OCR
Oxford Cambridge and RSA

GCSE

Computing

General Certificate of Secondary Education **J275**

OCR Report to Centres June 2014

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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.

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OCR REPORT TO CENTRES

A451 Computer Systems and Programming

General Comments:

There was evidence that many candidates had been explicitly taught the material in the specification and were adequately prepared for the examination. Such candidates demonstrated this in several ways. They were able to give clear and precise definitions of terms where needed instead of vague answers which rely largely on the everyday use rather than the technical meaning of these terms. They were also able to apply their understanding to the specific context of the questions rather than provide generic answers, or answers that might have appeared in previous mark schemes and were applicable to a different context. Finally, in their responses, they did not repeat some wildly held misconceptions and common technical misunderstanding in certain topics such as proprietary and open source software and the separation of data from database applications.

Examiners noted that candidates' numerical skills were generally good and candidates performed well in topics that required the manipulation of number and units, such as the questions on data representation, units, logic and the use of operators in programming code. On the other hand, some candidates were disadvantaged by having weak language skills and were not able to express their answers clearly enough to enable the examiner to determine their understanding of the subject.

There was evidence that suggested that some candidates had either not covered parts of the specification, or had not covered them to sufficient depth. This was manifested by the candidates' ability to answer complex and technical questions in some topics and otherwise demonstrate good ability in the subject, while giving vague and apparently guessed answers for other questions. The board advises that in order to develop a deep understanding of the subject matter, it is better that candidates study embed and reinforce the theory from the beginning of the course, alongside the controlled assessment units. Delivery models which consist of completing the controlled assessment component first followed by a burst of theory just before the examination are more likely to lead to the kind of superficial understanding that was witnessed in some candidates' answers.

Comments on Individual Questions:

Question No. 1
Q1(a) required candidates to describe what is meant by a Local Area Network, where one mark could be for describing each of the concepts "local area" and "network" in this context. Candidates who did not gain both marks often reused these terms in their answers instead of describing them. **Q1(b)** did not pose difficulties with most candidates although in some cases, diagrams could have been more clearly labelled. **Q1(c)** was also well answered – "bus" and "ring" are the other two topologies specifically required by the specification and this was the answer given by most candidates. Some candidates gave the correct names of other topologies not required by the specification and they were duly credited for these alternative correct answers.

Question 2
Q2(a) was generally well answered. In **Q2(b)** the most common error made by candidates was that they did not specify that programs and data/files are in RAM *while they are in use*. Where candidates had explicitly studied the use of virtual memory, they were able to give a detailed description to gain 2 or 3 marks in **Q2(c)**. A number of candidates appeared to be guessing the answer, the most common wrong answers confusing virtual memory with cloud storage.

Question 3

Q3(a) posed no difficulty for most candidates. In **Q3(b)**, while most candidates showed some understanding of what an overflow error is, fewer were able to give a detailed description for full marks. Using the context provided by the question (that we were dealing specifically with the addition of 2 8-bit numbers) might have helped some of these candidates to achieve the second mark. Candidates continue to confuse the terms “number” and “digit”. In most cases, this did not affect the candidates’ mark as their meaning was clear in the context of their answer, but in some cases it can be so ambiguous that the examiner is unable to determine the candidate’s level of understanding.

Question 4

This was another question where candidates may have scored better if they had considered the context of the question. They were presented with a web page consisting of an HTML file and some JPG and MPEG files. This was intended to guide them to consider how these files work together to constitute the web page in their responses. **Q4(a)** had been intended as an easier question, but many candidates did not know what HTML stands for, and took a guess. Centres should ensure that candidates learn what abbreviations and acronyms included in the specification stand for, particularly when (such as with HTML) the abbreviation is a good description of the concept and can assist with their understanding. Candidates who were mindful of the context tended to gain both marks in **Q4(b)**; other candidates gave more generic answers about HTML in general and in some cases were still able to gain marks. **Q4(c)** posed fewer difficulties.

Question 5

Q5(a) about input and output devices on an e-book reader posed few difficulties although a small number of candidates ignored the e-book reader and gave incorrect answers such as “mouse”. This was intended to be an easier question, and examiners gave candidates the benefit of the doubt by accepting answers such as “keyboard” and “monitor” as being built into the device when this was not specified. However, responses that were not devices (such as a software keyboard or speech recognition software) were not accepted. In **Q5(b)** and **Q5(c)** most candidates demonstrated an awareness of the key characteristics of different types of secondary storage. The strongest candidates were able to clearly link the characteristics of solid state storage to the operational requirements of an e-book reader for **Q5(b),** while **Q5(c)** about optical storage was more accessible. Centres should encourage candidates to answer such questions positively, for example, by arguing why the characteristics of solid state storage make it most suitable, rather than why magnetic and optical storage are not suitable. **Q5(d),** intended as a more difficult question to differentiate the top candidates, was generally poorly answered. It had been expected that more candidates would be able to provide a definition of proprietary software for **Q5(d)(i)** but many candidates appeared unfamiliar with the term in the context in which it is used in the specification. For those who were aware of the term, several common misconceptions were repeated such as the idea that proprietary software is always sold at a cost. Because of the general misunderstanding of the concept, and the necessity to apply it in this specific context and give advantages *to the manufacture of the e-book reader* in **Q5(d)(ii),** few candidates gained marks here. A common incorrect answer suggested that the manufacturer would benefit from selling the software to e-book users, when it was indicated in the question that the software is provided with the reader. Other incorrect answers appeared to be making points from a previous question about the use of open source software in schools, which did not apply in this context.

Question 6

Q6(a) was generally well answered, although a large number of candidates gave Integer as the data type for a customer card number. Centres should ensure that candidates understand the difference between numerical data (integers and real numbers), where it is the numerical value that is significant, and data which happens to be a string of digits and where it is the sequence of digits rather than their value that is significant, such as telephone numbers, PIN codes, ID numbers etc. In this case, an example customer number beginning with 5 leading zeros, was

provided to alert candidates of this issue, but this was ignored by many candidates. Examiners were pleased to see candidates of all abilities make a reasonable attempt at **Q6(b)**. Centres should continue to emphasise to candidates that QWC questions are not necessarily essay questions, and they are not required to give an introduction if it does not add any information which is already in the question. Similarly, a conclusion is not necessary if it just repeats points already made. Candidates should focus on answering the question and will be rewarded for making relevant, detailed points as well as for the clarity, organisation and use of English (especially the use of the technical terms) in their answers.

Question 7
Q7 was well answered by the majority of candidates, indicating that logic and truth tables – a core concept in computer science – is understood by most candidates.

Question 8
In **Q8** many candidates appeared not to have a clear understanding of system information and diagnostic utilities which were featuring here for the first time, whereas they have previously performed well on questions about other system utilities in the specification. Centres may need to reconsider how they address this topic to broaden candidates' understanding. Candidates should also ensure that they demonstrate their understanding in their answers. Responses such as "a system information utility provides information about the system" do not enable the examiner to assess what the candidate understands and were not awarded marks. Candidates, on the whole fared better on describing the purpose of diagnostic utilities, although in the example examiners expected the diagnosis of system faults rather than the presence of malware. Some candidates misunderstood the requirement to provide an example – they gave an example of brand names of utilities, rather than an example of the use of the utility. Candidates should be aware that brand names will never be required as answers to examination questions. Answers that were expected were of the form "System information utilities display the current state of the computer" with as a possible example "the amount of RAM available".

Question 9
Most candidates who attempted **Q9(a)** correctly converted between denary and hex, and vice versa. The most common error was the use of the hex digit "D" for the denary number 14. Some candidates omitted this question, although their performance in other questions suggested that they should have been able to make a reasonable attempt. **Q9(b)** was better answered than similar questions in previous sessions, but some candidates still fail to appreciate that data is not stored in hex and stated that using hex saves memory. Candidates who scored full marks were able to articulate clearly that, in addition to hex being more convenient than binary, the fact that hex and binary can easily be converted into one another.

Question 10
Given the good ability shown by candidates to follow the algorithm in **Q10(c)** and the fact that prior to taking this examination, candidates would have completed the controlled assessment tasks in A453, one would have expected stronger answers for the definitions of constants and variables in **Q10(a)** and **Q10(b)** than those seen. Typically vague answers such as "something that does not change" and "something that can change" do not demonstrate to the examiner an understanding of the meaning of these terms in the context of programming as they more closely describe their everyday meaning, and were not awarded any marks. Some candidates stated that "a constant is a variable which does not change" which was considered a self-contradictory answer. Another common mistake was to state that constants and variables were numbers. Also, candidates needed to be more precise when identifying constants and variables in the pseudocode provided by stating the name only. By quoting the whole line in which a constant appears, such as "CONST noise = 10), candidates indicate to the examiner that they either do not know what a constant is, or they do not know precisely where it is in that line of code. In **Q10(c)** many candidates followed the algorithm correctly and were awarded full marks. Weaker candidates demonstrated a misunderstanding of the abstractions used and seemed distracted

by alternative possible meanings of the identifiers in the question, for example by assuming that "Net" means the ball has touched the net and equating it to the number of goals.

Question 11

As a whole, **Q11** was very challenging for most candidates. That said, many candidates were able to give a clear, concise definition of a database which they had learnt on the course for **Q11(a)**. Other candidates attempted to define it in their own words and obtained the mark if this definition was clear enough, although poor language skills sometimes prevented this. Centres are reminded of the importance to teach standard definitions for terms highlighted in the specification. **Q11(b)** posed the most difficulties. Most candidates appeared not to have been taught about the separation of data from applications as required in the specification. Consequently, although the context was provided to help candidates, it proved a distraction. Most candidates answered in terms of providing security against unauthorised modification of the data. While this is obviously relevant to the context, it is not directly relevant to separating the data from the application. One can still implement good levels of security (different permissions/levels of access to the data – the most common answer given) without this separation, just as one can have poor security with the separation. The few candidates who were thinking along the right lines were able to identify that only one database was needed for all the different applications and that different views of this database could be presented to different users according to their need. Very few made any other points such as the fact that the database and applications can be maintained and upgraded independently of each other. In **Q11(c)** most candidates demonstrated some awareness of the use of queries and validation in database applications, but fewer candidates were able to clearly link this to the application in context. The context of a school was chosen as it was expected it would be familiar enough to most candidates. It was surprising, for example, that so many candidates suggested that in such a system the percentage attendance of a pupil would be an input that can may be validated when it is more likely to be an output of the system. However, as candidates were being assessed for their ability to apply their understanding of the subject rather than their understanding of the context, they were given the benefit of the doubt where possible for such answers.

Question 12

Once again, it is important to emphasise that QWC does not mean candidates are required to write essays. As part of a computer science qualification, it is important to assess the candidates' technical writing skills as relevant to computer science, including their ability to select and use the most appropriate form and register of written communication for the question set. In a QWC question, this is assessed in a holistic manner alongside the correctness and accuracy of the answer using levels of response. In this question, the most appropriate form of written communication for an algorithm was evidently pseudocode or a flowchart. A few candidates attempted to give their algorithms in prose which reduced the overall quality of the response, even when the logic of the algorithm was largely correct. That said, most candidates did answer in a flow chart, pseudocode or code in a language they have studied. Candidates who used a flow chart seemed to score better. They were less likely to omit parts of the specification or to create errors in their logic by incorrectly nesting branching structures. Overall, the question discriminated well between candidates of different abilities, with weaker candidates tending to either make an error in their logic, usually with the validation, or ignore parts of the question. Most often, candidates omitted checking that drinks were available before dispensing them and/or omitted to actually dispense the drink. Checking the algorithm with the requirements of the question may have prevented this. As well as the correctness of the algorithm, examiners considered the effectiveness of the written communication including for example the use of meaningful identifiers, consistent and clearly labelled symbols in flow charts or indentation in pseudocode. Centre's should also note that, as is often the case with QWC question, this question was intentionally open ended and candidates could adopt a variety of approaches such as considering the input of the system as a continuous input stream (as in the example given in the published mark scheme) or a completely event driven system with each key having its own logic or a hybrid of these approaches mimicking an interactive console application with the OK

button serving as an Enter key and the Cancel button clearing the input buffer. All of these approaches were equally valid.

A452 Practical investigation

General Comments:

There was a large increase in the entry this year as well as the first appearance of the newer tasks. This led to a wide variety of approaches which is the intention of this unit. Some Centres allowed their candidates a degree of choice in selecting which task to do and this was usually a successful strategy because the candidates were more able to follow their own preferences.

Candidates are expected to show enterprise and originality in their solutions to the tasks in order to gain the most credit. Many candidates impressed the moderating team with the extent of their computing knowledge and the confident use of appropriate terminology thereby showing a secure understanding of wider computing issues.

Throughout their reports, the candidates should take every opportunity to describe and explain what they are doing and the reasons for decisions made. The moderators look for knowledge that relates specifically to the scenario as well as links to A451 knowledge and the wider world of professional computing.

The best candidates explained most of the code or formulae that they used. Weaker ones just inserted code or screen shots with no commentary.

The better candidates expressed their work clearly and any third party material was brief and most importantly properly acknowledged. For example, the URLs of web sites consulted or quoted must be provided ideally together with the most recent date accessed.

The best responses came from candidates who were given a free rein to find material out for themselves and were not over directed. In particular, it needs to be noted that writing frames are not permitted and it is better if even headings are not over used in order to allow the individuality of each candidate's work to emerge and be properly credited. Stereotyped work is rarely at the top level.

Marking was generally at a realistic level or at least within tolerance limits, but it needs to be fully understood that a holistic approach is taken. Marking is not based on a tick list. The whole of the candidate report is judged against the marking criteria and a best fit arrived at. Problems generally arose when trivial work with little computing content was over credited or where allowances had not been made for missing sections of the tasks.

A further feature of the best work was that it was presented as a single, preferably word processed file. Well organised work was usually good work. Powerpoint presentations are acceptable but they tend not to work as well as an ordinary word processed document.

The URS form was often extremely helpful in providing insight into the teacher's approach to marking and often gave crucial insights into why a particular mark band was chosen. Many teachers helpfully highlighted sections of the mark scheme in order to show their judgements.

In all the tasks, the keys to success are particularly:

- detailed descriptions
- working solutions
- use of technical terms
- evidence of computing knowledge

- evidence of research beyond the scenario
- evidence of an original approach where the candidate has shown initiative.

Comments on Individual Questions:

Little Man Computer
This remains popular, partly because it has been available longest and also provides an excellent addition to A451 teaching of the processor. It was mostly done well by those who chose it although the tasks involving division were found difficult by many. In some cases, this was left out but not taken into account in the marking. Marks must be reduced to account for missing sections.

JavaScript
This was mostly done well. The main problems arose from candidates who did not explain the given code and their own code in sufficient detail. Many of the best candidates added extra cosmetic improvements which although not strictly necessary, did allow them to show off higher level skills.

Encryption
Those who chose this were mostly successful, with the better ones showing evidence of research into encryption in a wider sense. Some came up with ingenious methods to improve upon those given. Many used programming solutions which were often impressive. Others used spreadsheet functionality to achieve their solutions. It might be useful for Centres to note that this was a spreadsheet task but that does not necessarily mean using Excel.

Shopping Cart
This was the least popular task. The best ones showed insights into the technicalities of putting together an online vending website and provided plenty of detailed evidence that the required data had been entered and tested.

App Inventor
This has become the most popular choice. It needs to be understood that to do well with this, it is necessary to explain in great detail the code blocks used. Also, this task requires a reasonable or good knowledge of alternative development platforms in order to make adequate comparisons.

Raspberry Pi
This was focussed on system administration in a Unix or Linux environment and as it is a fairly new task, few centres submitted it. Those that did nearly all provided excellent work with much evidence that the candidates had gone to great lengths to find out the processes and techniques needed to solve the problems.

For next year, there will be new tasks, but to provide continuity for centres, three of the existing scenarios will again be used. The candidates will as always, need to be aware of the importance of:

- an original and creative approach where appropriate
- **detailed** commentaries on what they have done
- **detailed** comments on general related computing issues

- attempting ALL questions
- full acknowledgement of all sources used.

A453 Programming project

General Comments:

There was a large entry for this session with many centres new to this specification submitting work. Those centres who used the sample material on the OCR website as a guide to the report format tended to meet the criteria more effectively. A single narrative document detailing the process from analysis to evaluation focuses the minds of the students on the process much more effectively than can be achieved by several disparate documents in several folders.

The best work looked beyond the basic statement of the problem to identify what a successful solution would require and completed an in depth analysis of the requirements for such a solution. Once the problem requirements are identified and suitable success criteria are in place detailed design can be effective. Once again detailed design work was the pre cursor to the successful development of a solution, superficial efforts at design miss many crucial elements and limit the scope and effectiveness of the developed solution. A good design will provide algorithms that fully describe the intended solution with suitable data that will be used during the development phase.

The development was one of the most common weaknesses in the reports. We need to see the phased development of the solution showing testing and, if necessary, refinement at each stage of the process. Simply providing annotated code of the solution does not describe the process.

Testing was also a weakness in work that failed to score well. Testing should go beyond basic demonstration of the bits that work and should show that the code is robust and does not fall over easily and that it is a realistic useable solution to the problem.

There were some excellent examples with some very good coding on show and the best of these utilised a suitable high-level language. Solutions using other approaches resulted in limited programs that did not represent a realistic solution to the problem and, often, made the solution far more complex than was necessary.

Issues centred around over-guidance by centres which contravened the controlled conditions regulations and often limited the scope for the student to demonstrate the necessary skills. The use of feedback and templates is not permitted under the rules for controlled assessment and should be avoided.

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