OCR
RECOGNISING ACHIEVEMENT

GCE

Computing

Advanced GCE **A2 H447**

Advanced Subsidiary GCE **AS H047**

Mark Schemes for the Units

June 2009

HX47/MS/R/09

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of pupils of all ages and abilities. OCR qualifications include AS/A Levels, GCSEs, OCR Nationals, 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 syllabuses 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

CONTENTS

Advanced GCE Computing (H447)

Advanced Subsidiary GCE Computing (H047)

MARK SCHEMES FOR THE UNITS

F451 Computer Fundamentals

Question			Expected Answer	Mark
1	(a)	(i)	Hardware used to put **data** into a computer	[1]
		(ii)	Hardware used to get information from a computer	[1]
	(b)		**Input:** • Barcode reader/to input product ID printed on product • Keyboard/to manually input data if barcode will not read • Automatic scales/to input weight of fresh produce • Chip & Pin reader/card reader/to input card details • Keypad/to input PIN for card **Output:** • Screen/to show details of objects scanned/current state of transaction • Printer/to print till receipt • Beeper/to indicate valid reading of code **(2 per -, max 2 inputs and 2 outputs, max8)**	[8]
	(c)		• Rule base/contains all the rules that can be applied to the knowledge/data • Inference engine/software which uses the rules in the rule base/searches through the knowledge base • HCI/allows for data or queries to be input/results to be output **(2 per -, max 6)**	[6]
2	(a)		• Data bus/to transmit data between areas of the processor • Address bus/to carry address to which the data is being transmitted • Control bus/to send control signals from control unit to other parts of the processor **(2 per -, max 4)**	[4]
	(b)	(i)	• Serial is one bit transmitted at a time/single wire • Parallel is multiple bits transmitted at a time/many wires	[2]
		(ii)	• Half duplex is communication in both directions but one at a time • Duplex is communication in both directions simultaneously	[2]
	(c)		• PS has no established route/CS establishes a route along which to send packets • PS means packets being sent on individual routes/CS has packets all on same route • PS message cannot be (easily) intercepted/CS message can because all on same route • PS packets need to be reordered/CS packets remain in correct order • PS maximises use of network/CS ties up large areas of network **(1 per -, max 3)**	[3]

Question			Expected Answer	Mark
	(d)		**Mark band 6-8, High level response** Candidate has made a number of points about each of the social and ethical effects. Candidate has included both problems and positive points. Candidate has used appropriate technical terms throughout. There are few if any spelling errors or errors of grammar. **Mark band 3-5, Medium level response.** Candidate has made a number of points about either social or ethical issues, at least one of each. Candidate has considered either problems or positive points. Candidate has used some technical terminology in the response. There may be errors in spelling and/or grammar. **Mark band 0-2, Low level response** Candidate has made one or two points about either social or ethical factors. If more than one point there will be a lack of cohesion. Candidate may have used some technical terms but they will have been used inaccurately. The spelling and grammar errors are such as to affect the readability of the answer. Answers may include: Social: • Less socialising because on computer all the time • Sees other societies which will cause friction with… • Parents and other figures of authority • Will raise expectations/wants • Will increase knowledge of other societies… • Give opportunity to learn about others/communicate directly Ethical: Use of other people's work: • Copyright… • Plagiarism • Use for educational purposes… • Use to spread understanding	**[8]**
3		**(i)**	• Magnetic Ink Character Reader/Recognition • Special characters on document... • Written using magnetisable ink • Are both computer and human readable **(1 per -, max 2)** (2) Use: eg. Account numbers on cheques (1)	**[3]**
		(ii)	• Optical Character Reader/Recognition • Characters' shapes are scanned... • Optically • Shapes are compared with those stored in computer's memory **(1 per -, max 2)** (2) Use: eg. Reading documents into a word processor file (1)	**[3]**

Question			Expected Answer	Mark
		(iii)	• Optical Mark Reader/Recognition • Positions of marks on a document... • Equate with information • Document is scanned for coordinates of marks **(1 per -, max 2)** (2) Use: eg. Input of lottery choices (1)	**[3]**
4	**(a)**		• Technical feasibility • Can hardware/software be found to implement the solution • Economic feasibility • Is the proposed solution possible within budget/economic to run • Social feasibility • Is the effect on the humans involved too extreme to be allowed/Environmentally sound? • Skill level required/operational • Is there enough skill in the workforce? • What is the expected effect on the customer? • If customer not impressed then there may not be a point • Legal • Can the problem be solved within the law? • Time • Is time scale acceptable? **(1 per -, max 3 pairs, max 6)**	**[6]**
	(b)		• Analyst begins by collecting data followed by each of the other stages leading to… • Evaluation, which will lead to… • A return to data collection to modify the results • Important point is that the different stages are refined each time the spiral is worked through • The above points, shown in diagrammatic form, are acceptable **(1 per -, max 2)**	**[2]**
5	**(a)**		• Device which can be operated by a computer/produces physical movement/electric motor • Would be used to adjust gap between rollers/to control the rate at which the glass is fed through the rollers	**[2]**
	(b)	**(i)**	• Physical measurement is never exact/unrealistic to expect exactly 5mm/Sensors not precise enough. • Changes to rollers would occur continuously • Causing oscillation between > and < **(1 per -, max 2)**	**[2]**
		(ii)	Any sensible range eg. 5mm +/- 1mm/Symmetric.	**[1]**

Question			Expected Answer	Mark
	(c)		• Computer stores parameters between which the thickness is acceptable • Actual thickness input at regular intervals • From the sensors • Actual thickness compared with stored values • If acceptable then repeat • Else adjust roller • Mark for idea of feedback, (If roller adjusted, the next input is compared to previous one to see if it has had an effect) • If feedback shows that adjustment has had no effect then alarm **(1 per -, max 5)**	**[5]**
	(d)		• Technician reads value that has been input and... • Checks it against value on paper • Another technician also inputs it and.../Technician inputs value twice • System checks the two inputs are the same **(max 1 method, max 2)**	**[2]**
6	(a)	(i)	01011111 **(1 per nibble)**	**[2]**
		(ii)	10010101 **(1 per nibble)**	**[2]**
		(iii)	5F **(1 per digit)**	**[2]**
	(b)		• Arrange bits, in the binary value, in groups of 4... • from the right -(0101 , 1111) • Each group of 4 is then written as its hexadecimal equivalent • (0101=5 , 1111=F) **(1 per -, max 3)**	**[3]**

Question			Expected Answer	Mark
7	(a)		• Form of output - eg. Sound may be inappropriate/inaccurate on a noisy factory floor • Volume of data - e.g. Operator must not be subjected to information overload as this may lead to omissions • Colours used - e.g. Must be enough contrast to make it readable/sensible use of colours like red for danger • Limited use of effects like reverse video - The more they are used, the less the impact • Use of diagrams - Easy to relate data to position without need for extra information. • Experience of operator - eg CLI not suitable for inexperienced operator • Short/Long term memory - Operator must not be expected to remember too much/for too long • Operator disability - To ensure that disability is not an issue • Layout • - Spread around screen/important information in top left of screen/no overload/font size • Hardware choices - Suitability for both user and the application/environment to be used in **(1 per -, max 3 factors, max 6)**	**[6]**
	(b)	**(i)**	• Making copy of the data in a file... • And the file structure • On a portable medium • Kept away from originals • So that if the original is corrupted it can be replaced **(1 per -, max 2)** (2) Customer and order files are very important to the company, so must be protected (1)	**[3]**
		(ii)	• Storing the data produced... • On long term storage • So that it can be referred to if necessary **(1 per -, max 2)** (2) If the process fails then previous data can be searched for evidence/Data is available without taking up space on working storage/data is available for analysis of manufacturing process. (1)	**[3]**

Question			Expected Answer	Mark
	(c)		Either: • Back up copy taken weekly... • Immediately after updating of staff file • Multiple copies taken... • Stored in more than 1 location • At least one is stored off site • Mention of incremental back up Or: • Transaction file and staff file are merged... • The updated staff file becomes the MF • The old MF becomes the father file • The old father becomes the grandfather file • The TF is also stored so that... • It can be combined with father to produce another copy of staff file **(1 per -, max 4)**	**[4]**
8	**(a)**		• LAN over small area • WAN remote • Different forms of communication media • LAN is more secure • Data on a WAN is subject to interception **(1 per -, max 3)**	**[3]**
	(b)	**(i)**	• Blocks of bytes are added before transmission… • To give a total, with 'carries out of the total' ignored • This total is transmitted with the block • The same calculation is done on the data blocks at the destination • And result is compared with the transmitted value… • If different, there is a transmission error **(1 per -, max 4)**	**[4]**
		(ii)	• Each byte has a parity bit • Each bit place has also got a parity bit • All parity is checked • If there is an error in the parity for a byte and the parity for a place value • Then where they intersect will be the faulty bit • If it is 0, change it to 1/If it is 1 change it to 0 • If more than one error in block then data is re-transmitted **(1 per -, max 4)**	**[4]**

F452 Programming Techniques and Logical Methods

Question			Expected Answer	Max
1	(a)		Sequence • all instructions are executed... • ... once • ... in the order in which they appear	[2]
			Selection • a condition is used • to determine which of the statements (if any) will be executed • as a result some instructions may not be executed	[2]
			Iteration • a group of instructions is repeated • for a set number of times ... • ... or until a condition is met	[2]
	(b)	(i)	Sequence	[1]
		(ii)	7	[1]
	(c)	(i)	Answers: INPUTS X Y Z OUTPUT 3,9 3 -3 3 3 5,7 5 -3 1 1 8,2 8 -6 0 0 Award 1 mark per correct answer in the X, Y, Z and OUTPUT columns. Allow follow through for OUTPUT column: award mark if output is the same as Z.	[12]
		(ii)	• Division of Y by X (accept description eg "how many X's in Y") • Integer division/rounded down • using repeated subtraction	[2]

Question			Expected Answer	Max
		(iii)	Two from: • there is an infinite loop… • ... because repeated subtraction of - 4 from Y makes it bigger / Y will never be < 0 • Eventually Y will be too large to be stored • …causing the program to crash	[2]
			• run-time error	[1]
	(d)	(i)	• AND operator has higher precedence than > • ... so it will do (GasBill AND ElectricBill) > 10 • ... but GasBill and ElectricBill are not boolean expressions/they are numbers • ... which should have been added	[2]
			• syntax error (referring to ANDing numerals) / logic error (referring to AND instead of +)	[1]
		(ii)	• * operator has higher precedence than + • so it will do (ElectricBill * 0.95) + GasBill / the discount will only be applied to the Electricity bill • instead of (Electric Bill + GasBill) * 0.95	[2]
			• logic error.	[1]
	(e)		**High level response [5-6 marks]** Candidates will show a clear understanding of the question and answer the question with complete and comprehensive descriptions of a range of tools. 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 [3-4 marks]** Candidates will show an understanding of the question and answer the question with descriptions of some tools and techniques with some detail. 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 marks]** Candidates will demonstrate a limited understanding of the question, but will name some debugging tools and techniques. 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. Answers may include: • **translator diagnostics** pick up (especially) syntax errors and informs the programmer who can then correct the error and translate again (but sometimes the error messages are incorrect/in the wrong place)	[6]

Question			Expected Answer	Max
			• **break points** cause the program to halt in execution at strategic points current values of variables can then be checked • **watches** cause the program to halt in execution if a condition is met such as a variable changing • **stepping** – executing the code one statement at a time observing path of execution and changes to variables. Can be used with break points or watches	
2	**(a)**		eg: • pick up post code • …so the driver can arrange most efficient pick up route • name of customer / name of recipient • ... so that the company can address the customer / recipient • pick-Up Address / delivery address • ... so the driver can collect /deliver the parcel • telephone number of customer / recipient • ... to contact if there is a problem with the collection / delivery • size/weight of parcel • …so the company can calculate the delivery charge • Credit card number / payment details • ... so the company can charge the customer (Accept other valid answers)	**[6]**
	(b)		• Characters are compared from <u>left to right</u> • ... using their character (ASCII) codes. • The character with the lower code comes first. • Subsequent character used only if the two characters compared are equal • Upper case characters come before lower case characters in the ASCII table • ... eg 0G comes before 0e. • The space character has a lower character code than all letters… • … so the presence of a space changes the position of the post code • Any numbers are sorted by digit from left to right instead <u>of the number's value</u> • ... eg BF1, BF12, BF18, BF2.	**[6]**
	(c)	**(i)**	• Input data is checked <u>by the computer</u> • ... against a set of rules • ...to ensure that it is reasonable/sensible	**[2]**
		(ii)	• Presence check • ... that a postcode has been entered. • Length check • ... the postcode should be 7 or 8 characters long (including space). • Character check • …check that it is an uppercase characters • …or digit/space.	

Question			Expected Answer	Max
	(d)		• Format check • ... the postcode should consist of (one or) two letters, one or two digits • ... then a space followed by one digit and two letters. • Existence check/look-up check. • That there are addresses with this postcode. (Max 2 marks per validation check. The expansion must relate to postcodes rather than a general definition) **High level response [5-6 marks]** Candidates will show a clear understanding of the question and give a detailed description of the reformatting to be done and how this can be achieved. 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 [3-4 marks]** Candidates will show an understanding of the question and answer the question with some descriptions of the reformatting needed but with little detail of how to implement it. 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 marks]** Candidates will demonstrate a limited understanding of the question. Information may be a list of points. 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. Answers may include: • convert all lowercase characters to uppercase • a space character needs to be inserted if there isn't one before the last three characters • a space character/0 could also be inserted before the first digit IF there is only one digit in the first half of the post code • all of these with correct indication of functions/operations which will be needed.	**[6]** **[6]**
3	**(a)**		• A data structure / set of data items • Of the same data type • Grouped under one identifier • Each item can be addressed using its index/subscript.	**[2]**
	(b)		• Value: TRUE • Meaning: Called to go UP • ... from second floor.	**[3]**

Question			Expected Answer	Max
	(c)	(i)	• 1 • Floor • TRUE (Must be in the correct gap to be awarded a mark)	[3]
		(ii)	• Floor • Direction.	[2]

	(d)		Example:
			Sub SupervisorCall(Floor : Integer)
			  dim iFloor As Integer
			..dim iDirection As Integer
			  FOR iFloor = 1 to 5
			  FOR iDirection = 1 to 2
			  IF iFloor = Floor
			  LiftCalled(iFloor, iDirection) = TRUE
			  ELSE
			  LiftCalled(iFloor, iDirection) = FALSE
			  END IF
			  NEXT
			  NEXT
			END SUB
			
			Mark points for:
			
			• Using "SupervisorCall" as identifier of subroutine
			• Using 1 Parameter called Floor (of data type Integer)
			[2]
			
			• Setting all values of array LiftCalled to False...
			• ... except for LiftCalled(Floor, 1) and LiftCalled(Floor,2) which are set to TRUE
			[2]
			
			• Correct use of indentation
			• Code annotated / can be understood easily without comments
			• Descriptive identifier names
			[Max 2 for above]
				[6]

Question			Expected Answer	Max
4	(a)	(i)	• An identifier/name • Associated with a particular memory location. • Used to store (and manipulate) data • …which can be changed <u>while the program is running</u>.	[2]
		(ii)	• When a constant is declared it must be given a value. • The value cannot be changed <u>while the program is running</u>.	[1]
		(iii)	• A descriptive identifier/name is used for the constant. • …which makes the code clearer to read and understand (during maintenance). • ... and it is easier to remember the identifier than the value when writing code. • If the value needs to be changed then only one change needs to be made (where the constant is declared). • This updates the value throughout the program.	[2]
	(b)	(i)	• Integer. • Only whole numbers of tickets can be ordered.	[2]
		(ii)	• Boolean. • There are only two possible values (yes-no/true-false etc).	[2]
		(iii)	• String • The value contains letters as well as digits.	[2]
		(iv)	• Currency/real • The values will include decimal fractions/to allow for pence.	[2]
	(c)		• Input NumberOfTickets, n • If n < 0 or n > 15 produce an error message • And stop (Else) • Loop through the rows from Row A • Until seats are found • ... or you reach row J (provided this is within a loop) • Test that there are n seats available in row (together) • .... Eg by finding first empty seat • ..... and checking n – 1 seats after it. • If seats found then output the seat numbers. • Else output appropriate message.	[8]

Grade Thresholds

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

Unit Threshold Marks

Unit		Maximum Mark	A	B	C	D	E	U
F451	Raw	100	66	59	52	45	38	0
	UMS	100	80	70	60	50	40	0
F452	Raw	100	70	61	53	45	37	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

The cumulative percentage of candidates awarded each grade was as follows:

	A	B	C	D	E	U	Total Number of Candidates
H047	9.5	24.1	42.7	61.7	77.9	100	1373

1373 candidates aggregated this series

For a description of how UMS marks are calculated see:
http://www.ocr.org.uk/learners/ums_results.html

Statistics are correct at the time of publication.

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

OCR Customer Contact Centre

14 – 19 Qualifications (General)
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