of codes …cards can be stolen/lost and used by others …codes can be forgotten/told to others Biometric tests to unlock doors …via keypads/Voice recognition …can be time-consuming to collect user data …needs to be updated regularly as biometric data can change …can be fooled in various ways e.g. recordings of voice Bolting computers to the desk …very secure …computers not easily moved to other locations …computers in fixed positions may be difficult to use Using special pens to mark their postcode/owner details onto the computer/device case …can allow retrieval of stolen items …can be a deterrent to thieves …can deface items preventing resale/reducing asset value Keeping windows shut/locked/barred - especially if on the ground floor …prevents thieves from entering …reduces access to fresh air Using CCTV video cameras to monitor computer rooms/corridors …allows surveillance of large areas …needs constant attendance Employing security guards to check passes …effective at preventing unknown people from accessing area …requires more employees so increases costs …relies on integrity/honesty of security guard Positioning screens so passers-by cannot see what is on the screen …prevents others knowing/discovering the password …position may be unsuitable for long term use Type in passwords out of sight of others …prevents others knowing/discovering the password …may not be easy to achieve in crowded office/position of keyboard.	8