COMPUTER SCIENCE

Paper 0478/11
Computer Systems

Key messages

Candidates need to show a greater use of technical terminology in their responses. Candidates will also need to note the key terms given in a question and structure their responses using these. Candidates must also use the given context in their responses.

General comments

If a candidate writes their response to a question on an additional page, they must indicate very clearly on the script where their response is to be found. If answers are crossed out, any new answer must be written very clearly, so that the text can be easily read.

Comments on specific questions

Question 1

(a)   Many candidates were able to identify the correct data storage unit. The most common incorrect answer given was 'byte'.

(b)   Some candidates were able to give the correct number of tebibytes. Some candidates attempted to multiply 1024 by 1024 instead of multiplying it by 2.

(c) (i)   Most candidates were able to state that compression would be used. Types of compression such as lossy and lossless were also accepted.

(ii)   Many candidates were able to give another appropriate reason for reducing the file size. The most common correct answer is that less storage space would be needed. Some candidates stated that it would be quicker to transmit the file, however, this was given as a reason in the question. Candidates need to note the context given in the question and use it in their response.

Question 2

(a)   Most candidates were able to identify the appropriate output device.

(b) (i)   Many candidates were able to correctly convert the two hexadecimal numbers to binary. Some candidates tried to convert the value 14 to binary, instead of converting the values 1 and 4 individually.

(ii)   Many candidates were able to give two appropriate reasons. Some candidates also referred to it saving ink in printing the ticket. This was also accepted as an appropriate reason.

(c) (i)   Many candidates were able to convert the hexadecimal numbers to denary. Some candidates converted the values to binary instead of denary.

(ii)   Many candidates were able to convert the denary numbers to hexadecimal. Some candidates converted the values to binary instead of hexadecimal.

Question 3

Many candidates were able to correctly identify pixel and colour depth. Few candidates were able to identify metadata. Many candidates were able to give a correct definition for resolution. Some candidates did not provide enough information and just stated that it was related to the quality of the image.

Question 4

(a) (i) Many candidates were able to give two appropriate reasons for the data transmission method used. The most common correct answer given was that the data would likely be travelling over a reasonable distance.

(ii) Most candidates were able to recognise that parallel may make the data transmission time faster.

(b) (i) Candidates found this question challenging. Candidates need to have a greater technical understanding of how error checking methods operate. The most common mark awarded was a reference to using an algorithm to calculate the checksum.

(ii) Most candidates were able to identify another error detection method that could have been used.

(c) (i) Many candidates were able to correctly identify that the payload would not be part of the packet header.

(ii) Many candidates were able to use good reasoning for this question and provided appropriate responses for why the packets may need to be reordered.

Question 5

(a) Many candidates were able to identify the role of a core. Some candidates were able to identify the definition of an instruction set. Many candidates were able to give a definition for a current instruction register, cache and the accumulator. Some candidates incorrectly stated that the cache stores the data and instructions that have just been used or are just about to be used. This was not an accurate enough description of its role. Some candidates incorrectly stated that the accumulator stores calculations. Candidates need to understand that the accumulator stores the result of a calculation and not the actual calculation itself.

(b) Many candidates were able to identify that the control unit is responsible for decoding an instruction.

(c) Many candidates were able to give a detailed answer about how clock speed can affect the performance of a CPU. Some candidates incorrectly stated that it would mean that more fetch-decode-execute cycles could be carried out simultaneously.

Question 6

(a) Most candidates were able to select the correct missing terms. The most common incorrect answer was the use of 'unreadable' in place of 'meaningless'. It would be beneficial for candidates to understand that encryption does not make the data unreadable. The data can still be read; it will just be scrambled, so it will not mean anything to a person who attempts to read it.

(b) Most candidates were able to recognise that asymmetric would be more secure.

Question 7

(a) Most candidates were able to identify another type of primary storage. The most common correct answer was ROM. Other types of primary storage such as a register were also awarded.

(b) Many candidates were able to draw a comparison between the features of primary and secondary storage and identify why RAM is primary storage and not secondary storage.

(c) Candidates found this question very challenging. It would be beneficial for candidates to have a greater understanding of how virtual memory is created and used. The most common mark awarded was for stating that secondary storage is partitioned to create the virtual memory.

(d)(i) Many candidates were able to give two features of solid-state storage.

(ii) Many candidates were able to give two correct examples of solid-state storage.

Question 8

(a) Most candidates were able to identify another characteristic of a robot. Some candidates gave an inaccurate response of 'artificial intelligence'. It would be beneficial for candidates to understand that not all robots have artificial intelligence. It is not a key characteristic of a robot and does not define a robot.

(b) Few candidates were able to state what is meant by firmware. Candidates need to have a better understanding of firmware.

(c) Many candidates were able to give two correct examples of interrupts. Some candidates gave response such as 'keyboard' or 'mouse'. These are just devices and not examples of interrupt. Candidates need to make sure they are accurate in their example state what about the device would cause an interrupt to be generated, for example pressing a key on the keyboard.

(d) Some candidates were able to give appropriate advantages to the workers. Many candidates gave advantages to the employers instead of the workers. For example, the fact that the robots do not need to take a rest does not benefit workers; it would likely be a disadvantage to workers and not an advantage. Candidates are reminded to read the context given carefully and consider it in their response.

(e) Some candidates were able to correctly identify that machine learning was the ability described in the question.

Question 9

(a) Candidates found this question challenging. It would be beneficial for candidates to have a greater understanding of what is involved in the key functions of an operating system, such as memory management.

(b)(i) Many candidates were able to describe how the hacker would perform the brute-force attack.

(ii) Some candidates were able to give all three correct cyber security solutions that could be used. Many candidates were able to give two correct examples.

(c)(i) Many candidates were able to describe what is meant by a digital currency.

(ii) Many candidates were able to recognise that the name of the process described was blockchain.

COMPUTER SCIENCE

Paper 0478/12
Computer Systems

Key messages

Candidates need to show a greater use of technical terminology in their responses. Candidates will also need to note the key terms given in a question and structure their responses using these. Candidates must also use the given context in their responses.

General comments

If a candidate writes their response to a question on an additional page, they must indicate very clearly on the script where their response is to be found. If answers are crossed out, any new answer must be written very clearly, so that the text can be easily read.

Comments on specific questions

Question 1

(a) Most candidates were able to give another correct example of primary storage. Other correct examples were considered such as a register. Some candidates gave RAM as their example. RAM was already given as the example in the question, so could not be given as one other example.

(b) Many candidates were able to give an appropriate reason. The most common correct answer was that it is a volatile type of storage.

(c) Most candidates accurately converted the two denary numbers to binary.

(d) Most candidates accurately converted the two hexadecimal numbers to binary.

(e) Many candidates were able to carry out the correct binary addition. Some candidates did not show their working. Candidates must be reminded that if a question instructs to show all working that some marks will be allocated to this.

(f) Many candidates were able to explain why an overflow error would occur.

(g) Some candidates were able to calculate the correct two's complement binary integer. Some candidates gave the binary value for 22 instead of –22.

Question 2

(a) Most candidates identified that a digital camera is an example of an input device. The most common incorrect answer given was storage device.

(b)(i) Many candidates were able to calculate the correct number of kibibytes.

(ii) Many candidates were able state the correct number of nibbles in 1 byte. The most common incorrect answer given was 4.

(c)(i) Many candidates were able to state that it would mean 32 bits are used to present a colour. Candidates need to make sure that they are accurate. It is clear that they mean it is 32 bits for a single colour and not all colours. It was also accepted for candidates to state that a single pixel would have 32 bits.

(ii) Most candidates were able to explain the effect the change would have on the image file.

(d) Few candidates were able to fully explain how lossless compression would reduce the size of the image file. Many candidates gave a very generic response about a generic file and did not relate their response to the context given in the question. For example, many candidates explained how lossless compression would reduce the size of a text file, by finding repeating words. Candidates are reminded that if context is used in a question, this must be used in their responses.

Question 3

(a) Some candidates were able to give two appropriate reasons. Many candidates stated that it would be easier to read or write the program. This could not be considered as they were given in the question. Candidates are reminded to read the question in its entirety and consider the context given.

(b)(i) Many candidates were able to correctly complete the missing terms.

(ii) Some candidates were able to give two correct functions and their roles. Some candidates incorrectly gave functions of an operating system instead of an IDE. Some candidates gave two correct functions but their descriptions of the role of each function lacked the necessary detail. For example, they gave the function 'auto-completion', then gave the description it auto-completes the code written. Candidates need to describe the role of the function beyond rewording the function.

(c)(i) Most candidates were able to give an appropriate printer.

(ii) Many candidates were able to select an appropriate transmission method and gave a detailed explanation as to why that would be an appropriate choice. A range of transmission methods were seen with some detailed explanations as why they would make the best choice. The most successful candidates used the context given in their responses.

(iii) Candidates found this question challenging. It would be beneficial for candidates to have a greater understanding about the process of error detection methods. The most common mark awarded is that the number of 1s in the byte needs to be even. Many candidates just gave a generic description of a parity check and did not relate this specifically to it being an even parity check. Candidates must review and consider any context in a question in their responses.

Question 4

(a) Some candidates were able to correctly identify all four components and provide appropriate descriptions for the two components given. The most common component that was correctly identified was the arithmetic logic unit. Some candidates inaccurately gave 'clock speed' instead of 'clock' for controlling the number of fetch-decode-execute cycles. It would be beneficial for candidates to know that the clock speed is not a component and that it is a measure of how many clock cycles are completed and does not control how many clock cycles are completed.

(b) Many candidates were able to explain why the computer is not an embedded system. Most candidates referred to the computer having more than one set task. Candidates need to have a greater understanding of the features of an embedded system beyond it being designed to perform a dedicated function.

Question 5

(a) Candidates found this question challenging. Many candidates gave a very generic description about how an expert system operates. They mainly identified the component parts of an expert system and what they contain. Few candidates were able to relate this to the context given and did not describe how the components are used to decide a diagnosis.

(b)(i) Most candidates were able to give two examples of electrical components of a robot.

(ii) Candidates found this question challenging. Most candidates did not refer to the context given in the question. Most candidates gave generic responses such as robots do not need to take breaks. The context in the question stated that a human would be controlling the robot, so many of the

generic reasons given were not applicable to the context provided in the question, as they referred to the use of a robot instead of a human.

(iii) Many candidates were able to give an appropriate disadvantage of using a robot in the surgery. Most referred to the robot being expensive to purchase.

(c) (i) Some candidates found this question challenging. The most common marks awarded were for the DNS sending the IP address to the patient's computer and the web server sending the web page data to the patient's computer. Some candidates lacked the level of technical understanding required.

(ii) Candidates found this question challenging. The most common marks awarded were for referring to the data being encrypted and referring to digital certificates being used in the process. Candidates need to have a greater technical understanding of the process involved in secure socket layer (SSL).

COMPUTER SCIENCE

Paper 0478/13
Computer Systems

Key messages

Candidates need to show a greater use of technical terminology in their responses. Candidates will also need to note the key terms given in a question and structure their responses using these. Candidates must also use the given context in their responses.

General comments

If a candidate writes their response to a question on an additional page, they must indicate very clearly on the script where their response is to be found. If answers are crossed out, any new answer must be written very clearly, so that the text can be easily read.

Comments on specific questions

Question 1

(a) Most candidates were able to give an appropriate input device to record the song.

(b) Many candidates were able to select the correct type of software. The most common incorrect answer given was utility software.

(c) (i) Most candidates were able to convert the two binary numbers to denary.

(ii) Many candidates were able to convert the two binary numbers to hexadecimal.

(iii) Many candidates were able to give the correct binary value after the logical shift. Some candidates shifted the value the incorrect way. Some candidates replaced the values lost with 1s instead of 0s.

(d) Few candidates gave the correct value of –55. Most candidates were able to provide the correct working but then gave the final value as 55 instead of –55.

(e) Few candidates recognised the term for the first description. The most common incorrect answers were hertz and frequency. Some candidates were able to give accurate descriptions for the other terms. Candidates need to have a better understanding of the key terms relevant for sound representation.

Question 2

(a) Many candidates correctly recognised that this was a description of virtual memory.

(b) Few candidates were able to provide accurate features of magnetic storage. The most common correct answer was that it has moving parts. Candidates need to have a greater understanding of the key features of different types of storage device.

(c) Most candidates were able to give reasons why a HDD was an example of secondary storage.

Question 3

(a) Most candidates were able to identify that the first description was of a MAC address. Few candidates were able to recognise that the final description was of a core. Few candidates were

able to provide accurate descriptions of a register, clock and the control unit. Candidates need to have technical understanding of the role of key components in the CPU.

(b) Many candidates were able to give three correct registers. The most common incorrect answer given was the arithmetic logic unit.

(c) Many candidates were able to circle the two correct buses. The most common incorrect answer circled was hardware.

Question 4

(a) Candidates found this question challenging. Few candidates were able to describe how the operating system handles interrupts. The most common correct answer given was that it gives an interrupt a priority. Candidates need to have technical understanding of how interrupts are used and how they are handled by the operating system.

(b) Most candidates were able to give two other functions of an operating system.

(c) (i) Many candidates were able to give an example of a hardware interrupt.

(ii) Many candidates were able to give an example of a software interrupt.

Question 5

(a) Few candidates were able to describe the role of the DNS. The most common correct answer given was for stating the DNS converts a URL into an IP address. This was accepted in place of searching the database for a matching IP address.

(b) Many candidates were able to tick the correct security method.

(c) (i) Some candidates were able to draw an accurate diagram of a DDoS attack. The most common correct answer given was for computers being turned into bots.

(ii) Few candidates were able to identify tasks that would be performed by a proxy server but not performed by a firewall. Some candidates were able to identify that it can hide an IP address.

(d) (i) Many candidates were able to tick the correct type of cookie. The most common incorrect answer given was 'static'.

(ii) Many candidates were able to identify three ways that the company can use a cookie. Some candidates referred to it being used to store items in a shopping cart. This response could not be awarded as this was already given in the question. Candidates must read the entirety of the question and consider any context that is given in their response.

(iii) Many candidates were able to identify two other functions of a web browser.

Question 6

(a) Many candidates were able to identify other components that would be used in the automated system. The most common correct answer was a microprocessor.

(b) Most candidates were able to identify an appropriate sensor that could be used.

(c) (i) Candidates found this question challenging. Most gave a generic response that was not applied to the context given in the question. Candidates need to read any context given in a question and use it in their response.

(ii) Most candidates were able to accurately explain how the data is sent using serial simplex data transmission.

(d) Candidates found this question challenging. Many candidates gave generic reasons such as the robots will not need to take breaks. They did not consider the context given in the question and were not relevant as advantages to the employee.

(e)   Many candidates were able to give an accurate disadvantage. The most common correct disadvantage given is that the robots could take employees jobs.

(f) (i)   Many candidates correctly identified this as a description of artificial intelligence.

(ii)   Candidates found this question challenging. Few candidates were able to explain how machine learning would be used in the given context. Most candidates just gave a description of what is meant by machine learning. Candidates need to have a greater understanding of how machine learning can be used in a wide range of contexts.

Question 7

(a)   Many candidates were able to describe how an error could occur.

(b)   Some candidates were able to identify all the correct missing terms. The most common incorrect terms given were for the last two missing terms. Some candidates gave the responses 'correct' and 'incorrect' for these missing terms.

COMPUTER SCIENCE

Paper 0478/21
Algorithms, Programming and Logic

Key messages

Candidates were able to demonstrate a good level of understanding of algorithms and programming. It would be beneficial to candidates to fully understand the published pseudocode within the syllabus as this is the basis for the initial set of questions within the paper.

General comments

Candidates using additional pages are reminded to clearly indicate the question for which they are providing a further response. With the additional pages the candidates need to clearly write their name and candidate number on any additional booklets.

Comments on specific questions

Question 1

Most candidates were able to correctly identify extreme test data.

Question 2

(a) Most candidates were able to correctly identify the four correct validation checks.

(b) Most candidates identified a verification method and described it. Some candidates incorrectly identified validation checks which were given in part **(a)**

Question 3

This question was answered correctly by most candidates. Some candidates incorrectly attempted to rewrite the algorithm with another FOR loop.

Question 4

(a) This question was answered correctly by a few candidates, identifying correct use of the SUBSTRING function and using the string return correctly in a selection construct.

(b) This question was answered correctly by a few candidates, identifying the need for a condition-controlled loop and the use of the LENGTH function. Some candidates incorrectly answered the question using pseudocode only. The question required an explanation.

Question 5

Most candidates were able to identify the correct purpose of MOD and DIV with only a few giving the correct pseudocode for MOD and DIV.

Question 6

(a) A minority of candidates identified four correct corrections. Most candidates identified two correct corrections. Some candidates identified the correction in the use of the ROUND function and the incorrect placement of the counter incrementing.

(b) Some candidates achieved all the marks identifying a method to make the algorithm maintainable and giving a correct example using the algorithm in part **(a)**.

Question 7

(a) Most candidates produced the correct logic circuit.

(b) This question was answered well by most of the candidates. Use of the original logic expression is recommended to answer this question.

Question 8

(a) (i) Most candidates correctly identified Boolean as the most appropriate data type for the field.

(ii) Most candidates correctly identified that Boolean has only two states that make it appropriate.

(b) Most candidates achieved at least one of the marks for the SQL output. Punctuation marks should not be in the output from an SQL statement.

(c) Most candidates achieved all the marks for the SQL statement

Question 9

(a) Many candidates correctly gave the correct pseudocode for declaring variables. Some candidates incorrectly used text as a data type.

(b) The majority of candidates struggled with writing a function with a parameter. Some candidates achieved all the marks available.

(c) The majority of candidates completed the trace table correctly. Quotation marks on outputs are incorrect and once the stopping condition has been met, no further entries should be made in the trace table.

Question 10

There was an issue with this question, and this was discussed at the examiners' meeting before marking began. Some candidates mistakenly used only the first data for tracing. The examiners considered the impact on candidates based on the answers they had seen. Changes to the marking approach for this question were agreed to make sure that no candidates were disadvantaged by the issue.

(a) The majority of candidates completed the trace table correctly. The trace table could have been answered in one of two ways, either entry of one input data, as there was no loop back to enter more or complete the table with all the data.

(b) A minority of candidates identified correctly how to change the flow diagram to produce the correct output. Those who only gave one input data also identified that a loop should have been added to input the rest of the data.

Question 11

This question was a good differentiation question testing the candidate's ability to solve a problem by either using program code or pseudocode. The candidates were asked to meet three requirements, requirement 1 was to input each competitor's score, for each of the five events, validating the entry to ensure it fell with in the range of 0 to 100. Requirement 2 was to find the maximum score for each of the five events and output the competitors who achieved the high score. Requirement 3 was to total the scores of each competitor for all the five events and output the names of the competitors who had achieved the highest overall score.

Requirement 1 was attempted by well by most of the candidates using two loops to input the scores into the two-dimensional array. Most candidates produced correct use of a loop to validate the entries were within the set limits. Some candidates used an IF statement to validate the entry, but this only allows for one extra data entry.

Requirements 2 was attempted by most candidates who correctly calculated the maximum score for each of the events but stored and outputted a single name for the highest score. Only a few candidates correctly outputted the names of all the competitors who achieved the highest score. A few candidates chose to calculate the highest score separately for each of the five events instead of incorporating them in a loop. Although candidates would not have lost marks for this approach it is a time-consuming approach.

Requirement 3 was attempted most candidates who correctly calculated the total points achieved by each competitor for the five events. A few candidates used the one-dimensional array provided to achieve this and incorporated it into requirement 1. As with requirement 2, candidates only stored and output the name of one competitor instead of all the competitors who achieved the highest score.

COMPUTER SCIENCE

> **Paper 0478/22**
> **Algorithms, Programming and Logic**

Key messages

Candidates who read the questions carefully before answering, then ensured that they fully answered the questions that were asked, in an appropriate context, achieved better marks than candidates who gave generic responses.

Candidates who answered algorithm questions using pseudocode, as stated in the question, achieved the best marks. Candidates who had made themselves fully aware of the syntax of the pseudocode defined within the syllabus for this course were in a better position to answer pseudocode questions accurately.

Candidates who were fully aware of the meaning of the different flowchart boxes and were able to complete them appropriately were in a better position to correctly answer the flowchart question.

Candidates who answered questions in an appropriate manner to the command word used, such as answering questions beginning with explain with more detail than questions beginning with identify, were more likely to achieve higher marks.

General comments

Candidates demonstrated a good overall understanding of the requirements of this paper with very few questions left unanswered.

Candidates are reminded that explain type questions usually require an explanation of how something was done, rather than providing a simple description.

Candidates are also reminded that when answering practical questions, they should answer in the manner required in the question. For example, a question in which pseudocode is required, must be answered using pseudocode as shown in the syllabus.

Comments on specific questions

Question 1

Most candidates were aware that abstraction means removing details from the problem that are not relevant.

Question 2

Most candidates were able to connect all or some of the component parts: process, output and input to their most appropriate relevant description in the context of calculating the amount of paint required for a fence.

Question 3

Most candidates correctly suggested suitable test data for some or all of the given categories: normal, abnormal, extreme and boundary.

Question 4

(a) Candidates who described verification as a means to check that data has not been changed during input, or similar, achieved this mark. A significant number of candidates mistakenly stated that verification checks ensure that the entered data is correct or gave examples of validation.

(b) A mixed range of responses was seen with most candidates achieving at least one mark for writing an algorithm for a double entry verification check. Candidates with a good understanding of pseudocode, and who followed the given specification in the question accurately, achieved the highest marks.

Question 5

(a) Most candidates were able to find and correct at least one of the errors in the given pseudocode. Many of these candidates were able to find most or all the errors and achieved a high mark.

(b) Candidates who were able to write a formula to find an average, appropriate to the pseudocode given in the question, and who were correctly able to use a ROUND function, setting the rounding to one decimal place, all within an OUTPUT statement, achieved both marks.

(c) Candidates who correctly explained how they could amend the given pseudocode to achieve some additional stated functionality achieved the highest marks. Some very good responses were seen for this question.

Question 6

(a) A mixed range of responses for this trace table question. Some candidates correctly completed the trace table for the first and last letters of each word, but they did not take it any further. Many candidates did fully complete the trace table.

(b) A significant proportion of candidates recognised that the algorithm checked whether the words entered were spelt the same both forwards and backwards. Some candidates even used the correct term 'palindrome' in their response, although this was not necessary in this case.

(c) Candidates were mostly able to recognise how the algorithm confirmed that all the letters in the word had been checked. Candidates who gave complete answers, including how the indexes at the beginning and end of the words were used, achieved the higher marks.

Question 7

(a) Most candidates achieved some marks for completing a flowchart. Candidates who filled the various boxes with appropriate comments, for example, decisions in decision boxes, and who were consistent with their use of the same variables throughout, achieved the highest marks.

(b) Candidates who recognised that an array would be a better data structure to store the numbers with the use of the counter variable as the array index and then went on to describe a second loop after the given loop, for the purpose of outputting the contents of the array achieved the highest marks.

Question 8

(a) Most candidates drew the correct XOR logic gate symbol, as shown on the syllabus, with two inputs and one output, and then correctly completed its truth table for it.

(b)(i) Most candidates gave a partially correct logic expression to represent the crane moving, as described in the question.

(b)(ii) Most candidates were in general able to complete the truth table for the crane moving.

Question 9

(a) This question was generally answered well, with most candidates able to correctly identify at least two fields to match the given data types.

(b) There were a mixed number of responses for this question. Candidates were asked to complete the SQL statement to match the given criteria. A common mistake seen was candidates missing off the quotation marks around the search criteria 'Asia', which was a string.

Question 10

Due to an issue with Question 10, full marks were awarded to all candidates for this question to make sure that no candidates were disadvantaged. We recognise that the syllabus stated that functions may have up to two parameters. Question 10 asked for functions that required three parameters and therefore the question was not in line with the syllabus. The syllabus for 2026 onwards and the Scheme of Work have been updated to show that functions may have up to three parameters. The question no longer appears in the published Question Paper or the Mark Scheme.

COMPUTER SCIENCE

> **Paper 0478/23**
> **Algorithms, Programming and Logic**

Key messages

Candidates who read the questions carefully before answering, then ensured that they fully answered the questions that were asked, in an appropriate context, achieved better marks than candidates who gave generic responses.

Candidates who answered algorithm questions using pseudocode, as stated in the question, achieved the best marks. Candidates who used the syntax of the pseudocode as defined in the syllabus for this course provided more accurate responses to pseudocode questions.

Candidates who were fully aware of the meaning of the different flowchart boxes were more successful in correctly answering the flowchart question.

Candidates who answered questions in an appropriate manner to the command word used, such as answering questions beginning with explain with more detail than questions beginning with identify, achieved the highest marks.

General comments

Candidates demonstrated a good overall understanding of the requirements of this paper, with very few questions left unanswered.

Candidates are reminded that explain type questions usually require an explanation of how something was done, rather than a simple description. When answering practical questions, candidates must answer in the manner required in the question. For example, a question in which pseudocode is required must be answered using pseudocode as given in the syllabus. In addition, when answering the final programming question, candidates must ensure that their solutions accurately follow the details given in the scenario.

Candidates should read the scenario through to the end before beginning their solution. If the scenario states that arrays and variables do not need to be declared, as was the case with this paper, then candidates do not need to declare these variables and arrays. They should proceed straight to the writing of the program, ensuring that the variables and arrays defined in the scenario are used as stated in the scenario.

Comments on specific questions

Question 1

(a)   Most candidates achieved some marks for completing the given flowchart. Candidates who filled the various boxes with appropriate comments, for example, decisions in decision boxes, and who were consistent with their use of the same variables throughout, achieved the highest marks.

(b)   Most candidates achieved at least one mark for explaining how the flowchart could be altered to achieve some stated additional functionality. Candidates who carefully explained what the alterations would be and where achieved the highest marks.

Question 2

Many candidates were able to match at least one if the given arithmetic operator problems with their correct result. Candidates familiar with how DIV, MOD operate, achieved the highest marks.

Question 3

(a)	Many candidates were able to find and correct at least one of the errors in the given pseudocode. Candidates who had made themselves familiar with the pseudocode given in the syllabus achieved the highest marks.

(b)(i)	Candidates were asked to complete the pseudocode for a procedure to replace part of the pseudocode given in the question. Many candidates found this question difficult. Stronger responses understood that the first blank line required parameters, and the last three lines needed to match lines 11, 12 and 13 from the original pseudocode.

(ii)	Many candidates also found this question difficult. Stronger responses understood that this was a standard CALL statement involving the procedure Swap and two parameters.

(c)	Candidates generally found this question less difficult than the previous two. Only those who realised that it was asking about the difference between global and local variables, therefore recognising that the given variable was local, achieved both marks.

Question 4

(a)(i)	Many candidates correctly stated a range check was the type of check being described.

(ii)	Most candidates were able to suggest at least one piece of test data, but only candidates who were able to give a complete reason, including whether or not it would be accepted, achieved the higher marks.

(b)(i)	Most candidates correctly stated a length check was the type of check being described.

(ii)	Candidates were asked to write the pseudocode that would provide a length check to make sure new passwords were at least 12 characters in length. This required the use of the string handling function LENGTH. Some candidates provided good responses and achieved most or all the marks. However, some common issues were that the check was not in a loop, which was required to meet the criterion that expected the password to be re-input until it contained at least 12 characters. Also, the length function was often not used correctly.

Question 5

(a)	The majority of candidates achieved at least one mark for this question, with those candidates who were familiar with database data types achieving the highest marks.

(b)	There were mixed responses for this question. An SQL statement had to be completed to match given criteria. Candidates who listed only the required fields in the SELECT line, the correct table name in the FROM line and the correct search criteria in the WHERE line achieved the highest marks.

Question 6

(a)	Candidates who systematically followed the algorithm and completed the table as they went, achieved the highest marks.

(b)	Candidates generally recognised that the algorithm was looking for vowels in a word that had been input and replacing them with blanks. They also often saw that the letters of the word were being stored in individual array locations or that the consonants were being output.

Question 7

(a)	Candidates correctly drew the NOR logic gate symbol, as shown in the syllabus, with two inputs and one output and then correctly completed its truth table.

(b)(i)	Most candidates gave a partially correct logic expression to represent the security system described in the question, with many of these candidates achieving both marks.

(ii)   Most candidates were able to complete the truth table for the given security system, either correctly or nearly correctly, therefore achieving high marks.

Question 8

Candidates were required to complete an extended program using pseudocode, or program code, to meet a set of requirements given in a scenario intended for a collector to store details of their video library.

The program was to display a menu and then to allow three options:

- Add a new video to the video library, including its title, its format (4 K Blu-ray, Standard Blu-ray, DVD or digital download).
- Search for a specific title and store up to 20 items with that title in an array, then print the results.
- End the program.

Validation was also required, where appropriate, such as when inputting menu choices.

A wide range of quality of responses were provided, with most responses using either pseudocode or Python.

A high proportion of candidates achievied marks from the lower- or middle-mark bands. Candidates whose responses closely matched the requirements stated in the scenario, ensuring that all points were fully covered, achieved the highest marks.

Candidates who achieved the highest marks also followed the remaining additional guidance at the end of the scenario. This included the comprehensive use of comments to explain what each part or sub-part of their solution was doing and the use of appropriate messages to accompany all inputs and outputs.

The best responses correctly used the data structures given in the scenario in the way they were expected to be used as stated in their descriptions. These were the two-dimensional arrays `Video[]` to store the details of each video item and `Results[]` to store the results when searching for a specific title.