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GCSE  
COMPUTER SCIENCE  
8520/2  
PAPER 2

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Mark scheme

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Specimen 2015

v1.0

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, in which all associates participate, 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 Assessment Writer.

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](http://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	<p><b>Mark is for AO2 (apply)</b></p> <p><b>1 mark:</b> 78;</p>	1
01	2	<p><b>All marks AO2 (apply)</b></p> <p><b>1 mark:</b> 4; <b>1 mark:</b> E;</p> <p><b>Maximum 1 mark:</b> If final answer not correct.</p>	2
01	3	<p><b>All marks AO1 (understanding)</b></p> <p><b>1 mark:</b> The answer is incorrect because number will be represented using binary in a computer's memory; <b>1 mark:</b> so it will take up the same amount of memory space;</p>	2
01	4	<p><b>All marks AO1 (understanding)</b></p> <p>(Shifting the bit pattern) three places; to the left;</p> <p><b>Mark as follows:</b> <b>1 mark:</b> for correct direction of shift <b>1 mark:</b> for correct number of times to shift</p>	2
01	5	<p><b>Mark is for AO2 (apply)</b></p> <p><b>1 mark:</b> B:F;</p> <p><b>If more than one lozenge shaded then mark is not awarded</b></p>	1
01	6	<p><b>All marks AO1 (understanding)</b></p> <p><b>Advantages:</b> Can represent a wider range of characters; Can represent characters from a wider range of languages; Can represent characters used in scientific/mathematical/technical/specialist documents;</p> <p><b>Disadvantages:</b> (It is likely that Unicode) uses more bits to represent each character;</p>	2

		<p>Requires more storage space;                  Longer transmission time;  <b>NE</b> Unicode uses 16/32 bits</p> <p><b>Mark as follows:</b>  <b>1 mark:</b> correct advantage of Unicode given  <b>1 mark:</b> correct disadvantage of Unicode given</p>	
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01	7	<p><b>All marks AO2 (apply)</b></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Character</th> <th>Huffman coding</th> </tr> </thead> <tbody> <tr> <td>O</td> <td>111</td> </tr> <tr> <td>SPACE</td> <td>10</td> </tr> <tr> <td>B</td> <td>00110</td> </tr> </tbody> </table> <p><b>Mark as follows:</b>  <b>1 mark</b> per correct response</p>	Character	Huffman coding	O	111	SPACE	10	B	00110	3
Character	Huffman coding										
O	111										
SPACE	10										
B	00110										

01	8	<p><b>1 mark for AO1 (understanding) and 2 marks for AO2 (apply)</b></p> <p>7; * 26; = 182                  182 – 83; = 99</p> <p>//</p> <p>8; * 26; = 208                  208 – 83; = 125</p> <p><b>Mark as follows:</b>  <b>1 mark for AO1:</b> identifying number of bits used to represent an ASCII character;  <b>1 mark for AO2:</b> multiplying by 26;  <b>1 mark for AO2:</b> subtracting 83 from their answer for the number of bits used to represent the ASCII version of the text; <b>A.</b> Incorrectly calculated number of bits used for ASCII version  <b>Maximum 1 mark:</b> for correct answer with no working out shown</p>	3
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02	1	<p><b>Mark is for AO1 (recall)</b></p> <p><b>1 mark:</b> Physical/electrical components/parts (of a computer system);</p>	1
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02	2	<p><b>Mark is for AO1 (recall)</b></p> <p><b>1 mark:</b> B: Bus;</p> <p><b>If more than one lozenge shaded then mark is not awarded</b></p>	1
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02	3	<p><b>All marks AO1 (understanding)</b></p> <p>Program instructions (for current programs) are in the main memory;          The next instruction is fetched to the processor from the main memory;          Data being used by the instruction being executed may also be in the main memory;          To execute the instruction data may need to be fetched/read from the main memory;          Data/results may need to be written to the main memory;</p> <p><b>Max 4</b></p>	4
02	4	<p><b>All marks AO1 (recall)</b></p> <p><b>1 mark:</b> increase clock speed;  <b>1 mark:</b> increase number of cores/processors;  <b>A.</b> increase bus width  <b>A.</b> increase word size  <b>A.</b> improve processor architecture  <b>A.</b> increase amount of main memory</p>	2

03	1	<p><b>2 marks for AO1 (1 mark recall, 1 mark understanding)</b></p> <p><b>1 mark:</b> 1<sup>st</sup> statement; mark is AO1 recall; <b>B:False</b>  <b>1 mark:</b> 2<sup>nd</sup> statement; mark is for AO1 understanding; <b>B:False</b></p> <p><b>If more than one lozenge shaded for statement then mark is not awarded</b></p>	2
03	2	<p><b>2 marks for AO1 (understanding)</b></p> <p>In washing machines, programs are (likely to be) stored in ROM (instead of RAM);  Main memory and CPU in washing machines are one component/part of the same chip // main memory is (physically) separate from the CPU on a non-embedded system;  Washing machines (likely to) have more ROM than RAM;</p> <p><b>A.</b> No need for secondary storage in washing machines as programs are kept in ROM;</p> <p><b>MAX 2</b></p>	2
04	1	<p><b>2 marks for AO1 (understanding)</b></p> <p>Two colours needed in the image so two possible bit patterns needed // one bit per pixel (for black and white image);  36 pixels (so 36 bits needed);</p>	2
04	2	<p><b>1 mark for AO2 (apply)</b></p> <p>2;</p>	1
04	3	<p><b>1 mark for AO1 (recall)</b></p> <p>Smallest (addressable) part of a (bitmapped) image;  A single dot of colour;</p> <p><b>Max 1</b></p>	1

05	1	<p><b>All marks AO1 (understanding)</b></p> <p><b>Reasons for allowing:</b>            Teachers can access resources on the school network to allow them to plan lessons at home;            Teachers can teach lessons from home (using videoconferencing) if they are not able to get into work (eg travel difficulties);            Teachers can access electronic copies of student work so that they do not have to carry marking home;</p> <p><b>Reasons for not allowing:</b>            Data protection issues – schools may not want potentially sensitive student information to be accessed outside of school;            To try to help teachers have a work-life balance;            Increased security risks as teachers may not have fully-protected computers at home (eg if a teacher does not have anti-virus software on their home computer this may cause problems when they connect their computer to the school network);</p> <p><b>Max 1 mark:</b> if only described reasons for allowing access  <b>Max 1 mark:</b> if only described reasons for not allowing access</p>	2
05	2	<p><b>1 mark for AO1 (understanding)</b></p> <p>PANs are centered around one person, LANs cover a limited geographical area / LANs cover a larger area;            PANs have one user, LANs (normally) have more than one user;            PAN uses Bluetooth, LAN uses alternative protocols / connection methods (<b>A.</b> by example);</p> <p><b>Note:</b> answer must cover both PAN and LAN to be awarded a mark</p> <p><b>Max 1</b></p>	1
05	3	<p><b>1 mark for AO1 (understanding)</b></p> <p>Wearable computing devices;            Connecting headphones to a music player;            Connecting pedometer to a mobile phone;</p> <p><b>A.</b> any suitable example</p> <p><b>Max 1</b></p>	1



05	4	<b>6 marks for AO2 (apply)</b>		6	
		<b>Level</b>	<b>Description</b>		<b>Mark Range</b>
		3	Discussion with five or more relevant points includes a detailed consideration (more than two reasons) of why schools should use a wireless network (or why they should use a wired network) <b>and</b> a detailed consideration (more than two reasons) of why schools should use a wired network (or why they should use a wireless network). The reasons given are clearly <b>relevant</b> to the context of networks in a school environment. The discussion is <b>logically coherent</b> and the reasons given follow a <b>clear line of reasoning</b> from the advantages and disadvantages of the two types of network.		5-6
		2	A <b>logically coherent</b> discussion includes consideration (one or two reasons) of why schools should use a wireless network (or why they should use a wired network) <b>and</b> consideration (one or two reasons) of why schools should use a wired network (or why they should use a wireless network). Most of the reasons given will be clearly <b>relevant</b> to the context of networks in a school environment rather than being more general discussion points about the two types of network.		3-4
		1	A statement of one or two reasons why schools either should or should not use a wireless network has been included. The reasons given may not be strongly linked to a school environment.  Alternatively, a statement of one or two reasons why schools either should or should not use a wired network has been included. The reasons given may not be strongly linked to a school environment.		1-2
No creditworthy answer		0			

		<p><b>Guidance - Indicative Response</b></p> <p>Schools should use wired networks:</p> <ul style="list-style-type: none"> <li>• as they need high bandwidth as they make use of a lot of multimedia;</li> <li>• as they need high bandwidth / reliable systems as delays in lessons are not acceptable;</li> <li>• there is better security on wired networks making it easier for schools to control / monitor how students are using the network;</li> <li>• network performance may be poor if there are large numbers of student-owned devices using the school network at any one time;</li> </ul> <p>Schools should use wireless networks:</p> <ul style="list-style-type: none"> <li>• as it allows students to make use of their own portable devices in their learning;</li> <li>• as maintaining a safe learning environment is very important as children are more vulnerable to safety issues (like trailing wires);</li> <li>• it allows computing devices to be used outside of the lesson eg in PE lessons;</li> <li>• as schools have limited budgets and it is cheaper to add extra wireless devices to a school network;</li> <li>• less cable and drilling needed which may save money;</li> <li>• as there are now many devices which don't have wired connection ports and schools may want to be able to use these devices;</li> </ul>	
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05	5	<p><b>All marks AO1 (recall)</b></p> <p><b>1 mark:</b> a set of rules;</p> <p><b>1 mark:</b> that allow two devices to communicate;</p>	2
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05	6	<p><b>Mark is for AO1 (recall)</b></p> <p><b>1 mark:</b> E IMAP;</p> <p><b>If more than one lozenge shaded then mark is not awarded</b></p>	1
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05	7	<p><b>Mark is for AO1 (recall)</b></p> <p><b>1 mark:</b> B HTTPS;</p> <p><b>If more than one lozenge shaded then mark is not awarded</b></p>	1
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05	8	<p><b>Mark is for AO1 (recall)</b></p> <p><b>1 mark: D SMTP;</b></p> <p><b>If more than one lozenge shaded then mark is not awarded</b></p>	1
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05	9	<p><b>All marks AO1 (recall)</b></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Layer</th> <th>Order (1-4)</th> </tr> </thead> <tbody> <tr> <td>Transport</td> <td>2</td> </tr> <tr> <td>Data Link</td> <td>4</td> </tr> <tr> <td>Network</td> <td>3</td> </tr> <tr> <td>Application</td> <td>1</td> </tr> </tbody> </table> <p><b>Mark as follows:</b>  <b>1 mark:</b> any row correct;  <b>1 mark:</b> any two rows correct;  <b>1 mark:</b> all four rows correct;</p>	Layer	Order (1-4)	Transport	2	Data Link	4	Network	3	Application	1	3
Layer	Order (1-4)												
Transport	2												
Data Link	4												
Network	3												
Application	1												

06		<p><b>All marks for AO1 (understanding)</b></p> <p>The OS is needed to provide an interface between application software / user and hardware;  The OS is responsible for memory management;  The OS is responsible for processor access // allocating processor time;  The OS is needed to handle input/output devices;</p> <p><b>A.</b> any suitable examples of resource management</p> <p><b>Max 4</b></p>	4
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07	1	<p><b>Mark is for AO1 (understanding)</b></p> <p>With black-box penetration testing the tester does not know how the security systems work, with white-box testing the tester does know how the security systems work;</p> <p><b>Note:</b> answer must cover both black-box and white-box to be awarded a mark</p>	1
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07	2	<b>2 marks for AO1 (understanding) and 4 marks for AO2 (apply)</b>		6	
		<b>Level</b>	<b>Description</b>		<b>Mark Range</b>
		3	Clear descriptions of two social engineering techniques have been included along with a detailed description of appropriate measures that can be taken by an organisation to reduce the risks from phishing and the social engineering techniques that have been described.		5-6
		2	A description of one or two social engineering techniques has been included along with an appropriate description of one or more measure that can be taken by an organisation to reduce the risks from social engineering.		3-4
		1	Answer includes one of the following: an identification of one or two social engineering techniques, a description of a method that an organisation can use to reduce the risks from phishing, identification of a social engineering technique and a description of a method that an organisation can use to reduce the risks from that social engineering technique.		1-2
No creditworthy answer		0			

		<p><b>Guidance - Indicative Response for AO1</b>                  Pharming - setting up a fake website that looks like an official website for a reputable organisation/company (to try and harvest personal details);                  Shouldering / shoulder surfing – observing a legitimate user entering (security) data into a computer system;                  Baiting – leaving a malware infected portable storage device around hoping that a legitimate user will insert it into the computer system;                  Pretexting/blagging – persuading (often by use of a faked scenario) legitimate users to divulge personal data;  <b>Maximum two marks for AO1</b></p> <p><b>Guidance - Indicative Response for AO2 (note must be appropriate for the social engineering techniques described for marks to be awarded)</b>                  To reduce risks from phishing: allow emails only from known sources;                  To reduce risks from pharming: web filters;                  To reduce risks from shouldering: careful placement of terminals;                  To reduce risks from baiting: lock down systems so portable storage devices are not usable;                  To reduce risks from blagging: use of security details which cannot be accidentally divulged eg biometric measures;                  General strategies for reducing the risks from social engineering: train/educate users; making use of appropriate security protocols for handling sensitive/security data; performing frequent (unannounced) tests of security measures;  <b>Maximum four marks for AO2</b>  <b>Maximum three marks for AO2 if no strategy to reduce the risks from phishing has been given</b></p>	
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08	1	<p><b>1 mark for AO1 (recall) and 1 mark for AO2 (apply)</b></p> <p>1000 × 4 // 4000;;</p> <p><b>1 mark for AO1:</b> identifying that there are 1000 megabytes in a gigabyte;  <b>1 mark for AO2:</b> multiplying by 4;</p> <p><b>A. 1024 × 4 // 4096;;</b></p> <p><b>Maximum 1 mark:</b> If final answer not correct.</p>	2
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08	2	<p><b>All marks AO1 (understanding)</b></p> <p>Lighter; Smaller; Uses less power; More robust; Generates less heat; Quieter;</p> <p><b>Max 2</b></p>	2
08	3	<p><b>2 marks for AO2 (apply)</b></p> <p>Using just solid state would cost much more; Can get higher storage capacity by including magnetic hard disk;</p>	2
08	4	<p><b>All marks AO1 (understanding)</b></p> <p>On a hard disk binary data represented by tiny magnetised regions; where the magnetic orientation in one direction represent 0, and the other direction represents 1; When reading data the read/write head is moved (to be over correct track); and the platter/disk spins round; A whole sector/block read in one go (by the read/write head);</p> <p><b>Max 4</b></p>	4

08	5	<b>All marks AO2 (apply)</b>		9	
		<b>Level</b>	<b>Description</b>		<b>Mark Range</b>
		3	<p>Answer demonstrates a <b>sustained line of reasoning</b> with a <b>substantiated</b> explanation for the recent large growth in the use of cloud storage that includes <b>both</b> technological and social reasons.</p> <p>There is a <b>logically structured</b> consideration of the advantages and the disadvantages associated with the use of cloud storage - including <b>relevant</b> points covering <b>at least two</b> of legal, ethical and environmental issues.</p>		7-9
		2	<p>Answer includes an explanation for the recent large growth in the use of cloud storage that includes <b>both</b> technological and social reasons.</p> <p>There is a <b>logically structured</b> consideration of the advantages and the disadvantages associated with the use of cloud storage - including <b>one or two relevant</b> points related to legal, ethical and environmental issues.</p>		4-6
		1	The answer includes either a description of some of the reasons for the recent large growth in the use of cloud computing and/or brief consideration of the advantages and/or disadvantages associated with using cloud storage.		1-3
	No creditworthy answer	0			

	<p><b>Guidance - Indicative Response (reasons for growth)</b>  Higher bandwidth mobile networks (eg 4G);  Increased availability of mobile devices;  Reduction in cost of large capacity storage devices;  Improvements in network security;  People have a higher level of trust in cloud storage;  Improvements in web browser software;  Increased availability of supercomputers (for cloud processing);  Companies have managed to develop business models based on cloud computing that allow them to make a profit;</p> <p><b>Guidance - Indicative Response (advantages of cloud storage)</b>  Enables user to access their data from more places/devices;  Enables user to more easily share data with others (can make parts of their cloud storage publically available);  Increases the amount of storage available;  Reduced cost of computing devices for users as no need for as much built-in secondary storage;</p> <p><b>Guidance - Indicative Response (disadvantages of cloud storage)</b>  Increased security risks;  Relies on access to high-bandwidth network connection;  Could potentially cost more due to ongoing costs;  Reliance on company providing the cloud service;  Increased chance of others accessing personal data (data privacy issues);</p>	
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