# COMPUTER SCIENCE

**Paper 0478/11**
**Paper 1**

## Key messages

This syllabus has now been running for a few sessions and candidate's work continues to improve. There is a continued move to provide questions where candidates have to apply their knowledge, rather than just show their ability to simply remember facts. There is strong evidence that this is producing candidates who are now exhibiting an improved understanding of many of the topics.

## General comments

Candidates and Centres are reminded that written papers are now scanned in and marked on computer screens by Examiners. Consequently, if a candidate writes the answer to a question on an additional page, they must indicate very clearly to the Examiner where their revised answer is to be found. Also if answers have been crossed out, the new answer must be written very clearly, so that Examiners can easily read the text and award candidates the appropriate mark.

## Comments on specific questions

### Question 1(a)

Many candidates correctly identified all four hexadecimal characters. Some candidates wrote 15 and 12 in place of F and C. Candidates are reminded that they must fully convert binary to hexadecimal values to be awarded the marks.

### Question 1(b)

Many candidates provided accurate reasons for why hexadecimal is used. The most common answers given being that it is easier to read and easier to identify errors. Some candidates made the error of stating that it is used as it will take up less space in memory. Candidates must recognise this is incorrect as it will be stored as binary.

### Question 1(c)

Some candidates correctly identified at least one additional use of hexadecimal. The most common correct answer given was a MAC address. Some candidates accurately stated it is used for colour codes in HTML, other candidates gave a vague reference to this, e.g. colour in websites. Candidates must be accurate in their description and make sure they fully describe the additional use.

### Question 2(a)

Many candidates gained a mark by stating that high-level language is closer to English, some gained a further mark by stating an example of a high-level language. It would be beneficial for more candidates to demonstrate the knowledge that it is a language that is portable, being independent of any particular hardware.

### Question 2(b)

Many candidates correctly stated that a compiler or an interpreter could be used. Some candidates incorrectly stated that an assembler could be used. Candidates must understand that an assembler is not used to translate high level language.

**Question 2(c)**

Compiler
Most candidates correctly stated that a compiler translates the whole program as a single unit. Some candidates then stated that an executable file is produced. It would be beneficial for more candidates to demonstrate the knowledge that a report of errors is created and provided after the code is translated. Some candidates were not accurate in their description and could not be awarded a mark, e.g. it translates all the program. This statement could be applied to any translator.

Interpreter
Most candidates stated that a compiler translates the program one line of code at a time. Some candidates then stated that the translator will stop when it finds an error in the code.
Some candidates were not accurate in their description and could not be awarded a mark, e.g. it translates it bit by bit. This statement requires more accuracy and candidates must demonstrate the knowledge it is translated a line of code at a time.

**Question 3**

Most candidates correctly identified which statement was true or false. The most common incorrect answer given was 'true' given for 47 KB is larger than 10 MB. It was apparent that some candidates understood a KB to be larger than a MB. Candidates are reminded to follow the instruction given and tick (✓) the appropriate box. Some candidates used crosses (✗) instead or a mixture of both.

**Question 4**

Most candidates correctly identified the single correct true statement, marking all the other as false. The most common incorrect answer given was the first statement. Candidates had confused the operations of simplex and half-duplex in this instance. Candidates are reminded to follow the instruction given and tick (✓) the appropriate box. Some candidates used crosses (✗) instead or a mixture of both.

**Question 5(a)**

Some candidates correctly identified which parity bits had been corrupted during transmission, and which had been transmitted correctly. Some candidate used the incorrect parity and there gave the reverse answer and could not be awarded marks. Candidates are reminded to follow the instruction given and tick (✓) the appropriate box. Some candidates used crosses (✗) instead or a mixture of both.

**Question 5(b)**

Candidates found this question challenging. Some candidates demonstrated the knowledge that ARQ uses acknowledgement and time out. It would be beneficial for candidates to demonstrate further understanding about how the acknowledgement and time out operate. Many candidates demonstrated a misconception that ARQ is the same as echo checking, describing echo checking instead of ARQ.

**Question 6**

Most candidates correctly identify two buses. Many candidates gained further marks by stating what the bus transported. It would have been beneficial if candidates provided further detail about what the bus transported would be used for.

**Question 7**

Many candidates correctly match all six terms and definitions. The most common incorrect answers were the confusion of phishing and pharming, and firewall and proxy server.

**Question 8**

Some candidates gave the correct types and example of storage. Some candidates confused the types of storage and gave primary in place of secondary.

**Question 9**

Most candidates provided suitable input and output devices. Candidates need to remember to read the context of the question and apply it to their answer. Some candidates did not do this and provided input and output devices that were not applicable. Some candidates gave a very generic description of the use of the device e.g. barcode scanner, to scan barcodes. Candidates are reminded to refer to the context of the question when providing a use for input and output devices.

**Question 10(a)**

Many candidates provided the correct outputs for the logic gate.

**Question 10(b)**

Some candidates gave a correct statement. Some candidates did not use brackets in their statement and therefore could only was awarded a single mark for the connecting AND. Candidates are reminded to make sure that they use brackets, where necessary, in their logic statements.

**Question 11**

Many candidates provided three correct functions of an operating system. Some candidates were not accurate and detailed enough in their statement e.g. input/output. Candidates are reminded to make sure that they are accurate and provide enough detail in providing a function e.g. manages hardware devices/peripherals.

**Question 12(a)**

Many candidates provided two suitable sensors and described how they could be used in the chemical factory. Candidates had a large range of sensors they could choose and it was pleasing to see that the full range of suitable sensors were seen in candidate's answers.

**Question 12(b)**

Many candidates gave a detailed answer about how the sensors and the microprocessor would be used. Some candidates lacked detail in their answer, forgetting detail such as comparing the input value to the stored value. It would be beneficial for candidates to understand the context of the question and use it when describing the actions that may be taken, and not just provide a generic response. It would also be beneficial for candidates to understand that the process in continuous.

**Question 13(a)**

Many candidates gained marks for stating the file would be smaller and that it would be quicker to send. Some candidates provided an answer regarding the fact that it would take up less storage space. Candidates are reminded to read the question and answer according to the context. In the case, the question asked about the transmission of the data and not the storage of it. Some candidates demonstrated a misunderstanding that just because it was a smaller file, there was less chance of it being corrupted. This is speculative and not an accurate statement.

**Question 13(b)(i)**

Many candidates provided the correct compression method of lossless. Many candidates did not answer the question beyond this. Many candidates described the operation of lossless compression, rather than stating why it would be suitable, as required by the question.

**Question 13(b)(ii)**

Many candidates provided the correct compression method of lossy. Many candidates did not answer the question beyond this. Many candidates described the operation of lossy compression, rather than stating why it would be suitable, as required by the question.

# COMPUTER SCIENCE

**Paper 0478/12**
**Paper 1**

## Key messages

This syllabus has now been running for a few sessions and candidate's work continues to improve. There is a continued move to provide questions where candidates have to apply their knowledge, rather than just show their ability to simply remember facts. There is strong evidence that this is producing candidates who are now exhibiting an improved understanding of many of the topics.

## General comments

Candidates and Centres are reminded that written papers are now scanned in and marked on computer screens by Examiners. Consequently, if a candidate writes the answer to a question on an additional page, they must indicate very clearly to the Examiner where their revised answer is to be found. Also if answers have been crossed out, the new answer must be written very clearly, so that Examiners can easily read the text and award candidates the appropriate mark.

## Comments on specific questions

### Question 1

Many candidates provided three correct busses. The most common incorrect answer was candidates providing fetch, decode and execute, which demonstrated a misunderstanding of the question.

### Question 2

Some candidates demonstrated a good understanding of each storage type, providing correct examples. Some candidates did not have a clear understanding of the difference between primary and secondary storage. Many candidates provided two correct examples for off-line storage. It would be beneficial for candidates to have a greater understanding of what is meant by primary and secondary storage. Some candidates gave an inaccurate answer for off-line storage e.g. USB rather than USB flash memory. USB can also refer to the method of data transmission, so is not accurate enough to be awarded a mark.

### Question 3

Most candidates correctly match the five terms to the correct descriptions.

### Question 4

Candidates found this question very challenging. Some candidates provided a basic understanding of a parity check. Few candidates provided any relevant statements about a checksum and an automatic repeat request. Many candidates had a misconceived idea that a check digit is used in data transmission and many referred to recalculating and checking the digits after transmission. Many candidates had a misconceived idea that an echo check is the same as an automatic repeat request and described an echo check instead for the answer relating to automatic repeat request. It would be beneficial for candidates to have an accurate understanding of the operations of error checking methods.

### Question 5(a)

Many candidates provided a correct binary value and demonstrated their working.

**Question 5(b)**

Many candidates correctly represented the value in the two different registers.

**Question 5(c)**

Some candidates identified two correct examples, but some candidates misunderstood the question. Candidates were required to provide two further examples of what could be stored as a binary value in a register.

**Question 5(d)**

Most candidates provided a correct conversion to hexadecimal.

**Question 6**

Many candidates identified the barcode to be a QR code, and some candidates gave a description of how the QR code would be read. Many candidates provided an explanation of what a QR is and how much data it can store. Candidates are reminded to read the question and provide the detail required.

**Question 7(a)**

Many candidates correctly drew arrows to represent the direction of data transmission, some candidates did not fully answer the question, which required them to provide labels for each arrow. Some candidates did not provide an accurate label e.g. half duplex, data goes both ways

**Question 7(b)**

Many candidates provided a suitable example. Some candidates misunderstood the question and provided a description of simplex and duplex data transmission.

**Question 7(c)**

Some candidates identified the correct data transmission method for each example. Few candidates described what the examples were used for. It would be beneficial for candidates to understand what integrated circuits and USB are used for. Many candidates also had a misconception that the reference to USB was a device, rather than a transmission method. It would be beneficial for candidates to understand the difference between USB and USB flash memory.

**Question 8(a)**

Some candidates understood that the SSL protocol uses encryption, few candidates provided further detail than this. Some candidates misunderstood the question and described what SSL is used for.
Some candidates understood that a firewall acts as a filter, few candidates provided further detail than this. Many candidates were vague and inaccurate with their description.
It would be beneficial for candidates to have an accurate and more in-depth understanding of SSL and firewalls.

**Question 8(b)**

Many candidates provided a range of methods that could be used to keep the data safe. It would be beneficial for candidates to understand that methods such as anti-virus and anti-malware software can help prevent data being affected, but they do not fully prevent data being affected.

**Question 9**

Many candidates gave a detailed answer about how the sensors and the microprocessor would be used. Some candidates lacked detail in their answer, forgetting detail such as comparing the input value to the stored value. It would be beneficial for candidates to understand the context of the question and use it when describing the actions that may be taken, and not just provide a generic response. It would also be beneficial for candidates to understand that the process in continuous.

**Question 10(a)**

Many candidates provided a correct logic circuit.

**Question 10(b)**

Many candidates provided a correct truth table.

**Question 11**

Candidates found this question challenging. Some candidates described using a web browser and entering a URL, but after this their answer lacked detail of the process involved. It would be beneficial for candidates to have a greater understanding of how data is retrieved for a web page, and how it is displayed on the user's screen. Some candidates misunderstood the question and described the operations of security certificates.

# COMPUTER SCIENCE

**Paper 0478/13**
**Paper 1**

## Key messages

This syllabus has now been running for a few sessions and candidate's work continues to improve. There is a continued move to provide questions where candidates have to apply their knowledge, rather than just show their ability to simply remember facts. There is strong evidence that this is producing candidates who are now exhibiting an improved understanding of many of the topics.

## General comments

Candidates and Centres are reminded that written papers are now scanned in and marked on computer screens by Examiners. Consequently, if a candidate writes the answer to a question on an additional page, they must indicate very clearly to the Examiner where their revised answer is to be found. Also if answers have been crossed out, the new answer must be written very clearly, so that Examiners can easily read the text and award candidates the appropriate mark.

## Comments on specific questions

### Question 1(a)

Many candidates correctly identified all four hexadecimal characters. Some candidates wrote 15 and 12 in place of F and C. Candidates are reminded that they must fully convert binary to hexadecimal values to be awarded the marks.

### Question 1(b)

Many candidates provided accurate reasons for why hexadecimal is used. The most common answers given being that it is easier to read and easier to identify errors. Some candidates made the error of stating that it is used as it will take up less space in memory. Candidates must recognise this is incorrect as it will be stored as binary.

### Question 1(c)

Some candidates correctly identified at least one additional use of hexadecimal. The most common correct answer given was a MAC address. Some candidates accurately stated it is used for colour codes in HTML, other candidates gave a vague reference to this, e.g. colour in websites. Candidates must be accurate in their description and make sure they fully describe the additional use.

### Question 2(a)

Many candidates gained a mark by stating that high-level language is closer to English, some gained a further mark by stating an example of a high-level language. It would be beneficial for more candidates to demonstrate the knowledge that it is a language that is portable, being independent of any particular hardware.

### Question 2(b)

Many candidates correctly stated that a compiler or an interpreter could be used. Some candidates incorrectly stated that an assembler could be used. Candidates must understand that an assembler is not used to translate high level language.

**Question 2(c)**

Compiler
Most candidates correctly stated that a compiler translates the whole program as a single unit. Some candidates then stated that an executable file is produced. It would be beneficial for more candidates to demonstrate the knowledge that a report of errors is created and provided after the code is translated. Some candidates were not accurate in their description and could not be awarded a mark, e.g. it translates all the program. This statement could be applied to any translator.

Interpreter
Most candidates stated that a compiler translates the program one line of code at a time. Some candidates then stated that the translator will stop when it finds an error in the code.
Some candidates were not accurate in their description and could not be awarded a mark, e.g. it translates it bit by bit. This statement requires more accuracy and candidates must demonstrate the knowledge it is translated a line of code at a time.

**Question 3**

Most candidates correctly identified which statement was true or false. The most common incorrect answer given was 'true' given for 47 KB is larger than 10 MB. It was apparent that some candidates understood a KB to be larger than a MB. Candidates are reminded to follow the instruction given and tick (✓) the appropriate box. Some candidates used crosses (✗) instead or a mixture of both.

**Question 4**

Most candidates correctly identified the single correct true statement, marking all the other as false. The most common incorrect answer given was the first statement. Candidates had confused the operations of simplex and half-duplex in this instance. Candidates are reminded to follow the instruction given and tick (✓) the appropriate box. Some candidates used crosses (✗) instead or a mixture of both.

**Question 5(a)**

Some candidates correctly identified which parity bits had been corrupted during transmission, and which had been transmitted correctly. Some candidate used the incorrect parity and there gave the reverse answer and could not be awarded marks. Candidates are reminded to follow the instruction given and tick (✓) the appropriate box. Some candidates used crosses (✗) instead or a mixture of both.

**Question 5(b)**

Candidates found this question challenging. Some candidates demonstrated the knowledge that ARQ uses acknowledgement and time out. It would be beneficial for candidates to demonstrate further understanding about how the acknowledgement and time out operate. Many candidates demonstrated a misconception that ARQ is the same as echo checking, describing echo checking instead of ARQ.

**Question 6**

Most candidates correctly identify two buses. Many candidates gained further marks by stating what the bus transported. It would have been beneficial if candidates provided further detail about what the bus transported would be used for.

**Question 7**

Many candidates correctly match all six terms and definitions. The most common incorrect answers were the confusion of phishing and pharming, and firewall and proxy server.

**Question 8**

Some candidates gave the correct types and example of storage. Some candidates confused the types of storage and gave primary in place of secondary.

**Question 9**

Most candidates provided suitable input and output devices. Candidates need to remember to read the context of the question and apply it to their answer. Some candidates did not do this and provided input and output devices that were not applicable. Some candidates gave a very generic description of the use of the device e.g. barcode scanner, to scan barcodes. Candidates are reminded to refer to the context of the question when providing a use for input and output devices.

**Question 10(a)**

Many candidates provided the correct outputs for the logic gate.

**Question 10(b)**

Some candidates gave a correct statement. Some candidates did not use brackets in their statement and therefore could only was awarded a single mark for the connecting AND. Candidates are reminded to make sure that they use brackets, where necessary, in their logic statements.

**Question 11**

Many candidates provided three correct functions of an operating system. Some candidates were not accurate and detailed enough in their statement e.g. input/output. Candidates are reminded to make sure that they are accurate and provide enough detail in providing a function e.g. manages hardware devices/peripherals.

**Question 12(a)**

Many candidates provided two suitable sensors and described how they could be used in the chemical factory. Candidates had a large range of sensors they could choose and it was pleasing to see that the full range of suitable sensors were seen in candidate's answers.

**Question 12(b)**

Many candidates gave a detailed answer about how the sensors and the microprocessor would be used. Some candidates lacked detail in their answer, forgetting detail such as comparing the input value to the stored value. It would be beneficial for candidates to understand the context of the question and use it when describing the actions that may be taken, and not just provide a generic response. It would also be beneficial for candidates to understand that the process in continuous.

**Question 13(a)**

Many candidates gained marks for stating the file would be smaller and that it would be quicker to send. Some candidates provided an answer regarding the fact that it would take up less storage space. Candidates are reminded to read the question and answer according to the context. In the case, the question asked about the transmission of the data and not the storage of it. Some candidates demonstrated a misunderstanding that just because it was a smaller file, there was less chance of it being corrupted. This is speculative and not an accurate statement.

**Question 13(b)(i)**

Many candidates provided the correct compression method of lossless. Many candidates did not answer the question beyond this. Many candidates described the operation of lossless compression, rather than stating why it would be suitable, as required by the question.

**Question 13(b)(ii)**

Many candidates provided the correct compression method of lossy. Many candidates did not answer the question beyond this. Many candidates described the operation of lossy compression, rather than stating why it would be suitable, as required by the question.

# COMPUTER SCIENCE

**Paper 0478/21**
**Paper 2**

## Key messages

Candidates should be careful when declaring variables, constants and arrays to ensure that the identifier declared could be used in a program, that it is descriptive and follows the rules applicable to naming variables, constants and arrays. Candidates should also ensure that their answer is related to the part of the pre-release task mentioned in the question.

Candidates who explained their code when requested performed better than those who simply wrote out their code.

## General comments

Candidates who had previously completed the tasks for the pre-release (theme park trip) were able to demonstrate a good knowledge of techniques for solving this project using a number of acceptable interpretations and were therefore able to provide answers for ***Section A*** that showed a clear understanding of the programs they had created and how they had solved the tasks.

Very few questions were left unanswered.

## Comments on specific questions

***Section A***

**Question 1**

**(a) (i)** Many candidates correctly named up to two constants with appropriate and meaningful names. Common errors included spaces in the constants' names or the use of names for constants that would actually be variables in the program. The question also required a suitable value for each constant. A common error seen here was the use of a $ in the value when a cost was the subject of the constant. Only the numerical part is required.

**(ii)** Many correct answers were seen for this question. However, as with **part (i)**, the main reason for loss of marks was the inclusion of spaces within the array name. In this question, candidates were also asked to give the use of their arrays. Some answers were a little vague, but this part was generally well answered.

**(b)** Algorithms were seen in pseudocode, program code in a range of languages, or as a flowchart. Most candidates correctly initialised the costs of the coach and the entry ticket, prompted for and input the number of students taking part, and made an attempt at validation. Good candidates were also able to complete a robust validation that would work until a correct entry was made, as well as demonstrate the calculations involved in determining the cost per student. A number of interpretations for applying the free tickets to the cost of the trip were seen and so long as they would work within the supplied programs, they were accepted. Common errors included not providing a prompt for the input, not outputting the correct cost for each student and instead outputting the total cost of the trip, or validations that would not work.

**(c) (i)** Candidates were asked to suggest a suitable validation check and description for Task 1 and another for Task 2. Candidates' responses for Task 1 were better than those for Task 2; with a common mistake that the checks supplied by candidates did not match the task.

**(ii)** Candidates were asked to supply suitable test data relevant to the validation checks they had named in **part (c)(i)**, and the reasons for their choice. Common mistakes were that the test data supplied wasn't suitable for the validation checks provided, or the reasons given, were too vague.

**(d)** Most candidates demonstrated an understanding of how profit, loss or break even could be calculated in their programs. Good candidates gave good explanations of this and so earned full marks. Where marks were lost, it was due to candidates not being clear about how the total costs for the trip were calculated or from where the total income came. However, candidates generally showed awareness that the 'profit' was the difference between these two values.

***Section B***

**Question 2**

Candidates were able to spot a range of typical errors in program code. Common additional errors included candidates altering = signs to back arrows, when the question states that it is written in program code. Also, a small number of candidates offered descriptive answers when they were asked to provide corrections for the errors in code.

**Question 3**

Candidates who read this question carefully were able to provide the correct answers in the boxes, as all the necessary information was given. However, some candidates incorrectly copied some of the text from the diagram into the empty boxes and were therefore not successful.

**Question 4**

Most candidates attained marks on for this question, but very few attained all four marks. Candidates generally seemed to find the first part, 'checking the accuracy of a bar code' to be the most difficult.

**Question 5**

**(a)** Good candidates were able to provide good descriptions of each pseudocode statement as required by the question, which gave them both marks. Many candidates, however, did not do this and offered general descriptions of what was happening in the algorithm as a whole. Other descriptions were incomplete.

**(b)** This question was answered correctly by most candidates, with either a WHILE or REPEAT loop. However, a number of candidates suggested statements that were not pseudocode loops.

**(c)** Some candidates fully completed a valid pseudocode algorithm; others only completed part of the pseudocode algorithm. A number of candidates lost marks by using program code instead of the pseudocode required by the question. A few candidates used a flowchart, which was also not allowed.

**Question 6**

Many candidates were able to complete the first three columns of the trace table correctly and provide the correct values in the output. The most common mark not attained was therefore due to errors in the output text. This was often due to misspelling 'Celsius' as 'Celcius'. Some candidates also didn't notice that the first two columns were initialised to –100 in this question, rather than 0 as seen in previous papers.

**Question 7**

**(a)** Most candidates were able to supply a correct answer to this question of 'primary key and unique'. This question was phrased differently to those on previous papers where candidates may have expected to be asked to name the primary key and give reasons for its choice.

**(b)** Candidates demonstrated a good understanding of the Boolean data type, but were less confident with number and currency data types.

**(c)** Good candidates scored highly on this question, however, common mistakes included missing out the table name, not ticking the correct 'show' boxes, using search criteria in a format that didn't match the data types candidates had submitted for **part (b)**, or field names that didn't match the given field names exactly. Candidates who read the question carefully would have found all the information they needed to complete the query-by-example grid correctly.

# COMPUTER SCIENCE

**Paper 0478/22**
**Paper 2**

## Key messages

Candidates must take care when declaring variables, constants and arrays to ensure that the identifier declared could be used in a program. Identifiers must not contain spaces or other punctuation. Once declared the same identifier name should be used throughout the answer.

## General comments

Candidates who had completed the tasks for the pre-release (senior citizens' outing) were able to provide answers for ***Section A*** that showed good understanding of the tasks undertaken. Candidates, who read each question carefully and answered the question, set on the paper, performed better than those who wrote out the code from their solution to the task mentioned in the question.

Nearly all candidates attempted all the questions on the paper.

## Comments on specific questions

***Section A***

**Question 1**

**(a) (i)** Many candidates correctly declared a variable with a meaningful name, suitable data type and a description of its use in task 1. Common errors included incorrectly putting spaces in variable names, incorrect data type or choosing a variable from task 2.

**(ii)** Better candidates correctly stated two constants with their values and uses. Common errors included putting spaces in constant names, incorrectly stating a range of values, not being specific about the meal/ticket/coach referred to or indicating in the use that the value could change as the program was running.

**(b)** This question discriminated well with better candidates giving excellent explanations of the changes required to the calculation of the cost of the outing.

**(c)** Those candidates providing pseudocode, programming statements or flowcharts for task 2 usually scored high marks. Some candidates scored low marks by incorrectly providing an algorithm for task 1**.**

**(d)** Those candidates that provided an explanation of the programming statements used to find whether the outing had made a profit or has broken even scored good marks. Unlike **part (b)**, this answer requires an explanation of how the candidate's program, used to complete task 3, works. All programming statements must be explained in order to be creditworthy.

***Section B***

**Question 2**

**(a)** This part of question 2 discriminated well with better candidates writing excellent algorithms. Candidates needed to use a flowchart or pseudocode. Programming code was not asked for and candidates writing in a programming language sometimes did not include the required structure for example missing out the `THEN` from `IF` … `THEN` … `ELSE` … `ENDIF` statement.

**(b)** Candidates found this part more challenging with weaker candidates not supplying the required test data.

**Question 3**

Most candidates showed the skill of using a trace table for data entry and many correctly showed the calculated 'Total Weight'; better candidates correctly showed the 'OUTPUT'.

**Question 4**

**(a)** Generally well answered.

**(b)** Candidates found this part more challenging with weaker candidates not removing the statement to increment the variable `Count`.

**Question 5**

**(a)** Most candidates correctly identified the fields required. Choosing the correct data type proved more challenging.

**(b)** Most candidates correctly identified Ear Tag field as their choice of primary key.

**(c)** Completion of the query-by-example grid required good attention to detail and using the information provided to answer **part (a)** of the question. The criteria shown needed to be suitable for the data type chosen by the candidate, common errors included the addition of kg for the weight field or incorrectly including the date of birth field.

# COMPUTER SCIENCE

**Paper 0478/23**
**Paper 2**

## Key messages

Candidates should be careful when declaring variables, constants and arrays to ensure that the identifier declared could be used in a program, that it is descriptive and follows the rules applicable to naming variables, constants and arrays. Candidates should also ensure that their answer is related to the part of the pre-release task mentioned in the question.

Candidates who explained their code when requested performed better than those who simply wrote out their code.

## General comments

Candidates who had previously completed the tasks for the pre-release (theme park trip) were able to demonstrate a good knowledge of techniques for solving this project using a number of acceptable interpretations and were therefore able to provide answers for ***Section A*** that showed a clear understanding of the programs they had created and how they had solved the tasks.

Very few questions were left unanswered.

## Comments on specific questions

***Section A***

**Question 1**

**(a) (i)** Many candidates correctly named up to two constants with appropriate and meaningful names. Common errors included spaces in the constants' names or the use of names for constants that would actually be variables in the program. The question also required a suitable value for each constant. A common error seen here was the use of a $ in the value when a cost was the subject of the constant. Only the numerical part is required.

**(ii)** Many correct answers were seen for this question. However, as with **part (i)**, the main reason for loss of marks was the inclusion of spaces within the array name. In this question, candidates were also asked to give the use of their arrays. Some answers were a little vague, but this part was generally well answered.

**(b)** Algorithms were seen in pseudocode, program code in a range of languages, or as a flowchart. Most candidates correctly initialised the costs of the coach and the entry ticket, prompted for and input the number of students taking part, and made an attempt at validation. Good candidates were also able to complete a robust validation that would work until a correct entry was made, as well as demonstrate the calculations involved in determining the cost per student. A number of interpretations for applying the free tickets to the cost of the trip were seen and so long as they would work within the supplied programs, they were accepted. Common errors included not providing a prompt for the input, not outputting the correct cost for each student and instead outputting the total cost of the trip, or validations that would not work.

**(c) (i)** Candidates were asked to suggest a suitable validation check and description for Task 1 and another for Task 2. Candidates' responses for Task 1 were better than those for Task 2; with a common mistake that the checks supplied by candidates did not match the task.

**(ii)** Candidates were asked to supply suitable test data relevant to the validation checks they had named in **part (c)(i)**, and the reasons for their choice. Common mistakes were that the test data supplied wasn't suitable for the validation checks provided, or the reasons given, were too vague.

**(d)** Most candidates demonstrated an understanding of how profit, loss or break even could be calculated in their programs. Good candidates gave good explanations of this and so earned full marks. Where marks were lost, it was due to candidates not being clear about how the total costs for the trip were calculated or from where the total income came. However, candidates generally showed awareness that the 'profit' was the difference between these two values.

***Section B***

**Question 2**

Candidates were able to spot a range of typical errors in program code. Common additional errors included candidates altering = signs to back arrows, when the question states that it is written in program code. Also, a small number of candidates offered descriptive answers when they were asked to provide corrections for the errors in code.

**Question 3**

Candidates who read this question carefully were able to provide the correct answers in the boxes, as all the necessary information was given. However, some candidates incorrectly copied some of the text from the diagram into the empty boxes and were therefore not successful.

**Question 4**

Most candidates attained marks on for this question, but very few attained all four marks. Candidates generally seemed to find the first part, 'checking the accuracy of a bar code' to be the most difficult.

**Question 5**

**(a)** Good candidates were able to provide good descriptions of each pseudocode statement as required by the question, which gave them both marks. Many candidates, however, did not do this and offered general descriptions of what was happening in the algorithm as a whole. Other descriptions were incomplete.

**(b)** This question was answered correctly by most candidates, with either a WHILE or REPEAT loop. However, a number of candidates suggested statements that were not pseudocode loops.

**(c)** Some candidates fully completed a valid pseudocode algorithm; others only completed part of the pseudocode algorithm. A number of candidates lost marks by using program code instead of the pseudocode required by the question. A few candidates used a flowchart, which was also not allowed.

**Question 6**

Many candidates were able to complete the first three columns of the trace table correctly and provide the correct values in the output. The most common mark not attained was therefore due to errors in the output text. This was often due to misspelling 'Celsius' as 'Celcius'. Some candidates also didn't notice that the first two columns were initialised to –100 in this question, rather than 0 as seen in previous papers.

**Question 7**

**(a)** Most candidates were able to supply a correct answer to this question of 'primary key and unique'. This question was phrased differently to those on previous papers where candidates may have expected to be asked to name the primary key and give reasons for its choice.

**(b)** Candidates demonstrated a good understanding of the Boolean data type, but were less confident with number and currency data types.

**(c)** Good candidates scored highly on this question, however, common mistakes included missing out the table name, not ticking the correct 'show' boxes, using search criteria in a format that didn't match the data types candidates had submitted for **part (b)**, or field names that didn't match the given field names exactly. Candidates who read the question carefully would have found all the information they needed to complete the query-by-example grid correctly.