

# COMPUTER SCIENCE

---

<p><b>Paper 2210/11</b> <b>Computer Systems</b></p>
---

## **Key messages**

Candidates must show a greater use of technical terminology in their responses. They also need to note the key terms given in a question and structure their response based on the given context.

## **General comments**

Candidates and centres are reminded that written papers are scanned in and marked on computer screens by Examiners. 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 marks.

## **Comments on specific questions**

### **Question 1**

- (a) Most candidates were able to identify two suitable input devices. Some candidates gave input devices such as a keyboard and a mouse. These input devices are not suitable for the context of the device given in the question. Candidates must ensure that their response is suitable for the device given in the question.
- (b) Most candidates were able to identify a suitable output device. The most common incorrect answer given was headphones. Candidates are reminded to note that the question states the device could be built into the computer. It is not normal for headphones to be built into a tablet computer.
- (c) Most candidates were able to identify a suitable storage device. Some candidates referred to memory rather than storage device, for example RAM. These devices were also an acceptable response as they do store data and are built into the tablet. Some candidates gave incorrect responses such as a USB drive. This is not a storage device that is built into the tablet computer.

### **Question 2**

- (a) Most candidates identified the incorrect statement. The most common incorrect answer given was 'It uses the values 0 to 9 and A to F'. It is important for candidates to pay close attention to the requirement of the question.
- (b) Some candidates were able to provide three correct hexadecimal numbers. Some candidates only gave 2 rather than 20 for the second number. Many candidates converted the denary numbers into binary rather than hexadecimal. Candidates must pay close attention to the wording of the question.

### **Question 3**

- (a) Many candidates were able to give the correct binary number.
- (b) Many candidates were able to identify that it multiplied the binary number by 4. The most common incorrect answer given was that it would multiply the binary number by 2.

- (c) Some candidates were able to give the correct denary value. Some candidates just converted the binary value to denary and added a minus sign to the front of it to give the answer  $-163$ . These candidates seem to understand that as the most significant bit was 1, this meant the value would be negative, but they made the mistake of using this value as 128 rather than  $-128$ .
- (d) Many candidates were able to give the correct amount. Some candidates wrote 1000. This cannot be accepted as a value for kibibytes as it is not accurate. 1000 was previously accepted for kilobyte, but this unit system is no longer part of this syllabus.

#### Question 4

- (a) Most candidates were able to describe the structure of a packet by identifying the three different sections. Some candidates gave additional information about the contents of each section. This additional information was not necessary for the question, as it required them to describe the structure and not the content.
- (b) Many candidates were able to identify the correct device.
- (c) Few candidates could give a detailed and accurate explanation as to why serial data transmission is used. The most common correct point given was that the network may be over a long distance. Many candidates were inaccurate in their response, giving information about data packets possibly being skewed. This was incorrect for serial transmission. Candidates need to have a better understanding of serial data transmission in relation to it transmitting bits of data instead of packets of data. Candidates had a misconception that packets were sent along a single wire, one at a time, instead of bits being sent along a single wire, one at a time.

#### Question 5

- (a) Many candidates were able to correctly state the purpose of secondary storage. Some candidates incorrectly referred to the purpose being to create a backup of data away from the computer. Whilst this may be a use of it, it is not the purpose of it. These candidates appeared to have a misconception that secondary storage only exists outside the computer. Candidates need to understand that secondary storage also exists within the computer.
- (b) Some candidates were able to identify three correct examples of optical storage. The most common correct answer given was compact disk (CD). The most common incorrect answers given were read only memory (ROM) and hard disk drive (HDD). Many candidates appeared to have a misconception that an HDD is an example of optical storage. This may be because it has spinning platters, similar to the disk spinning in optical storage. Candidates need to understand that an HDD is magnetic storage and not optical storage.
- (c) Many candidates were able to explain why a computer needs RAM. Most candidates referred to RAM storing data temporarily along with the type of data that it would store, for example data currently in use. Few candidates referred to RAM speeding up the access time for data. Some candidates need to have a wider understanding of why a computer needs RAM.
- (d) Few candidates were able to draw a detailed and accurate diagram of the fetch stage of the FDE cycle. Many candidates incorrectly drew a diagram that identified the cycle had a fetch stage, a decode stage and an execute stage, with a short description of what happens in each stage.

#### Question 6

- (a) Few candidates were able to state the purpose of firmware. Some gave imprecise answers such as 'it runs the computer'. Some candidates need to have a greater understanding of the purpose of firmware.
- (b) Some candidates were able to give a correct example of firmware. The most common correct answers given were BIOS and Bootstrap.
- (c) Many candidates gave the operating system as an example of system software. A wide range of utility software was also given. Some candidates incorrectly gave functions of an operating system, for example memory management. The question required an example of system software and not a function of it.

### Question 7

Most candidates were able to give the correct missing terms.

### Question 8

- (a) Many candidates were able to refer to the robot being able to do tasks without the need for a human to operate them.
- (b) Many candidates were able to state that a robot has electrical components. Some were also able to state that it is programmable and that it has some degree of movement
- (c) Few candidates were able to accurately and technically explain how the sensors and the microprocessor would operate. Many candidates' responses were generic and had not been set in the context given.
- (d) Most candidates were able to give two correct advantages. The most common advantages given were 'no need to take breaks' and 'more efficient'.
- (e) Many candidates were able to give two correct disadvantages. The most common disadvantages given were 'the expensive cost to purchase' and 'costly to maintain'.
- (f) Few candidates were able to explain how machine learning would improve the robot. Most candidates gave a vague description about how it can now learn, but none of this was set in any context. Candidates need to have a greater understanding of how machine learning can improve a robot in different contexts.

### Question 9

- (a) Many candidates identified that data could be lost. Some also developed their answer to state that data could be also gained and changed.
- (b)(i) Few candidates were able to give an accurate and technically correct answer about how the two error detection systems would operate together. Most gave a vague description of 1s needing to be odd in an odd parity check. Most also described the ARQ system using both positive and negative acknowledgements in a mixed way that demonstrated a need for greater understanding.
- (ii) Most candidates were able to give two other examples of error methods.
- (c)(i) Some candidates were able to accurately describe the role of the firewall in keeping the network safe. Many candidates repeated and expanded on parts of the question simply stating that the firewall blocked hackers and various examples of malware. Candidates need to have a greater understanding of the operation of a firewall.
- (ii) Most candidates were able to give two examples of malware that the firewall would protect against.

# COMPUTER SCIENCE

---

<p><b>Paper 2210/12</b> <b>Computer Systems</b></p>
---

## Key messages

Candidates must show a greater use of technical terminology in their responses. They also need to note the key terms given in a question and structure their response based on the given context.

## General comments

Candidates and centres are reminded that written papers are 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 marks.

## Comments on specific questions

### Question 1

- (a) Most candidates were able to give the correct storage measurement.
- (b) Some candidates were able to give the correct number of bits. Many candidates gave the number of bytes rather than the number of bits.
- (c) Many candidates were able to give the correct storage measurement. Some candidates used the incorrect measurement of terabyte.
- (d) Some candidates were able to give their full working and a correct answer. Many candidates just gained working marks for having a correct multiplication and a correct division by 1024 but did not get the correct answer.

### Question 2

- (a) Most candidates were able to select the correct option.
- (b) Many candidates were able to give the correct unit.
- (c) (i) Some candidates were able to give a detailed and technical response. Many candidates gave vague statements describing encryption in general, rather than describing symmetric encryption specifically, for example, 'the data is encrypted using a key'. This kind of statement did not show the level of accuracy required that it is the same key that is used for encryption and decryption.
  - (ii) Most candidates were able to give the purpose of encryption. Some candidates incorrectly stated that it stops the data being stolen. These candidates need to improve their understanding of the purpose of encryption. The data can still be stolen, it will just not mean anything to the person that steals it.

### Question 3

- (a) Most candidates were able to give the correct number system.

- (b)(i) Most candidates were able to give the correct binary conversions.
- (ii) Some candidates were able to give an accurate and technical response. Many candidates made vague statements such as 'a computer can only understand binary'. These candidates need to have a more detailed understanding of why data needs to be converted to binary for a computer.
- (c) Many candidates were able to correctly add the two binary values. Some candidates did not show any working, for example they did not show the carry values that they had used. Candidates need to show all their working for binary addition questions that request working to be shown.
- (d) Many candidates were able to give the correct two's complement integer. Some candidates gave an incorrect binary number of 10100000. It is likely that these candidates have converted the value 32 to binary then added a 1 as the most significant bit to indicate it is negative. These candidates need to have an improved understanding of how to convert between denary and two's complement binary integers.

#### Question 4

- (a) Most candidates were able to give a correct example of system software. A range of utility software was seen in candidates' responses.
- (b) Many candidates were able to give two example of application software. The most common correct answers were word processor and spreadsheet. Some candidates gave brand names such as 'Microsoft Word'. Candidates are reminded that brand names should not be used in this exam. This is also stated on the front of the question paper.
- (c) Few candidates were able to accurately describe the difference between system software and application software, many candidates just repeated examples of each. The most common correct statement given was that application software allows the user to perform tasks.

#### Question 5

- (a) Few candidates were able to get all the missing terms correct. Many candidates completed the first term and second terms correctly but the third term incorrectly, stating 'The address is then sent to the memory data register (MDR)'. Many candidates completed the last term incorrectly stating that the 'current instruction register (CIR) that is built into the arithmetic logic unit (ALU).
- (b) Very few candidates were able to state what is meant by an instruction set. Many just gave a vague statement such as 'it is a set of instructions', just repeating the terms from the question.

#### Question 6

Many candidates were able to correctly complete the table. The most common error was candidates getting checksum and check digit mixed up.

#### Question 7

- (a) Many candidates were able to select the correct option.
- (b)(i) Few candidates were able to give a correct example of an IP address. The most common error made was the inclusion of values above 255. Some candidates gave incorrect responses such as router, ISP and different device names.
- (ii) Many candidates were able to give two correct characteristics. The most common correct responses were 128-bit and hexadecimal.

#### Question 8

- (a) Many candidates were able to draw and annotate a suitable diagram. Candidates need to make sure they are accurate in their responses, for example, they need to refer to the attack occurring on a web server and not the website.
- (b) Many candidates were able to provide a suitable security solution.

**Question 9**

- (a) Many candidates were able to correctly explain why secondary storage is needed. Some candidates incorrectly referred to the need to create a backup of data away from the computer. Whilst this may be a use of it, it is not why a computer needs it. These candidates appeared to have a misconception that secondary storage only exists outside the computer. It would be beneficial for candidates to understand that secondary storage also exists within the computer.
- (b) Few candidates were able to give accurate and detailed differences between the two types of storage. The most common correct answer given was about moving parts.

**Question 10**

- (a) Many candidates were able to describe what is meant by AI.
- (b) Few candidates were able to explain how the expert system would operate. Many candidates gave a generic response that simply listed the different components of an expert system. Most responses did not use the context given in the question.

**Question 11**

- (a) Many candidates were able to correctly describe the difference between the internet and the world wide web.
- (b) Many candidates were able to identify the three parts of a URL. The most common correct part given was the domain name.
- (c) Most candidates were able to give three correct functions of a web browser.

# COMPUTER SCIENCE

---

<p><b>Paper 2210/21</b> <b>Algorithms, Programming and Logic</b></p>
--

## Key messages

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. Practice for the large programming task would be beneficial to candidates. Correct flowchart symbols need to be used. Candidates also need a better understanding of trace tables.

## General comments

Candidates using additional pages must clearly indicate the question for which they are providing a further response. Candidates need to clearly write their name and candidate number on any additional booklets. Candidates need to fully read each question before attempting an answer.

## Comments on specific questions

### Question 1

Most candidates were able to correctly identify the correct validation check of a format check for an @ symbol with some candidates incorrectly identifying a presence check.

### Question 2

- (a) The majority of candidates correctly identified the procedure and function programming concepts.
- (b) There was confusion by many candidates with many candidates attempting to write the procedure heading instead of writing the pseudocode to call the procedure with the parameters.
- (c) Few candidates managed to identify the maintenance aspects of procedures and functions. Many candidates incorrectly answered the question describing how to write procedures and functions.

### Question 3

This question was answered well with correct explanations and examples given by most candidates.

### Question 4

- (a) The majority of candidates identified the errors on lines 9 and 10, with a few achieving all four marks for identifying all four errors.
- (b) Some candidates answered this question well. Some candidates tried to perform an average calculation instead of using the correct library routine.
- (c) Some candidates wrote their answer just in pseudocode. The question clearly asks for an explanation. In this case, candidates were allowed to use pseudocode, but it had to be fully explained, not using comments. Most candidates that explained the stages did not then include a loop in their explanation.

### Question 5

A minority of candidates used the correct pseudocode for a `CASE` statement. Most candidates only achieved the mark for inputting a number.

### Question 6

- (a) Most candidates correctly followed the flowchart algorithm and completed the trace table.
- (b) Generally, candidates did not answer this question well. Processes involve input of data, processing the data and outputting the data. A few candidates incorrectly stated the purpose of the algorithm and not the process involved.

### Question 7

- (a) The majority of candidates correctly outlined the purpose of storing data in a file.
- (b) This question was answered well by a minority of candidates. Candidates are reminded that reserved words are not allowed to be used for variable names. Most candidates did not use the correct pseudocode for opening, reading from and closing a file. Some used actual program code.

### Question 8

- (a) The majority of candidates achieved all the marks for the logic circuit, a minority used the incorrect symbol for an XOR gate.
- (b) This question was answered well by most candidates.

### Question 9

- (a) The answers for this question were mixed. Candidates either correctly identified that none were suitable or tried to justify one of the fields. Some candidates incorrectly identified 'Field' as a primary key, which was the heading of the table.
- (b) The minority of candidates used the correct SQL of `SUM` to return the number of cans. A significant number of candidates did not put quotation marks around 'Can' in the `WHERE` statement.

### Question 10

This question was a good differentiation question testing the candidate's ability to solve a problem by either using program code (Java, Python or Visual Basic) or pseudocode. The candidates were asked to meet three requirements. Requirement 1 was to input the number of matches played, the team's name for each of the 12 teams, and the wins, draws and losses for each team. This also needed to be validated. Requirement 2 was to calculate the number of points each team achieved and find the highest score or the teams with the highest score. Requirement 3 was to output the team or teams with the highest points if there was a tie for the top position.

The majority of candidates attempted the question.

Requirement 1: Most of the candidates correctly used loops. The best responses validated the number of matches against the wins, draws and losses.

Requirements 2: Most candidates only identified the index of the team with the highest points and not the highest points.

Requirement 3: Most of the candidates who attempted this requirement only identified the team with the highest points and had not written code in case of a tie.



# COMPUTER SCIENCE

---

<p><b>Paper 2210/22</b> <b>Algorithms, Programming and Logic</b></p>
--

## **Key messages**

Candidates must ensure that they fully answer the questions that were asked, with responses that match the context of the questions.

Candidates are also advised to answer pseudocode questions using pseudocode and flowchart questions are answered using a flowchart. Candidates are further advised to ensure that the style of pseudocode used matches the syntax of the pseudocode defined within the syllabus for this course.

Candidates must ensure that any answers 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'.

Candidates must ensure that they write a program using pseudocode, Python, Java or VB.NET for the final question and that the program accurately follows the details given in the scenario.

## **General comments**

Candidates demonstrated a good overall understanding of the requirements of most of the question paper.

Candidates are reminded that when answering the final programming question, they should read the scenario through to the end before writing their solution. Candidates do not need to declare variables and arrays unless it is stated this is required in the scenario. Candidates should proceed straight to the writing of the program, concentrating their efforts on the given tasks. Candidates must ensure that any variables and arrays defined or stated in the scenario to be used are included, and initialised if appropriate.

## **Comments on specific questions**

### **Question 1**

Most candidates were aware that a flowchart is a method used to design and construct a solution to a computing problem.

### **Question 2**

Most candidates were able to correctly identify the correct standard symbol for a range of logic functions.

### **Question 3**

A high proportion of candidates correctly identified abstraction and/or decomposition as two of the different tasks in the analysis stage of the program development life cycle. A number of these candidates were also able to identify a third task, such as identification of problem or identification of requirements.

### **Question 4**

- (a) The majority of candidates identified up to three validation checks as described in the question, with some additionally stating how each of these checks satisfied the rules given in the question. The correct tests seen were length check, format check and range check.
- (b)(i) A short piece of pseudocode was required to show how a length check could be implemented for a product code, to ensure it was only six characters in length. Candidates who demonstrated a

correct use of the `Length()` string function in combination with appropriate code to test that the result of this function was 6 achieved both marks.

- (ii) A short piece of pseudocode was required to show how a format check could be implemented for a product code, to ensure that the first two characters were 'PD'. Candidates who demonstrated a correct use of the `Substring()` string function in combination with appropriate code to test that the result of this function was 'PD' achieved both marks.

### Question 5

Many candidates found this question to be difficult. Brief statements on how arithmetic, Boolean and logical operators are used in programming, such as: used in calculations, used to test for true or false values, used in comparisons or conditional statements, for arithmetic, Boolean and logical operators, respectively, were required. In addition, an appropriate example in each case using pseudocode was also required.

Most candidates answered some or all this question and achieved one or more marks, with the full range of marks seen.

### Question 6

- (a) A pseudocode algorithm was required to demonstrate a totalling problem as described in the question. Most candidates answered the question, with those candidates who were better prepared in the use of pseudocode achieving the highest marks. The full range of possible marks was seen for this question.
- (b) A pseudocode algorithm was required to demonstrate a counting problem as described in the question. Although candidates seemed to find this question slightly more difficult than **Question 6(a)**, most candidates answered the question. As before, those candidates who were better prepared in the use of pseudocode achieved the highest marks. The full range of possible marks was seen for this question.

### Question 7

- (a) The majority of candidates achieved some or all the marks for this question in which they had to identify parts of the given code that used assignment, selection or iteration statements. Candidates were asked to identify the line number where each type of code could be found. A small number of candidates did not do this, but wrote out the code instead, which was not necessary.
- (b) Many candidates were able to identify one or two of the errors in the given algorithm, with a few candidates going on to achieve all three marks. As with **7(a)**, candidates were only required to identify the incorrect lines of code by giving the line numbers, but some wrote out the whole line, which was not necessary.

### Question 8

- (a) Many candidates achieved one or two marks for correctly writing some of the logic expression, with a relatively small number of candidates going on to achieve the third mark. A common mistake for this question was to include `X=` as the first part of a complete logic expression.
- (b) This question was answered well, with most candidates achieving high marks.

### Question 9

- (a) Many candidates found this trace table question to be quite difficult. A common error amongst nearly correct solutions was not providing enough evidence to show all the iterations of the algorithm through to its full completion.
- (b) The majority of candidates identified that the given algorithm was a sorting algorithm, even if they had not completed the trace table correctly. A high proportion of these candidates also correctly identified that the result was presented in descending order.

### Question 10

- (a) The majority of candidates correctly identified `ContractNumber` as the most appropriate field for a primary key from the given list.
- (b) Candidates with a good understanding of the acceptable data types given in the syllabus achieved the best marks for this question.
- (c) Candidates generally recognised the purpose of the given structured query language (SQL) statements. Those candidates who were able to explain this purpose using words other than those in the given code.
- (d) Most candidates achieved one or both marks for the completion of an SQL statement. Candidates whose completed SQL statements were accurate without spelling errors and were appropriate in terms of the data types that were being used, achieved the best marks.

### Question 11

Candidates were required to complete an extended program using pseudocode, Python, Java or VB.NET to meet a set of requirements given in a scenario based on a game to find the location of a randomly generated secret cell in a 5 × 5 grid.

A wide range of quality of responses was seen, with most responses using either pseudocode or Python, but a small number of VB.NET solutions were also seen.

The full range of marks was awarded, with many candidates achieving high marks. 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 full or near full marks also followed the remaining guidance at the end of the scenario to a high standard. This included the comprehensive use of comments to explain what each part or sub part of the solution was doing and the use of appropriate messages to accompany all inputs and outputs.

The best responses also correctly used the data structure given in the scenario in the way it was expected to be used as stated in the scenario; in this case a two-dimensional (2D) array `Grid()`.

Many good responses were seen with a larger proportion of candidates than expected giving their response in the form of a set of functions. It is acceptable for candidates to give responses that are at a higher level than required by the scenario, but to achieve the top marks, the most important thing to remember is that every one of the points given within the scenario must be completed. It should also be noted that if the question states 'you do **not** need to declare any arrays or variables; you may assume this has already been done', as is the case here, then no marks are awarded if these arrays or variable are declared. The time is therefore better spent on completing the requirements of the scenario. It is important to note that if variables need to be initialised, for the algorithm to perform correctly, then this does still need to be shown within the code.