

**Computing**

Advanced GCE A2 H447

Advanced Subsidiary GCE AS H047

**Mark Schemes for the Units**

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**January 2009**

**HX47/MS/R/09J**

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**Advanced Subsidiary GCE Computing (H047)**

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# F451 Computer Fundamentals

Question			Expected Answers	Mks
1	(a)	(i)	-A peripheral/external unit which/-allows storage of data/-over a long period (Mark for first point + one other point)	[1]
		(ii)	<ul style="list-style-type: none"> <li>• Hard drive               <ul style="list-style-type: none"> <li>– To store files/O.S./software</li> </ul> </li> <li>• CD ROM drive/DVD ROM               <ul style="list-style-type: none"> <li>– To load software/use encyclopaedias</li> </ul> </li> <li>• CD RW/DVD RW               <ul style="list-style-type: none"> <li>– To take back up/transport data</li> </ul> </li> <li>• Memory stick               <ul style="list-style-type: none"> <li>– To move data between school and home</li> </ul> </li> </ul> Accept others with – sensible reason <b>(2 per pair, max 3 pairs, max 6)</b>	[6]
	(b)		<ul style="list-style-type: none"> <li>• Data sent to buffer from primary memory</li> <li>• Interrupt sent when buffer is full</li> <li>• Buffer is emptied to storage device</li> <li>• At slower speed, to accommodate device</li> <li>• When buffer is empty</li> <li>• Interrupt is sent to processor</li> <li>• To request buffer refill</li> <li>• Mark for consideration of interrupt priority/waits in queue to be executed</li> </ul> <b>(1 per -, max 4)</b>	[4]
2	(a)	(i)	<ul style="list-style-type: none"> <li>• Patterns of light/dark lines...</li> <li>• Pairs of which store digits</li> <li>• Used to store ID code/used to access record on file</li> <li>• Different widths/pairs of widths used</li> <li>• Inclusion of check digit for automatic checking</li> <li>• Start and stop codes allow bars to be read both ways</li> </ul> <b>(1 per -, max 3)</b>	[3]

Question		Expected Answers	Mks
	(ii)	<ul style="list-style-type: none"> <li>• Laser/infra red/light used</li> <li>• Reflections show up (thickness) of lines</li> <li>• Guide lines to allow reading at an angle</li> <li>• Check digit calculation done for immediate checking of reading</li> <li>• Start and stop codes to decide direction of reading...</li> <li>• To allow reversal of bars</li> </ul> <p><b>(1 per -, max 3)</b></p>	
			<b>[3]</b>
	(b)	<ul style="list-style-type: none"> <li>• Database has entry for each ID number</li> <li>• When scanned. ID is found in database</li> <li>• Number in stock field is...</li> <li>• Incremented if goods coming in to warehouse</li> <li>• Decremented if goods going out of warehouse</li> <li>• Therefore number in stock is always up to date with what is in warehouse</li> </ul> <p><b>(1 per -, max 4)</b></p>	
			<b>[4]</b>
3	(a) (i)	<ul style="list-style-type: none"> <li>• (Contents of) memory which is not erased when power is off/non-volatile/memory contents cannot be altered</li> <li>• Boot program</li> <li>• Program is required immediately power is switched on, therefore must still be there</li> </ul>	
			<b>[3]</b>
	(ii)	<ul style="list-style-type: none"> <li>• (Contents of) memory is erased when power is off/volatile</li> <li>• Applications software/Operating System/User files</li> <li>• Allows changes to be made to saved contents/files in current use/fast access to data</li> </ul>	
			<b>[3]</b>
	(b) (i)	<ul style="list-style-type: none"> <li>• The position/address in memory...</li> <li>• Of the location containing either...</li> <li>• The next piece of data to be read or...</li> <li>• The next instruction to be used</li> </ul>	

Question		Expected Answers	Mks
	(ii)	<ul style="list-style-type: none"> <li>• It stores the address of the next instruction</li> <li>• It controls the sequence in which the instructions/order in which instructions...</li> <li>• Are retrieved/executed</li> <li>• It is incremented after being read</li> <li>• It is altered as the result of a jump instruction</li> </ul> <b>(1 per -, max 2 per dotty, max 4)</b>	
			[4]
4	(a)	<ul style="list-style-type: none"> <li>• (A set of) software/programs...</li> <li>• Designed to manage the hardware of the system.</li> </ul>	
			[2]
	(b)	<ul style="list-style-type: none"> <li>• Allows one user...</li> <li>• At a time to use the system</li> <li>• Allocates each user with rights</li> <li>• Keeps the user files separate</li> </ul> <b>(1 per -, max 3)</b>	
			[3]
	(c)	<ul style="list-style-type: none"> <li>• Allows more than one task/software to run (apparently) simultaneously</li> <li>• Use of separate windows for each task</li> <li>• Each is given an amount of processor time before</li> <li>• Going on to next</li> <li>• eg Plays music while typing essay</li> </ul> <b>(1 per -, max 3)</b>	
			[3]
5	(a) (i)	<ul style="list-style-type: none"> <li>• The client does not understand the potential of computer systems</li> <li>• The analyst does not understand the dairy industry</li> <li>• The two must pool their information in order to ensure the 'right' problem is solved</li> <li>• The analyst may produce a solution which does not satisfy the client</li> </ul> <b>(1 per -, max 3)</b>	
			[3]

Question		Expected Answers	Mks
	(ii)	<ul style="list-style-type: none"> <li>• Important to client because need to be sure it will perform as required/identifies areas where solution is lacking</li> <li>• Important to analyst because it determines the end of the job/the analyst being paid</li> </ul>	
			[2]
	(iii)	<ul style="list-style-type: none"> <li>• Corrective</li> <li>• To correct bugs found in software when being used</li> <li>• Adaptive</li> <li>• To alter software because of external need eg VAT paid on dairy produce is changed to 10%</li> <li>• Perfective</li> <li>• To improve performance of software</li> </ul>	
			[6]
(b)	(i)	<ul style="list-style-type: none"> <li>• Character check/type check <ul style="list-style-type: none"> <li>– Letters of alphabet for name</li> </ul> </li> <li>• Length check <ul style="list-style-type: none"> <li>– Herd type should be of length 4</li> </ul> </li> <li>• Format check <ul style="list-style-type: none"> <li>– Herd type should be 1 character followed by 3 digits.</li> <li>– Presence check</li> <li>– To ensure that a value has been entered</li> </ul> </li> <li>• Existence check <ul style="list-style-type: none"> <li>– Farmer's name is already in file</li> </ul> </li> </ul> <p><b>(2 per type, max 2 types, max 4)</b></p>	
			[4]
	(ii)	Accounting/Spreadsheet.	
			[1]
	(iii)	<pre> 111001000101       1111 11 1 </pre> <p><b>(1 for first 4 bits, 1 for next 8 bits, 1 for carries)</b></p>	
			[3]

Question	Expected Answers	Mks
	<p>(c)</p> <p><b>Mark band 6-8, High level response</b>  Candidate has discussed a range of reasons and the measures that can be taken to alleviate their fears.  Candidate has linked problems to the measures to be taken.  Candidate has used appropriate technical terms as appropriate.  There will be few, if any, errors in spelling and grammar.</p> <p><b>Mark band 3-5, Medium level response</b>  Candidate has discussed at least one reason and a measure that can be taken to alleviate their fears.  Candidate has linked a problem to a measure taken.  Candidate has used some technical terminology in the answer.  There may be spelling errors and/or grammatical errors, but they are not obtrusive.</p> <p><b>Mark band 0-2, Low level response</b>  Candidate has made one or two points about either the problem or measures. There will be a lack of cohesion if more than one point.  Candidate has failed to use technical terms in the answer.</p> <p>Points likely to be included:</p> <p>Reasons/Concerns/Worries:</p> <ul style="list-style-type: none"> <li>• Privacy of their personal details...</li> <li>• And commercially sensitive data about the farm...</li> <li>• Being hacked into by outsiders...</li> <li>• Being sold on by company or employees</li> <li>• Errors in data being stored leading to...</li> <li>• Compounded errors when data used in calculations</li> <li>• Farmers from new area do not have experience of working with company</li> </ul> <p>Measures:</p> <ul style="list-style-type: none"> <li>• Allow access to data by farmers in order to...</li> <li>• Check accuracy</li> <li>• Limit access to small number of named personnel</li> <li>• Abide by D.P. legislation</li> <li>• Take measures/firewalls to stop hacking</li> <li>• Use 'satisfied' farmers to placate worries among new customers</li> </ul>	<b>[8]</b>

Question		Expected Answers	Mks
6	(a)	<ul style="list-style-type: none"> <li>• A set of rules...</li> <li>• To govern communication (between devices)</li> </ul>	[2]
	(b)	<ul style="list-style-type: none"> <li>• A handshake signal sent from one device...</li> <li>• And acknowledged by the other</li> <li>• This states that each is now ready for communication</li> <li>• Establishment of medium for communication</li> <li>• Mention of one part of protocol being established: Parity/async or sync/ baud rate...</li> </ul> <p><b>(1 per -, max 3)</b></p>	[3]
	(c) (i)	<ul style="list-style-type: none"> <li>• Descriptions of the physical connections between the devices</li> <li>• Wireless or hard-wired?</li> <li>• What frequencies?</li> <li>• Serial or parallel?</li> <li>• Radio or microwave?</li> <li>• Copper cable or fibre optic?</li> </ul> <p><b>(1 per -, max 3)</b></p>	[3]
	(ii)	<ul style="list-style-type: none"> <li>• Baud rate</li> <li>• Error correction technique</li> <li>• Routing</li> <li>• Flow control/synchronisation of messages</li> <li>• Descriptions of the rules governing the data</li> <li>• Packet size</li> <li>• Compression techniques</li> <li>• Encryption algorithms</li> <li>• Digital signatures</li> </ul> <p><b>(1 per -, max 3)</b></p>	[3]

Question			Expected Answers	Mks
7	(a)	(i)	Software: <ul style="list-style-type: none"> <li>• Network Operating System</li> <li>• Drivers for hardware</li> <li>• Network versions of applications software</li> <li>• Communications software</li> </ul> Hardware: <ul style="list-style-type: none"> <li>• Network Interface cards</li> <li>• Cabling/or other communication medium/wireless access points</li> <li>• Server/File server/hub/switch</li> </ul> <b>(1 per -, max 2 per section, max 4)</b>	
				<b>[4]</b>
		(ii)	<ul style="list-style-type: none"> <li>• Fibre optic cable</li> <li>• Telephone cable</li> <li>• Infra red/microwave/satellite</li> <li>• Need for a modem/router</li> </ul> <b>(1 per -, max 2).</b>	
				<b>[2]</b>
	(b)	(i)	<ul style="list-style-type: none"> <li>• Text files use a small volume of data/Videos require large volume of data...</li> <li>• In a small period of time if video is to be seen in real time/it will freeze or lag otherwise</li> <li>• Consequently, number of bits per second is important/dependant on the data being sent</li> <li>• Video data is time sensitive</li> </ul> <b>(1 per -, max 3)</b>	
				<b>[3]</b>
		(ii)	<ul style="list-style-type: none"> <li>• List of choices on screen</li> <li>• Choice made by user leading to...</li> <li>• Further menus</li> <li>• Can use touch screen</li> <li>• Back/home options on each screen</li> </ul> <b>(1 per -, max 3)</b>	
				<b>[3]</b>

Question		Expected Answers	Mks
	(iii)	<ul style="list-style-type: none"> <li>• Limit on choices valuable for people with little knowledge to help them decide</li> <li>• Restricts users to those areas of system which the company is happy for them to visit</li> <li>• Use of touch screen limits damage /vandalism</li> <li>• Easy to use/intuitive/GUI more difficult to use</li> <li>• May be computer illiterate</li> </ul> <p><b>(1 per -, max 3)</b></p>	
			<b>[3]</b>
8	(a)	<ul style="list-style-type: none"> <li>• The symbols that the computer can recognise/use</li> <li>• Each symbol is distinguishable from all others</li> <li>• Normally determinable by reference to characters on keyboard</li> <li>• E.g. ASCII/Unicode/...</li> </ul> <p><b>(1 per -, max 2)</b></p>	
			<b>[2]</b>
	(b) (i)	eg Word Processing	
			<b>[1]</b>
	(ii)	eg ATM terminal	
			<b>[1]</b>
	(iii)	<ul style="list-style-type: none"> <li>• Each required character is given a unique...</li> <li>• Binary code</li> <li>• The more characters required, the more bits in each code</li> <li>• The number of bits to represent the code establishes the size of a byte</li> <li>• For example ASCII using 8 bits per character/EBCDIC using 8 bits/UNICODE using 16 bits</li> <li>• This will give ASCII 256/128 characters</li> <li>• ATM uses 10 digits + 6 command codes, 4 bits per character</li> <li>• Number of characters will tend to be a power of 2</li> <li>• Allows keys to have different characters</li> </ul> <p><b>(1 per -, max 4)</b></p>	
			<b>[4]</b>

# F452 Programming Techniques and Logical Methods

Question		Expected Answers	Mks	
1	(a)	<p>Easier to learn            ...due to familiar layout            ...and good use of online help            ...will be intuitive            Fewer mistakes will be made when using the program...            Input will be faster...            ...use of GUI objects such as drop downs/option buttons            ...dialogue boxes to alert on validation errors            No information overload / sensitive to the needs of the user</p>	4	
	(b)	<p>There is a title            The end user can enter the name of recipe            The end user can enter the Number catered for</p> <p>For each ingredient:            The end user can enter the Name of ingredient            The end user can enter the Quantity of ingredient            The end user can enter the Unit of ingredient</p> <p>Unit can be entered by a dropdown list...            ...which has been populated with some common values</p> <p>There is a facility for scrolling for more ingredients than the screen can fit</p> <p>There is a button to start over/clear data            There is a button to save ingredient data/add a line of ingredients            There is a button to close the program</p> <p>Optimal use of screen</p> <p>Space for ingredient and recipe name long enough (at least 10 characters)</p>	8	
	(c)	(i)	<p>The data is stored chronologically/in the order in which it is entered            New data always appended / added to the end of the file            You need to read each preceding item to reach an item you are searching for</p>	2

Question		Expected Answers	Mks
	(ii)	<p>The files are relatively short  The program will usually need all of the data / unlikely to need to search for individual ingredients  There is no need to have the ingredients in a particular order</p>	2
	(d)	<p><u>Correct answer:</u>  Pasta Bake  4  pasta bows;grams;200  milk; ml; 500  cheese; grams; 150</p> <p>Mark points:  Pasta Bake on its own as first line  4 on its own in second line  The three parts of each ingredient on same line  ...in correct order on line (name; unit; quantity)  ...separated by semi-colons</p>	4

Question	Expected Answers	Mks
(e)	Input NewNumberOfPeople (from user) Open both files ...one for Input/Reading, one for output/writing Read a line of text (recipe name) from Input file Write that line to output file Read a line of text from input Write NewNumberOfPeople to output file / scale number of people from input file Repeat ... / <u>use a loop</u> to read line by line Read a line of text from Input Calculate new recipe quantity Replace quantity in string Write string to output file Until input file gets to end of file Close all files (which have been opened)	<b>8</b>

Question		Expected Answers	Mks	
2	(a)	<p><b>RAD</b>            RAD is a method for designing software            Where a Prototype design...            ...with reduced functionality is produced            Then tested and evaluated            to refine the design of the next prototype            This is repeated (with a more refined prototype each time)            Until Prototype is accepted            Until final product is produced            [Max 3]</p> <p><b>Advantage</b>            "Something" can be seen working early in the project            End user more involved / can change the requirements as product becomes clearer            Overall development time is quicker (than alternative methods)            [Max 1]</p>	4	
	(b)	(i)	<p>(Suitable) inputs are tested...            ...against the expected output (according to the design)            ...without considering how the program works</p>	2
		(ii)	<p>Testing is carried out by the programmer(s)/ software company            Playing the role of the user / city council            During development            To find bugs in the program</p>	2

Question		Expected Answers	Mks
	(iii)	<p>The program is tested to prove to the end user /city council</p> <p>That the program works correctly</p> <p>Meets the original objectives</p> <p>After development is complete</p> <p>Before handing it over / end user will pay if satisfied</p>	<b>2</b>
	(c)	<p>Test cases include:</p> <p>Start and finish before 8 am</p> <p>Start and finish after 5 pm</p> <p>Start before 8 am and finish between 8 am and 5 pm</p> <p>Start and finish between 8 am and 5 pm</p> <p>Start between 8 am and 5 pm and finish after 5 pm</p> <p>Start before 8 am and finish after 5 pm</p> <p>Test involving 8 am boundary</p> <p>Test involving 5am boundary</p> <p>Test fractions of an hour</p> <p>Start or finish time between 12 midnight and 5 am</p> <p>Marks: For each test case above:</p> <p>1 mark for reason</p> <p>1 mark for dat</p> <p>1 mark for expected outcome if it matches data</p> <p>(3 marks per test case x 3)</p>	<b>9</b>

Question	Expected Answers	Mks
(d)	<p><b>High level response [5-6 marks]</b>  Candidates will be able to give a full and clear explanation of what the installation does.  The information will be presented in a structured and coherent form.  There will be few, if any, errors in spelling, grammar and punctuation.  Technical terms will be used appropriately and correctly.</p> <p><b>Medium level response [3-4 marks]</b>  Candidates will be able to give a satisfactory explanation of what the installation does.  The information will be presented in a structured format.  There may be occasional errors in spelling, grammar and punctuation.  Technical terms will be mainly correct.</p> <p><b>Low level response [0-2 marks]</b>  Candidates will be able to give a limited and general explanation of what the installation does.  Information may be a list of points, with little or no descriptions.  Information will be poorly expressed and there will be a limited, if any, use of technical terms.  Errors of grammar, punctuation and spelling may be intrusive.</p> <p>Answers may include  The program is copied to a designated folder on the target computer  Any necessary data files are copied  Any necessary library files are copied and registered  Shortcut / icon created to run the program easily  User has the opportunity to configure program / run settings  And configuration is saved in a file / registry  Programs may need extracting from a compressed file</p>	<b>6</b>

Question			Expected Answers	Mks
<b>3</b>	<b>(a)</b>	<b>(i)</b>	FALSE	<b>1</b>
		<b>(ii)</b>	TRUE	<b>1</b>
		<b>(iii)</b>	FALSE	<b>1</b>
		<b>(iv)</b>	PLEASE ADD PAPER	<b>1</b>
	<b>(b)</b>	<b>(i)</b>	Output: PRINTING... NOT(PaperTrayEmpty) is TRUE (FilesWaiting > 0) is TRUE So, overall, IF condition is true	<b>4</b>
		<b>(ii)</b>	Output: PLEASE ADD PAPER NOT(PaperTrayEmpty) is TRUE (FilesWaiting > 0) is FALSE So, overall, IF condition is false / "ELSE" part is executed	<b>4</b>
<b>(c)</b>		<p>Example</p> <pre>IF PaperTrayEmpty THEN   Output "PLEASE ADD PAPER" ELSE   IF FilesWaiting &gt; 0 THEN     Output "PRINTING"   ELSE     Output "STATUS OK"   END IF END IF</pre> <p>Marks for</p> <ul style="list-style-type: none"> <li>Tests for PaperTrayEmpty being TRUE or FALSE</li> <li>Tests for FilesWaiting being &gt; 0 or not</li> </ul> <p>And based on these tests:</p> <ul style="list-style-type: none"> <li>Outputs "STATUS OK" when PaperTrayEmpty = FALSE and FilesWaiting = 0</li> <li>Outputs "Please Add Paper" when PaperTrayEmpty = TRUE and FilesWaiting = 0</li> <li>Outputs "Please Add Paper" when PaperTrayEmpty = TRUE and FilesWaiting &gt; 0</li> <li>Outputs "PRINTING ..." when PaperTrayEmpty = FALSE and FilesWaiting &gt; 0</li> </ul> <p>[1 mark for "STATUS OK" and marks for up to any other 3 bullet points]</p>	<b>4</b>	

Question		Expected Answers	Mks
4	(a)	Initialise T (to its starting value/0) Before it is used in an expression (in line 6) Or else it might use a value retained from previous uses of T	2
	(b)	Line 6 is an assignment statement / will be interpreted as a comparison LHS should be a variable / it should be $T = T + L$ ... which will take the value of the expression on RHS Putting an expression on LHS will cause a syntax error if the algorithm were implemented	2
	(c)	Use indentation ... on lines 4,5,6,7 / to clearly the WHILE loop clearly Use meaningful identifiers/names for the variables ... so you do not need to remember what they are / make code easier to read / suitable example	4

Question	Expected Answers	Mks
(d)	<p><b>High level response [5-6 marks]</b> Candidates will show a clear understanding of the question and answer the question with complete and comprehensive justifications for using techniques. The information will be presented in a structured and coherent form. There will be few if any errors in spelling, grammar and punctuation. Technical terms will be used appropriately and correctly.</p> <p><b>Medium level response [3-4 marks]</b> Candidates will show an understanding of the question and answer the question with limited explanations of a few techniques. The information will be presented in a structured format. There may be occasional errors in spelling, grammar and punctuation. Technical terms will be mainly correct.</p> <p><b>Low level response [0-2 marks]</b> Candidates will demonstrate a limited understanding of the question. Information may be a list of points, with little or no explanations. Information will be poorly expressed and there will be a limited, if any, use of technical terms. Errors of grammar, punctuation and spelling may be intrusive.</p> <p>Answers may include:</p> <ul style="list-style-type: none"> <li>• Enables teams of programmers to work collaboratively</li> <li>• ... code split into modules / blocks which are easier to maintain / debug individually</li> <li>• ... conventions used to ensure everyone understands program</li> <li>• Code can easily be read by other programmers / at a future date</li> <li>• ... Indentation clearly shows structure of code</li> <li>• ... meaningful identifiers make code easier to read / understand</li> <li>• Program is less error prone</li> <li>• ... it is internally documented / comments can be compared with logic</li> <li>• ... and is easier to trace / debug</li> <li>• ... code is easier to read/closer to pseudocode</li> </ul>	<b>6</b>

Question			Expected Answers	Mks
5	(a)	(i)	<ul style="list-style-type: none"> <li>• A single instruction ...</li> <li>• ... which can be executed</li> <li>• suitable example</li> <li>• Some statements can contain others (eg IF, WHILE)</li> </ul>	2
		(ii)	<ul style="list-style-type: none"> <li>• A subroutine ...</li> <li>• ... which can return a single value</li> <li>• suitable example</li> <li>• So it can be used within expressions (as a variable)</li> </ul>	2
	(b)	(i)	10	1
		(ii)	TRUE	1
		(iii)	Error	1
	(c)	(i)	When a function/procedure/subroutine calls itself	1
		(ii)	Line 07	1
	(d)	(i)	20	1
		(ii)	40	1
	(e)	Award marks for <ul style="list-style-type: none"> <li>• Function called with argument ("AB")</li> <li>• Line 2 IF statement false so do lines 4/5</li> <li>• Line 7 Coinvalue(A) = 10</li> <li>• Line 7 needs Calculate ("B") – so new call <ul style="list-style-type: none"> <li>▪ Function called with argument ("B")</li> <li>▪ Line 2 IF Statement is TRUE so do line 3</li> <li>▪ Calculate = CoinValue("B") = 5</li> <li>▪ Call ends returning 5</li> </ul> </li> <li>• Line 7 continues: Return value = 10 + 5 = 15</li> <li>• Call ends returning 15</li> </ul>	6	

# Grade Thresholds

Advanced GCE Computing (H047/H447)  
January 2009 Examination Series

## Unit Threshold Marks

Unit		Maximum Mark	A	B	C	D	E	U
F451	Raw	100	64	57	50	43	37	0
	UMS	100	80	70	60	50	40	0
F452	Raw	100	83	74	65	56	48	0
	UMS	100	80	70	60	50	40	0

## Specification Aggregation Results

Overall threshold marks in UMS (ie after conversion of raw marks to uniform marks)

	Maximum Mark	A	B	C	D	E	U
H047	200	160	140	120	100	80	0
H447	400	320	280	240	200	160	0

For a description of how UMS marks are calculated see:  
[http://www.ocr.org.uk/learners/ums\\_results.html](http://www.ocr.org.uk/learners/ums_results.html)

Statistics are correct at the time of publication.

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