OCR
RECOGNISING ACHIEVEMENT

GCSE

# Computing

General Certificate of Secondary Education **J275**

# OCR Report to Centres

## June 2013

Oxford Cambridge and RSA Examinations

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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.

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

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## General Certificate of Secondary Education

## Computing (J275)

## OCR REPORT TO CENTRES

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# Overview

The numbers taking the specification continue to rise at a rapid rate. This is obviously gratifying to those of us involved in the setting and assessment of the work, especially as the standard of work submitted is still mostly high. There are many teachers preparing students for this specification who are new to computing and the quality of the work we are seeing is testament to their dedication and hard work.

The controlled assessments are working well in providing interesting challenges that engage most of the students and lead to creative solutions. The best work is generally free of constraints imposed by over detailed preparation and drilling, leaving the candidates to be original and creative. Solutions that are too derivative do not do as well.

The examination is being tackled successfully by most candidates although there are some signs that important concepts are not always being grasped. The principal examiner report for A451 details examples of these. In all the components, the age old advice still applies that candidates should address the questions as given and not as they would like them to be. Analysing what is required from a question is a computational thinking skill in itself.

It is becoming increasingly apparent what students need to do in order to perform well in this specification. Some of the main lessons from this and recent sessions have been demonstrated by the characteristics of the most successful candidates. These students tend to be:

- well organised
- concise and clear
- able to analyse a situation and break it into its component parts
- selective about what they present for assessment
- confident and experienced in at least one programming language
- able to recall certain standard definitions
- aware of how computing issues and concepts apply to the real world of IT professionals and beyond.

The importance of computing, not just as the study of systems but also as a widely applicable problem solving approach is fast becoming recognised throughout the educational world and beyond. It remains apparent that students and their teachers are having a lot of fun in exploring this fascinating world.

# A451 Computer Systems and Programming

### General Comments

There was a significant increase in the number of candidates this session, but it was also pleasing to see that this was accompanied by candidates who were on average better prepared for the qualification and able to have a go at most parts of the paper. This may be partly the effect of the impending linearisation of the qualification and that as a result only candidates who have completed the course are being entered for the examination, which has been OCR's advice all along.

While the answers were on the whole encouraging, there were a number of unfortunate trends emerging which centres should be aware of and address. Some evidence has started appearing that suggests that instead of learning the subject content, candidates are learning the mark schemes to past papers and repeating those usually in questions that are different and where they do not apply. Also, many candidates went far beyond what was asked in the question writing everything they know about a particular topic. This is to be discouraged because it is indicative of an inability to discern the answers to the specific question asked and works against the candidate.

### Question 1

This question was generally well answered.

### Question 2

Most candidates were able to say that 1024 or 1000 bytes in a kilobyte in part(a), but many struggled with giving the number of bytes in a gigabyte. Some of these simply failed to read the question carefully and give the number of megabytes in a gigabyte. In other cases the difficulty was due in part to attempting to calculate the answer using pencil and paper methods. Centres should note that we are primarily concerned with the difference in order of magnitude between different units, not mathematical skills, so answers such as 1024x1024x1024 are acceptable.

In part (b) and (c) many candidates demonstrated a good knowledge of facts about the RAM and ROM, but some of these failed to score well by being less discerning about the facts that are relevant to answering the question. Part (b) asked for the purpose of ROM and RAM, but several candidates listed the characteristics. In part (c) where candidates needed to give one difference between RAM and ROM, and candidates fared better.

### Question 3

Many candidates answered this well and obtained a high level mark. Centres should note that this question does not test essay writing skills but the ability to convey technical information effectively in written form. Although some centres appear to have heeded to this advice from previous years, there are still candidates who are clearly anxious to provide a formal essay with an introduction a middle and a conclusion. Although the use of language is a part of the assessment here this comes within assessing the candidates' ability to technical information about Computing effectively. In many "essay"-styled answers the introduction usually just repeats the question and the conclusion usually simply mentions points that have been previously given and so are not needed. On the other hand, using a table in this question would have been a highly effective way of putting the points required here across, but unfortunately very few candidates chose to do this.

Candidates should have focused on demonstrating the input, output and storage in a desktop system and a games console, using technical terms correctly. To perform at a higher level, candidates should particularly have demonstrated an understanding of the similarities in the hardware of these devices. The most common technical error made in this question by weaker candidates was to suggest that removable storage devices such as CD-ROMs and USB keys are input (or output) devices – or that devices output to the internet.

### Question 4

In part (a) most candidates got full marks for a relatively easy question. Weaker candidates struggled to articulate definitions for input and output devices in their own words, but where their understanding was clear from their response they were still able to gain the marks. However, centres should prepare candidates by ensuring that they learn key definitions of terms in the specification. Questions on these are designed to test basic knowledge and a definition learned by rote is sufficient. In part (b) candidates were required to apply their knowledge and understanding to the given context and candidates fared less well. Some candidates who were along the right lines were unable to gain full marks because they had not read the question carefully and did not state the hardware modifications needed to implement speech recognition, for example. Some candidates also failed to take the information in the scenario in consideration and appeared to be relying on previous answers from questions on this topic based on different scenarios to influence their answers eg by suggesting that sign language and a puff-suck switch could be incorporated into a user interface for blind users.

### Question 5

Candidates usually perform well at binary conversions and continued to do so this year which is pleasing to see. The majority of candidates obtained full marks for parts (a) and (b)(i) although some of the weaker candidates showed a clear lack of understanding of the importance and relevance of hex in (b)(ii), for example by suggest that hex requires less memory to store than binary. In applying their understanding to the scenario, many candidates also gave vague answers such as stating that numbers in Hex are “easier to understand” than their binary equivalent.

### Question 6

Parts (a) and (b) were answered reasonably well by most candidates. Some of the weakest candidates appeared unfamiliar with the term “data type”. Centres should note that number is too vague for a data type as the distinction between integers and real numbers is crucial. Marginal candidates also continue to confuse the symbols for less than (<) and greater than(>).

In part (c) the majority of candidates appeared to be unfamiliar with the term “entity” and as a result obtained no marks or very few marks here. Although the specification does not require the explicit use of entity relationship modelling or normalisation at GCSE level, candidates are required to understand the meaning of the term "entity" and the benefits of organising a relational database using several tables, each corresponding to a class of real world “objects” called entities that share similar attributes. It is this correspondence between the real world entities and the tables in a database that was being tested here, and we suspect that many candidates would have fared better if they knew what an entity was. Most took a guess that an entity was either an item of data, or a record or a field. Some candidates (perhaps influenced by a previous question) described the relationships between tables within a database rather than the correspondence between entities and their representation in tables in the database.

### Question 7

Part (a) was generally well answered. Centres should emphasise to candidates that in questions such as these where candidates are asked to identify a particular element from an extract of code, it is important that they give just the element required (in this case only the name of the constant or variable”). Giving additional elements of the code (such as a full constant or variable declaration) suggests a lack of understanding and is not credited.

Candidates who have completed the course will have used iteration and selection extensively as part of their programming, and so it was disappointing that many appeared not to recognise these terms, as they apply to programming, in 7(b) and made guesses based on the normal everyday meaning of the terms (and hence often getting better marks for iteration). Centres are advised not to teach the theoretical concepts relating to programming (which are assessed in this examination) separately from the programming practice which is assessed in A453, but rather to use their programming lessons as a context to bring this content alive. Again, it would be appropriate here for candidates to learn basic definitions by rote – their understanding of such definitions was tested separately by their being asked to apply them to the algorithm given.

Part (c) worked well as a differentiator, testing problem solving and computational thinking skills. While the weakest candidates were not able to answer the question, most candidates were able to explain how to implement the change that was explicitly required in the question (a random increment at every step). Only the strongest candidates identified the consequences of this change on other parts of the algorithm and explained what needed to be done to address them. Many candidates expressed one change as two (for example considering generating a random number and replacing the increment by 1 with an increment by this random number as two separate changes to the code).

### Question 8

Part (a) was generally answered well by most candidates. In part (b) middle ability candidates were largely able to show their understanding of lossless and lossy compression by identifying which was to be used in the scenarios given, and stronger candidates were able to also justify why. It was pleasing to see significantly better performance on this topic than in previous sessions, suggesting that centres have heeded to the advice given in previous reports. In 8(b)(ii), when candidates were justifying the use of lossy compression for the large video, most stated the fact that the loss of detail was relatively inconsequential but only the most able candidates went on to add that in addition it provides better compression ratios than lossless to give a full justification.

### Question 9

Parts (a) and (b) were a little disappointing. The question asked candidates to give the fundamental differences between the types of software given, and instead candidates listed everything they knew about them in particular their relative benefits and disadvantages (and often not the crucial fundamental difference). In 9(a) it was enough to say that off the shelf software is made for a general audience while custom made is for a particular person/company's need. (Not developed for a specific purpose as many candidates said, because this can be true of off-the-shelf software as well). For 9(b) it was sufficient to say that open source licences require that source code be made available while proprietary software restrict the availability and public use of sort code. We still have several candidates who write that the difference is that open source software is free of charge – this is true of a lot of proprietary software.

Part (c) was the more difficult of the two quality of written communication questions. It was intended to be open ended allowing candidates to take different approaches to demonstrate their understanding by applying their knowledge on two separate parts of the specification and demonstrate their understanding by connecting them to each other and to a given context. As expected the most able candidates did this well and were able to score in the high level band. Most other candidates focused either on legal issues or on different ways of acquiring software without making strong links between the two.

### Question 10

This question was generally well answered with most candidates obtaining 4 or 5 marks out of 5. Candidates not gaining the highest marks often made errors in writing an imprecise condition for the IF statements such as “Length1 = Length2 OR Length3”. While algorithms were acceptable in pseudocode, flowchart or code, the pseudocode of some of the candidates was so vague that it did not add anything to the specification in the question. Several candidates had innovative ways of determining whether the sides were equal and it was pleasing to see this creativity. Centres should advise candidates that when asked to give an algorithm to a specification, they read and follow the specification carefully. Some people do not class an equilateral triangle as an isosceles triangle, but the specification in this question made it clear that they should. Some candidates added additional constraints and while, on the whole they were not disadvantaged in this case from deviating from the specification, it is important that as programmers they learn to stick to a specification given.

# A452 Practical Investigation

The number of entries for this specification continues to rise dramatically but the A452 tasks continue to provide candidates with opportunities to show their skills and creativity. The newer A452 tasks are attracting more entries, but the Little Man Computer and the Web Forms Validation remain much the most popular choices. The standard of work remains gratifyingly high in most cases and also, the marking of the tasks has been generally realistic, with few centres requiring large adjustments.

The better candidates are characterised by some common attributes.

They do significant background research that goes beyond the material in A451. In particular, they show awareness of how the scenario relates to the world of IT professionals. This awareness is often most clearly apparent in the answers to the last question of the set, which in all cases requires a wider coverage of issues connected to the scenario. Where appropriate, the better candidates show knowledge about different methods of software production and procurement.

They demonstrate a secure knowledge of computing facts associated with the scenario and use technical terms widely, correctly and with confidence.

They produce practical solutions with economy. Where code is produced, it tends to be concise and the minimal amount necessary to achieve the desired objectives.

They are organised. The work is presented in clearly demarcated sections that follow the numbering of the tasks on the question paper.

They present the work clearly with the minimum number of supporting files. Although it is often helpful to include such materials as video screen captures and some associated files, the provision of great numbers of files is not required. Early versions are not required, neither are rough notes. The most successful candidates normally presented all their work in just one word processed file or one presentation.

Those who chose the Little Man Computer task mostly produced good and often highly impressive results. One of the benefits of choosing this task is that it supports work in the A451 module on the CPU. It is also a task that clearly signals that the specification is a technical one that requires detailed understanding of computing principles. The better candidates showed awareness that using a low level language can be hard work and error prone and were able to compare the process with the high level languages that they have used. Few candidates mentioned why low level programming is still important.

The Web Form Validation task was usually successfully done at least to a degree, with many candidates adding extra features that made their solutions more robust and capable. For the highest marks, as in all the tasks, they showed some detailed knowledge of various ways in which form data can be validated. The weaker candidates simply mentioned that JavaScript is a good way to validate forms, without explaining anything about why. Some showed little appreciation of what validation is.

The encryption task is becoming more popular. The best work was often characterised by a wide variety of methods being created within a single centre. Impressive detail was often given about modern methods of encryption and how they work.

The shopping cart remains relatively unpopular, although it is something that everyone has experience of, at least at the customer facing end of the process. Candidates could learn much about the process of online interactive databases by experimenting with other systems such as various booking systems. There are plenty of open source systems that can be downloaded and examined. It must be noted that this, as is the case with all the A452 tasks, is a technical assignment which requires detailed understanding of the platforms necessary to run an online vending operation and the software behind it.

The App Inventor task is appearing more often, with the better candidates producing impressively slick solutions to the problems. They also show much detailed knowledge of how mobile apps can be developed on more conventional platforms.

Centres that used the repository made the process a lot easier for the moderators. The ideal format was when each candidate's work was presented in a separate folder along with any (ideally very few) supporting files and a pdf of the marking grid. The moderators are grateful for the persistence with using this method even though on occasions, it posed some difficulties.

There were some examples of problems that centres should avoid. In particular it should be noted that templates and writing frames are not allowed. The intention of the controlled assessment is that the candidates should devise their own responses, although of course advice on approaches and presentation can be given. The simple rule is that everything that the candidate presents should be the work of that candidate. Having said that, it is perfectly permissible for them to include material that they have collected from elsewhere, provided that they make it perfectly clear with references that they have done so.

It also needs to be emphasised that candidates cannot access the top marks if they leave out parts of the tasks. There were some examples of the Little Man task where high marks had been awarded to candidates who had not solved the calculation of the mean.

The administration was mostly carried out correctly, but some points need to be made.

A completed mark sheet with comments makes the moderation process much easier and in particular, makes it easier to see where the teacher's marks have come from. A bare total is not really enough to make the thinking behind the marks apparent.

All centres must submit a signed CCS160 form to attest that all the work is in fact the candidates' own. This can be scanned and included with the submitted material if desired.

Where postal moderation is used, we would ask you to make sure that all work and mark sheets are labelled with the candidate name and number to avoid too much detective work in matching up the various lists.

# A453 Programming Project

There was a significant entry for this unit in this session and it provided an opportunity to look at how the unit is performing with a large cohort of candidates. There was some impressive work submitted by a large number of centres and, once again, it was demonstrated that this unit is able to provide suitable and engaging challenges for candidates of all abilities. Work that was less effective was often characterised by limited or no evidence of planning or design, often simply unexplained code. Candidates who planned their approach were able to demonstrate the development using suitable test strategies and data. Good code should not fall over easily and suitable validation of inputs and testing of routines is a vital element in developing good code. The analysis and design of a problem is a vital pre-requisite to good programming. 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 provided 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 Python and Java, 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, VBA or, for a small number of centres, Small Basic. Centres that chose to use SCRATCH often made the process quite difficult for the candidates who were forced to formulate quite complex ‘work-arounds’ to meet the requirements for the tasks. A number of centres opted to use more than one language thus allowing candidates to tackle some problems in SCRATCH and others in a language more suited to the problem.

There were a number of issues with clerical errors and it is important centres ensure the correct marks are submitted to OCR. It is also important the work is identified clearly, we use the candidate number to identify candidates and not names, and it is important centres also use the candidate number to identify marks sheets and candidate work. We encourage centres to submit work electronically, through the repository or on CD/DVD/Flash memory devices. It is important that this work is organised and far too many centres sent whole directories with many folders and unrelated files causing significant delays in the process. Please check that what is sent is, the final report and any essential supporting evidence, for example any screen capture video, only. 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.

Some common issues characterising less successful solutions:
A lack of validation; 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.

Designs should include success criteria but these were often missing from the work. The success criteria should be used with evidence of testing from the iterative development to evaluate the solutions.

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 are often the most effective approach. Some candidates provided flowcharts further refined with pseudo code explanations of the solutions.

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.

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 most 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.

It is worth noting that templates and teacher direction are not permitted under the regulations for controlled assessment and will be treated as malpractice. It is important students work independently producing their own solutions not constrained by writing frames, templates and teacher directed approaches to the solution. While we do not object to small sections of code taken from websites being modified and used, 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.

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