RECOGNISING ACHIEVEMENT

GCSE

Computing

General Certificate of Secondary Education **J275**

OCR Report to Centres

June 2012

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 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.

OCR will not enter into any discussion or correspondence in connection with this report.

CONTENTS

General Certificate of Secondary Education

Computing (J275)

OCR REPORT TO CENTRES

Overview

The first full cohort for this specification has proven to be extremely encouraging for all of us involved with the development and assessment of the subject. Most of the candidates were well prepared and work in all three units was mostly of a high standard. In particular, it was clear that most candidates had worked hard at the controlled assessments, learned a lot from them and above all had fun in developing their skills. The examining team saw much innovative and high quality work, which is a testament to the determination of the candidates and also to the efforts and interest of their teachers.

For many schools, the adoption of computing has been a leap of faith, in some cases involving a little nervousness about standards and assessment. In nearly all cases, the standards set by the centres have been high and there have been few problems in the internal marking of the controlled assessments.

Above all, what came across from the work submitted was that when students (and teachers) are set a new and worthwhile challenge, they rise to the occasion and produce impressive results. There are clear signs that all involved are finding the specification worthwhile and satisfying and those of us involved in assessing the work are extremely gratified with the levels of achievement demonstrated.

It is clear that computational thinking is at last becoming recognised as an important component of all students' education. It has immense benefits for them in all subjects and in solving many of life's challenges.

A451 Computer Systems and Programming

In comparison to previous series, there was a noticeable step change in how prepared the candidates were for the examination. While there were still some candidates who were not adequately prepared and left many questions blank, most candidates were able to give reasonable answers across the entire specification which matched their level of ability as apparent in the paper. This reflects the fact that this was the first series available for year 11 candidates who had studied the specification in the standard delivery mode over two full years. However, it probably also reflects the fact that centres are following advice not to enter candidates until they have studied the full specification.

Question 1

Most candidates answered question 1(a) correctly. Question 1(b) proved more difficult for lower ability candidates. The main errors were candidates not applying their knowledge to the context by referring to keyboard and mouse as input devices, although these are not appropriate for a tablet computer and considering removable storage devices such as USB drives as input devices. Candidates making these errors were also largely ignoring the wording of the question which asked for devices *built in* to the tablet computer. Centres should remind candidates to read questions carefully, phrases such as these often make the difference between a right and wrong answer. Some weaker candidates failed to get the marks for describing the use of the device by giving answers which did not mean much more than 'it is used as an input device', for example 'it is used to enter data'.

Question 2

Question 2(a) was generally well answered. The most common wrong answer was 'line'. A line topology is a (very seldom used) topology where each node is connected to exactly two neighbours. The functionality, advantages and disadvantages of such a topology are too different from the diagram in the question for the mark to be awarded. Besides the specification clearly lists the three topologies candidates should be know and so it is fair to expect one of these as the answer. In question 2(b) most candidates were able to name an appropriate device for connecting to the Internet (modem or router) with a small number saying hub or switch. Centres should continue emphasising the different functions of these devices as the names tend to be misused in everyday parlance. Question 2(c) was a good differentiator. While there were some excellent answers which focused on the different roles of the server as required, many answers were vague and related to the general advantages or use of the local area network as a whole. Question 2(d) also had a range of responses. This should normally have been a straight forward question for candidates who have studied the difference between a client-server and a peer-to-peer network, but there was significant evidence of candidates guessing the answer from the term 'peer-to-peer'.

Question 3

This question was very well answered with the overwhelming majority of candidates gaining all four marks. Some candidates also showed their working by writing intermediate answers onto the circuit where appropriate. This is to be encouraged.

Question 4

Question 4 was very well answered by most candidates and any errors were with AVI and BMP files.

Question 5

Candidates appeared to me more familiar with automatic update utilities than system clean up utilities – this may indicate that they are relying on their personal experience solely. Where candidates demonstrated some understanding of the utilities, their descriptions were often too vague for credit. In particular, centres should advise candidates that in such questions, they should avoid using the terms in the name of the utility as they are precisely being assessed on their understanding of those terms (as they apply in this case). It is for example, too vague to use say a "system clean up utility cleans up the system" or to use the words 'automatic' and 'update' in their answers (which was very common).

Question 6

Question 6 was generally well answered with only a few candidates losing marks because of an arithmetic error along the way. In 6(a), some candidates, however, appeared to be doing a BCD conversion or possibly a conversion from the Hex number 55 to binary. Centres are reminded that BCD is not on the specification for this examination. Centres are also reminded that, in accordance with the specification, candidates will be given and expected to produce 8-bit binary numbers. (They were also reminded of this in the question). Some candidates lost a mark because they did not ensure their answer was in 8 bits. In 6(b) some candidates worked from the original binary number of 55 while others worked from their binary conversion in 6(a). Either solution was obviously acceptable, and in cases where they used their answer to 6(a), follow through marks were awarded if their conversion was correct, but their answer to 6(a) was wrong.

Question 7

As a whole question 7 was a good discriminator, allowing the most able candidates with a good understanding of the CPU to stand out from the rest. In 7(a) candidates lost marks for being vague in their response. In 7(b) the emphasis was on providing an *explanation* and while most candidates had some idea that a faster processor speed and a larger cache size would improve the performance, only the strongest candidates were able to give a convincing explanation for the improvement by relating it to what the clock and cache are. A significant number of candidates confused the CPU cache with the web cache.

Question 8

Although on the whole, candidates performed well on question 8(a), most of those who did not get full marks would have done so if they had understood the requirements of the question. The question asked them to "*explain* how [they] obtained their answer from the flow diagram". They were expected to apply the data given in the question to the flow diagram showing what happens as they work through the diagram. Most candidates who did not get full marks probably followed the diagram correctly (as shown by the fact that they obtained the correct username) but when it came to the explanation either repeated the steps of the flow diagram or the data in the question without linking the two. Most candidates scored three out of four marks for question 8b, the fourth mark having been designed specifically as a discriminator for candidates who were able to describe (in reverse) the rule for adding hashes to the surname as accurately as one would expect in a formal specification.

Question 9

Question 9(a) was generally well answered. Question 9(b) was intended to provide a spread of answers, which it did, although a surprisingly high number of candidates were unable to make any relevant points and gained zero marks. This was the case even if the standard of English in the response was good, as this questions assesses how well they have communicated the answer to the question (of which spelling and grammar are an element, but only an element). Most candidates gained marks for discussing the use of forms, reports, queries etc... but few mentioned more fundamental aspects such as separation of data from application. Where this was mentioned, it was a very effective signpost to a high level response.

Question 10

While this was aimed at middle and high ability candidates, it was disappointing to see so few of them score any marks in 10(a). The relationship between the functioning of computer circuitry and hardware and the use of binary is included in the specification because it was felt that candidates ought to understand the rationale for learning about logic gates and binary representation of data (which they have otherwise demonstrated that they understand). The performance on this question suggests that centres are focusing on teaching the 'how' but not the 'why' of binary. Question 10b was also poorly answered suggesting it was something they simply had not learnt. A common error was discussing the binary representation of strings rather than instructions. In both cases, candidates who did not know the answers made very bland comments about the binary number system which did not answer the question and appeared to be guesses.

Question 11

Question 11 was generally well answered although some candidates may have scored better with better examination technique. The question asked for **two** differences and to help candidates the lines were numbered 1 and 2, but many candidates still gave only 1 difference, using the line numbered 1 to say something about high level code and the line numbered 2 to say the corresponding point about machine code. Other candidates failed to give a comparison with statements like 'machine code can be run by computers' or even 'machine code can be run by computers and high level code cannot'. To have a full comparison (and 2 marks) candidates should make a clear, positive comparative statement about each item being compared). Candidates should also be aware of the fact that marks were not gained for facts that were stated in the question such as 'High level code needs to be translated' unless there was further expansion/explanation. Both parts of question 11(b) were targeted at the more able candidates who were expected to have a deeper understanding of program translation and this was reflected in the marks. Question 11(c) was chosen to be open ended to give the candidates the opportunity to apply the material they had learned about professional standards in section 2.1.1 of the specification in a variety of ways. Where candidates did this, a variety of interesting answers were seen. Many candidates interpreted standards as 'quality' and were thus unable to make strong answers, if they scored at all.

Question 12

Question 12(a) was very well answered with most candidates identifying which of the scenarios used sequence, selection and iteration. The candidates who did not get full marks tended to only score 1 out 3. We emphasise again that in multiply choice style questions such as this, candidates should be taught not to make any assumptions about the distribution of the answers, and to answer each question separately. Questions are sometimes asked where an option is used more than once or not used at all. Most candidates were able to give a clear and correct answer, often supported by definitions for the terms ‘real number’ and ‘integer’ in question 12(b). Algorithm questions such as 12(c) are written such as not to exclude the weakest candidates and there were 2 marks available for the inputs and outputs to the algorithm which are given in the question. The remaining marks, however, were for solving the problem by stating precisely what computational steps need to be done to achieve the required outcome. Weaker candidates tended to simply repeat the phrasing of the question (where the computation is intentionally unclear) and only gained the marks for the input and output. However an encouraging number of fully correct answers were also seen. Generally answers written in code or pseudocode were better than those written as a flow chart, probably reflecting the difference in the ability of candidates who choose the different methods. As always, either method was acceptable and equally capable of achieving the mark that reflects the candidate’s ability.

A452 Practical Investigation

In general, the performance in this part of the assessment has been extremely encouraging. The level of work produced by many candidates has been impressive and often showing skills considerably in advance of typical GCSE work.

The most popular assignments were the Little Man Computer and the JavaScript validation. This might partly be explained by the fact that they were the first two to be released and have therefore been around longer for centres to get used to.

It has been gratifying to see how well many candidates have fared with the Assembly language tasks. Producing a program to calculate an average of a set of values involves a lot of code and attention to detail, but many managed it well and presented their work clearly.

The JavaScript tasks allowed candidates to show their research skills in finding techniques that would allow them to develop their solutions effectively. Many went to considerable lengths in order to embellish their code with extra features and to show clearly what they had done.

The encryption tasks allowed many candidates to produce highly inventive solutions as well as to show how they had researched into a variety of available encryption methods.

The shopping cart tended to produce the more disappointing work, perhaps because its challenges were underestimated and it was often treated as a simple ICT task instead of looking into the technicalities of implementing such a system.

A wide variety of presentation methods was seen, with word processed documents being favoured as well as plenty of presentations. There were many animated screen captures showing solutions in action.

The best responses were the ones which were well organised. It does not help the moderation process or the candidates themselves to throw together rough planning notes and early practice attempts to get the assignments working. The number of files presented should be strictly limited to what is necessary to demonstrate the solutions to the problems and the answers to the questions. Rough notes, especially those done by hand are not wanted and can cause much confusion. In many cases, a single inclusive file is the most effective way to present what is required.

The best candidates usually showed their knowledge well in the evaluation sections. It should be noted that all the assignments contain a question which specifically relates the activities of the tasks to real-world computing. This inevitably requires some research, which can be credited in addition to work done in preparing for the task. Some candidates showed deep understanding of the pros and cons of assembly language, validation methods or how real world encryption is needed and implemented.

The reports must be the candidates' own work. It is not acceptable to paste unacknowledged material from web sites as an answer to the questions. Apart from being clear malpractice, such verbatim or minimally altered material is rarely exactly suited to the questions posed and will not be worthy of high marks.

Similarly, the candidates must not work to a pre-planned template. The A452 tasks are designed to be open ended to various degrees and it is intended that candidates find their own, preferably original solutions to problems. This does not lend itself to a formulaic directed approach and will not give the candidates any advantage.

Ideally, work should be submitted electronically, with great care being taken to ensure that all material is well organised and easy to find. The repository is the preferred method for many reasons and the moderation process is greatly facilitated which is to the candidates' advantage.

Most of the marking was realistic, showing that the banded approach is well understood by the centres. There were some cases where the marking was at the edge of tolerance and unusually, there were many cases where the marking was rather more severe than is required at GCSE level. There were a very few centres where minimal and trivial work was credited with very high marks. In particular, it should be noted that top bands cannot be awarded unless all of the questions are successfully tackled.

For the first full cohort, the A452 module has demonstrated that GCSE candidates will respond to a challenge and that students of all abilities are able to demonstrate achievement at some level. Students who do well in this module show the sort of investigative skills that can be adapted to suit future work, irrespective of computer platform. Indeed, these skills are transferable to a wide range of problem solving activities.

A453 Programming Project

This session was the first opportunity to assess the work for a significant number of students and the overall impression was very encouraging with many candidates producing excellent work. It was also clear that the best work was produced as a result of a well-organised and logical approach to the controlled assessment. Candidates who were well organised tended to provide the evidence required to demonstrate the required skills more effectively than those who were not. The characteristics of these well-organised submissions were single document reports for each task (or for all tasks) taking the assessor through the process illustrating the key elements of the process with explained code and evidence of testing. Where candidates had submitted a large number of randomly named files it was often a reflection of a disorganised and, consequently, less effective approach to completing the assignments.

The whole range of available task sets were used and centres were generally selecting the task set most suited to their choice of language. In some cases it was clear this had not been thought through and the combination of tasks set and language was not working in favour of the candidates. By far the most popular choices of language were Visual Basic and Python, these worked well and candidates were able to complete the tasks effectively. For the more visual tasks, such as the calculator and hangman tasks, centres were choosing VB or VBA. For console style programming many centres were selecting Python. It was also good to see a few centres choosing to use C and Java, which tended to produce good results. There were other choices including Small Basic and Scratch, the latter requiring the candidates to find 'inventive' approaches for some tasks because of the inherent limitations in the structure of the language. A small number of centres also chose to use a number of different languages, selecting different approaches to each of the sub-tasks, this tended to work quite well.

The process to complete the tasks should start with an analysis of the problem. Candidates should think about what the task requires and identify other information they will need to complete the tasks. While the tasks are generally quite clear in their requirements it must not be assumed that there are no other factors to consider, most programs will fall over easily if there is no validation of inputs, for example. It is important candidates plan the solutions carefully based on an analysis of the requirements but this was often the weakest section in the work submitted. Designs must show evidence of planning and an important part of planning is to know what the goal is. Identifying success criteria is a key part of the process but one that was most frequently missing from work. The design section needs to include success criteria, detailed algorithms and a test strategy or plan including the data to be used to test the solution during development. Algorithms are an essential element of this subject and it was disappointing to see algorithm marks when there were no discernable algorithms. The written design, the actual coded solution or project plan do not constitute algorithms. A good algorithm will define the solution and flowcharts were often the most effective approach with many giving flowcharts further refined with pseudo code explanations of the solutions. A number of centres also got the students to dry run these algorithms to test that they worked as expected.

The development should show the code being built and tested. Too frequently the code was presented in a completed form with little evidence of any testing. We urge candidates to show an iterative approach to coding testing and providing evidence at each stage of the process. We do not object to small sections of code taken from websites being modified and used, but this must be acknowledged and the supervising teacher must ensure that the bulk of the code is generated by the student and that the entire code is not simply presented as the student's own work. While we require annotation it is worth noting we require this to explain the code and demonstrate an understanding of what the code does. Some candidates are annotating on a line-by-line basis and consequently wasting time they could use more effectively on other parts of the process.

Testing should be used to try and break the program, not simply to show that it works if the right values are input. Lack of test evidence was also a significant factor characterising weaker solutions. In the best solutions the testing was chosen to be destructive and identify issues and used to cross-reference with the success criteria to evaluate the solution. Evaluations that simply concentrate on the candidate's feelings about the process do not meet the criteria for this section and good evaluations are a result of careful, detailed design, a good choice of measurable success criteria and careful planning for, and completion of, testing.

Having made all of these points it is worth noting that the majority of centres produced well-structured and organised work and marked realistically. The tasks were accessible to a wide range of abilities with many lower grade students clearly getting something positive from the experience. The best work was produced by candidates who had independence when writing the code, those that were too teacher led failed to allow the candidates to demonstrate their abilities effectively.

Please note that templates and teacher direction are not permitted under the regulations for controlled assessment and will be treated as malpractice. It is important that students work independently producing their own solutions not constrained by writing frames, templates and teacher directed approaches to the solution. Whether choosing postal or repository entry the advice is to submit the work electronically in a small number of well-organised files with electronic evidence of the solution.

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