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COMPUTER SCIENCE

Paper 0478/11
Paper 1 Theory

Key messages

Candidates continue to provide a high standard of answers to mathematical and logic-style questions. Candidates also continue to provide a high standard of answers to questions that require knowledge recall. It would be beneficial for candidates to take note of the context that is used in questions and apply this to their answers. Candidates demonstrated limited ability in doing this.

General comments

Candidates should make sure that if they use any additional space to answer a question they clearly note that they have done this in their answer and clearly label the additional space used with the question number they have answered there.

Comments on specific questions

Question 1

(a) Many candidates gave a suitable input device. The most common correct answers were keyboard and mouse. Some candidates then provided a suitable explanation for use that was in the context of the question. Some candidates just gave a generic use such as 'to type things in'.

(b) Many candidates gave a suitable output device. The most common correct answers were screen and speaker. Only some candidates provided an explanation in context.

(c) Many candidates were able to provide a correct storage example. Some candidates were able to give a correct example of what would be stored. The most common incorrect answer was hard disk drive.

Question 2

(a) Many candidates were able to provide at least one correct bus. Many candidates were able to correctly identify that the purpose of the data bus is to transmit data around the CPU. Some candidates were able to correctly give the purpose of the control bus.

(b) Many candidates were able to give a correct stage of the fetch-decode-execute cycle.

(c) Many candidates were able to identify that it is present in the arithmetic logic unit (ALU). Some candidates demonstrated an understanding of its purpose, but this was limited. The most candidates could normally provide was that it was involved in calculations in some respect.

Question 3

(a) Most candidates were able to provide the correct binary.

(b) Most candidates were able to provide the correct binary.

(c) Most candidates were able to provide the correct denary.

(d) Most candidates were able to provide the correct hexadecimal.

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(e) Many candidates demonstrated an understanding that hexadecimal is easier to read or understand. Few candidates were able to demonstrate an understanding that it saved space on the screen. Candidates had a common misconception that hexadecimal saves storage space. This is not the case as it is still stored as binary.

Question 4

(a) Most candidates were able to give two correct methods. Most achieved at least one mark for a description also. The most common correct answers were phishing and hacking.

(b) (i) Many candidates understood the data would be meaningless if stolen. Candidates had a common misconception that it stops the data from being stolen.

(ii) Few candidates demonstrated a detailed understanding of the operation of symmetric encryption. The most frequent marks awarded were for understanding that plain text is encrypted into cypher text.

(iii) Most candidates were able to identify at least two other methods that could be used. The most common correct answers were strong passwords and firewall.

Question 5

(a) Most candidates were able to provide a correct logic circuit.

(b) Most candidates were able to identify a logic gate not present. The most common correct answer was XOR.

(c) Most candidates were able to complete the logic table correctly.

Question 6

Many candidates were able to give at least one example of when the signal would be used. Few candidates were able to identify the name of the signal.

Question 7

(a) Most candidates correctly identified it as a low-level language.

(b) Some candidates were able to identify the correct translator.

(c) Few candidates were able to demonstrate an understanding of the benefits of using assembly language for the task. The most common correct answer was to directly access and manipulate the hardware.

(d) Very few candidates were able to demonstrate an understanding of the drawbacks of using assembly language.

Question 8

(a) (i) Most candidates gave two correct examples of presentation. The most common correct answers related to font and colour.

(ii) Some candidates were able to give examples of structure.

(b) Very few candidates were able to describe the process of how the data is securely transmitted. The most common marks awarded were that the data is encrypted and the use of digital certificates.

(c) Few candidates were able to give a description of a cookie. Most were able to provide examples of their use. The most common correct examples were to store login details and user preferences.

(d) Some candidates understood that a proxy server could be used. Few candidates were able to describe how it would operate to prevent the attack.

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COMPUTER SCIENCE

Paper 0478/12
Paper 1 Theory

Key messages

Candidates continue to provide a high standard of answers to mathematical and logic-style questions. Candidates also continue to provide a high standard of answers to questions that require knowledge recall. It would be beneficial for candidates to take note of the context that is used in questions and apply this to their answers. Candidates demonstrated limited ability in doing this.

General comments

Candidates should make sure that if they use any additional space to answer a question they clearly note that they have done this in their answer and clearly label the additional space used with the question number they have answered there.

Comments on specific questions

Question 1

(a) Most candidates were able to give two appropriate input devices. Candidates are reminded that if they write more than one input device on each given answer space, only the first input device given can be considered.

(b) Most candidates were able to give an appropriate output device.

(c) (i) Some candidates were able to give a detailed description of the operation of the touchscreen. The most common mark awarded was for the screen having multiple layers.

(ii) Many candidates were able to give at least one benefit of the touchscreen. The most common mark awarded was for stating that it can still be used whilst wearing gloves.

(iii) Many candidates were able to give at least one drawback of the touchscreen. The most common mark awarded was for stating that there can be visibility issues with the screen in sunlight.

(vi) Most candidates were able to give another type of touchscreen. The most common mark awarded was for capacitive.

(d) Very few candidates showed an understanding of the stored program concept. Candidates gave vague responses to this such as ‘all programs are stored in memory before they are processed’.

(e) Many candidates were able to give three other functions.

(f) (i) Most candidates were able to give the correct binary.

(ii) Most candidates were able to give the correct denary.

(iii) Most candidates were able to give the correct hexadecimal.

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Question 2

(a) Most candidates gave a vague description, that lacked technical detail, of how the system would operate. The most common marks were for the type of sensor used and that the sensor sends data to the microprocessor.

(b) Most candidates were able to give an appropriate sensor for each application. The most common incorrect answer was a moisture sensor for checking the acidity level of the soil.

Question 3

Few candidates were able to provide a fully correct answer. The most common incorrect answer was RAM not ticked for 'it does not have any moving parts'.

Question 4

Most candidates were able to provide creating a backup as one suitable method. It would be beneficial for candidates to understand how data loss can be prevented beyond creating a backup.

Question 5

Most candidates were able to select the correct bit and byte. They were also able to provide a response as to how they had found these.

Question 6

(a) Most candidates gave HTTPS and looking for a locked padlock symbol.

(b) Many candidates were able to give the correct protocol.

(c) Few candidates were able to describe the role of a proxy server. Most candidates referred to a standard role of a firewall in a network.

(d)(i) Many candidates were able to give the response of spyware.

(ii) Many candidates were able to give appropriate methods of prevention. The most common marks awarded were for biometrics and the use of an onscreen keyboard.

(e) Many candidates were able to identify the correct missing terms that needed to be used. The most common incorrect response was the confusion of URL and IP address.

Question 7

(a) Some candidates were able to identify the correct statements for each logic gate. The most common incorrect response was for the second statement.

(b) Most candidates were able to provide the AND logic gate and a correct truth table.

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COMPUTER SCIENCE

Paper 0478/13
Paper 1 Theory

Key messages

Candidates continue to provide a high standard of answers to mathematical and logic-style questions. Candidates also continue to provide a high standard of answers to questions that require knowledge recall. It would be beneficial for candidates to take note of the context that is used in questions and apply this to their answers. Candidates demonstrated limited ability in doing this.

General comments

Candidates should make sure that if they use any additional space to answer a question they clearly note that they have done this in their answer and clearly label the additional space used with the question number they have answered there.

Comments on specific questions

Question 1

Most candidates got at least three components correct. The most common incorrect answers were actuator and register marked as input.

Question 2

(a) Most candidates were able to identify the correct binary.

(b) Most candidates were able to give the correct hexadecimal.

Question 3

Few candidates were able to calculate the correct number. Most candidates gained a mark for 100 × 100. It was at this point many candidates then did not give a correct calculation. Some only multiplied by 16. Some only divided by 8.

Question 4

(a) Most candidates were able to give the name of a type of touch screen. Many candidates were able to give at least one benefit of the type of touch screen chosen. Few candidates were able to give multiple benefits of the touch screen type chosen.

(b) Most candidates were able to identify that they are examples of primary storage. Few candidates were able to explain why. Most gave an example of what would be stored in RAM or ROM.

(c) (i) Most candidates were able to state that serial transmission is used and that data is sent down a single wire.

(ii) Many candidates were able to give at least two benefits of the connection. The most common correct answers were that it can power the device and that it is a universal standard.

(d) Few candidates were able to give a technical description of how the message is displayed. The most common mark awarded was for the interrupt signal being sent to the CPU.

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Question 5

(a) Most candidates were able to provide a correct logic circuit.

(b) Most candidates were able to provide a correct truth table.

Question 6

(a) Few candidates were able to provide a technical description of how the video would be displayed. The most common marks awarded were for shining a laser onto the QR code and the black and white sections of code reflecting light differently.

(b) Most candidates correctly identified MP4 files as the answer.

(c) Most candidates were able to give that the file size would be reduced. Some candidates were able to then state that this would reduce storage space or transmission time.

(d) Few candidates were able to provide a technical description of how the screen operates. The most common mark awarded was for LEDs being behind the screen.

Question 7

Most candidates were able to identify at least four correct missing terms. The most common incorrect answers were memory data register and data bus.

Question 8

(a) Many candidates were able to give one similarity. The most common one given was that they are both unique addresses. Some candidates were able to give a second correct similarity.

(b) Few candidates were able to give a difference between the addresses. The most common correct answer given was that a MAC address cannot normally be changed, but an IP address can sometimes change.

Question 9

Most candidates were able to give at least one correct piece of information about each part of the process. The most common mark awarded for parity is that odd or even parity is set. The most common mark awarded for ARQ is that it uses acknowledgment and timeout. Few candidates were able to give a technical description covering both sections in detail.

Question 10

(a) (i) Most candidates were able to give the meaning of HTTPS.

(ii) Most candidates identified that they could look for a locked padlock symbol.

(b) Many candidates were able to identify hacking and a virus. some also gave malware or a suitable type of malware. Some candidates gave multiple, different types of malware. This was also awarded.

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COMPUTER SCIENCE

Paper 0478/21

Paper 2 Problem-solving and Programming

Key messages

Successful candidates showed evidence of practical experience in designing, programming, and testing solutions to the three tasks from the pre-release (swimming club management) to provide answers for ***Section A*** that demonstrated problem-solving and programming skills. Candidates need to read each question carefully and answer the question as set on the paper as a question may only require a response that is a partial solution or an extension to a task set out in the pre-release material.

Successful candidates ensured that any identifier declared in their response could be used consistently in a program. Identifiers must not contain spaces or other punctuation. Once an identifier is declared or used it must remain the same throughout the response to the question. Candidates are advised to read through each written response to ensure that no changes or errors have been made.

Successful candidates showed an understanding of programming techniques including the use of calculation, iteration, and selection.

Successful candidates ensured that questions, where an explanation was required, included an explanation for any programming or pseudocode statements used in their answers.

Successful candidates showed evidence of good examination technique by answering the question as set on the examination paper in the space provided for the answer or clearly signposting where the answer was to be found on the examination paper.

General comments

Some candidates did not attempt all the questions on the paper.

Comments on specific questions

Section A

Question 1

Some candidates did not attempt parts of this question.

(a) (i) Many candidates correctly identified at least one array with a meaningful name, suitable data type, and sample data for use in **Task 1**. A common error seen was not including the sample data required by the question.

(ii) Better candidates explained how their program had populated the arrays, giving examples of the statements used and explaining how the statements were repeated for each element of the array.

(b) Some candidates explained how their program removed members that had not paid their fees. An example of a suitable response is**:**

Using a FOR loop to check all members, then checking the payment for each member with an IF statement and only copying those member details where payment had been made.

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(c) Many responses providing pseudocode, code, or a flowchart for **Task 3** scored some marks. Some responses seen incorrectly included more than required by the question as they covered the whole of **Task 3**. Common errors seen included outputting the changes to the type of membership rather than updating the membership array.

(d) Some candidates did not attempt this part of the question. Responses providing sample programming statements together with an explanation of what the statement did in their program for **Task 2** scored higher marks. Common errors included responses that were all code with no explanation.

Section B

Question 2

(a) Many candidates correctly completed lines 1 and 19. Common errors seen were missing the variable `Value` from line 7, and incorrect indexes in lines 11 and 18.

(b) Some candidates did not attempt this part of the question. Better responses identified the statements that needed changing and showed the correctly rewritten statements.

Question 3

(a) Generally well answered, most candidates identified suitable validation checks. Better candidates described how the validation check was applied to the PIN in the question.

(b) Some candidates described the process of verifying the PIN. A common error seen was including a description of validation rather than verification

Question 4

(a) Most candidates completed all columns in the trace table, and few candidates' traces were completely correct. Common errors seen included not initialising the `Stock` and `Total` columns and putting the variable name `Total` in the OUTPUT column rather than the value, 102.

(b) Some candidates correctly identified the problem caused by an input value of 70, explaining how to correct the problem proved challenging for many candidates.

An example of a suitable response is**:**

If 70 was used as an input the stock level will fall below zero. To prevent this from happening test that the stock level for the rolls is greater than or equal to the number of rolls to be sold before trying to subtract `Sold` from `Stock`.

Question 5

(a) Most candidates correctly identified the field to use for the primary key. Nearly all of these candidates gave an appropriate reason.

(b) Some candidates did not attempt this part of the question. Many candidates correctly completed the query-by-example grid. Common errors seen were an incorrect criterion for number in stock below 10 or showing the `Level` field.

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COMPUTER SCIENCE

Paper 0478/22

Paper 2 Problem-solving and Programming

Key messages

Candidates who had previously worked through the pre-release material (visitor car park) and who completed the tasks by producing their own programming code were able to demonstrate appropriate techniques for solving this problem.

Candidates who took care to ensure that they fully answered the questions that were asked, taking care to ensure their responses matched the context of the questions, scored higher marks than those who gave generic responses. Examples included: candidates who described how their program achieved certain tasks; candidates who supplied detailed annotations to their program code; candidates who took care to name or describe variables and arrays appropriately to match their purpose.

Candidates are advised to answer algorithm questions as stated in the question so that pseudocode questions are answered using pseudocode, program code questions are answered using program code and flowchart questions are answered using a flowchart.

Candidates are advised to make sure that any answers they provide are appropriate for the command word used in the question, such that questions beginning with explain will require more detail than those beginning with state. In addition, those questions beginning with explain usually require an explanation of how something was done, rather than a simple description of what was done.

General comments

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

Candidates demonstrated a good understanding of how arrays could be used within the context of the given pre-release task.

Candidates are reminded that they should avoid using spaces in constant, variable, and array names.

Comments on specific questions

Section A

Question 1

(a) (i) Candidates who identified a relevant constant for **Task 1** and stated its value achieved both marks. Marks were lost if the constant name contained spaces or if the example stated would not work as a constant and would be better as a variable or an array.

(ii) Candidates who identified an array that could be used for **Task 1** and stated its use achieved both marks. Marks were lost if the variable name contained spaces or if the stated use was too vague.

(b) Candidates who described how the input of the day number for **Task 1** could be validated achieved marks for this question. Correct responses included descriptions of specific validation checks to check the range and/or the data type, the use of conditional statements to check the input, or the

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use of loops to repeat the input if required. An example of code to support the response was also required for full marks. Candidates who described how to validate other data entry, such as parking space number, or whether accessible parking was required, did not achieve marks.

(c) The vast majority of candidates achieved some marks for this question, which required a section of code to be written to solve part of **Task 2**. Candidates were allowed to write their responses using pseudocode, program code or a flowchart. Candidates who wrote their responses using program code generally performed better. The full range of marks was seen for this question, with candidates mostly providing code that used some or all of the following: inputs of day number and whether accessible parking was required, a conditional statement to check the input for type of parking required, input and storage in arrays of visitor names and car license numbers, output to show booking details or no spaces available.

(d) This question required an explanation of how the program from the pre-release material could be changed to allow bookings to be made over a four-week period instead of the two-week period as stated in the scenario. Candidates correctly identified a range of changes that would need to be made, including input prompts for users, maximum constants for the number of parking spaces or days, array sizes for data storage, validation checks, and loop termination values. Many good responses were seen, but candidates who only gave a coded response did not receive any marks because an explanation was required.

(e) This question required an explanation of how part of **Task 3** was achieved, in this case, how the program records and outputs the number of general and accessible parking spaces for the two-week cycle of the given scenario. Candidates correctly identified the use of counters, which could be counting variables for both of these values, that would need to be initialised at the start of the cycle. Many candidates went on to explain how, using conditional statements, allocated parking spaces were identified and the relevant counters incremented. Some candidates also explained the output that would be derived to show these values. Many good answers were seen, with the full range of marks awarded. However, candidates who only gave a coded response did not receive any marks, because an explanation was required.

Section B

Question 2

Most candidates achieved at least one mark here, to demonstrate that they could identify correct descriptions of a number of given programming concepts. Many candidates achieved high marks.

Question 3

Candidates were required to describe the use of verification on input of data and explain why it was necessary. Candidates who noted that verification is used to make sure that the data entered does not change from the original data, or similar achieved the mark. Candidates who named and described a method of verification, such as double entry, achieved more marks. Marks were lost where explanations for why verification was necessary stated that it was to make sure correct data was entered, or if the descriptions of verification methods lacked sufficient detail. Some candidates incorrectly described validation techniques in this question.

Question 4

Candidates were required to describe a type of test data used to test for a program accepting valid input data. Candidates who described normal, extreme, or acceptable boundary data achieved the marks. Candidates who described any type of abnormal data did not achieve the marks because this type of test data is to test for data that is rejected.

Question 5

(a) The vast majority of candidates were able to identify and give corrections for at least one of the errors in the pseudocode algorithm, with many candidates achieving high marks. The full range of marks was seen for this question.

(b) A wide range of quality answers was seen, with some candidates suggesting good solutions to allow the algorithm to run indefinitely until the user wanted it to stop. The full range of marks was

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seen with many candidates achieving high marks. However, some candidates only rewrote the original algorithm with their corrections from **part 5(a)** added, without including the required additional functionality.

Question 6

The vast majority of candidates achieved some marks for this trace table question, with the full range of marks seen. Some marks were lost by candidates not following the algorithm through to its conclusion, therefore not including all the values in all of the columns that should have been there. Other marks were lost in the OUTPUT column where additional punctuation was added to the output rather than only including what would have been produced by the algorithm.

Question 7

(a) (i) The vast majority of candidates recognised that the SubjectCode and Exams fields were of the text and number data types, respectively. Some candidates incorrectly gave some examples of data from these fields or applied data types, such as string, which were not available in the question.

(ii) The majority of candidates recognised that the Candidates field could not be of the Boolean data type because it contained more than two possible values.

(b) Most candidates achieved some marks for this question, with many candidates achieving full marks for showing the output that the given query-by-example grid would provide. Some candidates, however, gave a description of what the output would contain, or how the output would be produced, neither of which answer the question. Other typical errors included candidates showing output for all three fields in the grid when only the SubjectName and Candidates fields are displayed, or gave outputs in the wrong order.

(c) The majority of candidates achieved at least one mark for their completed query-by-example grid, with many achieving two or three marks. Some candidates lost marks because they had missed out one of the required fields, they had not completed the Table row, the sort method was missing or incorrect, or there was an error in the search criteria.

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COMPUTER SCIENCE

Paper 0478/23

Paper 2 Problem-solving and Programming

Key messages

Successful candidates showed evidence of practical experience in designing, programming and testing solutions to the three tasks from the pre-release (window cleaning services) to provide answers for ***Section A*** that demonstrated problem-solving and programming skills. Candidates need to read each question carefully and answer the question as set on the paper as a question may only require a response that is a partial solution or an extension to a task set out in the pre-release material.

Successful candidates ensured that any identifier declared in their response could be used consistently in a program. Identifiers must not contain spaces or other punctuation. Once an identifier is declared or used it must remain the same throughout the response to the question. Candidates are advised to read through each written response to ensure that no changes or errors have been made.

Successful candidates showed an understanding of programming techniques including the use of calculation and selection.

Successful candidates ensured that questions, where an explanation was required, included an explanation for any programming or pseudocode statements used in their answers.

Successful candidates showed evidence of good examination technique by answering the question as set on the examination paper in the space provided for the answer or clearly signposting where the answer was to be found on the examination paper.

General comments

Some candidates did not attempt all the questions on the paper.

Comments on specific questions

Section A

Question 1

Some candidates did not attempt parts of this question.

(a) (i) Many candidates correctly identified a constant with a meaningful name, and suitable value and gave a reason for use of that constant in **Task 1**. Common errors included naming an identifier where the value assigned to it could be changed during the execution of **Task 1** or stating the purpose of the constant instead of the reason for using the constant in **Task 1**.

(ii) Many candidates correctly identified a meaningful name for the array used to store customer details in **Task 1** and gave a suitable data type. Better candidates included appropriate sample data for the array.

(b) Some candidates explained how their program allowed only two floors or three floors, including identification of the type of statements used in their program and how they were applied to the problem.

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An example of a suitable response is:

Using an INPUT statement to enter the number of floors, then checking the input with a CASE statement that has separate outcomes for 1, 2, and 3 floors, rejecting all other values with a suitable error message.

(c) Many responses providing pseudocode, code or a flowchart for **Task 2** scored high marks. Some responses seen incorrectly included more than required by the question as they covered the whole of **Task 2**. Common errors seen included applying a percentage increase for both 2 and 3 floors and incorrect percentage calculations.

(d) Some candidates did not attempt this part of the question. Responses providing sample programming statements together with an explanation of what the statement did in their program for **Task 3** scored higher marks. Common errors included responses that were all code with no explanation.

Section B

Question 2

(a) Many candidates correctly completed the lines 1 and 24. Common errors seen were missing the variable `Value` from line 8, incorrect indexes in lines 12 and 23.

(b) Some candidates did not attempt this part of the question. Better responses identified the statements that needed changing and showed the correctly rewritten statements.

Question 3

(a) (i) Generally well answered.

(ii) Generally well answered.

(b) (i) Many candidates correctly identified an input error that would not be found. Better responses included good descriptions of the error.

An example of a good answer is:

(b) (i) Describe an input error that would **not** be found using this check digit.

The check digit ~~error~~ ~~errors~~ Errors of transposition, where ~~one~~ digits may have switched places ~~,~~ as the position of the digit is not taken into account, ~~#~~ but only the sum is calculated.

(ii) Some candidates did not attempt this part of the question. Better candidates clearly described a more suitable algorithm.

An example of a good answer is:

(ii) Describe a more suitable algorithm to calculate the check digit for this identification number.

Multiply the digit by its position. Add all the numbers obtained from ~~by~~ digits multiplying ~~its~~ their positions. Divide this sum by 10 and obtain the remainder. The remainder is the check digit.

(c) Generally well answered.

Question 4

(a) Most candidates correctly completed the trace table. A common error seen was an incomplete `Stock` column.

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(b) Many candidates gave a good explanation of how the algorithm could be extended.

Question 5

(a) Generally well answered.

(b) Most candidates correctly completed of the query-by-example grid. Common errors seen were an incorrect criterion for selection of items not in store or showing the `ItemCode` field.

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