

Computing

Advanced GCE A2 H447

Advanced Subsidiary GCE AS H047

Reports on the Units

January 2010

HX47/R/10J

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This report on the Examination provides information on the performance of candidates which it is hoped will be useful to teachers in their preparation of candidates for future examinations. It is intended to be constructive and informative and to promote better understanding of the specification content, of the operation of the scheme of assessment and of the application of assessment criteria.

Reports should be read in conjunction with the published question papers and mark schemes for the Examination.

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Advanced Subsidiary GCE Computing (H047)

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Chief Examiner Report

The three examination papers worked very well. They each managed to provide a large degree of discrimination across the grade boundaries while ensuring a challenging test for the most able of candidates and maintaining the interest of weaker candidates, allowing them to achieve in many places across the papers. The project work was only submitted by a very small cohort, as would be expected because this is the first possible chance for submission. However, it is encouraging to read in the Principal Moderator's report that a wider range of work was submitted than has been the case previously. There are possible problems that can arise when centres leave the safety of tried and tested project subjects but it can only be a good thing for the interest of the candidates not to be too restricted in what is possible. Centres are encouraged to contact the board if they are in any doubt about the legitimacy of a particular project idea before the work becomes too advanced, if only to set minds at rest.

Readers of this report have their attention directed to the published mark schemes for all the written papers containing model responses for all the questions.

F451 Computer Fundamentals

General Comments:

The standard of presentation of the responses was good. Candidates are sensibly giving indications to the examiners of occasions where answers are continued on extra sheets to ensure that the examiner finds them, they are using sensible pens so that the image is not corrupted by ink showing through from the other side of the paper and they seem to be aware that variations in colour created by the candidate in things like diagrams do not appear to the examiner so they are not using different pens. These are all different examples of the candidates helping the examiner in order that they are awarded appropriate credit for their efforts.

There were very few candidates who were either unable or unwilling to give reasonable responses to the questions on the paper, the majority equipped themselves well and provided full answers to most of the questions. The standards of written English continue to improve and many candidates are beginning to use alternative forms of answering including using diagrams where possible and bulleting or numbering sections in the responses. This is to be applauded and the examiners will always search a response and attempt to award marks where evidence, in whatever form, is presented.

Candidates should guard against a notable increase in rephrasing questions to provide the response: A question about backup might be answered as 'The data is backed up...'; 'Compression software is used to compress data'; or when explaining the purpose of a feasibility study '...is it feasible?' Credit is not given for a reordering of the wording from the question and candidates should be wary of this.

Comments on individual questions

Question 1

- a) Generally well answered, though too many defined hardware as a component of a computer system. This is not specific enough as items of software are also components of the system. This response occurred too regularly to be a mistake from the candidate leading the examiners to believe that this 'definition' is being taught in some centres. The message must be that we must be careful to be accurate in the teaching of definitions to students.
- b) Some candidates answered by saying the reverse of the first response: 'The non-physical parts of the computer system'. While this approach of saying that it is not something else is not necessarily wrong, it is dangerous to answer in this way because it divides all the possible components of a system into two groups which is fair enough as long as there is not a third group, data.
- c) (i) There were many answers of 'game' or 'computer game'. These are not necessarily real-time applications and did not attract credit unless the candidate had made clear what they were referring to in their explanation.
(ii) This was well answered by many candidates, a full range of marks being awarded. However, there was a significant minority who answered in terms of how a payroll was produced rather than using a payroll to describe batch processing. While these candidates still scored the emphasis of their responses was wrong.

Question 2

- a) (i) and (ii) were good discriminators though some candidates got the two definitions the wrong way around, most managed at least one mark in each part. There were a number of candidates who wanted to answer (iii) in terms of the speed of the response or in terms of the cost, neither was acceptable as they could both be argued in either way.
- b) There were some candidates who simply did not answer the question but most were able to provide enough evidence for their response to be allocated into one of the bands. One observation which should be made to future candidates is that the volume of the answer does not directly relate to the mark awarded. Indeed, the better answers were restricted to around a half of the allocated space for the response. This seemed to be because the candidate was focussed on presenting the correct information while those who provided larger answers tended to struggle to focus on the answer to the question. Candidates should also note that the form of the response does not have to be prose, the mark scheme concentrating on: the ability of the candidate to communicate their ideas; the logical flow of the argument; and the correct use of technical terminology. While this must include an acknowledgement of the importance of the language used it does not preclude other forms of response, some of which may be more sensible than a prose essay for this question.

Question 3

- a) Well answered, though some decided to give different methods of information collection and others talked about different stages in the systems life cycle.
- b) (i) The user guide was well described by most, though a small number evidently had little idea of the concept of two forms of documentation. A point must also be made about the surprising lack of examination technique shown by some candidates who simply ignored the fact that three types of content were required. As examiners we will always accept the fact that the candidate is in a stressful environment and our policy is always to choose the best responses when the candidate has offered one more than necessary but that if a long list is given then we mark the first responses in the list on the grounds that the candidate is demonstrating an inability to distinguish between acceptable and unacceptable responses.
- (ii) Many candidates scored well here with sensible examples of diagrams. There were a number who gave the answers: waterfall and spiral diagrams, the suspicion is that this was taught and once again teachers are urged to ensure that candidates do not wrongly assign facts to incorrect areas of the work.
- c) Lots of cameras but little else. To quote one examiner: 'The extension marks were often not achieved, with few candidates showing knowledge of the process of capturing images'.
- d) Many candidates gave points from the data protection act, but did not answer the question which was about the need for legislation, not about the legislation itself. For a full list of the expected responses to this and to all other questions on the paper, the attention of the reader is drawn to the published mark scheme.

Question 4

- a) This is now a standard question, there being little else that can be asked about these components within the confines of our syllabus. Once again, the control unit is the least well understood, while most candidates scored full marks on the ALU.
- b) Most candidates were able to name two busses and the breadth of acceptable answers was very wide. Many candidates were able to correctly describe how they were used although many saw them as registers rather than conduits and referred to 'The data bus which holds the data for...'

Question 5

- a) This was intended to be a simple question and so it proved for most candidates, however there was a significant minority that chose the methods of input carelessly, MICR being a popular choice among these candidates. Some chose OCR which was ignored by examiners in most cases as the candidate went on to describe bar codes which was duly credited.
- b) The format of the output does not mean 'a printer', it means the hardcopy which is produced by a printer, although the device was marked correct if the extension mark was earned. It was sobering to see at this level that some candidates confused the concepts of input and output in parts a and b. While it is possible to make silly mistakes in the exam room, this is so basic a concept that it is worrying that some candidates could make it.
- c) This was a more complex question because it required analysis of a situation and many of the candidates were unable to produce the required analysis. Most were able to say something about loss of jobs and need for training but the question was about work expectation and there were few who could answer the question save for stating 'The work will be easier because they will have less to do and so the pay will go down.'

Question 6

As mentioned above, there is a temptation to just rearrange the words in the question. Responses like 'Compression means to compress files...' are not worth credit. Apart from knowing about the utilities there was an added difficulty to the question in that candidates had to relate the utility under discussion to a use which could be made of it by the author. This is recognised as a higher level skill and so it proved in this case. There is an argument that candidates will not know about being an author but there was plenty of information given in the question to be able to formulate such answers. This question was a good discriminator ranging from candidates who confused the meaning of 'hardware drivers' and wrote about a hard drive, to those that scored maximum marks across the question.

Question 7

- a) There are too many candidates still stating that bit rate is 'the speed of...' although it is far less prevalent than it used to be. Equally there is a great improvement in the examples with candidates being very careful to talk about streaming video pictures and not just downloading video files. It was therefore a shame that most who had scored the first marking point failed to score the other two marks in (ii), being satisfied with stating one additional point.

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- b) Most candidates have a general understanding of the need for a handshake but were unable to go past one mark. This is an improvement on past experience but still something that requires work. It is not intended that the description needs to be very technical, the standard types of response are shown in the mark scheme, though more technical responses would be credited.

Question 8

This question was well answered by most candidates. A number do not understand the difference between octal and hexadecimal, probably because the example past paper question most recently seen was about octal. There were also a number of candidates who did not get (i) correct but used it correctly in (ii) to get the wrong answer there as well. Follow through marking was used so as to not disadvantage these candidates unfairly. Many had shown the correct method in (ii) and yet left (iii) blank. Again, follow through marking was used in order to give credit where the points were shown in (ii).

F452 Programming Techniques and Logical Methods

General Points

Overall the paper worked well allowing the candidates to demonstrate their knowledge and understanding of the areas of the specification that were tested. There were, in particular, significant improvements in certain areas for which centres should be commended for having prepared their candidates. One of these was the very low omission rate, with more candidates attempting all questions than in previous sessions, suggesting that candidates had enough understanding of all the questions to, at least, make an attempt.

The main concern related to the candidates' abilities to give precise and accurate answers, especially where these answers use technical terms which mean one thing in the context of this specification and something else in everyday usage. Several examples are given in the details about the question below, but such terms include procedure, function, condition, parameter, variable and many more. Candidates should be taught to appreciate the difference in their meaning within the specification, and be encouraged to use the terms correctly, both when talking and writing about their work. It appeared, in many cases, that concepts which were sufficiently well acquired through extensive practical work were not being well expressed because candidates did not have an adequate technical vocabulary.

This is a modular specification, and the centre may enter candidates for each module in any order. However, centres should carefully consider the order in which F451 and F452 are taught and taken, to suit their candidates. While resit candidates and candidates with considerable prior programming experience were obviously in a better position, it is possible that candidates sitting F452 first in January may not have had sufficient experience of discussing the concepts and putting them into context in their practical work and consequently were limited to giving vague or superficial answers.

Individual questions

Question 1

Part (a) was generally well answered although fewer students obtained full marks than was expected. The weakest candidates had difficulty with deciding which basic units to use, confusing bits, bytes, kilobytes and characters in their answer. It is expected that in questions like these, if the units for the sizes of fields are not stated, they should be given in bytes. More candidates mistakenly assumed that the field length depended on the number of characters even in non-string data types. Candidates should be taught to use powers of 2 bytes (1, 2, 4 and 8 as appropriate for the data type and maximum value) as the field length for these data types. Where a range of answers for field size is possible, candidates should state just one value in the range. Many candidates suggested, for example, that the field size for Name would be "10-20" and for GamesPlayed would be "2/4/8" suggesting they had learnt this without a full understanding. In centres which complete the specification in a modular manner, this is an area where if F452 is completed before the appropriate section of F451, candidates may have only a superficial understanding and make some of the errors described above.

Part (b) was well answered with most candidates scoring 4 or 5 marks out of 5. Those who missed a mark tended not to add an extra allowance to the size of the file (typically 10%) for overheads.

Part (c) was poorly answered, most candidates not knowing what an indexed sequential file is. Some were able to pick up a few marks by describing a sequential file and by stating that searches would be faster. Many candidates wrongly stated that in an indexed sequential file, the index contains entries for each record, and the location of the record. How indexed sequential files work is often taught using a diagram showing how entries in the index point to records in the file. Such a diagram would have been an excellent answer to this question, but was seldom seen.

Parts (d) and (e) were well answered, most candidates gaining full marks. Where candidates lost marks in part (d) it was often due to not understanding the inequality operators $<$, $<=$, $>$ and $>=$. Where candidates lost marks in part (e), it was usually as a result of reconnecting their flow chart incorrectly to the example given. It is worth noting for future reference that although when marking flow charts in general the emphasis is on the logic of the algorithm and not the accurate use of conventions, in a question such as this where the logic was spelt out in the question and the conventions were extensively modelled, an accurate answer is needed for full marks (and was achieved by most candidates)

Question 2

In part (a) only about a third of candidates identified the programming construct as a sequence. We assume this is due to being unfamiliar both with the terms “programming construct” and “sequence” (as it is used in this context). The programming constructs are a fundamental concept in this unit and, while it is clear that most candidates do understand the concept, they also need to be familiar with the correct terminology.

In part (b), most candidates were aware of the concept of parameters and could identify the parameters of the procedure in part b(ii). However, in part b(i) they needed to be more careful in expressing their answers accurately, and to avoid the general everyday meaning of the term “parameter”. Many candidates correctly stated that a parameter is an item of data needed by the procedure for one mark, but very few gave correct further details for the full three marks.

In part (c) about half the candidates were unaware of the integer division operator DIV. As the algorithm for this question used this in two places, these candidates lost two marks. They were, however, able to receive follow through marks by showing an ability to evaluate expressions containing other arithmetic operators as required by the specification.

Part (d) tested their understanding of the term “concatenation” as well as their ability to apply it in context. About half the candidates understood what was required and most of these gained full marks. About 10% did not recognise the term at all and consequently did not attempt the question, making this the most omitted question in the paper.

It was very pleasing to see a majority of medium and high level responses in part (e). Candidates were clearly familiar with the correct terminology and understood what was required. In the best responses, candidates fully covered the scope by not only mentioning a range of internal documentation techniques, but carefully selected just the techniques which apply to the code given, demonstrated how these applied and explained how they would make maintenance easier. Some candidates still felt that the answer to this question should be structured like an essay with an introduction (which basically repeats the question) and a conclusion (which repeats the answers already given). **This is not the case.** The candidate’s ability to communicate the answer clearly, completely and concisely is what is being assessed.

Question 3

Part (a) was generally well answered. It was clear that many candidates had learnt a definition for iteration for 3(a)(i) and most were able to identify other iteration constructs for 3(a)(ii). Only the strongest candidates were able to clearly describe the concepts for full marks, while some

missed marks by incorrectly using technical terms which are highly relevant in the context such as “condition” and “output” resulting in answers that are too vague such as “the code is repeated until you get the output you want”.

Answers to part (b) were similar; most candidates were able to make some correct application of a SELECT CASE statement to the game in the question and gained at least 2 marks. However, only the candidates who were also able to use technical terms accurately gave a full general description to gain full marks. An example of a common vague answer in this case was to suggest that a SELECT CASE statement uses inputs. While this is true using a very general sense of the term “input”, in this context “input” has a clear technical meaning, and candidates who state this are not clearly demonstrating that they understand SELECT CASE statements in general (which may depend on variables other than an input to the program). Note that SELECT CASE was used in the question as this is the pseudocode given in the specification. However, answers using just CASE, SWITCH or whichever syntax is used in the language familiar to the candidates were equally acceptable.

In part (c) most candidates spotted the wrongly nested IF statement, and many gave a full enough explanation of this to gain full marks (often using the term “nesting” which was pleasing to see.) It was disappointing that many candidates thought the effect would be that as the REPEAT loop had no end condition, it will loop infinitely, betraying perhaps, insufficient experience of having attempted to compile such code. This ties in with only half the candidates being able to identify this as a syntax error in part c(ii).

Part (d) was quite well answered, with most candidates able to identify and describe a type of error. Due to an unintended ambiguity in the question, candidates were given the benefit of the doubt if they had incorrectly identified the type of error in part (c) and consequently chose a syntax error as their other type of error for this question.

Question 4

It was very pleasing to see a significant improvement in the quality of answers in part(a), when compared to a similar question in June 2009 (which in that case was about variables and constants), suggesting that centres had considered advice given in the principal examiner’s report in that session. While there were still a few answers such as “a variable is a value which can change” (or worse “a number which can change”), more candidates were careful to be more precise with their explanations. A variable is not a value (which by definition cannot change, but the value **represented by** a variable can). Also, stating that a variable can change does not add any more to the everyday meaning of the term variable and so is too vague. The concepts of global and local variables were well understood, both formally by definition in part (a)(iii) and in context in part (a)(ii).

Part (b) was fairly well answered, with most candidates appreciating the fact that as TotalWeight and TotalVolume are global variables, they may already contain values from a previous run. Weaker candidates simply stated that lines 10 and 11 set the value to 0. Candidates should read the questions carefully as this simply describes what happens on the lines but does not answer the question as to **why** this is needed. We would also have liked to see more candidates use the technical term “initialise” in their answers.

Part (c) received a variety of responses. Most candidates had some awareness of what beta testing is, although some were obviously influenced by their experience of the beta testing of major software titles and implied that a beta test was the same as a public beta test which they were familiar with (such candidates were still able to gain all the marks available for beta testing). Fewer candidates were able to fully describe acceptance testing with, once again, the weakest candidates confusing acceptance testing with black box testing.

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Part (d) was well answered with most candidates achieving at least 7 of the 9 marks. Centres may consider the way a trace table is laid out in this question as a model for similar questions in the future and especially stress the importance of changing only one variable on each line of the trace, for clarity (not for the examiner, but in the context of the purpose of the trace). Candidates who did not get full marks often failed to appreciate that in a FOR loop, the variable is incremented on the NEXT line (line 16) suggesting instead that it is incremented on the FOR line.

Part(e) received a mix of answers, as would be expected. It was very pleasing to see that virtually all candidates did attempt the question, as these questions have something for the E candidate as well as the A candidate. In this case, the question clearly asked for a function which returns the total cost to the rest of the program, and required that the function used the global variables TotalCost and TotalWeight, and marks were available for doing this. Most candidates were able to produce working logic for the algorithm, but only the strongest candidates were able to give a full detailed algorithm (in particular when, say, computing how many 0.1 kg there are in the excess weight.) As is the case for similar questions on this specification, only the logic of the algorithm is considered, and not the syntax (or the accurate use of flow chart symbols if the answer is given as a flow chart.)

F453 Advanced Computing Theory

General points:

As this was the first examination for the new Specification, it was pleasing to see that a significant number of candidates scored high marks, though it is likely that in many centres only the better candidates were entered for the examination. Candidates seemed able to attempt most questions, giving reasonable responses.

A major problem for examiners was the poor presentation of some candidates' work. Occasionally it was a pleasure to mark clear answers, well-written and set out neatly. Unfortunately this was a rarity. A large number of scripts were messy, with answers scrawled carelessly into odd spaces and margins. Many were almost illegible. In a few cases, from mistakes made in answers it was evident that even the candidates could not read their writing. The written script is the only opportunity for candidates to impress the examiner, so it would be wise for candidates and centres to address this issue.

Candidates are also advised to use their examination time sensibly. They should be aware that the only definitive list of topics to be examined is that found in the OCR Specification. Written complaints about the lack of a topic in a textbook, or that the candidate forgot to revise a topic, are irrelevant and merely waste the candidate's examination time. When asked to explain the difference between diagrams, it would be more instructive if the candidate looked for a difference instead of stating that there is no difference, as several did.

It is essential that candidates read questions carefully and ensure they answer what is asked. For example, some lost easy marks by omitting to give examples when required. Also, more consideration needs to be given to good written communication. This could involve an essay, a list of points, or diagrams with some explanation. The choice between these must be appropriate to what is required by the question.

Individual Questions

Question 1

In part (a), some good answers were seen. Weaker candidates often failed to write why interrupts are used. Many gave poor examples of sources of interrupt and so were unable to explain why these had different priorities. Similarly, in (b) a number of candidates described scheduling algorithms instead of giving reasons for their use.

Question 2

There were some good answers to part (a), but numerous candidates described a compiler instead of an assembler in (iii). In (b), most knew that something happened "line by line" when using an interpreter, but the weaker candidates were unable to give more detail. It was pleasing to see some detailed answers to (c). However, candidates must read the instructions. They were asked to describe what happens. The question stated clearly that written communication would be assessed, yet a number of candidates merely listed a few words and phrases.

Question 3

Most gained the marks in (a), though a few gave facts about Von Neumann architecture which were not relevant here. Most gained marks in (b), but few gave good answers in (c), with numerous candidates describing a multiprocessor instead.

Question 4

All but the weakest candidates gained good marks here.

Question 5

Parts (a) and (b) were answered well by the majority. In (c), insufficient detail lost marks for some candidates and there was some confusion with other data structures. Many gained full marks in (d), though a few lost marks by failing to explain their method as required by the question.

Question 6

Most gained good marks in (a) and (b), though many were unable to distinguish between objects and classes in (c).

Question 7

Part (a) was answered quite well, with the majority gaining good marks. A few forgot to use examples to clarify their answer to (ii). It was pleasing to see that (b) was answered quite well by many candidates. A common mistake was to use the term “post fix” for the traversal, which should have been called “post order”.

Question 8

Some candidates answered this well, but many had either not learnt definitions or had misunderstood them. There appeared to be some confusion between indexed, indirect and relative addressing.

Question 9

Parts (a) and (b) allowed many candidates to gain good marks. A significant number of candidates did not understand where the foreign key is stored to form a relationship and gave, incorrectly, “PetID in OWNER” as an example. Answers to part (c) were very poor. Many candidates appeared to guess in part (d) but most gained marks in part (e).

F454

There were only a limited number of entries for this unit in this session. The vast majority of the entries seen were from centres that had taken advantage of the coursework consultancy service and had marked very accurately.

Early indications show a much more varied set of project ideas than for the previous specification with centres taking full advantage of the flexibility introduced in this version of the specification.

One major topic of discussion in the coursework consultancy has been the emphasis on testing and the number of marks awarded to this. I anticipate candidates will prototype their work using, as they develop the system, white box alpha testing. Once the system has been completed they should use their test plan to test the final product using black box alpha testing. Finally, they will hand this over to the end user for black box beta testing. These three types of testing need to be identified in advance in the test strategy with overall descriptions of the white box alpha testing process indicating what type of data will be used. The traditional test plan needs to be identified for the black box alpha testing with test data, reason and expected results. For the final testing mark all these types of testing need to be accounted for, though they are unlikely to be in a discreet section called 'testing'.

The project reports for this unit can be quite bulky and consequently difficult to navigate. In order to help the moderator find evidence to support the centre assessment it is recommended that centres encourage candidates to provide suitable navigation aids for the report, for example a contents page and page numbering.

Grade Thresholds

Advanced GCE Computing (H047/H447)
January 2010 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	A	B	C	D	E	U
F451	Raw	100	73	65	57	50	43	0
	UMS	100	80	70	60	50	40	0
F452	Raw	100	79	72	65	58	52	0
	UMS	100	80	70	60	50	40	0
F453	Raw	120	96	86	76	66	56	0
	UMS	120	96	84	72	60	48	0
F454	Raw	80	64	56	48	40	32	0
	UMS	80	64	56	48	40	32	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

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

	A	B	C	D	E	U	Total Number of Candidates
H047	11.5	33.1	60.1	81.8	94.6	100	148

148 candidates aggregated this series

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

Statistics are correct at the time of publication.

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