OCR
Oxford Cambridge and RSA

GCSE

Computing

Unit **A451**: Computer systems and programming

General Certificate of Secondary Education

Mark Scheme for June 2016

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

These are the annotations, (including abbreviations), including those used in scoris, which are used when marking

Annotation	Meaning of annotation
BP	Blank Page – this annotation **must** be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response.
^	Omission mark
BOD	Benefit of doubt
C	Subordinate clause/Consequential error
	Cross
E	Expansion of a point
FT	Follow through
NAQ	Not answered question
NBOD	Benefit of doubt not given
P	Point being made
REP	Repeat
	Slash
	Tick
TV	Too vague
0	Zero (big)

<table>
<tr><th colspan="3">Question</th><th>Answer/Indicative content</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>1</td><td>a</td><td></td><td>• The characters/symbols a <u>computer</u> uses/understands/displays</td><td>1</td><td>This has to explain what the set is, not how they are stored.

0 marks for:
• The characters for coding/programming
• the amount/number of/quantity of characters</td></tr>
<tr><td>1</td><td>b</td><td>i</td><td>1 mark each
<table><tr><td>Hex:</td><td>1</td><td>F</td><td>6</td><td>4</td><td>A</td></tr><tr><td>Binary:</td><td>0001</td><td>1111</td><td>0110</td><td>0100</td><td>1010</td></tr></table></td><td>2</td><td>Allow 100 for 4</td></tr>
<tr><td>1</td><td>b</td><td>ii</td><td>• Unicode has more characters/space (to store the emoji)
• Unicode is 16 bit/1-4bytes compared to ASCII’s 7/8 bits</td><td>2</td><td>Allow the opposite for bullet 1 i.e. ASCII does not have enough space

Allow any acceptable format for Unicode e.g. 1, 2, 3 or 4 bytes long
Allow numeric quantities in place of bits/bytes for bullet 2</td></tr>
</table>

Question			Answer/Indicative content	Mark	Guidance
2*			Points may include: **Legal** • Data Protection Act • Rules of DPA • Keeping data secure, need for firewall, anti-virus • Methods of restricting access • Intellectual property/copyright/licences **Ethical** • Storing and access to personal information • Rules/terms set up before people can join • Consequences for misconduct e.g. cyberbullying • Plagiarism • Communication of inappropriate materials for students/school/teacher • Backing up to preserve/save data • Gaining parental consent for communication online • E-safety • Acceptable use policy	6	**High Level Response (5-6):** A detailed discussion of the ethical **and** legal issues, with clear explanations that are linked to the scenario. There will be few if any errors in spelling, grammar and punctuation. Technical terms will be used appropriately and correctly. **Medium Level Response (3-4):** A description of some ethical **and/or** legal issues with some explanation/justification. Material may not be explicitly linked to the context. There may be occasional errors in spelling, grammar and punctuation. Technical terms will be mainly correct. **Low Level Response (1-2):** There is an attempt to describe either a legal issue **and/or** ethical issue. The points are poorly expressed and/or not related to the context. There is limited, if any, use of technical terms. Errors in grammar, punctuation and spelling may be intrusive.
3	a		• It is a foreign key • It is a Primary Key in FILM • It links to the FILM table // create a relationship to the FILM table • To get details about the film the rating refers to • Do not have to repeat the data/film/rating // reduces data redundancy • 1 film can be given many ratings	3	It must be clear that foreign key is in the rating table.

Question			Answer/Indicative content	Mark	Guidance
3	b		• Multiple/different brands of applications/platforms can access the database… • …without having to adapt the database structure • Different views of the data can be set up // can limit what users can access • The applications can be changed ... • ...without affecting the data/file structure • The data can be updated/changed // database structure can be changed ... • ...without affecting the application(s) • Data consistency/integrity is maintained	2	Not <u>data</u> redundancy
3	c		One piece of valid data for each of the fields in the user table e.g. J123, Joe, blogs, 1/4/1982	1	Accept any valid/reasonable data for each field Username, First name, Surname, DateOfBirth
3	d	i	00215	1	Correct answer only Must have leading 0s 0 marks if any additional
3		ii	1 mark per bullet • Year = 2015 • AND • Category=”Comedy”	3	Comedy must have speech marks Ignore speech marks around 2015 ‘ ok for “ Spellings must be accurate
4	a		Sequence	1	
4	b		• A location in <u>memory</u> • The <u>value/contents</u> **<u>cannot</u>** be changed (whilst the program is running)	2	0 mark for "a variable that does not change" 0 marks for "stays the same"
4	c		numberOfPages = numberOfPages+numberOfChapters	1	Accept: • += instead of = numberOfPages • numberOfPages=RoundDown(numberOfWords/wordsPerPage) +numberOfChapters • numberOfPages=RoundDown(numberOfWords/300) +numberOfChapters Variable names must be spelt correctly, ignore case

Question			Answer/Indicative content	Mark	Guidance
4	d		• Integer/Int • It is a whole number/you can't have half a word	2	Do not allow 'need to ignore the decimal' Cannot get reason if data type incorrect
4	e		• String (name) • Real/Single/Double/Currency/Float/(Decimal) (price)	2	
4	f		1 mark for identification, 1 for matching description e.g. • Error diagnostics/debugger • …highlight errors/suggest changes • Run-time environment • …Lets you run/test the program • Text editor • …highlight key words • …auto-indent • …to type/edit source code • …Auto-complete • …highlight syntax errors • Versioning tools • …To allow for tracing back • …To create new files with changes • Stepping/breakpoints • …Allow tracing of algorithms	4	Do not allow auto-documentation. Can get description mark, without identification/incorrect identification Allow: • Variable watch/window • See how the values change Do not allow compiler/interpreter

Question			Answer/Indicative content	Mark	Guidance
4	g		Max 2 for compiler, 2 for interpreter Compiler • To convert to low-level in one go • Create an executable//export the file • To distribute the software • Users will have no access to source code... • ...so no-one can edit/steal/copy the code/program • Use for error detection Interpreter • To convert to low-level line by line • To test the program // to find errors • stops running when it finds an error//shows the location of the error when found • it is quicker (compared to compiler) to re-interpret than re-compile	4	The uses must be different for compiler and interpreter

Question			Answer/Indicative content	Mark	Guidance
5	a		max 2 for explanation max 1 for example/use of Figure 2 or 3 • An image is made up of/consists of pixels • A pixel can be one colour • Each colour has a unique/corresponding binary number • Each pixel/square is given the binary number of its colour • The binary numbers are stored in order in the file • E.g. White = 000, Red = 010, Blue= 110, top line would be 000000010010010110110	3	Accept answers that are annotated on Figures 1 and 2, or that use these to explain the storage of the image, that meet each bullet The example must be more than describing what the diagram shows, e.g. 'the squares with W in are white' is not enough.
5	b		2 from • Fewer bits are needed per colour • which means fewer bits per pixel • Any example from diagram	2	"fewer bits" with no reason or application is 0
5	c		Max 1 for description, 1 for example • To store data/information about the image/data • E.g.Dimensions/height/width/No. of bits per pixel/Colours used/location/date/file type	2	0 marks for filename as example 'tells you something about the image' = TV 0 marks for definition referring to how the image is ‘displayed’

Question			Answer/Indicative content	Mark	Guidance
5	d	i	• The amplitude/height of the wave is measured • At set/regular intervals//by reasonable example • And stored as a binary number • The samples form an approximated sound wave	3	NOT frequency/pitch NB For the second bullet, this must relate to set intervals/the same interval. A set number of times per second does not suggest the same intervals.
5	d	ii	• File size increases • So the sound is truer/better quality/more accurate compared to the original/analogue	2	
6	a		2 from • Tasks can split between the processors… • …tasks/processes/software/ can be processed faster • …more processes completed per second • Allows multitasking // Run more than one process/task/instruction/data at a time/per clock cycle… • … tasks/processes/software/ can be processed faster • …more processes completed per second	2	MUST have given splitting tasks, or multi-tasking to allow speed Faster can only be given a mark if the first bullet(s) have been given.
6	b	i	Max 2 per difference, 1 for RAM, 1 for ROM e.g. • RAM is volatile • ROM is non-volatile • RAM stores currently running instructions/programs/applications/OS/data • ROM stores boot-up instructions/bios • RAM can be changed • ROM (normally) cannot be changed	4	Do not allow e.g. ROM is not for 2nd mark. Mark in pairs

Question			Answer/Indicative content	Mark	Guidance
6	b	ii	2 from • More instructions/programs/applications can run at the same time/be held in RAM • Open software faster/respond faster • More memory space for current programs • Run more memory intensive programs/relevant example e.g. computer games/graphic rendering • reduces use of Virtual Memory • .....less use of hard drive which is slower to access	2	
6*	b	iii	e.g. • Increase processor clock speed • Run more FE cycles per second • Faster response • Smoother actions • Less likely to freeze • Add more cores • Run more tasks simultaneously • Better performance for programs that are programmed for multi-core systems o E.g. new computer games • Increase cache size • Cache stores frequently used instructions/programs/data • Can store more so increase access speed to more frequently used instructions/programs/data • New graphics card • Can carry out more processes for CPU • Can improve speed and quality of graphics • Change hard disk drive to SSD • faster read/write speed	6	**High Level Response (5-6):** Several upgrades are identified and there is a detailed explanation of how each of these will impact the computer given in the example. There will be few if any errors in spelling, grammar and punctuation. Technical terms will be used appropriately and correctly. **Medium Level Response (3-4):** Upgrades are identified, although how these would improve the performance may be weak. There may be occasional errors in spelling, grammar and punctuation. Technical terms will be mainly correct. **Low Level Response (1-2):** There is an attempt to identify upgrades that could be made. There may be little or no explanation of how these improve performance. The points are poorly expressed or are not related to the context. There is limited, if any, use of technical terms. Errors in grammar, punctuation and spelling may be intrusive. Allow defragmentation and reducing the read time for the hard disk.

Question			Answer/Indicative content	Mark	Guidance
					Do not allow hard drive if referring to secondary storage size, allow for increasing amount of VM. Do not allow: • Increasing RAM • Upgrading components that do not affect performance (e.g. peripherals)

Question			Answer/Indicative Content	Marks	Guidance
7	a		• WAN is over a large geographical area/needs to transmit over a large distance // a LAN is over a small geographical area. • WAN uses external hardware/infrastructure/cables/network // LAN has its own infrastructure/cables/network/hardware due to distance/practicalities	2	NB Examples of infrastructure/hardware are allowed for WAN e.g. satellite, phone lines, Internet Allow LAN as Ethernet for second bullet NOT wide area for WAN
7	b		2 marks per benefit E.g. • All files can be stored centrally • …so workers can access files from any computer • …all computers can update the central database/file • …Peer-to-peer files might be stored on their own computers/spread across many computers • Backups are central • …all data is backed up each time • …individual computers do not need to backup their own data • …Peer-to-peer may need to perform their own backups. • Monitor clients • …to ensure they are working correctly • Upgrade software centrally • …so you do not have to install on each computer individually • Central security (antivirus/firewall) • …do not need to install protection on all computers • …Peer-to-peer individual security may need to be installed on individual computers	4	Do not allow: -easy to share data -“more secure”

Question			Answer/Indicative Content	Marks	Guidance
7	c		• WWW is the web pages (that are stored on servers) • Internet is the infrastructure // collection of networks	2	

Question			Answer/Indicative content	Mark	Guidance
8	a		10111111	1	
8	b		1 mark per nibble 1100 0110	2	

9			1 mark per bullet
			• Taking the move as input
			• Checking if array element input is free …
			  ○ …Outputting if it is taken
			• Writing "A" to the correct array element
			• Counting how many free space there are…
			  ○ …Outputting the number of free spaces (if good attempt at counting free spaces)
			e.g.
			`INPUT move`
			`IF numbers(move) = "" then`
			`  numbers(move) = "A"`
			`ELSE`
			`  output "taken"`
			`ENDIF`
			`free = 0`
			`FOR x = 0 TO 100`
			`  IF numbers(x) = "" then`
			`  free = free + 1`
			`  ENDIF`
			`NEXT x`
			`OUTPUT free`
			e.g.
			`INPUT move`
			`IF numbers(move) = "" then`
			`  numbers(move) = "A"`
			`  numberFree = numberFree - 1`
			`ELSE`
			`  output "taken"`
			`ENDIF`
			`OUTPUT numberfree`
				6	The output mark can only be awarded if a reasonable attempt at adding the free spaces have been performed
					
					Counting how many free spaces there are can be done by either:
					• Looping through each element of the array and updating a variable if free/taken
					• Subtracting 1 each time an element is taken (this must work, i.e. there is no initialisation of the variable e.g. to 101, as that would run every time and reset the variable). If Initialisation is used, this must be outside a loop and must be 101.

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