

OXFORD

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AQA EXAMINATIONS

INTERNATIONAL GCSE COMPUTER SCIENCE

(9210/2) Paper 2

Report on the examination

June 2022

REPORT ON EXAMINATION: INTERNATIONAL GCSE COMPUTER SCIENCE 9210/2 PAPER 2 JUNE 2022

QUESTION 01

Question parts 1.1 and 1.4 were tackled well, but students found parts 1.2 and 1.3 more challenging.

More than two thirds of students were correctly able to convert the number from binary to hexadecimal successfully in part 1.1. The most common mistake was to convert the number to decimal instead of hexadecimal, for which no credit was awarded. Another common mistake was writing the hexadecimal digits in the wrong order, resulting in an answer of 9C instead of C9.

For both question parts 1.2 and 1.3, students needed to recognise that a computer stores all values in binary. Therefore, the number of values that can be stored in a byte can be calculated as $2^8 = 256$, regardless of which number system (hexadecimal or decimal) was being used. The most common incorrect response was 255, which is the biggest value that could be stored in a byte rather than the number of different values that could be stored. Indeed, for part 1.3, this response was seen more frequently than the correct response.

The vast majority of students were able to convert the decimal number to binary in question part 1.4. However, some students failed to achieve this mark as they wrote their answer as a 7-bit value, when the question required that it was written as a byte.

QUESTION 02

Good responses to question part 2.1 recognised that a pixel was the smallest part of an image that could have its colour set independently. Most students made a reasonable attempt at this question but some lost marks owing to lack of precision in their responses.

Question part 2.2 was very well answered with the vast majority of students recognising that more storage space would be required.

For part 2.3, the maximum number of colours that can be represented in three bits could be calculated as $2^3 = 8$. The most common incorrect response was 7, which is the highest number that can be represented in 3 bits. Students need to remember that 0 is also a valid number for a colour so if the highest representable number is 7, there are 8 possible colours in total.

Most students achieved at least two marks for question part 2.4. Many students did not recognise that the coloured image could be represented by the bit pattern, with a colour depth of 2, and so did not achieve full marks.

QUESTION 03

Question parts 3.1 and 3.2 were very well tackled. Almost three-quarters of students recognising that an assembler would be used to translate assembly language into machine code and over 90% of students knew that machine code instructions are represented in binary.

The most commonly stated response for part 3.3 was that high-level languages are easier to understand than low-level languages. Other commonly seen responses included that high-level languages always required translation and that low-level languages offer good control over computer hardware.

Relatively few students wrote about the different features of the two types of language, which is an important area of this topic. High-level languages provided many additional features, such as data structures, iteration structures, subroutines and extensive libraries. It is important that students realise that the terms machine-code and low-level language are not interchangeable, as low-level languages also include assembly language. Whilst it is true that machine code is written in binary and does not need translating, this is not true for assembly language and so is not true for all low-level languages.

QUESTION 04

Approximately 10% of students did not attempt question 4. Of those who did, most either achieved full marks or no marks at all. Good responses showed how the lists would be merged together at each stage until a fully sorted list was arrived at. Some students re-wrote the single item list of [30] when they combined the other six values into three two-item lists. This was not penalised, but a merge sort program would be unlikely to do this.

QUESTION 05

There were many good responses to question part 5.1, which recognised that sound was an analogue quantity and that as computers use binary they can only represent and process digital values.

Students found question part 5.2 more challenging. This question required students to calculate the duration of a sampled sound instead of the amount of memory that the sampled sound required to represent it. Many students achieved some working marks, most commonly for multiplying 16 by 10000, and approximately 40% of students were able to perform the calculation fully to arrive at the correct answer of 50 seconds. A small number of students used the value of 1024 for the number of bytes in a kilobyte which made the calculations more complex. For this specification, the value of 1000 is used in line with the International System of Units standard.

QUESTION 06

For question part 6.1, approximately half of students recognised that secondary storage is required to store data whilst a computer is turned off. Secondary storage can also be used to transfer data between computers and to install new software. The most common misconception was that secondary storage was just an extension of main memory which allowed more data to be stored.

Almost all students tackled question part 6.2 and attempted to describe how an optical disc works. There was a significant variation in the quality of the responses, from the very superficial, to responses that went well beyond the degree of technical understanding that is required at this level. Approximately a quarter of students achieved all four marks. Good responses recognised that pits and lands were used to represent 0s and 1s as reflective and non-reflective spots on the disc. These are read by a laser that is directed at the disc and a sensor that measures how much light is reflected. A common mistake was to suggest that the laser itself read the data off the disc, rather than the sensor.

QUESTION 07

The vast majority of students got some marks for completing the trace of the algorithm in question part 7.1, but only a quarter of students achieved full marks. The most commonly achieved marks were for setting the initial values of some of the variables. Given that few students completed the trace fully, the number who were able to describe the purpose of the algorithm in question part 7.2 was low. When writing such descriptions, students need to ensure that they describe the overall purpose of the algorithm, rather than writing literal descriptions of how the code is working.

QUESTION 08

The vast majority of students were able to achieve some marks for writing correct HTML code in question part 8.1. The most frequently achieved mark was for the tag `</title>` at the start. Some students incorrectly wrote `</br>` for a line break – the responses `<br>` and `<br />` were both accepted. Another frequently given, but incorrect tag for a line break was `</n>`, which was probably given as `/n` is often used in programming languages to generate a new line. Some students confused bulleted and numbered lists and used `<ol>` and `</ol>` incorrectly instead of `<ul>` and `</ul>`.

Question part 8.2 was tackled less successfully than 8.1. Fewer than half of the students achieved any marks for completing the CSS code correctly. The correct responses were `color` and `font-weight`. Students often wrote `colour` instead of `color` and whilst we would not penalise spelling mistakes in most questions, as this was code, `color` had to be spelt as defined in the CSS standard for the mark to be awarded. Other common

mistakes were to write `font-color` or `text-color`. With regard to selecting bold text, the most common incorrect response was `font-style`.

For question part 8.3, the majority of students correctly identified that the `<img />` tag is available in both HTML 5 and earlier versions of HTML.

QUESTION 09

Most students tackled some parts of question 9 successfully. Students found question parts 9.1 and 9.2 the hardest and found parts 9.4 and 9.5 the most accessible.

Good responses to question part 9.1 recognised that the control unit was responsible for managing the fetch-execute cycle, decoding instructions, or controlling the other components of the computer when an instruction is executed. Most students found these concepts difficult to describe and did not achieve a mark. Some responses assigned more tasks to the control unit than it actually carries out, such as fetching instructions and generating a clock pulse.

Many students gave partial responses to question part 9.2, explaining that the bus was a set of wires that connected components but did not achieve a mark because the question asked about the role of a bus, which such responses did not address. A student needed to go further and explain that the wires would be used to transfer data between components to be awarded the mark.

Most students achieved full marks for writing a completely correct Boolean expression for question part 9.3. Those who did not achieve full marks usually added the + C correctly at the end of the expression but went wrong when they tried to represent the NOT gates.

Question parts 9.4 and 9.5 were very well answered with over three quarters of students achieving full marks for correctly completing the trace table and being able to name the OR gate.

Many students achieved some marks in question parts 9.6 and 9.7, but frequently the responses did not contain enough explanation to award both of the marks that were available.

Good responses to question part 9.6 identified that each core could process instructions independently and so a processor with more cores could execute more instructions simultaneously. Weaker responses stated that more instructions could be executed or that instructions would be executed more quickly but did not explain why, so were not credited.

Good responses to question part 9.7 explained that cache memory could be accessed more quickly than main memory and that having more cache would reduce the number of fetches from main memory, improving performance. A common misconception was that increasing the amount of cache memory would allow the computer to store more data.

QUESTION 10

Students found question part 10.1 challenging. Many responses discussed specific details of a network that were not relevant or identified that a network connected computers but did not explain why and so did not achieve a mark.

A range of good points were made in responses to question part 10.2. The most commonly identified benefits were that hardware devices such as printers could be shared and that files could be shared or worked on collaboratively. In relation to risks, students often explained that hacking might occur or that viruses could spread more easily through the network. It is important to note that viruses can spread without a network through the use of removable drives.

It is important that students understand that if a question asks them to describe something, then simply stating it will not be enough to achieve a mark; more detail is required. It is also worth noting that risks and disadvantages are not the same thing. For example, the need to purchase networking hardware or to employ a network manager might be described as disadvantages of having a computer network but they are not risks.

QUESTION 11

Most students tackled all of the parts of question 11 and achieved some marks.

Just under half of students achieved the mark for question part 11.1. Good responses explained that a protocol was a set of rules that governed how communications between devices occurred. The term instructions should not be used as an alternative to rules in this instance.

In question part 11.2, most students correctly identified that SMTP was used for sending emails. In contrast, only a minority were able to explain that HTTPS was used for secure web transactions that required the data to be encrypted. Common errors were to compare HTTPS to HTTP instead of explaining the purpose of HTTPS and to state that HTTPS would make a website secure, when it is the connection to the website that it secures.

QUESTION 12

Question 12 continued on the theme of networking.

Question part 12.1 was mostly well answered, but there was some confusion between TCP/IP and OSI terminology. The name given for the bottom level of the TCP/IP stack in this specification is link layer, whilst the OSI model uses the term data link layer for its layer two. There is some overlap between the functionality of these layers, so this year data link was awarded a mark but it will not be in future examination series.

Part 12.2 was not well tackled, with less than a third of students achieving the mark. Good responses recognised that the key function of the network layer was to route data across a series of networks, which could include the Internet. Students who stated that the layer would transmit data across the Internet were not awarded the mark as the term “transmit” does not capture the idea of the selection of a pathway, which “routing” does.

Fewer than half of students achieved any marks for question part 12.3. The most commonly identified difference between TCP and UDP was that transmission using UDP was faster as it does not perform the error recovery that TCP does. The applications of streaming and online gaming were commonly cited in responses.

QUESTION 13

Question part 13.1 required students to select a method of social engineering and describe it. The vast majority of students were able to name a method and achieved some marks for describing it.

The most frequently described social engineering method was phishing. Students usually identified that an email would be sent and this might be used to collect David’s login details but many failed to explain the email would contain a link that David would need to click on to be taken to a website where he would enter these details.

Some students described pharming and correctly identified that a fake website would be used to collect David’s login details but many failed to explain that the traffic to the genuine website would be redirected to the fake website automatically, which is an important feature of pharming.

A small number of students described a method of social engineering but did not name it, so could not be awarded any marks.

Some very good descriptions of penetration testing were seen for question part 13.2. The best descriptions explained that penetration testing involved people being employed by a company to try to break into their computer systems and steal data without, or with only limited knowledge of, login details etc to identify security vulnerabilities. Some students described the difference between black-box and white-box penetration which was not required, but these students generally made other points that were creditworthy as well.

QUESTION 14

The vast majority of students correctly explained that compression would reduce the size of a file and so were awarded the mark for question part 14.1. A small number of students made other valid points, such as that a compressed file could be transmitted more quickly. A few responses were too vague, such as that compression would free up space, and so did not receive a mark.

Question part 14.2 was well tackled with approximately two thirds of students successfully placing at least some letters in the Huffman tree. The most common error was to fail to add an extra node to the tree to represent the letter C.

QUESTION 15

This question was about databases. Question parts 15.1 and 15.2 were well answered with the vast majority of students correctly giving a data type such as float and identifying the primary key as `StudentID`.

Most students knew how to tackle question part 15.3 and correctly gave a list of records formed from the two tables in the database. Whilst some errors were made, nearly two thirds of students included records for the correct two students and books in the table. The most common mistake was to also include a record for the student McCay.

For question part 15.4, the vast majority of students correctly identified that the SQL code to delete the record was `DELETE FROM Student WHERE StudentID = 27`.

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