OCR
RECOGNISING ACHIEVEMENT

GCE

Computing

Advanced GCE **A2 H447**

Advanced Subsidiary GCE **AS H047**

OCR Report to Centres

January 2013

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, Cambridge Nationals, Cambridge Technicals, 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.

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OCR REPORT TO CENTRES

Overview

This is the last January session that will be available for these examinations. Centres seem to be preparing for the change and many have already decided to only offer the examinations in June. This is particularly noticeable in F452 where the size of the cohort is significantly lower than in previous years.

Examiners are concerned about the standard of presentation of work and although examiners did not report any candidates being disadvantaged by this it must be accepted that if the presentation is so poor that the examiner cannot read parts of the response then the candidate is penalising themselves.

There are many methods of presenting answers including prose, diagrams, bullet or numbered points, algorithms and others. Different styles of presentation are appropriate for different questions and the choice of style of an answer is part of the examination technique which candidates must become familiar with. The style of presentation is rarely penalised, although a question that states an algorithm is required in pseudocode would not gain full marks if another style were chosen.

F451 Computer Fundamentals

General comments:

The work of the candidates generally showed a knowledge of the subject matter, there being very few candidates who were obviously unprepared for the rigours of the examination. However, the more complex questions proved to be more of a challenge and there were few candidates who had the understanding necessary to successfully attempt them.

The presentation of the work is generally very good although there are still some scripts that are very difficult to read. The exam team believe that all responses have been given the credit that they deserve, but candidates should be aware that if they make it impossible for the examiner to be able to read then they run the risk of not being given the credit that they otherwise would have done.

Individual comments on specific questions:

1(a) There were two basic strands to the answer. One was to describe the physical item, for example that it is a piece of hardware and the other was to describe its use which needed to be more than just 'storage' as this was in the question and also needed to distinguish it from memory. Another mark point was to describe the method used for the storage, for example magnetic or solid state.

1(b) There is still a large minority of candidates who state that she would use ROM devices. Most candidates were able to suggest sensible devices but making the question centred around her particular requirements made the second marks for each device much more difficult to get as it was no longer enough to state that a pen drive would be used to transfer data to another computer, which other computer?

1(c) This is a very low level question which still causes trouble for some students. The question stated that we wanted advantages and disadvantages to the reporter, not for the business or for the wider society. Despite this being explicitly stated in the question the most common answer was still about saving the environment because of less pollution. The histogram of results shows that it is actually a very good discriminator question.

2(a) Another good discriminator question providing a good spread of responses from 0 to 6 marks. It is disappointing to see candidates who persist in stating that the PC 'counts the number of programs that have been run'.

2(b) Understanding of the purpose of the three bus types named in the specification continues to improve although there is still the desire among candidates to imbue them with rather more power than they have got. Typical is the desire to say that the bus 'stores' something rather than acting as a conduit. The address bus should be seen as a transport for the location that the data in the data bus is being transported to. On a base level candidates can picture data being sent around the processor in the data bus and the details of where it is being sent to are carried in the address bus. The control bus simply passes the control signals to the registers.

3(a) This is a standard question made more difficult by having to provide the justifications in context. Candidates must be careful in their use of justifications. This is most noticeable when trying to justify the use of an interview. The justification must state the case in preference to any other method. For example a common reason for using an interview was given as the ability for the interviewee to give more detailed

answers, whereas a questionnaire is a much better method for this because the interviewee is able to think carefully about their response and change their mind or the language that they use as appropriate.

3(b) The responses to this question were very disappointing. The majority either talked about the full systems life cycle and used the waterfall diagram as their example diagram, or they concentrated on the design stage using the diagrams to illustrate what they were going to do rather than what was being analysed.

4(a) This question was answered well.

4(b)(i) Some good answers and most were able to provide at least a part of the description. Some candidates are solely interested in Games and provided inappropriate examples here and also a poor use of terms like 'functionality' and 'game play' that they obviously feel comfortable with but are not valid as answers on their own.

4(b)(ii) Many candidates wrote about HCIs and the need to provide 'communication between user and hardware' despite being told in the question that other features were needed.

4(c)(i) Good answers with only a few candidates omitting the 'at a time'.

4(c)(ii) Many responses were difficult to understand as the candidates obviously had difficulty in expressing their ideas. Many wrote about differences between LAN and WAN or decided that the difference is simply one of security issues.

5(a)(i) Candidates who understood the significance of the position on the paper where the marks were made invariably scored all the marks.

5(a)(ii) Candidates who described taking an image (in some way) which was then matched with images in the computer's memory scored well, unfortunately too many confused this with MICR and described the reading of account numbers on cheques.

5(b) The devices had to be appropriate for a fast food environment. The question was asking about input and output devices and consequently it was necessary to provide computer devices. Answers that suggested microphone and speakers so that the person at the counter could tell the people in the kitchen what the order was were not credited, although those that suggested drive through restaurants where the order is made using a microphone and speech recognition software was then used to take the order were because it is feasible. Care needs to be taken with the choice of input device, for example 'keyboard' is not specific enough while 'mouse' is not a sensible device in the scenario.

5(c)(i) There were a lot of answers describing verification and most validation answers were weak on detail.

5(c)(ii) Many different types of validation check were accepted, the decision often relying on the justification given by the candidate. There were some validation checks that were not sensible, for example a presence check is not sensible as the question says that the bar code has been read. Many responses were simply what had been learned by rote, so a range check was explained by using dates in a date of birth.

6(a) This question has made the journey from being a very difficult question aimed at the most able candidates to one that most candidates now score well on.

6(b) Inevitably some of the points made in part (a) were reused here. There is no problem with that because the marks were awarded in part (b) for the comparison between the two types of data transfer.

7(a) A few candidates failed to mention the importance of communication in their answers, but otherwise this is a well known part of the specification.

7(b) Most candidates were able to describe the parts of the protocol very well. Unfortunately there were many who did not read the question properly and talked about error checking. This is an important area of examination technique that many candidates failed to take note of in a number of the questions and cost them a number of marks over the paper.

8(a) These were well answered with the exception of the BCD.

8(b) This tended to be worth three marks or nothing because those candidates who understood the method covered all the points in the method while others either gave no explanation or confused the use of octal with hexadecimal.

F452 Programming Techniques and Logical Methods

General Comments:

The number of candidates who appear to be insufficiently prepared for this examination in January has fallen (as well as the total number of candidates) which we see as a positive thing. Centres appear to be taking note of advice given in previous sessions to allow candidates' programming skills to mature before sitting the examination and also altering their planning in preparation for future sessions when this examination will only be available in June.

On the whole, the question paper appeared to perform well in differentiating candidates, although there were specific areas where candidates' performance was lower than expected. These are highlighted in the comments on individual questions below. In general terms, as far as content is concerned, candidates appeared to need more practice on string manipulation and some continue to need to learn standard definitions. Better examination technique, in particular paying closer attention to details in the question and using the number of marks available to gauge the level of detail required, may have enabled some candidates to perform better.

Comments on individual questions:

1(a) Candidates did not perform as well on this question as was expected, possibly due to them not reading the question carefully. Most candidates were able to state some reasonable items of data relevant to the problem in the question. However, the question specifically asked for data that "needs to be provided" in order to assess the candidate's ability to consider the relevance of the data. We suspect that many of the candidates who did not gain full marks would have scored better if they had stopped to consider whether the answer they were giving was not just possible but necessary.

1(b) Candidates' general ability to design interfaces and present their designs seems to be improving. In this session there were fewer examples of students who did not make adequate use of the space given for the design or over-annotated the design to the detriment of clarity. Centres should continue to remind candidates that in questions such as these, the outline provided is intended to be the screen on which the interface is shown, and annotation can be included within or outside it as convenient. Candidates do not need to draw a new screen within the space (which is inevitably smaller and less clear than intended). Also annotation can be helpful to explain the design (such as annotating what a progress bar shows), but it is not necessary to annotate what is obvious such as whether screen objects are buttons. Although most candidates achieved 5 or 6 marks, only the most able candidates showed the attention to detail and awareness of data requirements needed to achieve 7 or 8 marks.

1(c)&(d) Many candidates struggled with these parts of the question, suggesting that they had not had sufficient practice of string manipulation both within the programming language they are studying and with related examination-style questions. One difficulty was with the function MID which was not understood by candidates. This is given in the specification as the name that will be used in the pseudocode in examination papers. Centres are reminded that they should prepare their candidates by making them aware of the names of functions, data types etc... that have been used in the specification and how these relate to the language they are studying. Also, some candidates did not realise that in line 04 of the algorithm, = was used for comparison and returned a single Boolean value. Instead they returned, for example "0 = 0" or simply the value of (TicketNumber MOD Key). Candidates were given follow through marks where appropriate.

1(e) This question was aimed at the most able candidates and appeared to work well in differentiating them. In questions like these candidates are not being asked to simply repeat the algorithm in prose (as some did) but to refer back to the problem domain and demonstrate their understanding of the algorithm by describing the problem that it solves.

1(f) Most candidates demonstrated an awareness that lower and upper case letters have different ASCII codes. Where they didn't get full marks, they did not provide enough detail in explaining why this causes the algorithm in the function isValid() to be case sensitive – for example by saying why a different ASCII value would produce a wrong result. They may have considered that given the fact that the function uses ASCII codes, this was enough of an explanation. Centres should continue to train candidates to use the number of marks to judge the level of detail required – candidates who noticed that this was a 2 mark question were in a better position to realise that further detail was needed.

1(g) This question was fairly well answered (and should have prompted those candidates who had not understood that line 04 of the algorithm returns a Boolean to go back and revisit their answers to parts (c) and (d). The specification lists operators used to compare numeric values as well as the operations themselves. While examiners accepted other operators that are in common use in programming languages such as != for "not equal to", some candidates did not get the marks although they appeared to understand the operation required because they used an incorrect operator, frequently >< or =!. On a positive note, there seemed to be less confusion between > and < than in previous sessions.

2(a) While it was thought that this would be a relatively easy question, only about half of the candidates were able to gain both marks, with common wrong answers including function, procedure, recursion etc...

2(b) The main difference between a FOR loop and a WHILE loop being sought was the difference between a count-controlled and a condition-controlled loop. While candidates seemed to be familiar enough with both to answer questions (c) and (d), a small number of candidates struggled with articulating this difference. This question, as well as part (a) above underline the need for candidates to prepare for this exam by learning some fundamental theoretical programming principles as well as having applied these principles in practice as they learn to program.

2(c) This was fairly well answered with most candidates gaining at least the mark for the first set of arguments. The second set of arguments where t=0 and so the loop is not executed was less well answered.

2(d) Stronger candidates were able to rewrite the FOR loop as a WHILE loop, taking care when using an iterator explicitly that the initial value and loop condition ensured that the loops were equivalent. Weaker candidates lost a few marks because this wasn't the case, but a significant number of candidates did little more than just replace the word FOR with WHILE There was also a surprisingly high omit rate, with nearly 1 in 10 candidates not attempting the question at all. . A few candidates also missed a mark because, although the question asked them to rewrite the procedure, they only rewrote the loop.

2(e) Most candidates were able to list the names of the variables in the procedure as identifiers, but many failed to recognise the name of the procedure itself is an identifier, and a few also missed out i, which was a variable but not a parameter. Candidates should be careful and pay attention to detail in giving the exact correct answer when a question asks candidates to pick something from the code. Answers

such as "Procedure B" for example do not demonstrate that the candidate knows that it is the string "B" itself and not the procedure that is an identifier. Candidates who used the wrong case were not given the benefit of the doubt.

2(f) This question was generally well answered.

3(a) Most candidates were able to define initialisation, although some weaker candidates confused the very specific use of the word in the context of this question with a more general use meaning initial set up of the device or even installation of the device. As expected, candidates were slightly less able to apply this definition to the context of the program, enabling the question to differentiate well between candidates.

3(b)&(c) Most candidates obtained both marks in part (b) demonstrating that they were able to follow the flow chart with the data given. However, a significant 1 in 3 candidates did not get this right. This wasn't directly linked to overall ability as many of the weakest candidates were able to answer this question correctly. Errors tended to be systematic (evidenced by the fact that candidates tended to get both parts of the question wrong) suggesting that this is an area that centres should look at. About half of the candidates demonstrated an overall understanding of the algorithm by giving, correctly, the values that needed to be input to obtain the required output in part (c).

3(d) The vast majority of candidates defined an integer correctly in part (i) and demonstrated some understanding of integer division in part (ii). Parts (iii) and (iv), which focused on string manipulation, were surprisingly very badly answered. Candidates appeared to be unfamiliar with the term CONCATENATE. It was used in this algorithm to produce an incorrect output which the candidates were required to identify in part (iii). Most candidates either wrote what they knew the correct output should be, or a comma or space separated the list of the three variables. This caused problems in part (iv) where candidates were precisely being required to correct the problem with the formatting that they should have identified in part (iii), although the example provided in the question enabled many of the candidates to recover themselves. A very surprising 1 in 4 candidates simply left this question out. Many thought the problem to solve was to convert PM times into the 24 hour clock. For those candidates who were along the right lines, most were able to identify the need for colons between the hours, minutes and seconds, but fewer also identified the need to add a 0 before single digit numbers. Also, the level of detail was often lacking. The question asked for "how the code should be modified", so simply stating what needed to be achieved was not sufficient to get full marks.

3(e) Most candidates correctly identified the error in the procedure as a logic error in part (ii) and indicated an awareness that there was an issue with the sequencing of the instructions in part (i). Weaker candidates did not explain this error with the detail required to gain full marks or did not explicitly state how it may be corrected. A common error made by some weak candidates when attempting to correct the error was to subtract 1 from the previous time, which they explained as "the previous time is the latest time but 1".

3(f) Most candidates were able to define operator precedence in part (i). In part (ii) there was a mix of responses. A number of candidates implied that the operations would be carried out from left to right (with the subtraction occurring before the multiplication). Most candidates were able to place parentheses in the correct place to achieve the result described in the stem of the question. In part (iii) most candidates were able to identify the need for comments in the procedure, and a good number went on to state a second way in which code for the procedure could be improved. Some candidates reverted to general, standard answers such as the use of meaningful identifiers and indentation, even though the code in this question already has these.

3(g) This question provided a mix of responses as expected with some very good responses seen from some of the strongest candidates. On the other hand about 1 in 10 candidates left this question out. There was a tendency to answer completely in prose. Centres are reminded that a quality of written communication question is not an essay question, and candidates are being assessed on the correctness of their answer and their ability to select an effective way of communicating it. In this case, while some prose was probably necessary to put the algorithms in context, the algorithms themselves were probably best described in code and the best answers included the right mix of the two. As for the algorithms themselves, while candidates appeared to have a reasonable method for calculating the highest speed, the total distance was more problematic. Questions in this paper are always set in some context and every effort is made to ensure that enough information about the context is provided in the question, although assumptions have to be made about what one would expect candidates to know. In this case, it was anticipated that most candidates would know that at every turn of the wheel a bicycle travels a distance corresponding to the circumference. Many candidates did not realise this and instead tried to derive the speed from the distance. Examiners obviously considered this method, although it was more difficult for candidates taking this approach to give a strong answer because the method is more complex.

4(a)&(b) Part (a) asked candidates to describe a 2-dimensional array for 4 marks. Some candidates had obviously learnt a definition of the term array and wrote that without considering the 2-dimensional aspect. Part (b) expected candidates to demonstrate their understanding of their description in some practical way by declaring an array to fit the requirements given while incorporating aspects of the description they have provided in (a). Only these aspects were being assessed, not the use of the correct syntax in the indicated language and examiners took adequate consideration of the conventions and habits in the languages attempted by the candidates. For example, candidates who used dynamically typed languages where declaring variables is not the norm were able to gain the marks for initialising an array to the given requirements.

4(c) Centres should make candidates aware that there is a difference in what aspects of validation are assessed in F451 and F452. While F451 requires candidates, as part of studying data processing, to know different types of validation check, F452 encourages candidates, in the context of programming, to make given programs robust by validating input data. Consequently, as in this question, candidates are normally asked in F452 to state what validation is needed for a program – the names of types of validation check are usually not detailed enough (eg instead of "length check" they needed to say that the word needs to be at most 10 characters long).

4(d)&(e) Part (d) was generally well answered with most candidates obtaining the full 6 marks. Most candidates opted for the more sensible option of showing the letters in the grid given. In part (e), most candidates identified that the word was too long to fit in the array but many were not able to express it clearly in terms of a programming error that would occur such as "it would attempt to address an invalid index". Instead they gave answers that are strictly wrong such as "part will be stored outside the array". Although the question indicated (by the number of marks as well as the word "errors" in plural) most candidates stopped after they had found one error.

4(f) This question produced a range of answers as expected with many candidates scoring highly. However, the best candidates struggled to include sufficient detail in their algorithms and there were fewer scoring full marks than anticipated. Most commonly, candidates did not specify in their algorithm that the characters to be included needed to be random or in the range A-Z. Candidates who performed well appeared to have had some prior experience in writing a program that traverses a 2-D array, and we would consider such practice to be essential preparation for this examination.

F453 Advanced Computing Theory

Candidates seem to be more acquainted with the specifications of the paper and show this in that most can at least attempt an answer on every question. There still seem to be areas where their knowledge is not as thorough as it could be and this shows especially in the UML questions. This is a huge area to cover and not all styles of UML are the same, Centres should take note of this and reference the definitive version on the OCR website to access the support material specifically for this section.

Generally, candidates' answers were in line with the questions and were on the right track although there were exceptions. One major failing was a marked lack of understanding shown in the differences between features and purpose; this again shows that candidates must read the question carefully. Some very good answers were given but unfortunately they were not for the question asked. Centres should also be aware that, broadly speaking, extra pages should not be necessary and that if candidates are using these, the answer is probably too long for the marks assigned to it.

1(a)(i) Most candidates could recognise this as spooling

1(a)(ii) Again most candidates could answer this question although many candidates were unable to give 3 distinctly different answers. Most often the first bullet point on the mark scheme was given as two separate points.

1(b)(i) Most candidates could identify a utility program. The commonest answers were defragmenting and anti-virus software.

1(b)(ii) Most candidates answered this by identifying passwords and access rights with a few getting all three bullets by stating encryption as well.

1(b)(iii) About 50% of candidates managed to gain one mark on this, very few managed to get both marks. A significant number thought that this referred to saving files.

2(a) Most candidates got over 4 marks with a number getting full marks this was an encouraging sign that this is being well taught and is understood by candidates.

2(b) This question was either answered well or the student had no idea, given the good response to the previous question it was disappointing to see a sizeable portion of candidates not gaining full marks.

3(a) Most candidates got at least 2 marks but a number of those who failed to attain full marks had given the first bullet as two separate points. The one most commonly missing was "Program and data stored in the same format".

3(b)(i) A good number of candidates answered this correctly, the most common answers being "location in the processor" and "used for a particular purpose".

3(b)(ii) Most candidates understood the basics of the CIR although most were unable to stretch this knowledge to get 5 marks, with "splits instruction into component parts" and "determines the type of addressing to be used" getting almost no responses.

4(a)(i) This question was answered well with a variety of different ways of solving the problem being shown. All ways are valid as long as the logic can be followed.

4(a)(ii) Most candidates answered this question correctly although a significant number used parts of both methods shown in the mark scheme.

4(b) This was well understood and a good grasp of the significance of the exponent and mantissa was shown in the responses given.

5(i) A simple question which most candidates could correctly identify as a stack.

5(ii) This was either answered fairly well or they did not understand how to construct an algorithm

5(iii) Most candidates showed a good understanding of an algorithm and could correctly identify each step. A few lost the opportunity to gain full marks because they are incrementing a stack rather than decrementing. Also, some stated that the data was deleted from the stack, this is not true.

5(iv) Most candidates could correctly identify a stack overflow.

6(a)(i) Most candidates could gain two out of the three marks. The least common response was that "statements do not have to be in a specific order".

6(a)(ii) A good number of candidates did not understand what features are and so missed the opportunity to gain maximum marks. Centres should note that candidates need to know the difference between features and purpose.

6(b)(i) Most candidates did not read the question correctly and therefore answered stating what it could be used for rather than **why** you would use this type of program.

6(b)(ii) Following on from the previous question candidates again stated how it could be applied, giving examples of what it could be used for rather than **why** this particular type of programming suited the scenario set.

7(a)(i) Those that had been taught the standard definition got this question correct. A number gave answers that were too vague to gain the mark. At this level it was considered that candidates should be aware that BNF is used to define the syntax unambiguously.

7(a)(ii) Most candidates answered this question correctly showing a good understanding of being able to follows the rules laid down in the stem.

7(a)(iii) This was, in general, answered fairly well by candidates who understood the question. Candidates fell into 2 groups – they either fully understood BNF and did well or had a very basic understanding of it and did not score well.

7(b) Not such a good response to this question.

8(a)(i) Poorly answered, candidates did not seem to grasp the concept that the processor would be limited in size or that memory locations could be accessed directly.

8(a)(ii) A significant amount of candidates could say that the problem would be complex OR that it may need to be portable but that was about as far as they got. Very few could say both, most were distracted as to how and not why. Candidates need to be instructed to look out for key words in a sentence to make sure they answer the proper question.

8(b) A good number of candidates understood the concept but couldn't get 2 different points – most got the example. Candidates frequently referred to the opcode as the instruction part of the instruction whereas the definition is given as "the operation part of the instruction".

8(c) Most candidates were able to state that the address pointed to another address that was the address to be used. A few were able to say that this increased the number of addresses available but very few could say that it increased the size of the address to be used.

8(d) A range of answers was received for this question that varied from accurate to wild guesses. Some descriptions given were too vague to be able to award a mark. It is expected that candidates will know that "a real address is calculated by adding a base address to the operand".

9(a)(i) Surprisingly a fair number of candidates could not get this correct, standard notation was expected. SQL is part of the specification and some knowledge of the language is expected.

9(a)(ii) An astonishing amount of candidates thought that an Integer was fine for storing a phone number.

9(b)(i) Usually answered correctly but some candidates showed little or no comprehension of ER Diagrams

9(b)(ii) Usually either completely right or completely wrong. Those that got it wrong tended to put an unsuitable name for the link entity and got the one to many links the wrong way round.

9(c)(i) Very few candidates had a good understanding of what views were or their purpose. The candidates who understood views could provide enough for an explanation for the two marks, many had no idea.

9(c)(ii) The extension of explanation of what views may be used for and why taxed a lot of candidates. Those whose comprehension was limited or sketchy could answer the what but the why was not well answered and most did not grasp what they were being asked to do.

10 General
In the main this question was not well answered
Candidates had a very weak understanding of UML. Centres are again asked to access the support materials on the OCR website specifically for explanations of the versions of the UML diagrams. Many candidates were unable to identify or explain the diagrams in the paper.

10(a) 2 types of answers
Showed understanding and so got good marks
Showed no understanding and got no marks
More were in the second group.

10(b)(i) Most candidates could get a mark here but it was more often one rather than two.

10(b)(ii) They could identify either the name or purpose but rarely both.

10(b)(iii) This question was very poorly answered with very few candidates being able to say that this was an activation and most getting no mark for this.

10(b)(iv) If a student got a mark for this it was for saying that it was a message, only one or two knew that it should have been defined as between the objects in class Name1 and class Name2.

10(c) Most candidates answered this question correctly.

10(d) This question was rather poorly answered with most marks that were awarded for the arrows and numbers. Very few could get the correct notation or get the labels correct.

11 Most candidates showed a fairly good understanding of the two types of sort, however a significant amount of candidates who could say what a Insertion sort was went on to demonstrate a bubble sort. Most got the quick sort correct and described/demonstrated this well. The advantages and disadvantages of each were, in general, correct and there was a good use of diagrams which is to be encouraged.

F454 Computing Project

There were a limited number of entries for this last January session. The standard was, as usual, very good with some interesting and varied projects. The range of projects in the limited sample was varied and included some interesting and appropriate ideas. It is important the project idea chosen is able to provide sufficient opportunities to demonstrate the skills required, in a small number of instances this was not the case.

Good project work is typically developed from a thorough investigation of the problem and possible approaches beyond a simple interview. Those candidates who researched around the topic looking at similar problems and more in depth analysis of the requirements tended to go on to produce well focussed and effective solutions, those who did not often failed to provide designs in sufficient depth to define the problem successfully.

The design section has three basic components; screen designs, file formats, validation etc as appropriate, a full set of algorithms to describe the solution and a complete test strategy. A test strategy is not just a standard test plan to be applied to the eventual solution but should include details of how the solution will be tested during development and post development acceptance testing by the end user.

The best development sections demonstrated the process including the testing that had taken place during development often using a rapid prototyping approach. It is important the development process is clearly demonstrated using evidence of testing, relating the code to the results and evidence of refinement or modification as appropriate. Simply submitting completed code does not tell the story of development. Full testing should include this evidence, evidence of post development testing against the success criteria and acceptance testing by the end user. In fact the best projects had evidence of good end user involvement throughout the process.

The documentation section requires the solution to have good on screen support including clear guidance as well as clear organisation of input and output. The user documentation should include help features and useful error messages as appropriate to the program. These should be identified as part of the evidence for documentation along with the essential extra bits of supporting and technical documentation a user would need in order to use the product.

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