RECOGNISING ACHIEVEMENT

GCE

Computing

Advanced Subsidiary GCE

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

Mark Scheme for January 2011

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.

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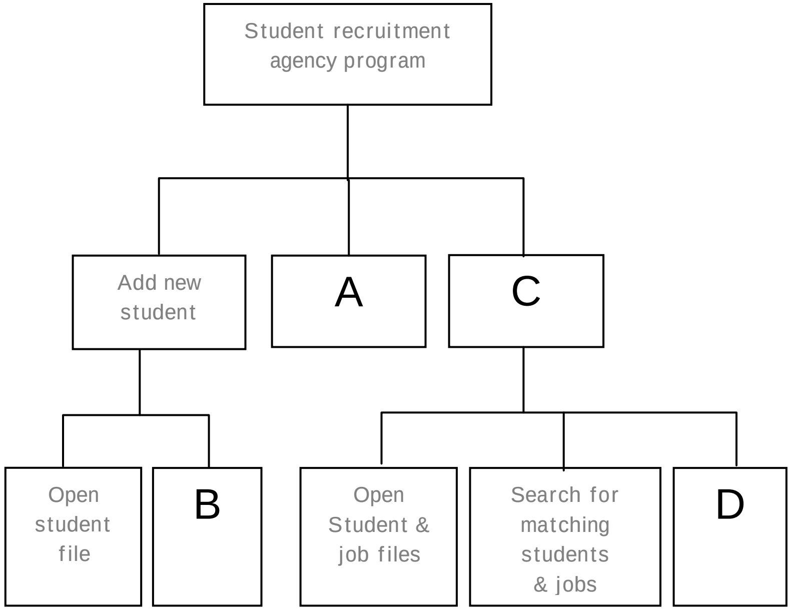
Question			Expected Answer	Mark	Rationale/Additional Guidance
Unless otherwise stated, award 1 mark per bullet point up to the maximum stated.					
1	(a)		• Avenue	[1]	
	(b)	(i)	• 6	[1]	Award Benefit of doubt "BusStop(6)"
		(ii)	• Check the array is not empty (and report an error if it is) • Set a counter to 1/0/start from first position • Check if item (at current position) is item searched • If found return the position/value of counter • If not found increment counter/move to next position • Until the end of the array / until item found • If item still not found, return "Not Found"	[5]	"searches through all the values IN ORDER" is equivalent to the 5th bullet point. Just "searches through all the values" should be given the benefit of doubt.
	(c)	(i)	• String • Consists of a series of characters (some of which happen to be digits) / not a numeric value	[2]	In all parts of (c) the second mark is not dependent on the first. If two answers are given for the data type they must BOTH be correct to award the mark. Accept Text, Alphanumeric, array or pointer to Character
		(ii)	• Real • To allow for pounds and pence	[2]	Accept known real types eg double, single, float. Also accept Currency
		(iii)	• String • Consists of a series of characters/ a word	[2]	Accept Text, Alphanumeric, Character
		(iv)	• Integer • The position in an array must be a whole number	[2]	Accept known integer data types eg int, byte, long but **not** Number

Question			Expected Answer	Mark	Rationale/Additional Guidance
	(d)	(i)	• Distance = 4 – 1/Distance = 3 • Fare = 3 * 0.20 • All IF statements are False and not executed • 0.60 is returned	[3]	Accept follow through for arithmetic errors made in previous steps
		(ii)	• Distance = 6 – 5/Distance = 1 • Fare = 1 * 0.20 • As Type = "CHILD" is TRUE • ... Fare = 0.20/2 • 0.10 is returned	[4]	Accept follow through for arithmetic errors made in previous steps
		(iii)	• Distance = 5 – 2/Distance = 3 • Fare = 3 * 0.20 = 0.60 • As Type = "PENSIONER" AND Fare > PensionerMax are both TRUE • ... Fare = PensionerMax / 0.50	[4]	Accept follow through for arithmetic errors made in previous steps For 3rd bullet point, candidate must clearly indicate that both conditions /the overall condition is TRUE
	(e)	(i)	• If the value of PensionerMax changes, this only needs to be updated once (on line 2)... (and the new value will be used throughout the code) • The statements (on lines 8 and 9) are clearer because we know what the value represents • Cannot be accidentally changed/will be consistent throughout the program.	[2]	

Question			Expected Answer	Mark	Rationale/Additional Guidance
		(ii)	• 0.20 (on line 4) • Suitable identifier eg CostPerStop OR • 2 (on line 6) • Suitable identifier eg DivisorForChildFare	**[2]**	Accept solutions where the candidate has changed line 6 to a valid multiplication
	(f)	**(i)**	• Concatenation/recognisable concatenation operator used... • ... on “ROUTE ” and RouteNumber	**[2]**	
		(ii)	Method 1: • Append spaces • ... at least **6** spaces needed (or 7 if string may be empty) • Extract first seven characters. Method 2: • find the length of the name of the stop • If length >= 7, extract the first 7 characters (eg Left) • If length is < 7 append spaces to bring length up to 7 Accept alternative methods which work.	**[3]**	
		(iii)	• Determine length of Ticket Type • Format Fare to Currency/to 2 d.p.with £ sign • Determine length of formatted fare • Calculate number of spaces needed (15 – length of other strings) • Concatenate TicketType, spaces and (formatted) fare	**[5]**	

Question			Expected Answer	Mark	Rationale/Additional Guidance
2	(a)		 1 mark per letter placed in correct box.	[4]	
	(b)		Award marks for following items correctly shown on data capture form • Title • Appropriate instructions (eg Use block capitals) • Name can be entered... • ... as separate Surname & Other names • Date of birth can be entered • ... in a specified format • Mobile phone number can be entered • ... in a specified format • Driving Licence can be entered • ... as a tick-box, YES/NO etc...	[8]	

Question			Expected Answer	Mark	Rationale/Additional Guidance
	(c)		**High level response [6-8 marks]** Candidates answer the question with a complete and comprehensive discussion including many of the points below. Their answers show a thorough understanding of the importance of good user interface design, and a clear connection between good design and its implications using a variety of examples from the student recruitment agency and/or elsewhere. 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. **Medium level response [3-5 marks]** Candidates discuss some of the points below. They demonstrate an awareness of the need for good user interface design and provide some examples of what would constitute good design – but the two are not always linked effectively. Some relevant examples are given, but these are mainly from the question and lack in variety. 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. **Low level response [0-2 mark]** Candidates will demonstrate a limited understanding of the question. A few points from the list below will be made. Elements of what constitutes good design may be stated, but their implications are not argued. Use of examples to illustrate the points made will be minimal and/or not effective in enhancing the argument. 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.		

Question			Expected Answer	Mark	Rationale/Additional Guidance
			Points to be made may include: • The UI should be effective ie all the data required can be input accurately • The data capture form can help by ensuring data is already in format to be input • ... eg boxes can be supplied for individual characters/format of date of birth/telephone numbers • ... and clear instructions to users • As a result, the agency will not lose contacts of students resulting in potential loss of business • The UI should be efficient ie make best use of available resources • ... the input screen should be in the same order as the data capture form • … as this does not waste staff time finding the data on the form • use of user interface tools like drop downs and check boxes (eg for driving license) • This maximises throughput of data entry ultimately saving money for the agency Examples other than the student recruitment agency may also be given.	[8]	
3	(a)	(i)	• A single step/instruction within the algorithm • Suitable example	[2]	Accept multi-line statements eg IF as example A task (not single is BOD) Not a line of code.
		(ii)	• Whether code is executed depends on a condition • Eg IF statement in line(s) 04 (to 12)	[2]	
	(b)		• While is contained within the IF Statement • ... as the IF statement goes from 04(06) to 12 • ... and the WHILE statement goes from 07 to 10	[3]	If candidate identifies the IF and/or the While statement but is describing something other than nesting, mark as too vague.

Question			Expected Answer	Mark	Rationale/Additional Guidance
	(c)	(i)	• Indentation of • ... blocks of code which are included within a control structure • ... allows you to see clearly where the structure starts and ends • Suitable example from code	[2]	Underlined phrase does not have to be exact, any correct name for the technique is worth a mark Accept other techniques as long as they are used in the code
		(ii)	EITHER • Use of meaningful identifiers • ... instead of A, B, C • ... which tell us what the values represent OR • Use of comments • ... which explain the steps of the algorithm to the reader • ... but are not to be executed	[2]	Underlined phrase does not have to be exact, any correct name for the technique is worth a mark Accept other techniques as long as they are not used in the code
	(d)		• In line 4 = is a comparison/relational/equality operator... • ... which checks if A is the same as B (and returns TRUE or FALSE) • In line 10 = is an assignment operator • ... which sets the value of A to become the value of B	[4]	give benefit of doubt for “line 4 is a condition”
	(e)		• Initialise the value of C • ... before it is used (in line 09) • ... otherwise previous values of C will lead to wrong results	[2]	“Assigns a value” on it’s own is too vague, but if a reason for the assignment given, then give it a BOD.

Question			Expected Answer	Mark	Rationale/Additional Guidance
	(f)		• In white box testing, the actual steps of the algorithm are tested... • ... to make sure all parts work as intended • ... you need to test all possible paths through the algorithm • In black box testing, sets of inputs are tested... • ... to see if they produce the intended outputs • ... you need to test all possible types of input/situations • ... but how the algorithm works is not considered (Max of 3 if candidate mentions or describes only white box or black box testing)	[4]	
	(g)	(i)	PATH • 01, 02, 03, 04(TRUE) • 05 • (06) , 12 VALUES • A = 10, B = 1, C =0	[4]	To mark incorrect answers remember that: the 2nd bullet is for knowing that if A=B then control moves to the next line; the 3rd bullet is for knowing that the ELSE section is not exectuted. There is no follow through. If candidate says line 4 is false, they are likely to get no marks Give benefit of doubt if value of condition not shown but path correct
		(ii)	PATH • 01, 02, 03, 04(FALSE) • 06, 07(TRUE) • 08, 09, 10, • 07(FALSE), 11, 12/ 07(FALSE), 10, 11, 12 VALUES • A = 2, B = 2, C =1	[5]	
	(h)		• The first input (A) is greater than the second input (B) • Any suitable example	[2]	

Question			Expected Answer	Mark	Rationale/Additional Guidance

4			Example
			`REPEAT`
			`  INPUT NumberOfRings`
			`  IF NumberOfRings < 1 OR NumberOfRings > 8 THEN`
			`    OUTPUT “The number must be between 1 and 8”`
			`  END IF`
			`UNTIL NumberOfRings >= 1 AND NumberOfRings <= 8`
			
			`INPUT Ring(1)`
			
			`FOR i = 2 TO NumberOfRings`
			`  REPEAT`
			`    INPUT Ring(i)`
			`    IF Ring(i) >= Ring(i – 1) THEN`
			`      OUTPUT “The number must be lower than the`
			`              the previous input.”`
			`    END IF`
			`  UNTIL Ring(i) < Ring(i – 1)`
			`NEXT i`
			
			`FOR i = (NumberOfRings + 1) TO 8`
			`  Ring(i) = 0`
			`NEXT i`
					Allow loops starting from 0 to n -1

Question			Expected Answer	Mark	Rationale/Additional Guidance

			Award mark for an algorithm that addresses the following mark points:
			
			• Input number of rings
			• Number input must be between 1 and 8
			• ... an appropriate error message is given if it isn't
			• Uses a loop set from 1 (or from 2 if 1 dealt with separately)
			• to Number of Rings
			(Within the loop)
			    • Input for number of teeth
			    • Checks that number of teeth < number of teeth for previous ring
			    • ... but does not check this for the first ring
			• All unused array positions filled with 0
				[8]	

			Total	**[100]**	

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