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COMPUTER SCIENCE

Paper 0478/12
Paper 1

Key messages

Candidates were able to demonstrate a good understanding of many topics. In some cases, candidates were not answering the question given, for example describing a concept instead of explaining why it was needed.

General comments

Candidates are reminded to make sure that they do not write outside the given writing space in a question. If additional writing space is required, candidates should use the additional pages available. They should make sure, they clearly indicate the question for which they are providing a further response.

Comments on specific questions

Question 1

(a) Many candidates were able to correctly convert the given denary values to binary. It would be helpful if candidates could clearly cross out an error and rewrite the answer, as opposed to attempting to convert a 0 to 1 or vice-versa which can make it difficult to interpret.

(b) Many candidates were able to give the correct denary value here. A common error was 256 which is the quantity of different binary numbers.

(c) Many candidates were able to correctly give 11 as the number of bits. Some candidates gave the binary value for 2000 in 11-bits but did not give the answer to the question.

(d) (i) Many candidates were able to identify that the transmission was over a long distance, but fewer were able to relate this to why serial was better. Candidates need to make sure they are answering the question, a common answer involved defining serial and parallel transmission, as opposed to why serial was more appropriate in this scenario. The most common answers identified the reduced risk of errors and desynchronisation, although many candidates thought that serial does not have any errors, which is inaccurate.

(ii) This question was answered well by many candidates who were able to correctly give both key points. A common error was describing it as sending down one cable, which may not be the case.

(iii) Candidates were able to demonstrate a reasonable understanding of checksums. Many candidates gave a description of a formula used to generate a checksum from the data. A common error was describing the checksum as counting the number of bits, this would generate the file size and not any value based upon the data and could be mistaken for parity bits. Another misconception is that the checksum creates a check digit, which is confusing the use of checksums and check digits and does not identify that a checksum could be multiple digits.

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Question 2

(a) Many candidates were able to demonstrate an understanding of compression. Candidates understood that lossy compression removed data permanently, but fewer candidates could accurately apply their understanding to the scenario of images. A common error was referring to compressing sound files or describing run-length encoding. Candidates need to make sure they are referring to the removal of unnecessary data and not unwanted data, because the compression algorithm will not understand what is wanted or not but can identify unnecessary data such as colours that cannot be distinguished between.

(b) This question was answered well with most candidates correctly matching the addresses.

(c)(i) Candidates could often describe that this was a secure connection, but this is given in the name of the layer 'Secure Socket Layer (SSL) connection', candidates need to give the benefit of this secure connection. Some candidates were able to express this primarily as using encryption which meant that the data could not be understood.

(ii) Candidates did well on this question, with many being able to correctly describe how the connection was created. A common error involved candidates describing how the transmission is encrypted, for example how the SSL works to protect data, as opposed to answering the question about how it is created. Another common error was describing the web server as asking the browser to identify itself, for example reversing the actions. Candidates need to make sure they are using appropriate technical terminology when answering questions, for example a website cannot send a certificate because it is just a HTML page, it is the web server that performs the processes. Similarly, the user does not request the web server to identify itself, this is done by the software of the web browser.

Question 3

Many candidates found this question challenging. The most commonly correct responses were the identification of a projector and inkjet printer. Many candidates attempted to describe a mouse, but responses were often generic to input devices, for example it allows a user to open software. Fewer candidates could describe an actuator, the most commonly correct responses referred to it as producing physical movement. Answers that were not specific enough often described it giving an output, which all output devices do.

Question 4

(a) Many candidates could demonstrate an understanding of how a barcode is read. Some candidates did not answer the given question, and many described what is meant by a barcode, for example describing the format and not how it is read. Fewer candidates were able to describe how the price of the product is found, a common error was describing how the quantity of items in stock would be updated, which did not form part of this question. For the second part of this question, candidates often gave generic statements of how the system stores data and finds the price for the product, without referring to how this is actually done and what data is stored.

(b)(i) Many candidates were able to give some relevant points about solid state storage, most commonly the use of transistors and/or gates. Fewer candidates could explain how these components work to store the data.

(ii) Candidates found this question challenging. Many answers referred to generic advantages of SSD, without any consideration for the context. The SSD is used in the supermarket and therefore it is unlikely to be moved and size is unlikely to be important, therefore advantages related to these points were not relevant to the scenario. The most common answer related to the faster read/write operation, but at times this was given as faster, without any context as to what it is faster at. Also, faster transmission was often given, but the SSD does not dictate the transmission speed, this is the connection used and therefore if it has the same connection as an HDD then the transmission speed is the same.

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Question 5

(a) Most candidates were able to get at least one of these logic gates correct, with many successfully giving all three.

(b) This question was also answered well, with many candidates giving fully correct logic circuits with a range of correct alternatives also given. Candidates must make sure their gates are clearly drawn so that there is a clear difference, for example between an AND and OR gate.

Question 6

(a) Responses to this question were mixed, with some candidates demonstrating a good understanding of firewalls, but other responses were often vague and did not clearly explain how it prevents hacking. The most commonly awarded points included the monitoring of incoming and outgoing traffic and blocking signals that do not meet the requirements. Fewer candidate were able to give further depth, for example that the user can set the criteria, or that the firewall can block specific ports for entry or exit.

(b) Many candidates were able to correctly identify two types of risk that are used to obtain personal data. A common error was candidates identifying any internet risk, including those that are not used to obtain personal data, for example viruses. Some candidates also repeated hacking from the previous question. Some candidates mixed up phishing and pharming, giving the opposite description for each. When describing phishing candidates need to be clear as to what directs the user to the fake website, for example opening the email on its own will not take the user to a fake website, it is the action of clicking on a link or attachment that does this.

Question 7

(a) Many candidates were able to demonstrate an understanding of high-level languages. The question asked what is meant by the high-level language, but many candidates instead gave benefits instead, for example that it is easier to read, without giving the feature that makes it easier to read.

(b) Many candidates were able to give features of both interpreters and compilers. Most commonly this included interpreters translating one line at a time, while compilers translate all the code. The question asked for the features of interpreters and compilers, many candidates gave benefits and drawbacks of each instead, for example being able to run the code without the compiler is not a feature of a compiler, it is a result of using the compiler.

Most candidates focused on the differences between the two, and fewer also identified what both translators can do, for example identify errors and translate the code from high-level to low-level.

(c) Many candidates had a good understanding of both free software and shareware. They commonly gave descriptions of the user being able to edit free software and not shareware. Shareware was also often correctly described as having a free trial. Some responses referred to programs being copyrighted, for example that free software is not copyrighted, where it might be subject to copyright, but states that the user can edit and modify it.

(d) Most candidates had the idea that it involved using someone else's work, but many did not identify that it was claiming this work as your own.

(e) Candidates were often able to convey that this was to protect the application but did not explain why this is done. Copyrighting does not stop the application being copied or plagiarised, people can still do this, copyrighting it means that doing this is illegal and that Adeel can take legal action against them.

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Question 8

(a) Candidates found this question challenging. Some candidates were able to identify that the instructions and data were stored in the same memory, but some responses referred to data on its own, or the programs and data which is inaccurate. Fewer could identify that the instructions were fetched and executed in order.

(b) (i) Some candidates were able to clearly describe the role of the program counter as storing the address of the next instruction. Two common misconceptions were that the program counter stores the instructions (as opposed to the address) and that the program counter counts how many programs/instructions have run. Candidates need to be careful when explaining that it stores the address of the instruction, for example stating it stores the address of the location of the instruction, could be read as the address points to an address that points to the instruction.

(ii) Candidates found this question challenging. Many candidates described it as controlling components, for example doing the actual control as opposed to carrying these control signals. Some candidates also described it as carrying instructions, which does not differentiate these control instructions from program instructions.

(c) Many candidates were able to demonstrate an understanding of what an interrupt was, fewer could explain why they were actually needed. The most common answers reference multitasking and stopping the current process. A number of responses also reference the need to prioritise actions. Many candidates gave an example of an interrupt instead of why they are needed in general. A common misconception is that the interrupt takes place to tell the user that something has happened, associating interrupts with error messages to the user, which would be the result of some interrupts.

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Paper 0478/22
Paper 2

Key messages

Candidates who had completed the tasks for the pre-release (multiplication table quiz) 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, as set on the paper, performed better than those who had memorised their solution and used all of that information without considering what information needed to be included in their answer.

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

Questions asking for an explanation about changes to a section of a program, for example **Question 1(d),** require the candidate to explain what changes to program are required and include any programming code for those statements.

Trace tables should be clearly completed in ink, not in pencil with alterations made in ink, because both answers are visible when the answer is scanned.

General comments

Most candidates attempted all questions in both sections.

Comments on specific questions

Section A

Question 1

(a) Most candidates correctly identified a suitable variable to use for storing the students answer in **Task 1**. Many candidates explained how their program ensured that the data entered for the answer was valid.

A common error seen for the variable was identifying a variable used for another purpose, for example storing the student's name. Common errors seen for the validation included explanations of verification, checking for a correct answer and not including an explanation relating to the program. An example of an answer that would gain the marks available is *'use of a REPEAT … UNTIL loop to check that the answer was greater than or equal to 2 and less than or equal to 144'*.

(b) Most candidates correctly stated a meaningful variable name and an appropriate data type for a different variable used in **Task 2**.

(c) Generally, well answered. Algorithms were usually written in pseudocode or program code; a few flowcharts were seen. Most candidates correctly showed most of the steps required for **Task 1**. Some candidates included the extra code needed for **Tasks 2** and **3**, this was not required. Common errors in the programs, included lack of prompts and/or validation for entry of data and incorrect use of the Boolean operators AND and OR.

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(d) Well answered by those candidates who explained how their program completed **Task 3** and included each of the programming statements added to **Task 1** as well as a full explanation of the purpose of the statement added. Many candidates identified the addition of extra prompts and inputs for the number of questions and whether a 'mixed' set of questions was required. Some candidates then explained how the extra data entered would be used, for example '*use of the variable,* `NumberOfQuestions` *as a replacement limit for a FOR … NEXT loop to ensure that the correct number of questions is asked.* `FOR Counter ← 1 to NumberOfQuestions`' provides an explanation with the programming statement that was changed.
Common errors included programming code without an explanation and explanations not supported by programming code.

(e) Well answered by those candidates who explained how their program for **Task 1** could have been changed. Many possible methods of providing three different answers with the correct answer not always displayed in the same position were explained. Responses that only paraphrased the bullet points in the question or only included code shown without explanation were not creditworthy.
Common errors seen, included providing redundant explanations of how other unchanged parts of **Task 1** worked.

Section B

Question 2

(a) Generally, well answered with few errors.

(b) Generally, well answered. Stating an example of extreme test data proved most challenging for candidates. Common errors seen, included giving examples of extreme data that were erroneous and would not be accepted.

(c) Many candidates identified the changes required to the algorithm by describing the functionality and position of the extra code required. Common errors seen, included not providing a position or description of the code required.

Question 3

Most candidates could match each pseudocode statement with the correct flowchart symbol.

Question 4

(a) The full range of marks was awarded with many candidates showing the skill of completing a trace table. Common errors seen, included not initialising the columns for `Accept`, `Over` and `Under`, initialising the columns for `BagWeight`, `Error` and `Total` or including extra values in the `Total` column. Candidates also found the OUTPUT column a challenging column to complete correctly and common errors seen were to incorrectly include inverted commas round the output, for example `"Number overweight"`, or include a comma for example `Number overweight, 2` or omit the message completely.

Some trace tables were completed in pencil with alterations made in ink, this made identifying correct answers difficult because both answers were clearly visible when the answer was scanned.

(b) Generally, well answered, most candidates correctly identified the error and a suitable correction.

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Question 5

(a) Many candidates gained marks for this part of the question showing understanding of the data types required. Common errors seen, included restating the data type chosen as the reason for the choice of data type or selecting a data type not listed in the question.

An example of an answer with suitable reasons is:

SIZE data type	*Text*
Reason	*The sizes used are single words with a suitable meaning.*
PRICE data type	*Currency*
Reason	*The price could be used in calculations and should be displayed with the appropriate currency sign.*
NUMBERSOLD data type	*Number*
Reason	*The number of chocolate bars is a whole number that could be used in calculations.*

(b) Generally, well answered with many query-by-example grids completed as required. Common errors seen, included missing item(s) from the criteria row, incorrect criterion for NUMBERSOLD or missing column for SIZE.