GCSE
COMPUTER SCIENCE
8520/2

Paper 2 Written Assessment

Mark scheme

June 2021

Version: 1.0 Final

216G8520/2/MS

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this mark scheme are available from aqa.org.uk

The following annotation is used in the mark scheme:

; - means a single mark

// - means alternative response

/ - means an alternative word or sub-phrase

A. - means acceptable creditworthy answer. Also used to denote a valid answer that goes beyond the expectations of the GCSE syllabus.

R. - means reject answer as not creditworthy

NE. - means not enough

I. - means ignore

DPT. - in some questions a specific error made by a candidate, if repeated, could result in the candidate failing to gain more than one mark. The DPT label indicates that this mistake should only result in a candidate losing one mark on the first occasion that the error is made. Provided that the answer remains understandable, subsequent marks should be awarded as if the error was not being repeated.

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Level of response marking instructions

Level of response mark schemes are broken down into levels, each of which has a descriptor. The descriptor for the level shows the average performance for the level. There are marks in each level.

Before you apply the mark scheme to a student's answer read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

Step 1 Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer. With practice and familiarity you will find that for better answers you will be able to quickly skip through the lower levels of the mark scheme.

When assigning a level you should look at the overall quality of the answer and not look to pick holes in small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level and then use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 3 with a small amount of level 4 material it would be placed in level 3 but be awarded a mark near the top of the level because of the level 4 content.

Step 2 Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this. The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do not have to cover all of the points mentioned in the Indicative content to reach the highest level of the mark scheme.

An answer which contains nothing of relevance to the question must be awarded no marks.

Qu	Part	Marking guidance	Total marks
01	1	**Mark is for AO2 (apply)** 11011100;	1

Qu	Part	Marking guidance	Total marks
01	2	**2 marks for AO2 (apply)** 10101101;; If the binary answer given is incorrect then award a maximum of **one** working mark as follows: • A converted to 1010 • D converted to 1101 • both hexadecimal digits converted correctly to decimal, ie A=10, D=13	2

Qu	Part	Marking guidance	Total marks
01	3	**Mark is for AO2 (apply)** 26;	1

Qu	Part	Marking guidance	Total marks
01	4	**Mark is for AO2 (apply)** FF;	1

Qu	Part	Marking guidance	Total marks
02		**Mark is for AO1 (understanding)** **D** Hexadecimal is more compact when displayed on screen; **R.** If more than one lozenge shaded.	1

Qu	Part	Marking guidance	Total marks
03		**Mark is for AO2 (apply)** 00101100; **A.** Any number of leading zeros including none, eg 101100.	1

Qu	Part	Marking guidance	Total marks
04		**2 marks for AO2 (apply)** 1110 1011;; If the binary answer given is incorrect then award a maximum of **one** working mark as follows: • left-hand side 4 bits are correct, ie 1110 • right-hand side 4 bits are correct, ie 1011	2

Qu	Part	Marking guidance	Total marks
05	1	**4 marks for AO2 (apply)** 6;;;; If the answer given is incorrect then award a maximum of **three** working marks as follows: • converting 8 minutes to 480 (seconds); • 100 000 // 25 000 x 4; • divide by 8; • divide by 1 million;	4

Qu	Part	Marking guidance	Total marks
05	2	**2 marks for AO1 (understanding)** One mark for each of the following points: • the file size would increase; • (the more samples per second) the more accurate / (the higher the sampling rate) the truer (higher quality) the (recorded) sound;	2

Qu	Part	Marking guidance	Total marks
06		**2 marks for AO1 (recall)** **B** Application management; **E** Processor management; **R.** If more than two lozenges shaded.	2

Qu	Part	Marking guidance	Total marks
07	1	**Mark is for AO1 (recall)** Example answers: (Software) that is for end-user tasks; (Software) that allows the user to carry out day to day tasks/work;	1

Qu	Part	Marking guidance	Total marks
07	2	**2 marks for AO1 (recall)** Any two relevant examples (maximum of **two** marks), such as: • word-processing software; • database software; • spreadsheet software; • social media application; • communication software; • online ordering applications; • online auction software; • gaming software; **R.** Proprietary names. **R.** Utility software such as anti-virus, disk defragmenter / disk cleaner.	2

Qu	Part	Marking guidance	Total marks
08	1	**3 marks for AO1 (understanding)** One mark for each of the following points (maximum of **three** marks): • there isn't a groove; • there isn't a needle; • there aren't any bumps; • nothing runs along the surface of the disk;	3

Qu	Part	Marking guidance	Total marks
08	2	**Mark is for AO1 (understanding)** One mark for either of the following points (maximum of **one** mark): • (a magnetic hard) disk spins (very quickly); • (one of the components of the drive is) a read / write head;	1

Qu	Part	Marking guidance	Total marks
09		**2 marks for AO1 (recall)** **B** It is used for main memory; **D** It is volatile memory; **R.** If more than two lozenges shaded.	2

Qu	Part	Marking guidance	Total marks
10		**6 marks for AO1 (understanding)** One mark for each point (maximum of **two** marks per section). **Clock speed:** • the more pulses a second the more fetch-execute cycles / processes per second; • each instruction starts on a clock pulse; • the more pulses per second the more instructions are likely to be carried out // a higher clock speed means more instructions can start per second; **A.** Opposites of above. **A.** Limitations including consequences of overclocking; heat build-up affecting performance. **Number of processor cores:** • affects the number of instructions that may be executed simultaneously // the greater the number of (processor) cores the greater the number of instructions that may be executed simultaneously; • different (processor) cores dealing with different types of instruction (eg graphics, maths) (improve the execution of software); • each (processor) core can fetch / execute its own instructions (which increases the speed at which instructions can be executed); **A.** Opposites of above. **Cache size:** • instructions / data take less time to transfer to the processor from cache; • because cache is held closer to the processor; • the more cache the more data / instructions can be held (close to the CPU); • the more cache the faster the CPU can access frequently needed instructions / data; **A.** Opposites of above.	6

<table>
<tr><th>Qu</th><th>Part</th><th>Marking guidance</th><th>Total marks</th></tr>
<tr><td>11</td><td>1</td><td>3 marks for AO2 (apply)

<table>
<tr><th>X</th><th>Y</th><th>P</th></tr>
<tr><td>0</td><td>1</td><td>0</td></tr>
<tr><td>0</td><td>0</td><td>0</td></tr>
<tr><td>0</td><td>1</td><td>0</td></tr>
<tr><td>0</td><td>0</td><td>0</td></tr>
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<tr><td>0</td><td>0</td><td>0</td></tr>
<tr><td>1</td><td>1</td><td>1</td></tr>
<tr><td>1</td><td>0</td><td>0</td></tr>
</table>

One mark for each column completed correctly;

A. Follow through on column P from incorrect columns X or Y.</td><td>3</td></tr>
</table>

Qu	Part	Marking guidance	Total marks
11	2	**Mark is for AO1 (recall)** OR;	1

Qu	Part	Marking guidance	Total marks
11	3	**2 marks for AO2 (apply)** One mark for each of the following: • replace (gate) G1 with an OR gate; • replace (gate) G3 with an OR gate; **A.** Any other acceptable alternative.	2

Qu	Part	Marking guidance	Total marks
12		**2 marks for AO1 (understanding)** One mark for any of the following points for embedded systems (maximum of **two** marks): • embedded systems have a specific purpose while non-embedded systems are general-purpose; • embedded systems (tend to) have smaller amounts of memory than non-embedded systems; • embedded systems (tend to) have less processing power than non-embedded systems; • embedded systems are built into a specific device while non-embedded systems are not; • embedded systems (tend to) have a higher proportion of ROM than non-embedded systems; **A.** Opposites of above.	2

Qu	Part	Marking guidance	Total marks
13	1	**2 marks for AO1 (recall)** 1 mark for each of the following points: • two or more computers; • connected together (to allow communication);	2

Qu	Part	Marking guidance	Total marks
13	2	**2 marks for AO1 (understanding)** 1 mark for each of the following points (maximum of **two** marks): • acts as a barrier / interface between a computer (network) and external connections / devices; • inspects incoming and / or outgoing packets of data; • to see if packets may be malicious; • to see if packets may be allowed / disallowed by firewall settings / criteria; • restricts use of certain services / ports;	2

Qu	Part	Marking guidance	Total marks
13	3	**2 marks for AO1 (understanding)** Marks can only be awarded for one of the two security methods. 1 mark for any of the following points (maximum of **two** marks): **Authentication:** • takes one or more pieces of data specific to the user; • and compares them to known / stored credentials // and only allows access to the system if the credentials are valid; **MAC address filtering:** • takes the (unique / specific) MAC address for a device; • and checks to see if it is in the list of allowed / blocked addresses // and only allows device to connect to the system if it has permission to do so;	2

Qu	Part	Marking guidance	Total marks
13	4	**2 marks for AO1 (recall)** **A** A protocol is a set of rules; **D** Ethernet is a family of protocols; **R.** If more than two lozenges shaded.	2

<table>
<tr><th>Qu</th><th>Part</th><th>Marking guidance</th><th>Total marks</th></tr>
<tr><td>14</td><td></td><td>

6 marks for AO2 (apply)

<table>
<tr><th>Level</th><th>Description</th><th>Mark Range</th></tr>
<tr><td>3</td><td>A range of uses, advantages legal and/or ethical considerations has been accurately described. The descriptions are in the context of travel.</td><td>5–6</td></tr>
<tr><td>2</td><td>Statements have been made about uses, advantages and legal and/or ethical considerations. There is a brief description of some which may contain inaccuracies. The statements are in the context of travel.</td><td>3–4</td></tr>
<tr><td>1</td><td>Some statements have been made about one or more of potential uses, advantages, legal and/or ethical considerations. These may not be accurate or correct. Some of the statements are in the context of travel.</td><td>1–2</td></tr>
<tr><td>0</td><td>No creditworthy material.</td><td>0</td></tr>
</table>

Indicative content

Uses:

- near-field communication (NFC) payments for tickets can be made
- easy personal identification (without physical ID) when picking up pre-booked tickets
- enables secure access to systems / devices (eg a rental car)
- enables others access to your medical information if difficulties occur when you are travelling / if language is a barrier
- crossing borders without passport.

Advantages:

- you'll not need a wallet / cash
- don't have to carry multiple cards
- may contain health data for emergency use.

Legal and ethical considerations:

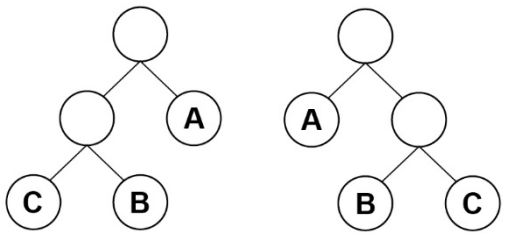
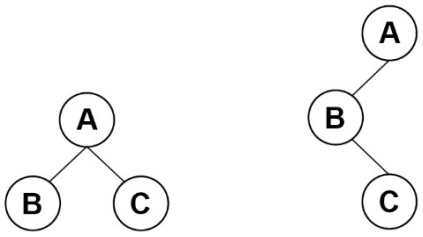
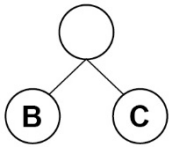
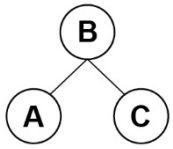
- may pose a risk of greater surveillance (by government / employers)
- may be exploited by criminals
- privacy of (and amount of) stored data and consent for use.

</td><td>6</td></tr>
</table>

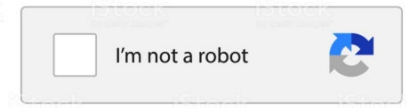
Qu	Part	Marking guidance	Total marks
15		**2 marks for AO1 (understanding)** 1 mark for any of the following concerns and 1 mark for relevant expansion: • spoofing or session hijacking; where the attacker assumes the identity of an authorised user; • eavesdropping; all network data is broadcast and can be intercepted by third party; • encrypting data; making sure that data is not transmitted in plain text; by ensuring that routers have encryption turned on; • malware infiltration; a Wi-Fi network is more exposed to attack because it's visible; • malicious hotspots; unofficial access points that look like they are part of the network;	2

Qu	Part	Marking guidance	Total marks
16	1	**Mark is for AO2 (apply)** B11 W12 B17;	1

Qu	Part	Marking guidance	Total marks
16	2	**2 marks is for AO2 (apply)** 00001111 10001001;; If answer is not correct, **one** working mark may be given as follows: • the first bit values (for colour) are both correct (0 and 1); • the frequency values are both correct (0001111 and 0001001);	2

Qu	Part	Marking guidance	Total marks
17	1	**3 marks for AO2 (apply)** 3 marks if solution is fully correct;;; If solution is not fully correct then mark as follows: • If all three letters shown then award 1 mark for each letter in correct relative location (to a maximum of **two** marks) • Award 1 mark if only two letters shown but they are in the correct relative locations **I.** Frequency totals written inside nodes. **Correct solutions**  3 marks;;; **Partially correct solutions**  2 marks (all three letters shown with two letters in correct relative location);;  1 mark (only two letters shown in correct relative location);  1 mark (all three letters shown but only 1 letter (C) in correct relative location);	3

Qu	Part	Marking guidance	Total marks
17	2	**3 marks for AO2 (apply)** 43;;; If incorrect answer then a maximum of **two** working out marks may be awarded as follows: • calculate ASCII bits: 9 characters x 7 bits // 63 (bits); • Huffman bits: (3 x 2) + (2 x 2) + (2 x 2) + (1 x 3) + (1 x 3) / (7 x 2) + (2 x 3) // 20 (bits); • correctly subtracting Huffman bit total from ASCII bit total; • Huffman code written in full (10 11 01 000 10 11 10 01 001);	3

Qu	Part	Marking guidance	Total marks
18	1	**Mark is for AO1 (understanding)**  ; **R.** If more than one box ticked.	1

Qu	Part	Marking guidance	Total marks
18	2	**3 marks for AO1 (understanding)** 1 mark for each of the following points (maximum of **three** marks): • account registration; • account access; • online voting systems; • ticket purchasing / transaction completion; • on pages where comments / reviews can be posted; • on parts of the website where fraudulent click-throughs may be possible;	3

Qu	Part	Marking guidance	Total marks
19		**2 marks for AO1 (recall)** **A** Blagging; **D** Phishing; **R.** If more than two lozenges are shaded.	2

<table>
<tr><th>Qu</th><th>Part</th><th>Marking guidance</th><th>Total marks</th></tr>
<tr><td>20</td><td></td><td>

9 marks for AO1 (understanding)

<table>
<tr><th>Level</th><th>Description</th><th>Marks</th></tr>
<tr><td>3</td><td>There is a good description of the role of one named protocol in each layer.

Correct technical language is used throughout.</td><td>7–9</td></tr>
<tr><td>2</td><td>There is some description of the role of one named protocol in each layer.

Some correct technical language is used though there may be errors.</td><td>4–6</td></tr>
<tr><td>1</td><td>Statements are made about the role of one named protocol in each layer.

Little or no technical language is used or is used incorrectly.</td><td>1–3</td></tr>
<tr><td>0</td><td>No creditworthy material.</td><td>0</td></tr>
</table>

Guidance to examiners

Good description of protocol role might be:

HTTPS is an extension of HTTP and allows secure transfer of data between a browser and a website by encrypting data. The web browser will check the website server's security certificate and ensure it is legitimate. This means it's not possible to see or eavesdrop on what you're browsing or for your data to be stolen.

Some description of protocol role might be:

HTTPS allows secure transfer of data between a browser and a website by encrypting the data being transferred to stop your data being stolen. It does this by checking a security certificate to see if the website is legitimate.

Statements about protocol role might be:

In HTTPS the S stands for secure and stops your data being stolen on a website. It encrypts your data.

Indicative content (role of protocols listed in question)

HTTP	Provides a way for users to interact with web resources. Transmits messages between client and server using hypertext.
HTTPS	As HTTP but in addition uses an encryption protocol to ensure communications are secure.
SMTP	Enables users to send (and receive) email messages.

</td><td>9</td></tr>
</table>

			Initiates sessions between user and mail server. Server then forwards messages. Uses a process called 'store and forward' to store messages and forward as necessary. The server decides which server to send the message to and the inbox provider then downloads the message and places it in the recipient's inbox. Often used in conjunction with IMAP.	
		IMAP	Stores email messages on an ISPs server but allows user to manipulate messages as though on a local device. Local devices access the ISP server to access the messages. IMAP works with desktop clients and webmail clients. Allows simultaneous logins from different devices to one account	
		FTP	Allows secure transfer of files between client and server. Files are uploaded to and downloaded from the server using FTP.	
		TCP	Connects network devices to the Internet. It defines how applications can create channels of communication across a network. It manages how a message is assembled into smaller packets before transmission and reassembles packets in the correct order at destination.	
		UDP	Communications protocol that establishes low latency and loss-tolerating connections between applications. Enables the transfer of data before an agreement is provided by the receiving party. This speeds up transfers. Can start transferring data before agreement is received from receiving party.	
		IP	Relays data across network boundaries. It defines how to address and route each packet to make sure it reaches the right destination.	