OCR
RECOGNISING ACHIEVEMENT

GCE

Computing

Advanced Subsidiary GCE

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

Mark Scheme for June 2012

Oxford Cambridge and RSA Examinations

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, OCR Nationals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

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.

Any enquiries about publications should be addressed to:

OCR Publications
PO Box 5050
Annesley
NOTTINGHAM
NG15 0DL

Telephone: 0870 770 6622
Facsimile: 01223 552610
E-mail: publications@ocr.org.uk

Annotations

Annotation	Meaning
^	Omission mark
BOD	Benefit of doubt
C	Subordinate clause/Consequential error
Cross	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	Tick
TV	Too vague
ZERO	Zero (big)

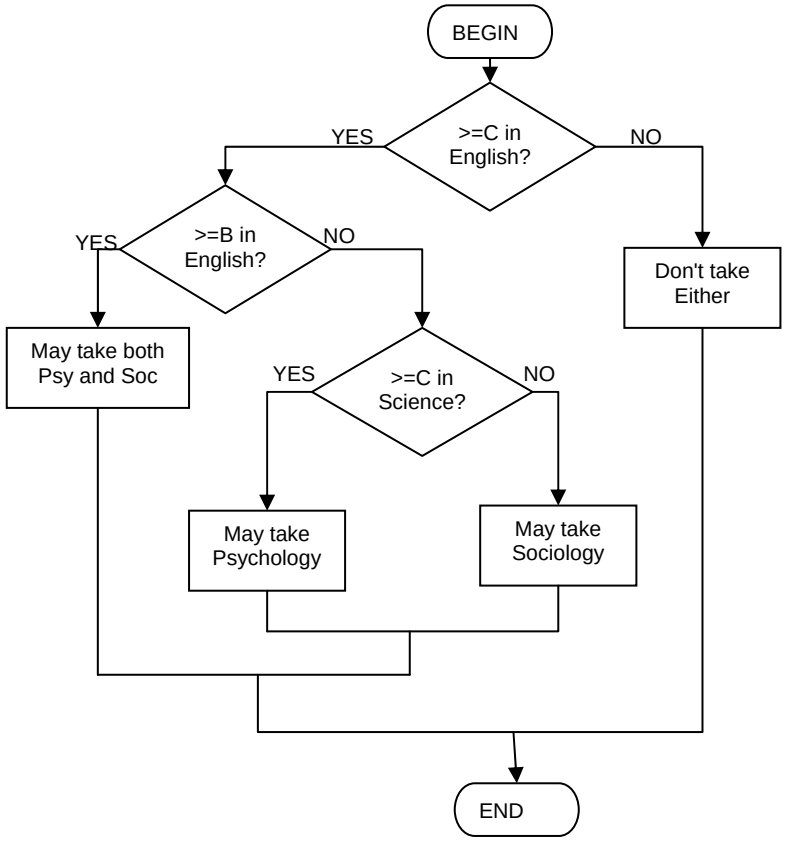
Question			Answer	Marks	Guidance
1	(a)		Award marks for: • Displays name of athlete • Displays current number of points • Areas to press for 0.1, 0.3, 0.5 and 1 • … in a logical order • Area to press to undo points deduction • Area to press for ENTER/Finish • Title and overall good layout	7	If a dropdown is used to enter the points to deduct award 1 mark for bullets 3 and 4 If a textbox is used to enter the points to deduct award 0 marks for bullets 3 and 4
	(b)		• String • Consists of a series of characters • Real • Can include decimal fractions • Boolean • Is true or false	2 2 2	Accept Text, Alphanumeric (but the reason will have to use different terms) Accept Single, Double, float, Decimal(once) Do not accept Number or Numeric as this is too vague Accept bool
	(c)		• A number of data items • Can be of different data types • Grouped under a single identifier/into a single data structure • Individual items called fields… • can be accessed using field names and dot notation/example such as Gymnast.Name… • Used because the data are related to each other/referring to a single entity • Allows the gymnast's name, score, qualification etc.. to be kept together • Makes it easier to manipulate (eg save, copy, search, sort) a whole record/keeps record data in sync	5	Third bullet point – must clearly say that the data is grouped 7th bullet point is for applying the principles to the data about a gymnast.

Question			Answer	Marks	Guidance
	(d)	(i)	• Code can be compiled/executed…/follows the rules of the language • … but does not perform the intended action/performs a different action than intended • Suitable example / e.g. wrong mathematical operation	2	
		(ii)	• On line 1…/>=3 • Should be <= 3	2	Check for answer in (i)
	(e)	(i)	• A group of data items… • …of the same data type • Stored under a single identifier • Each item can be accessed via its index	3	
		(ii)	• Scores (correct case) • Data type is REAL • should allow for 6 items	3	There is no mark for stating the language and we are not looking for a syntactically correct declaration for the stated language. It is there so that (if the language used is not obvious from the code itself) it can be used to make allowances for some loosely typed languages or languages where dynamically sized arrays are the norm. Allow any known names of real data types: float, single, double, real etc... as usual Also allow 5 or 6 as an upper bound. (to allow for 0 base arrays) Identifier must be correct in correct case, however allow for sigils and prefixes common to given language e.g. $RawScores, RawScores#, arRawScores

Question			Answer	Marks	Guidance

		(iii)	Example
			`Total = 0`
			`Highest = 0`
			`Lowest = 20`
			`FOR i = 1 to 6`
			
			`  IF RawScores(i) > Highest THEN`
			`  Highest = RawScores(i)`
			`  END IF`
			
			`  IF RawScores(i) < Lowest THEN`
			`  Lowest = RawScores(i)`
			`  END IF`
			
			`  Total = Total + RawScores(i)`
			`NEXT i`
			
			`PointScore = Total – (Highest + Lowest)`
			
			Award marks for an algorithm that:
			• Identifies the highest item in RawScores
			• … with an explicit (and largely correct method)
			• Identifies the lowest item in RawScores
			• … with an explicit (and largely correct method)
			• Adds values in RawScores
			• … excluding highest and lowest
			
			Award up to 2 marks for evidence of
			• Sensible initialisations
			• Appropriate indentation / clear flowchart
			• Good use of iteration
				8	Remember that this is an algorithm (pseudocode, flowchart, structured formats are all fine – and we are judging the overall logic of the solution only).
					• Candidates must state that searching for the highest and lowest elements are essential steps of the algorithm for the first and third mark points. If they simply use the highest and lowest in their algorithm without stating where it was obtained they cannot be given these marks implicitly.
					• They can gain up to 2 more marks for the algorithm to do this. Note that the method for the search (or sort, see next point) only needs to be "largely correct". The algorithm must be sound but there may be errors for example in loop conditions or initialisation which get taken into account later.
					• Sorting methods can get up to four marks for identifying the highest and lowest element, if done explicitly
					• Sorting methods gain the mark for excluding the highest and lowest(mark point 6) from the addition loop/expression (e.g. for i = 2 to 5)
					• Any method can gain mark point 6 by setting the highest/lowest element to 0/removing them from the array. Not necessarily by subtraction
					• Use professional judgement to award 2 of the last three points, there must be enough material/evidence in the response to show that the candidate is achieving this comfortably/consistently.

Question			Answer	Marks	Guidance
2	(a)		• Rapid Application Development/Design • Ravi will design and create prototype (with reduced functionality) • Ravi will then show the prototype to Head of Sixth Form /Head of sixth will feedback on the features/suggest improvements • Cycle is repeated (each iteration improving the program) • … until final product is produced.	4	
	(b)		eg • Grades are between A* to G/possible, actual grade • There is a grade for Maths/Science/English • There are grades for (no more than) 3 optional subjects • (no more than) 6 subjects in total • Only subjects from the list are chosen • A grade has been entered • A subject has not been entered twice	4	Only allow "one character" if "A*" has been dealt with explicitly (e.g. enter "*" for A*) Do not accept lookup of the pupils. You can accept the same type of check more than once (e.g. look up grades, look up subjects). The note on the question is about the same subject e.g. A*-G for English, A* - G for Maths Range check – accept a clear indication of the range being correct (e.g. acceptable boundaries/ max/min)
	(c)		• AS Uses of Maths • AS Further Maths • AS Maths • Do not do Maths	4	

Question	Answer	Marks	Guidance
(d)	Example  Award 1 mark each for the 4 outcomes being correct within the flow chart 2 additional marks for: • Begin and End terminators, correctly connected • Decisions in conventional symbol distinguishing it from outcome (rhombus)	6	To mark this, look in turn for each of the 4 outcomes and trace back to see if the decisions that lead to it will satisfy the conditions for that outcome: • BOTH: at least B in English • Psychology: at least C in English and Science • Sociology: at least C in English • Neither: Less than C in English Decisions can be merged or different from those in the example, but the prerequisites have to be satisfied by the decisions given. Accept if only the minimum grade is given. i.e. C in English is equivalent to “at least in English” If only one arrow from a decision is labelled (as YES or NO) assume for the other.

Question			Answer	Marks	Guidance
	(e)		• Copy program from CD to computer • Copy any data files from CD to computer • Copy any library routines which are needed from CD to computer • Check for any dependencies • Check for compatibility / space • Register the program in the computer / enable the program to be uninstalled later • Initial user configuration/options • Provide an icon/means of easily accessing the program	4	Do not award a mark for copying compressed or installation files / unpacking / uncompressing / deleting installation files. What we want is an indication that at *the end of the process* the required executable / data / library files are correctly in place. Also do not award marks for the user's experience of installation (e.g. running a wizard, accepting EULA) **but award the mark for user choosing options** as this implies that the installation then configures the program according to these options. (7th bullet)

Question			Answer	Marks	Guidance
3	(a)	(i)	• Global variable is declared at beginning of program • Local variable declared within a subroutine/block • Global variable applies to the whole program • Local variable only applied to the subroutine within which it is declared. (marks in pairs)	2	
		(ii)	EITHER: • The translator will create an error • As there is already a variable with that name (in the current scope) OR: • (Within the procedure where it is declared) the programmer will only be able to access the local variable • may produce wrong result • The global variable will apply to the rest of the code. No more than two from either section.	2	
	(b)		Global variable: HourlyRate Local variable: TimeInMinutes/CostOfParts	2	Must be the identifier only (not the whole declaration for example) but allow spaces/wrong case

Question			Answer	Marks	Guidance
	(c)	(i)	• DIV done correctly / TimeInMinutes DIV 60 = 1 • Operator recedence correct / (TimeInMinutes DIV 60) + (1x HourlyRate) + CostOfParts	2	
		(ii)	• 16	1	

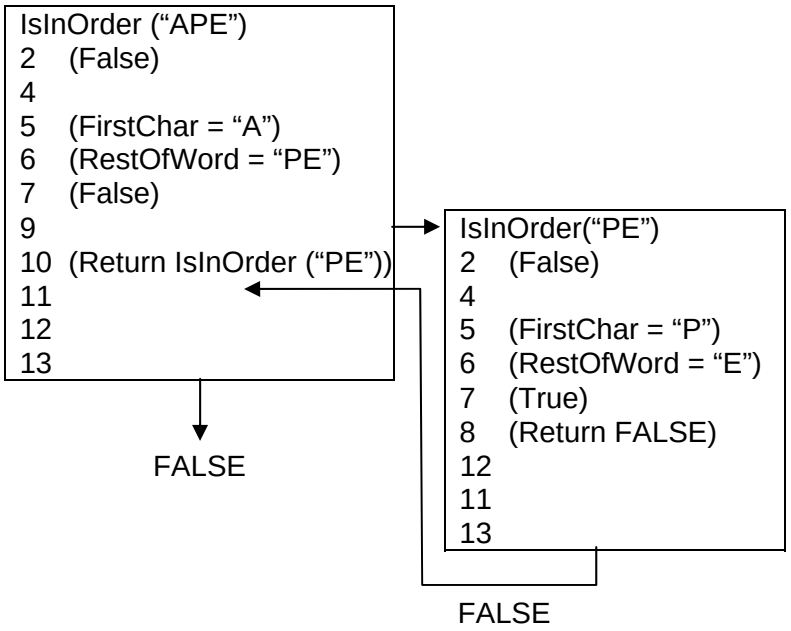
		(iii)	Example
			IF TimeInMinutes MOD 60 = 0 THEN
			OUTPUT TimeInMinutes DIV 60 x HourlyRate + CostOfParts
			ELSE
			OUTPUT (TimeInMinutes DIV 60 +1) x HourlyRate + CostOfParts
			END IF
			
			Award marks for
			• Checking if time in minutes is a multiple of 60
			• … if so, TimeInMinutes DIV 60 x HourlyRate + CostOfParts
			• … else (TimeInMinutes DIV 60 +1) x HourlyRate + CostOfParts
			(additional parenthesis may be added for clarity but the above MUST be shown to get the mark)
				3	Accept known symbols for DIV and MOD in various languages
					MOD : %, rem, \\
					DIV: backslash

Question			Answer	Marks	Guidance	
					Content	**Levels of response**
	(d)		Points to be made include: Positive: • Meaningful identifiers eg TimeInMinutes • … which describe the procedures/variables • … so they can be understood without referring to a data dictionary • Indentation • … eg line 61 – 65 • … clearly shows where structures start and end • Code is modular eg using Initiative (40-42) • … each subroutine does a small part rather than one big program • … easier to identify where something is not working and debug Negative • Should have comments • … explaining the steps of the algorithm • … for example in line 65 • Use of white space • … eg between lines 61 and 62 • … breaks code further into logical chunks (declarations and statements) • Should consider a constant • … for values which do not change such as HourlyRate	8		**High level response [6-8 marks]** Candidate gives a clear explanation of both positive and negative aspects of the code, justifying their reason for considering them positive or negative and explaining the impact on maintainability in detail or with examples. 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]** Candidate identifies some positive and negative aspects of the code and explains these well, but their opinions are generally not justified or implications not detailed. 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]** Candidate may identify some positive or negative aspects of the code although this may include inaccuracies. There is little or no justification of implications.

Question			Answer	Marks	Guidance	
					Content	Levels of response
			• … the constant can then only be set in one place. • Break up multi-stage calculations • … eg line 65 • … so that each step of the algorithm is clear			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			Answer	Marks	Guidance
4	(a)	(i)	• (A description) of an item of data supplied to a function/procedure/subroutine • Is given an actual value/address when the function/procedure/subroutine is called • used as a variable within subroutine	2	
		(ii)	• Word • RestOfWord <u>on line 10</u>	1	Correct answer only (although it may be in quotes or brackets,; also ignor incorrect case) Note that RestOfWord can only be accepted if the candidate refers specifically to its use as an argument on line 10.
	(b)		• In line 02 the = is a relational/comparison operator • … to test if two items have the same value / as part of a conditional expression • In line 05 = is an assignment operator • .. It sets the value of FirstChar/ the assignment operation is a statement on its own Combined bullelts to make it clearer	4	The aim of the first and third bullet points is that the candidate must **state the type** of operation as required by the question. You can award this mark if they use the verb instead i.e. "used to **compare**", "used to **assign**" but candidate must then explain further to get the second mark in each case. Do not accept "conditional operator" for the first bullet point as this is incorrect. Similarly "= is a condition" is wrong but a mark can be awarded for saying this as a BOD for the second bullet if not already given.
	(c)		• (Comparison of strings) uses their character codes/ASCII code/Unicode value • uppercase codes are all smaller than lowercase codes / there are different (range of) codes for upper and lower case • The function should first convert them to the same case • Or ensure the comparison is not case sensitive by setting options within the program/language	3	"It is case sensitive" is not sufficient. We are looking for the reason why it is case sensitive (i.e. the first 2 bullet points). For the solution (last two bullet points) do not accept answers where the parameters are to be changed before the call is made or value is validated. They have to explain how the algorithm should be altered so that the correct result is obtained when the input is of mixed case.

Question			Answer	Marks	Guidance
	(d)		• When a function/procedure/subroutine calls itself • … as shown in line 10 / contains a call to IsInOrder()	2	Award BOD for program calls itself – it is the "calling itself" that is the key concept being tested here.
	(e)		• TRUE • 1,2,3,12,13	2	Award BOD if the candidate includes line 4. i.e. 1,2,3,4,12,13 (These candidates are in effect using the ELSE statement as a marker for the end of the THEN block, not stating that the ELSE is executed)
	(f)		• Line 2 is False (so it does the ELSE part) • but it cannot find the first/rest of an empty string... • ... which will cause a (runtime) error / crash	2	Mark as NBOD if candidate contradicts him/herself e.g. "it will crash because there is an infinite loop" Do not accept a vague mention of an error – candidate should demonstrate some indication of why/where there is an error even if it falls short of the second bullet point.

Question	Answer	Marks	Guidance
(g)	Example  Award marks for: <u>In original Call</u> IsinOrder("APE") • Do lines 1,2(FALSE), 4, 5, 6 , 7 (FALSE) • (9,10) PE call made to IsInOrder("PE") <u>In new call</u> do lines • 1, 2(FALSE), 4, 5,6 7 is (TRUE) • (line 8) return FALSE • (this call finishes, then…) return to line 10/resumes from line 11 of original call • return FALSE from original call	6	

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office; 1 Hills Road, Cambridge, CB1 2EU
Registered Company Number: 3484466
OCR is an exempt Charity

OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553