AQA

GCSE
COMPUTER SCIENCE
8520/2

Paper 2 Written Assessment

Mark scheme

June 2020

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206G8520/2/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.

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)** 148;	1
01	2	**Mark is for AO2 (apply)** 94;	1
01	3	**2 marks for AO2 (apply)** 8F;; If the answer given is not 8F then award a **maximum of 1 working mark** for any of the following: • converted 143 to `10001111`; • converted 143 to an incorrect 8-bit binary number but converted this correctly to hexadecimal; • attempted division of 143 by 16 to get a quotient of 8 and a remainder of 15 but incorrectly represented this in hexadecimal; • either the 8 or the F are present anywhere within the answer;	2
01	4	**2 marks for AO2 (apply)** `10111110`;; If the answer given is not `10111110` then award a **maximum of 1 working mark** for any of the following: • converted B to 1011; • converted E to 1110; • converted BE to 190 and then incorrectly converted this value to binary;	2

Qu	Part	Marking guidance	Total marks
01	5	**2 marks for AO1 (understanding)** A **maximum of 2 marks** can be awarded. Examples include: • hexadecimal is easier (for humans) to read (than binary); **A.** easier to understand • numbers are displayed in a more compact way (in hexadecimal than in binary); • it is quicker to type in (hexadecimal numbers than binary numbers); • it reduces the risk of typing errors (hexadecimal numbers than binary numbers); **R.** individual points that imply less memory is used.	2
02	1	**2 marks for AO2 (apply)** Marks should be awarded as follows: • the right hand side 2 bits are correct (10); • the answer is fully correct (11011010);	2
02	2	**Mark is for AO2 (apply)** One mark for the correct answer only; 1 1 1 0 0 1 0 0	1
03	1	**Mark is for AO2 (apply)** 63 // 2^6 -1;	1
03	2	**2 marks for AO2 (apply)** 40 000;; If incorrect answer is given then **maximum of 1 mark** for working: • 5000; • multiplying by 8; • multiplying by 1000;	2

Qu	Part	Marking guidance	Total marks
04	1	**3 marks for AO1 (understanding)** A **maximum of 3 marks** can be awarded. Example mark points include: • a microphone/sound sensor picks up/detects the sound wave; • this wave is converted to an (electrical) analogue signal; • the amplitude/height of the wave is measured; • the sampling takes place at regular intervals; • these samples are stored as binary values; **Note:** award one mark for "analogue (signal) converted to digital" if none of the last three example mark points awarded	3
04	2	**2 marks for AO2 (apply)** 1320 (kB);; If the answer given is not 1320 kilobytes, a **maximum of 1 working mark** should be awarded as follows: 1. Multiplying the correct 3 values together (44 000 * 30 * 8 = 10,560,000 bits) even if the result is incorrect; 2. Dividing the result of a multiplication by 8 (even if the result is incorrect); 3. Correctly dividing the result of a calculation by 1000;	2

Qu	Part	Marking guidance	Total marks
05	1	**Mark is for AO1 (recall)** **C** The process of encoding information to try and use fewer bits than the original; **R.** if more than one lozenge shaded.	1
05	2	**2 marks for AO1 (understanding)** A **maximum of 2 marks** can be awarded. Example mark points include: • To speed up file transfer; • To use less storage (capacity); • (It could) save money if you use less bandwidth; • To use less memory; • (It could) save money if you use less storage capacity;	2
05	3	**Mark is for AO1 (understanding)** (The data) contains lots of runs; **A.** repeating values	1
05	4	**2 marks for AO1 (understanding)** **How it works** (max 1 mark) • the number of consecutive pixels/data points/characters of the same colour/value/character would need to be counted; • (pairs of values would be stored), which would consist of a run length and the colour/value/character of the pixels/data points/text in the run; **Example** (max 1 mark) • Image example of how the specific row of pixels would be compressed eg 9 Black, 11 Red, 8 White; • Text example of how the specific run of characters would be compressed eg 7 G, 6 Y, 12 $ **A.** run length and data value either way round.	2

Qu	Part	Marking guidance	Total marks
06		**3 marks for AO1 (recall)** **B** Control unit; **D** Memory; **H** Shared bus; **R.** if more than three lozenges shaded.	3
07	1	**3 marks for AO1 (understanding)** A **maximum of 3 marks** can be awarded. Example mark points include: • it stores instructions whilst a program is being executed; • it stores data whilst a program is being executed; • each unique memory location in memory holds one value; • every memory location has a unique address; • once data has been stored in memory it can be found again later (when it's needed); • data and instructions are replaced in memory as needed;	3
07	2	**2 marks for AO1 (understanding)** A **maximum of 2 marks** can be awarded. Example mark points include: • RAM is volatile // the contents of RAM are lost when the power is removed // secondary storage is non-volatile // the contents of secondary storage are not lost when the power is removed; • RAM capacities are (usually) lower than secondary storage capacities; • generally (the contents of RAM can be read/written) faster than secondary storage // RAM is physically closer to the CPU; **R.** references to cost **R.** references to physical size	2

<table>
<tr><th>Qu</th><th>Part</th><th>Marking guidance</th><th>Total marks</th></tr>
<tr><td>08</td><td></td><td>2 marks for AO1 (recall)

A maximum of 2 marks can be awarded for any two of the following:

• Processor/CPU;
• I/O devices;
• Applications/programs;
• Security;
• File storage/management;

R. references to memory</td><td>2</td></tr>
<tr><td>09</td><td>1</td><td>3 marks for AO2 (apply)

1 mark for any one character correctly encoded
2 marks for any three characters correctly encoded
3 marks for all characters correctly encoded

<table><tr><th>M</th><th>O</th><th>S</th><th>T</th></tr><tr><td>10111</td><td>10110</td><td>010</td><td>111</td></tr></table></td><td>3</td></tr>
<tr><td>09</td><td>2</td><td>4 marks for AO1 (understanding)

1 mark for each of the following:

• the characters with the highest frequencies should not be combined // the characters with the lowest frequencies should be combined;
• the frequency table should not be sorted alphabetically // the frequency table should be sorted in order of frequency;
• the letter S does not have the highest frequency in Figure 2 // E has the highest frequency;
• the new node should not be added to the end of the frequency table // the new node should be inserted in the correct place based on the combined frequencies;</td><td>4</td></tr>
</table>

Qu	Part	Marking guidance	Total marks
09	3	**2 marks for AO2 (apply)** 122 (bits);; If the answer given is not 122 bits, a **maximum of 1 working out mark** should be awarded as follows: **ASCII Calculation** 36 characters * 7 bits // 252 (bits); **Calculate Saving** Subtracting 130 from any other value;	2
10	1	**2 marks for AO1 (recall)** A **maximum of 2 marks** can be awarded. • a collection/group of computers; • connected/joined together; **A.** references to allowing the sharing of resources if context is correct	2

<table>
<tr><th>Qu</th><th>Part</th><th>Marking guidance</th><th>Total marks</th></tr>
<tr><td>10</td><td>2</td><td>9 marks for AO1 (understanding)
<table>
<tr><th>Level</th><th>Description</th><th>Mark Range</th></tr>
<tr><td>3</td><td>Responses at the upper end of the level will contain a thorough discussion of the advantages and disadvantages of both wired and wireless networks. The security of both types of network are compared in detail. The response is well structured and coherent.

Responses at the lower end of the level will mostly contain discussions, but may also include some thorough explanations, of the advantages and disadvantages of both wired and wireless networks. The security of at least one type of network is explained in detail. The response is well structured and coherent.</td><td>7–9</td></tr>
<tr><td>2</td><td>Responses at the upper end of the level will contain detailed explanations of the advantages and disadvantages of both wired and wireless networks. The security of at least one type of network is explained. The response makes sense when read as a whole and a logical trail of thought is apparent.

Responses at the lower end of the level will mostly contain explanations, but may also include some descriptions, of the advantages and/or disadvantages of both wired and wireless networks. The security of at least one type of network is described. The response makes some sense when read as a whole.</td><td>4–6</td></tr>
<tr><td>1</td><td>Responses at the upper end of the level will contain descriptions of the advantages and/or disadvantages of wired and/or wireless networks. The security of at least one type of network is described. The response makes some sense when read as a whole.

Responses at the lower end of the level will include a few statements related to one or more of the required points. The response might be disjointed and without any cohesion.</td><td>1–3</td></tr>
<tr><td colspan="2">No creditworthy material</td><td>0</td></tr>
</table></td><td>9</td></tr>
</table>

Indicative Content

	Wired Network	Wireless Network
Advantages	• Connection speeds are typically faster • They typically have higher bandwidth • They typically have better security/fewer security risks	• Typically lower setup costs • No wires/cables are required • It is easy to connect new devices • Users not confined to a single location // Users can connect to the network as long as they are within range • Can connect multiple devices without the need for extra hardware
Disadvantages	• Cables can be hazardous and unsightly • Not all devices can connect via cable eg some tablets • Can be expensive to set up	• Connection speeds can be slower • Connection speeds can reduce the further from the WAP you are • They can be subject to interference from walls, objects and other nearby electronic devices • They are typically less secure • Connections are not as stable as wired networks and can 'drop off'
Security	• Typically more secure than wireless as need physical access to the network to intercept data	• Risk of theft of bandwidth by neighbouring users within range • Risk of data loss/data being stolen unless encryption is used • Typically easier to intercept data/'hack' network // Wireless transmissions can be intercepted by anyone within range of the router

<table>
<tr><th>Qu</th><th>Part</th><th>Marking guidance</th><th>Total marks</th></tr>
<tr><td>10</td><td>3</td><td>4 marks for AO1 (understanding)

A maximum of 4 marks can be awarded.
Award 1 mark for each correct tick.

<table>
<tr><th>Network Protocol</th><th>Application layer</th><th>Transport layer</th><th>Internet layer</th><th>Link layer</th></tr>
<tr><td>HTTP</td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>UDP</td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>IP</td><td></td><td></td><td>✓</td><td></td></tr>
<tr><td>IMAP</td><td>✓</td><td></td><td></td><td></td></tr>
</table>

R. Any row that contains more than one tick.</td><td>4</td></tr>
<tr><td>11</td><td>1</td><td>2 marks for AO1 (recall)

• (the processes/practices/technologies/methods designed to) protect networks/computers/programs/data;
• from attack/damage/threats/unauthorised access;</td><td>2</td></tr>
<tr><td>11</td><td>2</td><td>2 marks for AO1 (recall)

• (Malware is a blanket/umbrella term for) computer software/program/code;
• with malicious/hostile/intrusive intent;</td><td>2</td></tr>
</table>

<table>
<tr><th>Qu</th><th>Part</th><th>Marking guidance</th><th>Total marks</th></tr>
<tr><td>11</td><td>3</td><td>8 marks for AO2 (apply)
<table>
<tr><th>Level</th><th>Description</th><th>Mark Range</th></tr>
<tr><td>4</td><td>Responses at this level will contain a thorough explanation of how all of the threats could be exploited by a student. The response makes clear reference to a school network. The response is well structured and coherent.

More than one consequence has been described.</td><td>7–8</td></tr>
<tr><td>3</td><td>Responses at this level will contain a detailed explanation of how most of the threats could be exploited by a student. The response makes clear reference to a school network. The response is well structured and coherent.

At least one consequence has been described.</td><td>5-–6</td></tr>
<tr><td>2</td><td>Responses at the upper end of the level will contain some explanations of how most of the threats could be exploited by a student. The response makes some reference to a school network. The response makes sense when read as a whole.

Responses at the lower end of the level will mostly contain descriptions of how some of the threats could be exploited by a student. The response might make some reference to a school network. The response makes some sense when read as a whole.

In this level students may not have referred to the consequences.</td><td>3–4</td></tr>
<tr><td>1</td><td>Responses at the upper end of the level will contain descriptions of at least one of the threats and/or consequences.

Responses at the lower end of the level will include a few statements related to one or more of the required threats/consequences.</td><td>1–2</td></tr>
<tr><td colspan="2">No creditworthy material</td><td>0</td></tr>
</table></td><td>8</td></tr>
</table>

		Indicative Content The indicative content below is written in a generic manner for the benefit of examiners. Responses should be worded in the context of a school to gain the highest marks. For example reference to pupils using default passwords or them gaining access to staff-only areas through misconfigured access rights. • Weak and default passwords: o students could use brute force methods to crack passwords o weak admin passwords would allow students to gain admin level access o default passwords allow students to gain access without any effort o default passwords published online so everyone knows them. • Misconfigured access rights: o allows students to access areas they are not supposed to o network admins might not know that secure areas had been breached as no-one has 'broken in' o students could reconfigure network o students could create new user accounts to give themselves admin access. • Removable media: o could contain malware that allows students to gain access to network o could be used to steal data o could be used to allow students to take control of certain network processes (eg remote access systems). • Unpatched and/or outdated software: o could allow students to exploit known weakness/flaw o known weaknesses/flaws are published online o once in a student could install malware.	

11	4	**1 mark for AO1 (recall)** **C** The art of manipulating people so they give up confidential information. **R.** if more than one lozenge shaded.	1

Qu	Part	Marking guidance	Total marks

11	5	**4 marks for AO2 (apply)**
		
		A **maximum of 4 marks** can be awarded.
		
		One mark for each point and **one mark** for an expansion.
		
		Answers that are too similar to each other must only be credited once.
		
		Example responses include:
		
		• Train staff/students to be cautious of emails;
		  ○ that come from unrecognised senders;
		  ○ that ask you to confirm personal/financial information (over the Internet);
		  ○ that make urgent requests for personal/financial information;
		  ○ that are not personalised;
		  ○ that try to upset you into acting quickly by threatening you with frightening information;
		• Train staff/students not to click on links/download files/open attachments (in emails); from unknown senders/sources;
		• Prevent students from being able to download; anything from the internet/email links;
		• Train staff/students to never enter personal information; in a pop-up screen;
		• Train staff/students not to copy web addresses (into a browser); from pop-ups;
		• Protect the school computers with a firewall/spam filters/anti-virus/anti-spyware software; and keep the software updated;
			4

Qu	Part	Marking guidance	Total marks
12		**2 marks for AO1 (understanding) and 2 marks for AO2 (apply)** A **maximum of 4 marks** can be awarded. **One mark** for each point and **one mark** for an expansion. Where creditworthy points are too similar to each other they must only be credited once. Example responses include: • if the microchip was going to be implanted in a person they would need to give consent; If they are suffering from an illness like Alzheimer's disease, they may not be able to give consent; • a doctor/hospital might be able to apply to the courts; for permission to implant a microchip against the patient's will; • guarantees might not exist that only the correct hospital/doctor; can read the information on the chip; • if a hacker gains access; they could use the information for blackmail or identity theft; • if the patient decides they want the implant removed; it may not be ethical to implant something that cannot be easily removed;	4