Oxford Cambridge and RSA

GCSE

Computing

General Certificate of Secondary Education **J275**

OCR Report to Centres June 2015

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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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General Certificate of Secondary Education

Computing (J275)

OCR REPORT TO CENTRES

A451 Computer Systems and Programming

General Comments:

As the take up of the subject increases, the number of candidates has doubled since last year's session. There was clear evidence that many of the candidates had been adequately prepared and were able to fully demonstrate their knowledge and ability. For candidates who could have performed better, the main areas for improvement were examination technique and a fuller understanding of the material required by the curriculum, particularly in programming.

There was evidence that some candidates may have performed better if they had read the questions more carefully and contextualised their responses accordingly. These candidates did not pay enough attention to the precise question being asked, or to additional instructions within the question which may have impacted on their performance. In many cases, they picked up on a few key words in the questions and wrote more generally about that topic, sometimes repeating answers from past questions on the same topic, without addressing precisely what the question was asking for. Where candidates were required to demonstrate their understanding by applying their knowledge to a context or example in the question, some candidates did not do so. Finally some candidates ignored basic question instruction such as the requirement to show working in Q.3 and to use iteration in Q.10.

There was some evidence some candidates subject knowledge was weak in certain areas of the specification. These candidates scored well in many questions, including some of the more difficult questions, but uncharacteristically did not perform as well in specific areas. Areas that were particularly affected were, the representation of CPU instructions, how the CPU and memory work, especially cache memory, security in standalone computers and networks environments and programming.

Regarding programming, centres should consider that a good amount of experience in solving a variety of problems by designing algorithms and writing code is required to adequately prepare candidates both for this exam and for doing the programming tasks in A453. Candidates who had this experience were able to harness this to provide impressive answers both for Q.5(b) and Q.10(c). However, candidates who appeared to have just done the bare minimum of programming required to complete the A453 tasks struggled with these questions.

These points, and others, are explained in more detail in the comments on individual questions below.

Comments on Individual Questions:

Question 1

The question was about input, output and secondary storage devices on a typical smartphone. The question was generally well answered. Most candidates were able to identify an appropriate input and output device. Where they used the screen as an input device, they needed to specify that it was a touch screen, and most did. A few candidates gave a hard drive or hard disk as a storage device which was not considered appropriate for a smart phone as these generally refer to magnetic drives. A few candidates gave RAM and ROM which was also not accepted; although the distinction between primary memory and secondary storage can be somewhat blurred in some handheld devices, RAM and ROM cannot be considered as secondary storage. On the whole there were fewer candidates giving communication or storage channels (e.g. USB port/cable, memory card slot) as input devices than in previous sessions, which was encouraging. Some candidates did not read the question carefully and gave devices that are not built into a mobile phone.

Question 2

The question was about file types and compression.

In Q.2(a) candidates were asked to state the most suitable file type for different items, from the list given. Where candidates didn't get full marks, there was some evidence that they might have scored better if they had read the question more carefully. Some candidates gave file types other than on the list given which would otherwise have been appropriate answers. The list contains the file types that the specification requires candidates to know and centres should ensure that candidates are familiar with them. The question also stated that a file type may be used more than once (and this was necessary to gain full marks) but many candidates assumed this was not permitted.

In Q.2(b) most candidates demonstrated an awareness of lossy compression and were able to articulate the impact on a video file. A few found it more difficult to explain why it is not appropriate for a text file. Common misconceptions included the idea that it might make the text blurry or faint, showing a misunderstanding of how text is represented in a computer.

Question 3

This question was about an algorithm presented in a flow chart. Candidates were required to identify the data types used in the algorithm and follow the algorithm with some given input data.

In Q.3(a) candidates who knew what a data type is generally gave good answers. However, it was noticeable that a number of candidates did not know what data types are. The algorithm clearly shows Gender to be a string and Dose to be a real number, but many candidates gave alternative answers for these which might have been correct in an alternative implementation (such as character for Gender or integer for Dose). Some candidates also gave the vague answer of "number" for the data type of Dose – where the data type is numeric, candidates need to specify whether this is an integer or a real number. Allowances were made in marking for names of data types in various known systems and programming languages that are equivalent to the names given in the specification.

In Q.3(b) candidates were required to show their working. This was misinterpreted by many candidates as meaning that they should show their calculations (as would be required in a Mathematics examination). While the specification requires candidates to be able to carry out the arithmetic operations in the algorithm, as a Computing question the working that needed to be shown also expected candidates to demonstrate how they have used the flow chart. A more detailed explanation of this would have been preferred than was seen in most candidates' scripts but allowances were made in marking and where there was enough indication of how the flow chart had been used, candidates were awarded the mark. Where this was clear, it enabled candidates to gain follow through marks for following the second part of the algorithm correctly even if they had made an error in the first part. There were some candidates who confused the less than (<) and greater than (>) symbols, but apparently fewer than in previous sessions.

Question 4

This question was about security on a computer provided by utility programs and by the operating system.

Q.4(a) candidates had to identify which of the utilities could be used for security, and this was well answered by most candidates.
Q.4(b) was less well answered. Candidates were asked to describe security provided directly by the operating system, as opposed to through the use of utilities. Many candidates gave answers that are clearly identified as utilities in the specification (such as system updates) and even though some of these utilities are typically bundled with many modern operating systems, these were not considered correct answers. In some cases, candidates gave the same answers as in Q.4(a) revealing that they had not read the question thoroughly. The most obvious and common correct answers were the use of passwords and file permissions/levels of access. It was also noted that when candidates correctly identified encryption as a method of security, they went on to describe encrypting messages rather than encrypting files on the system and centres should ensure candidates know that this is another application of encryption.

Question 5

Q.5(a) was about high level languages and machine code. Most candidates demonstrated an understanding of what these were and were able gain some of the marks. There where however, as in previous sessions, a number of candidates who suggested that high level code refers to code that is somehow more complex or better than machine code.

Q.5(b) was about standards that should be applied to programming code. As with most QWC questions, it was sufficiently open ended to allow candidates to discuss a variety of standards. However, the standards needed to apply to the code as required by the question and this was missed by a number of candidates. While the most applicable standards relate to how the code is written such as the examples given in the mark scheme, and answers considered to be of a higher level were expected to at least have some of these standards, some consideration was given to standards that apply to other aspects of the coding process. A large number of candidates discussed types of standards (such as de jure, de facto, proprietary and industry standards). Centres should ensure candidates are aware that these are not standards, but only tell us how the standard is set. Some candidates went on to relate these types of standards to specific coding standards – in some cases giving excellent answers. Unfortunately, many candidates who went down this route did not describe any actual standards in their response that apply to coding and hence were not given credit as they had not answered the question.

Question 6

Q.6 was about the use of an off-the-shelf data-handling software package at a hairdresser's.

In Q.6(a) a definition of off-the-shelf software was given by most candidates enabling them to get the mark, although some of the weakest candidates had the right idea but struggled to articulate their answer clearly. This can be helped in the future by ensuring that candidates have some standard definitions for many of the terms in the specification such as this one.

Q.6(b) was specifically about setting up the structure of the database while Q.6(c) was about the use of the software once the database has been set up. This distinction was missed by a lot of candidates who gave answers that were appropriate for one part in the other. In answering Q.6(b) many candidates did not use the correct technical terms (such as referring to fields as columns) and while some allowance was made for this, candidates disadvantaged themselves by having, in some cases, to provide lengthy explanations where the appropriate technical term would have sufficed. Some candidates did not refer to the setting up of the database in their response but instead described what a database is and even where these description contained some of the key terms (such as tables, relationships) candidates were not given credit unless it was clear in their answer that setting this up was part of preparing a database. Other answers that were commonly seen and not credited involved the preparation of forms for data input and reports for output – these are not part of the structure of the database itself as required in the question, but part of the database application.

In Q.6(c) candidates were expected to relate their answers to the context in the question to demonstrate a deeper understanding of the use of a database application than simply rote learning what a database can do. When a context or a scenario is given in a question, such as this one, it is good examination technique to refer to the context in the response.

Question 7

Q.7 was about the CPU and memory, particularly as they apply to a tablet computer.

In Q7.(a) most candidates showed an awareness of the purpose of the CPU and the RAM. Where they failed to gain full marks, it was often because they defined or described the two separately, but did not specifically describe how they work together as required in the question.

Q.7(b) helped discriminate some of the better or more knowledgeable candidates. Many candidates did not know what cache memory is and confused this with virtual memory, cloud storage or other uses of the term cache (such as an internet browser cache or a disk cache). Those who know what cache is sometimes give an unclear description of the purpose (and occasionally a very detailed description of the cache but nothing about the purpose) and were not able to gain full marks. Among weaker candidates, there seemed to be a misunderstanding that RAM controls the flow of data but is not where the data is stored.

Although, as one would expect, responses for Q.7(c) varied in quality, there were more candidates providing more higher and medium level responses than had been anticipated. Once again, there was an open ended element to this question, enabling candidates to be credited for discussing a wide array of memory technologies including storage devices if they chose to and to interpret the term “advances” in the time scale of their choosing. In the best responses, candidates selected two or three advances that are particularly relevant to tablet computers and described both the advances and their impact in detail, rather than making numerous points that were less detailed and less relevant. The technical knowledge and use of technical terms by some candidates was outstanding. Where candidates attempted to use technical terms and give technical details such as the typical specifications of types of memory devices but did so incorrectly, this impacted negatively on the overall quality of the answer particularly (but not only) if the technical terms or details concerned are covered in the specification. Some candidates also went beyond the remit of the question and discussed other technological advances (especially advances in CPUs) and the inclusion of this irrelevant material also impacted negatively on the overall quality of the response.

Question 8

This question was about binary instructions and data. Candidates were given examples of instructions codes as bit patterns.

In Q.8(a) candidates were asked to explain, using the example instructions given, what the opcode and the operand are. Many candidates appeared not to know what these terms meant and seemed to be guessing. The specification requires that candidates should be able to explain how instructions are coded as bit patterns. While the terms “opcode” and “operand” are not specifically mentioned, these are the correct technical terms for the two parts of the instructions (the “opcode” being the bit pattern for the operator) and centres should ensure that candidates are aware of these terms. Candidates who were familiar with this part of the specification gave reasonable answers.

Q.8(b) was well answered by most candidates and this was encouraging to see as it was a conceptually more difficult binary conversion question than has been previously asked – candidates were given examples of the converted times and they had to first realise that this was a denary to binary conversion of the minutes and seconds, and then do the conversion itself. It was pleasing to see that most candidates rose to the challenge although a very small minority lost marks by not using 8-bits for each part of time as stated in the question and shown in the examples.

Q8(c) was a difficult question designed to discriminate the most able candidates and expectedly, not many candidates got the one mark available.

Question 9

Question 9 was about the local area network in a bank.

In Q9.(a) many candidates were able to use their basic understanding of the activities with a bank as well as their experience of using a local area network in the school environment to apply their subject knowledge about local area networks to the bank scenario and give answers beyond rote-learnt text book answers which demonstrated understanding and which was pleasing to see. Weaker candidates gave vague answers often repeating words that are in the question, such as ‘monitor’, without any further explanation or described the advantages of using a LAN in general (for example by stating that employees can share files).

In Q9.(b) it appeared that while many candidates have some awareness of IP and MAC addresses, this seems to be largely from their own experience rather than from studying the subject. Candidates that responded with a valid response identified the fact that IP addresses are usually written in denary and MAC addresses are usually written in hex, although it should be noted that they were not given the benefit of the doubt when they used technically incorrect terms – both addresses are written as numbers; A B C D E and F in MAC addresses are hex digits and not letters. Many candidates tried to express the fact that MAC addresses are coded in to the hardware during manufacture but were vague with their answers.

Q.9(c) was only well answered by a small number of candidates. Most candidates confused failover with back up of data, an emergency shutdown or described some security measure which suggested that they were not familiar with the term “failover”. Some candidates also ignored the second part of the question where they needed to apply their understanding of what failover is to the context of a bank.

Question 10

This question was about an algorithm involving data in an array. The question included a stimulus picture showing the real world situation. Candidates were required to use their experience of arrays in programming to understand the array representation of the picture shown.
Q.10(a) was correctly answered by virtually all candidates. However, answers to Q.10(b) were more mixed and suggested that a good number of the candidates had failed to distinguish between the real world data and its representation by suggesting, for example, that the table would be made larger or an extra seat would be added. Also the limitations of the array as a fixed-size linear data structure were not taken into account by many candidates. So while most

candidates identified that an error would occur (but were not given the benefit of the doubt if they said it would be a syntax error), only the most able were able to explain the error.

In Q.10(c) candidates were required to write an algorithm to rotate the elements of the array by a given number of places, say n, using iteration. While there are many ways of doing this, the most common correct approaches were either doing n iterations of each element moving by 1 place (as shown in the example in the mark scheme) or 6 iterations of moving each seat to the position n places ahead. It had been expected that most candidates would at least get the input of the number of places and the iterations correct, with only the most able candidates dealing with the more difficult aspects of the algorithm: realising that it cannot be done in-place and that some temporary stores are needed, and rotating past the end of the array. However, most candidates did not get the iteration correct or did not even use iteration despite the fact that this is especially required by the question (using instead a large number of case or if statement). Many candidates also showed a lack of understanding in their use of arrays in algorithms by for example adding the increment to the array element rather than the array value, for example writing PlayerName(i)+1 rather than PlayerName(i +1). Another common misconception was that the indices were assigned to the contents of the array element (the names of the players), rather than the other way around. As a result, marks for this algorithm were generally lower than expected.

A452 Practical investigation

General Comments:

The specification continued to experience a large increase in the number of entries. The majority of the work received was for the now withdrawn tasks. Where centres had made use of the new tasks, the standard was generally higher, which suggests that for the best performance, it is desirable that the candidates are given a free rein with new material. Original and well documented work fares better than the formulaic approach which was often seen with the re-use of the old tasks.

Candidates need to be prepared for the controlled assessments but this should be as limited as possible. The best work was always where the candidates had carried out independent research and made their own way through the tasks, deciding for themselves on an approach and justifying it. The controlled assessment is an example of where it is possible to give too much help and thereby limit the creativity of the candidates.

The moderating team was always looking for evidence of a solid and wide ranging computing know-how. This is likely to be acquired through individual reading and research. It must be emphasised as usual that the assessment of the work is not a box-ticking exercise. The response is judged holistically in terms of skill, enterprise and knowledge.

Many less good submissions adopted a common sense approach with little more than general knowledge in evidence. It must be understood that computing is a technical subject and the A452 (and A453) tasks are designed to give candidates a chance to show off what they know and can do. This should make it plain that they have in fact learned a body of specialised computing knowledge that demonstrates computational thinking and problem solving, not just some evidence that they have used a computer. In all the controlled assessments, there should be evidence of problem breakdown and the use of algorithms.

Presentation is always important. Less well performing work was often difficult to follow. Common faults were work presented in multiple files or even folders. It is far preferable for the submission to be one file, ideally a word processed document. If this is provided as a pdf file, this is even better. Powerpoint presentations generally do not work well. They tend to impose a granular approach to the work which does not fit in well with the free ranging intentions of the assignments. Screen capture videos often were helpful in demonstrating success although they can lead to unhelpfully large amounts of data being presented or uploaded.

Candidates need to be aware that throughout their reports, it is up to them to explain in detail what they are doing and why. Many poor submissions just presented some unexplained screen shots or uncommented snippets of code. The candidates must communicate what they have done.

The better candidates make it clear how they researched their material and give concise references about where they obtained their information. This will usually be web based, and when that is the case, the full URLs and most recent dates accessed should be given. Too often material was pasted in unacknowledged from web sources. It should be clearly understood that this is regarded as malpractice and can lead to sanctions as well as reduced credit.

As has been pointed out, the best responses came from candidates who were given the freedom to find material out for themselves and who 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 provided, 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.

The standard of marking was variable with most centres correctly and reasonably applying the marking criteria. Some centres showed a misunderstanding of the level required, with trivial work sometimes being awarded very high marks. Centres should realise that work awarded marks in the top boxes is always impressive in some way and not just routine and minimalist.

All the questions in the tasks must be attempted if the candidate is to obtain high marks. Missing questions must result in the withholding of marks, the reduction being judged according to the significance of the omitted sections.

Most centres supplied a filled in URS form which was in most cases extremely helpful in explaining why marks were given or not given.

The following comments from last year are worth repeating:

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

With the withdrawal of the old tasks, centres should note that next year, only the tasks set for that year should be submitted. Old (legacy) tasks will not be accepted except under special circumstances which must have been agreed with OCR by now.

The newer tasks have been designed to make it even clearer that creativity and originality are rewarded in the controlled assessment. As stated above, the assessments should be viewed by the candidates as an opportunity to “show off” their skills and enterprise and not just to tick off tasks in an unimaginative mechanical way.

Comments on Individual Questions:

With the withdrawal of the legacy tasks, the most useful comments are to mention general points that are applicable to any that are submitted in the future.

Little Man Computer

The use of this software has been carried forward to the new tasks albeit with a slightly different approach. A small amount of research is needed in the new tasks to investigate in a slightly different direction but as before, detail is what will bring the greatest credit.

It should be noted that the original version of LMC as provided York University Canada, doesn’t work with new versions of Java and any substitute used must have exactly the same instruction set as given on: http://www.yorku.ca/sychen/research/LMC/LMCInstructions.html.

JavaScript

The best submissions included planning with detailed algorithms as well as fully explained code with clear references to sources used for information. When code is used as part of a submission, it is particularly important that there is full explanation of the thinking behind it.

Encryption

As with all the choices, the best examples were the most original which showed good research into possible methods. It should be noticed that this was a spreadsheet task which does not mean it has to be Excel. Other spreadsheet programs can sometimes provide the functionality needed with no need to write one's own code.

Shopping Cart

This was the least popular task although the examples submitted this year were mostly good, showing good research into the software behind online vending systems and good practical problem solving.

App Inventor

This was popular with many examples submitted for the legacy as well as the new tasks. It needs to be understood that to do well with this, it is necessary to explain the code blocks used in considerable detail. Many examples suffered because the blocks were simply pasted in with no explanation or planning. Uncommented code blocks will not earn high marks. Also, the legacy task requires a reasonable or good knowledge of alternative development platforms in order to make adequate comparisons. Centres are reminded that there must be solid evidence of technical understanding in any A452 submission and that simply working through the practical aspects without comments and explanations is not enough for the highest marks.

Linux

There were examples of old and new Linux tasks and in most cases these were of good quality. The message comes through yet again; candidates who do their own individual research and explore new territory produce the most successful results.

A453 Programming project

There was a significant entry for this unit, with many new centres. There was evidence of some good coding in much of the work with candidates preparing work well and explaining clearly and in detail the process they followed. Where candidates had produced a single narrative on the process from analysis through design, development and testing to evaluation they tended to cover all the requirements effectively. Those who produced a variety of separate documents often tended to produce disjointed reports missing several of the requirements.

Typically analysis should go beyond a simple restatement of the problem; a successful solution will look at the need for a robust solution and the necessary validation and structures to make this happen. This will define validation procedures and success criteria.

Designs should be sufficiently detailed to define the problem so that another programmer could complete the process effectively with no further analysis or design work. In a number of cases designs were superficial overviews and did not define the underlying programming requirements for the solutions.

Development should show the process, testing, evaluating and modifying as necessary at each stage during the development. The testing should cover all aspects of the success criteria and identified validation, checking not only for function but also the robustness of the solution.

In a number of cases it was evident candidates had been given more support than is acceptable, templates, template solutions or detailed feedback. Centres must be aware of the regulations published in section 4 of the specification and put in place suitable supervision to ensure there is no plagiarism.

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