

# **Computing**

Advanced Subsidiary GCE

Unit **F452**: Programming Techniques and Logical Methods

## **Mark Scheme for June 2011**

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Question	Expected Answer	Mark	Additional Guidance
1 (a)	Design to include: <ul style="list-style-type: none"> <li>• Suitable title <b>AND</b> generally good use of space</li> <li>• Size, number of spots and colour of spots can be entered</li> <li>• Method for entering <b>either</b> numeric value (size <b>or</b> number of spots) is suitable for touch screen interface (eg drop-down, spinner, numeric software keyboard)</li> <li>• Method for entering colour of spots is suitable for touch screen interface (eg drop down, menu, radio buttons, tickboxes)</li> <li>• Command button (or similar) to initiate search</li> <li>• Clear/reset/close button</li> <li>• Area for output of picture of ladybird</li> <li>• Area for outputting the name of the ladybird</li> <li>• Area for output of textual description</li> <li>• Facility to deal with more than 1 match.</li> </ul>	[8]	
	(b) eg IF (InputSpotColour = "Black") OR (InputSpotColour = "Red") <ul style="list-style-type: none"> <li>• 1 mark for testing for black/red</li> <li>• 1 mark for correct use of OR (accept valid alternatives)</li> </ul>	[2]	IF InputSpotColour = "Black" OR "Red" = 1 mark  Ignore case for keywords in this and all questions, and lack of quotation marks.  Accept recognisable symbols for or e.g     If the candidate has 2 successive (not nested) IF statements then this is not answering the question and does not get the mark for ORing i.e. the answer below only gets one mark.  IF InputSpotColour = "Red" THEN Match = TRUE ELSEIF InputSpotColour = "Black" Then Match = TRUE END IF

	<b>(c)</b>	eg IF (MinSpots <= InputSpots) AND (InputSpots <= MaxSpots) THEN <ul style="list-style-type: none"><li>• MinSpots &lt;= InputSpots</li><li>• AND</li><li>• InputSpots &lt;= MaxSpots</li></ul> (accept valid alternatives)	<b>[3]</b>	Award a FT mark if < used instead of <= twice  Accept two separate IF statements if it is clear that they are nested.  Accept recognisable symbols for AND e.g. &&
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Question	Expected Answer	Mark	Additional Guidance
(d)	<p>eg  IF (InputLength &gt;= AveLength - 1) AND (InputLength &lt;= AveLength + 1) THEN</p> <p>Mark points</p> <ul style="list-style-type: none"> <li>• matches if InputLength = AveLength</li> <li>• matches if InputLength = AveLength + 1 <b>or</b> AveLength - 1 (i.e. boundaries of range)</li> <li>• does not match for any values outside range</li> </ul> <p>Other possible correct answers:</p> <p>IF (InputLength&gt;AveLength AND InputLength-AveLength&lt;=1) OR (AveLength&gt;InputLength AND AveLength-InputLength&lt;=1) THEN</p> <p>If InputLength = AveLength OR InputLength =( AveLength + 1) + OR (InputLength = AveLength - 1) THEN</p>	[3]	Some candidates will use absolute value eg ABS(Input - Ave) <= 1. This is correct for full marks
(e)	<ul style="list-style-type: none"> <li>• When an construct is written within another</li> <li>• Each construct must be <u>completely</u> contained in the preceding construct/they are not allowed to overlap</li> <li>• Correct example</li> </ul>	[2]	Because of the preceding questions, the most likely example is “an IF statement within another”. This would be awarded a mark(3 <sup>rd</sup> bullet point)

Question	Expected Answer	Mark	Additional Guidance
(f)	<p><b>High level response [6-8 marks]</b> Candidates answer the question with a complete and comprehensive explanation showing detail of the beta testing and the advantages and disadvantages. Points made are linked well to Wayne's program. 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 [3-5 marks]</b> Candidates answer the question with an explanation of beta testing with some advantage and disadvantages, although their use may be one-sided. There will be some attempt to link the points made to Wayne's program. 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 mark]</b> Candidates will demonstrate a limited understanding of the question. Answers may be descriptions or points with little relevance to Wayne's program. 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>Points to be made include:</p> <p>Explain how used</p> <ul style="list-style-type: none"> <li>• beta version is test version of the application</li> <li>• nearly complete and already tested by Wayne</li> <li>• Wayne makes the application available to small group of testers</li> <li>• Testers use the program as normal/in the field to identify ladybirds</li> <li>• They report any errors in the program, such as functions which do not work, ladybirds found outside the expected range, incompatibility issues with other software on their phones</li> <li>• May also report on desirable improvements</li> </ul> <p>Wayne tries to replicate and then solve these errors and may release updates/fixes/workarounds to the beta testers</p>		

Question	Expected Answer	Mark	Additional Guidance
	<p>Adv/Disadv:</p> <ul style="list-style-type: none"><li>• Application is tested using real data, some of which may not have been anticipated by Wayne when he was testing it</li><li>• Application will be tested in a number of different phones possibly with different configurations</li><li>• Consequently the final version will be more robust</li><li>• However, beta application may cause damage to tester's equipment due to unexpected feature</li><li>• Wayne should ask the beta testers to agree to test the software at their own risk</li></ul>	<p>[8]</p>	

Question		Expected Answer	Mark	Additional Guidance
2	(a)	<ul style="list-style-type: none"> <li>• A mock-up/prototype of the program produced ...</li> <li>• ... with reduced functionality</li> <li>• To a set deadline</li> <li>• It is tested / Feedback is obtained from users</li> <li>• These results are used to inform the next prototype</li> <li>• Process is repeated (until final, fully working version is produced)</li> </ul>	[4]	Accept Use of specialised programs/CASE tools/prototyping language such as VB
	(b) (i)	<ul style="list-style-type: none"> <li>• A subroutine/subprogram / Section of code which is given an identifier</li> <li>• It can be called from the main program / from another procedure</li> <li>• When called the code in the procedure is executed</li> <li>• And then control is passed back to where the procedure is called from</li> </ul>	[4]	
	(ii)	<ul style="list-style-type: none"> <li>• DispenseCash/PrintReceipt</li> </ul>	[1]	Accept wrong case/spaces/spelling error
	(c) (i)	<ul style="list-style-type: none"> <li>• A function returns a single value (Accept void functions)</li> <li>• A procedure does not return a value/returns values by reference</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>• A function is used as part of an expression</li> <li>• A procedure is used as an instruction/statement</li> </ul> <p>(Both marks have to come from the same pair) 1</p>	[2]	In order to get full marks, candidate must make a valid comparison mentioning both a procedure and a function.
	(ii)	<ul style="list-style-type: none"> <li>• GetWhetherReceiptWanted/Balance</li> </ul>	[1]	

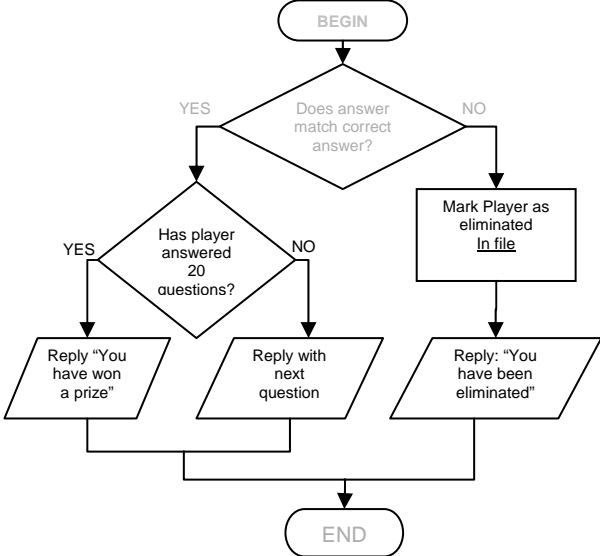


Question		Expected Answer	Mark	Additional Guidance	
	(d)	<ul style="list-style-type: none"> <li>• (A description of an item of) data which is given to a procedure/ function</li> <li>• ... it is given a variable/name when procedure is defined</li> <li>• Example: AccountNo (is a parameter of WithdrawCash)/ Amount (on line 7) / AccountNo (on line 9) / Amount (on line 9)</li> </ul>	[3]	First bullet refers to actual parameter/argument.. and second refers to formal parameter	
	(e)	(i)	<ul style="list-style-type: none"> <li>• Words which are already used for a purpose within the language</li> <li>• A reserved word/ cannot be used as an identifier (for a variable, subroutine etc...)1</li> </ul>	[2]	
		(ii)	<ul style="list-style-type: none"> <li>• It breaks the rules of the language</li> </ul>	[1]	
	(f)	(i)	<ul style="list-style-type: none"> <li>• Cash is dispensed only if the customer does not have enough money/when the balance is less than the amount wanted.</li> <li>• Customers will go overdrawn/will not be able to withdraw money they have in the bank</li> </ul>	[2]	
		(ii)	<ul style="list-style-type: none"> <li>• Logic error</li> </ul>	[1]	

Question	Expected Answer	Mark	Additional Guidance
(g)	<p>Example</p> <pre> FUNCTION GetAmountWanted()   REPEAT     OUTPUT "Please enter amount"     INPUT Amount     IF Amount &lt;= 0 OR Amount MOD 10 &lt;&gt; 0       AmountIsValid = FALSE       OUTPUT "That amount is invalid. Would         you like to cancel?"       INPUT UserWantsToCancel     ELSE       AmountIsValid = TRUE     END IF   UNTIL AmountIsValid = TRUE OR   UserWantsToCancel = TRUE   IF AmountIsValid = TRUE THEN     RETURN Amount   ELSE     RETURN -1   END IF END FUNCTION </pre> <ul style="list-style-type: none"> <li>• Loops until amount is valid or user chooses to cancel</li> </ul> <p>Within the loop:</p> <ul style="list-style-type: none"> <li>• Output request for amount to withdraw</li> <li>• Input amount</li> <li>• If amount is divisible by 10</li> <li>• Return amount (this could be after the loop)</li> <li>• Else output question to restart or cancel</li> <li>• ... and input user's response</li> <li>• if user cancelled return -1 (this could be after the loop)</li> </ul>	<b>[8]</b>	<p>There is only 1 mark for a correct loop. Award other mark points independently of the loop unless the logic is completely flawed.</p> <p>Accept recursive solutions i.e. instead of a loop, the function is called again if the user chooses to input a different amount. This is an alternative to the first bullet point.</p>

Question			Expected Answer	Mark	Additional Guidance												
3	(a)	(i)	<ul style="list-style-type: none"> <li>Records are stored according to a (unique) key field (eg phone number/other suitable example) ...</li> <li>A separate index is kept to allow groups of records to be accessed quickly</li> </ul>	[2]													
		(ii)	<ul style="list-style-type: none"> <li>Records can be accessed sequentially when all records need to be accessed...</li> <li>... eg when sending questions to all players/ other suitable example</li> <li>Records can be accessed quickly when a particular player's record is needed...</li> <li>... eg to check if a particular player has sent the right answer / as there is a large number of records</li> </ul> <p>Candidate must get the reason correct to be given a mark for the example (i.e. first bullet point must be correct to get second etc).</p>	[3]													
	(b)		<ul style="list-style-type: none"> <li>A phone number is not a value...</li> <li>... but a sequence of digits / a string</li> <li>Phone numbers may have leading 0's</li> <li>...which would be lost if stored as an integer</li> </ul>	[2]													
	(c)		<table border="1"> <thead> <tr> <th>Field Name</th> <th>Data Type</th> <th>Max Size in bytes</th> </tr> </thead> <tbody> <tr> <td>PhoneNumber</td> <td>String</td> <td>11</td> </tr> <tr> <td>LastCorrectQuestion</td> <td>Integer</td> <td>1, 2 or 4</td> </tr> <tr> <td>Eliminated</td> <td>Boolean</td> <td>1</td> </tr> </tbody> </table> <p>One mark per box For String accept eg Text, Alphanumeric For Integer, accept Byte, size = 1</p>	Field Name	Data Type	Max Size in bytes	PhoneNumber	String	11	LastCorrectQuestion	Integer	1, 2 or 4	Eliminated	Boolean	1	[6]	For string, accept text, array of character or pointer to character, not character by itself
Field Name	Data Type	Max Size in bytes															
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Question		Expected Answer	Mark	Additional Guidance
	(d)	<ul style="list-style-type: none"> <li>• 13/14/16/FT from c</li> <li>• 130000/ 140000/ 160000/FT from above</li> <li>• 143000, 154000, 176000 or FT from above</li> <li>• 143kB/154kB/ 176kB or ft from above/Divided by 1024 (139 kB, 150kB, 172kB or FT from above)</li> </ul>	[4]	The marks are for doing the correct steps in the calculation and not for getting the correct answers. If the calculation is clear but the answer is wrong, the mark should be awarded.
	(e) (i)	<ul style="list-style-type: none"> <li>• Need to initialise values / existing contents of the file will be used and give false results</li> <li>• ... eg player may start off eliminated / start off from a higher question number</li> </ul>	[2]	
	(ii)	<ul style="list-style-type: none"> <li>• CurrentRecord.Eliminated = False</li> <li>• (UNTIL) all the records have been read/ end of file/record number 10000</li> </ul> <p>1 mark each, in correct gap</p>	[2]	

Question	Expected Answer	Mark	Additional Guidance
(f)	<p>eg</p>  <pre> graph TD     BEGIN([BEGIN]) --&gt; D1{Does answer match correct answer?}     D1 -- YES --&gt; D2{Has player answered 20 questions?}     D1 -- NO --&gt; E1[Mark Player as eliminated In file]     D2 -- YES --&gt; R1[/Reply "You have won a prize"/]     D2 -- NO --&gt; R2[/Reply with next question/]     E1 --&gt; R3[/Reply: "You have been eliminated"/]     R1 --&gt; END([END])     R2 --&gt; END     R3 --&gt; END     </pre> <p>1 mark per correctly filled in box.</p> <p>Correct Yes and No labelling needed to award marks for the two outputs on the left hand side.</p>	[5]	<p>Accept equivalent wording. accept YES/NO the other way round with correct corresponding reply messages</p>

Question		Expected Answer	Mark	Additional Guidance																					
4	(a)	<ul style="list-style-type: none"> <li>• (A section of) code is executed repeatedly / loops</li> <li>• ... for a fixed number of times</li> <li>• ... or until a condition is met</li> <li>• In the algorithm line 04 is repeated... /FOR Loop in line 3 (to 5) / otherwise identifies where the repeat occurs in the code</li> <li>• ... n times</li> </ul>	[4]																						
	(b)	<table border="1"> <thead> <tr> <th>n</th> <th>i</th> <th>answer</th> </tr> </thead> <tbody> <tr> <td>5</td> <td></td> <td>1</td> </tr> <tr> <td></td> <td>1</td> <td>2</td> </tr> <tr> <td></td> <td>2</td> <td>4</td> </tr> <tr> <td></td> <td>3</td> <td>7</td> </tr> <tr> <td></td> <td>4</td> <td>11</td> </tr> <tr> <td></td> <td>5</td> <td>16</td> </tr> </tbody> </table> <p>1 mark per row</p>	n	i	answer	5		1		1	2		2	4		3	7		4	11		5	16	[6]	
n	i	answer																							
5		1																							
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	2	4																							
	3	7																							
	4	11																							
	5	16																							
	(c) (i)	<ul style="list-style-type: none"> <li>• A subroutine/function/procedure...</li> <li>• ... calls itself</li> <li>• Until it reaches a base case</li> </ul>	[2]																						

Question	Expected Answer	Mark	Additional Guidance
	<p>(ii) Example:</p> <pre> FUNCTION SequenceItem(n:INTEGER) : INTEGER // Returns the nTH number in the // sequence using recursion  //The first item is 2s IF n = 1 THEN     RETURN 2  // otherwise, add n to the previous item ELSE     RETURN n + SequenceItem(n-1) END IF END FUNCTION </pre> <p>Mark points: Algorithm:</p> <ul style="list-style-type: none"> <li>• A function which takes 1 parameter (an returns an integer)</li> <li>• Test for base case: if n =1 ...</li> <li>• ... return 2</li> <li>• Otherwise return n + ...</li> <li>• ... the value of SequenceItem(n-1)</li> </ul> <p>Coding style:</p> <ul style="list-style-type: none"> <li>• Meaningful identifiers are used / Comments explain the algorithm</li> <li>• Correct indentation</li> </ul>	<b>[7]</b>	<p>Accept base case if n=0, return 1 Do not award mark for indentation if there isn't much to indent. There should be at least two levels correctly indented</p>

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