OCR
Oxford Cambridge and RSA

GCSE

Computing

Unit **A451**: Computer systems and programming

General Certificate of Secondary Education

Mark Scheme for June 2017

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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.

Annotations

Annotation	Meaning
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)

MARK SCHEME

Question			Answer / Indicative Content	Mark	Guidance
1	a		1 mark per bullet to max 2 • Hardware • Software • Allows for input, process and output	2	All of input, process and output required for third bullet. Do not accept examples of hardware/software.
1	b	i	Input: to allow instructions/data/commands/destination to be input/entered/given/example (e.g. entering a post code)	1	Do not accept "information".
1	b	ii	1 mark for input device, 1 for sensible use of device e.g. • Microphone… • …to let the user say their destination/voice recognition • Touch screen… • …let the user press options/enter data • Keyboard / braille keyboard… • …to let the user enter their destination • Camera… • …to let the user enter/select options by moving their eye/use an eye typer • Puff/suck switch… • …to allow the users to select options	2	Allow any reasonable **input** device, do not accept software e.g. voice recognition. Do not accept "sensor" without detailing what type of sensor. Accept "braille keyboard" but do not accept "braille" on its own. Accept buttons. Second mark is awarded for a sensible use of the device – for example, what is inputted (eg the destination) or how it is inputted (eg inputted using your voice). If input device is incorrect, do not award follow on mark for use.
1	c	i	1 mark for why, 1 for application • Long term/permanent/non-volatile/persistent storage • Store maps//user preferences//journey history//operating system//sat nav software	2	Second bullet point must be related to the sat nav, not just generic "programs" or "data".

1	**c**	**ii**	1 mark for identifying the reason why solid state was chosen, 1 for explanation e.g. • Is durable/robust//no moving parts • Less likely to be damaged//by example (eg dropped) • Faster <u>read/write speed</u> • Faster to boot//faster to load maps//more responsive • Small in size/light in weight • Reduces size of the sat nav// fit inside the sat nav • Lower power requirements • More suitable for running off batteries	**2**	Do not accept portability / reliability. Do not accept "faster" without clarification of what is faster.
1	**d**	**i**	1 mark per bullet to max 1 • <u>Fetch data/instructions</u> • <u>Decode data/instructions</u> • <u>Execute instructions</u> • Performs fetch-(decode)-execute cycle • Performs calculations/arithmetic/logical operations	**1**	Must include fetch / decode / execute as verb for first three bullet points. Must include reference to either data or instructions. Allow reference to tasks carried out by the Control Unit.
1	**d**	**ii**	1 mark per bullet to max 2 • Computers are made of logic gates/transistors/switches… • …which can only be two states / on or off / 1 or 0 /high or low	**2**	Second point dependent on first bullet point being awarded.

<table>
<tr><td>2</td><td>a</td><td>i</td><td>1 mark
e.g.
• Tags
• Hyperlinks
• Location/dimensions/name of images/videos/sound
• Structure / e.g. table
• Layout instructions
• Formatting e.g font/colour/style
• Metadata</td><td>1</td><td>Accept any valid item that could be in a HTML file e.g. a link to a CSS file

Accept other languages/scripting that could embedded into a HTML document, eg CSS/Javascript/etc.

Do not accept: image, video etc. The HTML file holds a link to the files, not the actual image or video itself.

Mark first answer only.</td></tr>
<tr><td>2</td><td>a</td><td>ii</td><td>1 mark per bullet to max 2
• All webpages are made using HTML
• All <u>browsers</u> read/understand HTML
• Allows for compatibility
• Allows devices to understand the same code/display the webpage correctly</td><td>2</td><td></td></tr>
<tr><td>2</td><td>b</td><td>i</td><td>1 mark for getting 1 correct
2 marks for getting both correct
<table><tr><td></td><td>Red</td><td>Green</td><td>Blue</td></tr><tr><td>Decimal</td><td>111</td><td>58</td><td>156</td></tr><tr><td>Hexadecimal</td><td>6F</td><td>3A</td><td>9C</td></tr></table></td><td>2</td><td></td></tr>
<tr><td>2</td><td>b</td><td>ii</td><td>1 mark per bullet to max 1
• Easier to remember/to enter/to read
• Faster to enter/read
• Fewer digits to remember/to enter/to read
• Less prone to error <u>when entering/reading/communicating</u>
• Quick to convert into binary</td><td>1</td><td>Do not accept “easier to understand”

“Less prone to error” requires further detail as shown.</td></tr>
</table>

2	**c**		1 mark per bullet to max 2 • Compression makes the file size smaller//takes up less space (on Shannon's computer) • File(s) upload more quickly / lower bandwidth required • File(s) take up less storage space <u>on the web server</u> • File(s) can be downloaded/streamed more quickly by the end user//website will load more quickly	**2**	
2	**d**		1 mark per bullet, to max 3 • <u>URL/domain name</u> is sent to the DNS • DNS has a list/database/table of URLs **and** matching IP addresses. • DNS looks up/translates/resolves/searches/finds the IP address • DNS sends back IP address (to web browser) • If not found, refers to higher/other DNS/returns error • DNS updates from other DNS • Browser uses IP address to retrieve webpage / connect to web server.	**3**	Do not accept "each URL has an associated IP address" on its own.

3	**a**		1 mark for each pseudocode statement
			
			`Total = Total + NumberArray(`**`Count`**`)`
			
			`Mean =` **`Total/Quantity`**
			`or`
			`Mean =` **`Total/Count`**
			`or`
			`Mean =` **`Total/10`**
				2	Ignore capitalisation.
					
					Accept any correct symbol or structured English meaning division for mean calculation.
					
					Accept mean calculations that refer to 11 numbers:
					e.g.
					• Total/11
					• Total/(Count+1)
					• Total/(Quantity+1)

3	**b**		1 mark per bullet, max 2 for definition, 1 for example Definition: • A location in memory • A value/data that cannot be changed (whilst the program is running) Example: • `Quantity`	**3**	0 marks for "stays the same" / “does not change”. Must have the idea that it cannot / is impossible to change. Correct answer only (“Quantity”) for the example. Do not accept other surrounding code (eg “Const Quantity = 10” is incorrect). Do not accept incorrect spellings. Ignore capitalisation. Do not accept “a constant is a variable that…”
3	**c**		1 mark for data type, 1 for justification Data type: Real/Float/Single/Double/Decimal Justification: can be decimal/fractional/not a whole number	**2**	If candidate uses “decimal” as data type, do not accept “can be decimal” for the justification. Do not award justification if data type is incorrect.
3	**d**	**i**	1 mark per bullet, to max 2 • A construct • Code is executed/run repeatedly//is looped • Until a condition is met/while a condition is true/a set number of times	**2**	Do not accept only an example (eg “for loop”).
3	**d**	**ii**	• While/do while • Repeat/ Repeat until/do until/ Until	**2**	Do not accept “do loop”.

3	**e**		1 mark for sensible borderline data, 1 mark for sensible invalid data. • Borderline – 0, 100 • Invalid – number less than 0 (eg -1, -12) / number more than 100 (eg 101, 206) / non-numeric data (eg “test”, “#!*%”)	**2**	
4	**a**		1 mark per bullet to max 2 • The data is stored permanently / is unchanging / remains when the DBMS or application is closed / non-volatile / on secondary storage • The data has a structure / stored in tables / fields / records	**2**	Accept rows / columns as alternative to records / fields for second bullet point.
4	**b**	**i**	1 mark for data type, 1 for justification Data type: Text/String Reason: leading 0s/will not be treated as a number	**2**	Accept Alphanumeric/Varchar/Char as alternatives for Data type. Do not award reason if data type is incorrect.
4	**b**	**ii**	4	**1**	Correct answer only.
4	**b**	**iii**	1 mark for Field name, 1 for reason Field: RequestID Reason: it will be unique/each request will have a unique number/it will not be repeated/other fields can be repeated	**2**	Do not award reason if field is incorrect. Do not penalise incorrect spelling or capitalisation.
4	**c**	**i**	Max 1 mark per validation rule. Both rules must be different, e.g. cannot both be presence TeacherID e.g. • Presence check//must be entered • Format check//must be letters then numbers • Existence check//must already exist in the database • Lookup//must be selected from a list of valid teachers • Type/character check//must be string • Length check//must be (minimum of) 3 characters long	**2**	Accept any reasonable validation rule for a field Accept name of a rule, or example Mark first answer only if candidates have provided multiple validation techniques for each.

			Date e.g. • Range check//must be within certain dates • Presence check//must be entered • Format/character check//must be DD/MM/YYYY • Type check//must be a valid date • Length check//must be 8/10 characters • Lookup/existence check//must be a valid date (eg from calendar)		
4	**c**	**ii**	3 marks for each feature, 1 for identifying, 1 for description, 1 for example use e.g • Query • Use to select specific information // find records that match a criteria // search for records // extract data • e.g. Find all requests made on a specific date • Form • User friendly way to enter data // uses drop down boxes etc. • e.g. form to enter a new request • Report • User friendly/formatted copy of results // can be used as a hard copy // method of outputting data • e.g. report of all requests made by one teacher for printing • Security • Stop unauthorised access or modification • e.g. usernames and passwords	**6**	The feature identified must be a feature of a DBMS and not a database. Allow any sensible example that relates to this database. If feature is incorrect, do not award marks for description or example. If feature is poorly identified (eg search instead of query), give credit for matching description / example but not for identification. Mark feature/description/example together. Allow table <u>creation</u> / editor / modules / integrity checks / access control / concurrent access / creating links between tables. Do not accept validation (in the question) Do not accept tables / fields/ key fields (all features of a database, not a DBMS).

5*			Points may include: Ethical issues: • Safer driving as no room for human error • Can machines make snap judgements, taking into account all factors – can impact safety • Cars can react to the facts, i.e. avoid accidents • Can record where people go and when they go – how is this data going to be stored, or used? • Impact on pollution (negative and positives) • Impact on employment (taxis / delivery drivers) Legal issues: • Cars will not break traffic laws, e.g. run red lights • Issues with who is legally the driver • Is a drivers' licence needed? • Who is legally liable/responsible in an accident? • Insurance requirements • Data Protection issues with data generated • Possibility of "hacking" into cars • May need to change or adapt existing laws Many points can be considered from both an ethical and legal point of view. Candidates may refer to other valid scenarios of automated technology, not just driverless cars.	**6**	**High Level Response (5-6):** A detailed discussion of at least one ethical and one legal issue, 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 an ethical and/or a legal issue with some explanation/justification that may be weak at times. 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 or ethical issue. 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. 0 marks, response not worthy of credit

6	a		Max 2 per explanation, 1 for example e.g. • Share files between computers/employees // by example • Centralised data storage // by example • Allows for collaborative working // by example • More efficient working practices // by example • e.g. OCR Accounts use a shared drive to share work • Share devices / printers / routers // by example • Fewer peripherals / printers required// by example • Save money in purchasing equipment// by example • e.g. OCR Accounts only needs 1 printer, rather than 1 per employee • Improved communication // by example • Can use e-mail/other appropriate means // by example • e.g. OCR Accounts can e-mail documents/work • Central management of security // by example • Anti-virus/firewall/security is configured for all computers // by example • e.g. each computer at OCR Accounts does not need its own security • Centralised backups // by example • Can backup all computers automatically // by example • e.g. OCR Accounts can backup data for all staff • • Centralised updates // by example • Can update all computers at the same time // by example • e.g. OCR Accounts can update software without having to visit everyworkstation.	6	Accept any other reasonable benefit for using a network in this scenario, except for monitoring. Mark question as a whole. 3rd mark is awarded for example linked to the scenario, so max 2 per benefit if no example given.

6	**b**	**i**	Modem/Router	**1**	

6	**b**	**ii**	max 2 marks per hardware device e.g. • NIC… • …to connect Ethernet cable to computer • Router… • …to receive and transmit data within the network/to send data around a network/to join networks together/to connect to the Internet • Bridge… • …connect networks together • Switch… • …to connect multiple devices together / directs traffic to its destination. • Hub… • …to connect multiple devices together. • Server… • …to store the data/manage the network/store backups • Wireless Access Point/WAP… • …to allow for wireless transmission of data • Cables… • …to connect devices together • Modem… • …to connect computers via telephone lines // to covert digital data to analogue / to convert analogue data to digital.	**4**	Accept any hardware device that can be used to create/set up/produce a network. Device must be different than answer given in 6bi Accept repeater / range extender / powerline adaptor etc.

6	**c***		Points may include:
			• Acceptable use
			  ○ Define what employees can/cannot do on a network
			  ○ Restrict employees to only performing work tasks
			  ○ Stop illegal activities such as accessing inappropriate material, downloading software
			• Disaster recovery
			  ○ A plan in case something happens to the computers/network/data
			  ○ A plan to allow recovery to avoid downtime/restore the network/data
			• Failover
			  ○ Backup devices ready to automatically take over if a device fails
			  ○ Allows the company to continue working
			  ○ Avoids downtime
			• Backup
			  ○ A plan for when data is backed up
			  ○ How it is backed up
			  ○ Who is responsible for it
			  ○ Where it is backed up etc.
			• Archiving
			  ○ Removing old data that is no longer needed but kept in case needed
			  ○ Free up memory space in a computer
			  ○ Plan of when data will be archived, what will be archived etc.
			• Security
			  ○ Levels of access
			  ○ Usernames / passwords / authentication
			  ○ Encryption
				6	**High Level Response (5-6):**
					A detailed discussion of network policies, covering points from at least **two** different policies, with clear explanations of purpose 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 network policies, covering points from at least **two** policies, with some explanation/justification that may be weak at times. 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 at least **one** network policy. 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.
					
					0 marks, response not worthy of credit

7			1 mark per bullet:
			• Storing a number for the user to guess
			• Loops 10 times correctly
			• Inputs the user's guess
			• If correct, outputs congratulations **and** stops the loop / ends the game (any appropriate method of breaking out of loop)
			• If the guess is greater than stored number, outputs lower (or similar)
			• If the guess is lower than stored number, outputs higher (or similar)
			
			e.g. using while loop
			`num = 50 //(could be a random number)`
			`x = 0`
			`while x < 10`
			`  input guess`
			`  if guess == num then`
			`  output "Congratulations"`
			`  x = 10`
			`  elseif guess > num then`
			`  output "lower"`
			`  else`
			`  output "higher"`
			`  endif`
			`x = x + 1`
			`end while`
			
			e.g. example using for loop
			`num = 50 //(could be a random number)`
			`for x = 1 to 10`
			`  input guess`
			`  if guess == num then`
			`  output "Congratulations"`
			`  end //(could be break / exit, or x = 10)`
			`  elseif guess > num then`
			`  output "lower"`
			`  else`
				6	Allow pseudocode, flowchart, or structured English as long as it is not just repeating the instructions and where it meets the bullet points.
					
					If candidate uses FOR loop, accept 0 to 9 / 0 to 10 / 1 to 10 / 1 to 11 (or equivalent) as valid for 2nd bullet point.

			output "higher" endif next		

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