Student responses with examiner commentary

GCSE Computer Science 8520
Paper 2 (8520/2)

8520/2

For teaching from September 2015

For assessment from summer 2017

Specimen Assessment Paper 2 (8520/2)

Introduction

This resource should be used in conjunction with the Specimen material (8520/2) from the AQA website. This document illustrates how examiners intend to apply the mark scheme in live assessments. While every attempt has been made to show a range of student responses examiners have used responses, and subsequent comments, which will provide teachers with the best opportunity to understand the application of the mark scheme.

GCSE
COMPUTER SCIENCE
8520/2

Paper 2

| Specimen 2015 | am/pm | Time allowed: 1hr 30mins |

Materials
There are no additional materials required for this paper.

Instructions
- Use black ink or black ball point pen. Use pencil only for drawing.
- Answer **all** questions.
- You must answer the questions in the spaces provided.
- Some questions will require you to shade a lozenge. If you make a mistake cross through the incorrect answer ⬛
- Do all rough work in this book. Cross through any work that you do not want to be marked.
- You must not use a calculator.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80
- You are reminded of the need for good English and clear presentation in your answers.

Please write clearly, in block capitals, to allow character computer recognition.

Centre number ☐☐☐☐☐ Candidate number ☐☐☐☐

Surname ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Forename(s) ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Candidate signature _____

8520/2

Specimen paper 2 with student responses v1.0

Answer **all** questions in the spaces provided.

| 0 | 1 | A bit pattern is shown in **Figure 1**.

Figure 1

01001110

| 0 | 1 | . | 1 | Convert the bit pattern in **Figure 1** into decimal.

[1 mark]

78

Correct answer.

1

| 0 | 1 | . | 2 | Convert the bit pattern in **Figure 1** into hexadecimal.

[2 marks]

414

The first digit is correct so one mark awarded for this. The student has worked out that the 4 and 14 from the bit pattern but not represented 14 with the symbol E.

1

| 0 | 1 | . | 3 | A student's answer to the question "Why is hexadecimal often used instead of binary?" is shown in **Figure 2**.

Figure 2

Because it uses fewer digits it will take up less space in a computer's memory.

Explain why the student's answer is incorrect.

[2 marks]

The answer is wrong because it will not use less memory.

The answer given is accurate but does not demonstrate any understanding and is not worth any marks. Stating that it would use the same amount of memory would be more precise and worth one mark, to get the second mark an explanation that they would both be represented as bit patterns is needed.

0

0 1 . 4 Explain how a binary number can be multiplied by 8 by shifting bits.

[2 marks]

By shifting 8 places to the left.

The direction of the shift is correct so one mark has been awarded.

1

ASCII (American Standard Code for Information Interchange) is a coding system that can be used to represent characters. In ASCII the character A is represented by the numeric code 65.

0 1 . 5 Shade **one** lozenge to indicate which character is represented by the numeric code 70.

[1 mark]

A E ⬭

B F ⬤

C f ⬭

D 6 ⬭

E e ⬭

Correct answer.

1

0 1 . 6 Unicode is an alternative to the ASCII coding system.

Describe **one** advantage and **one** disadvantage of using Unicode to represent characters instead of using ASCII.

[2 marks]

Advantage: can be used for more languages.

Disadvantage: uses more disk space.

Advantage is correct, though not very clearly written. Disadvantage stated is correct.

2

Turn over ▶

When data is stored in a computer it is often compressed. One method that can be used to compress text data is Huffman coding. To produce a Huffman code each character in a piece of text is placed in a tree, with its position in the tree determined by how often the character was used in the piece of text.

A Huffman tree for the text ZOE SAW A ZEBRA AT THE ZOO is shown in **Figure 3**.

Figure 3
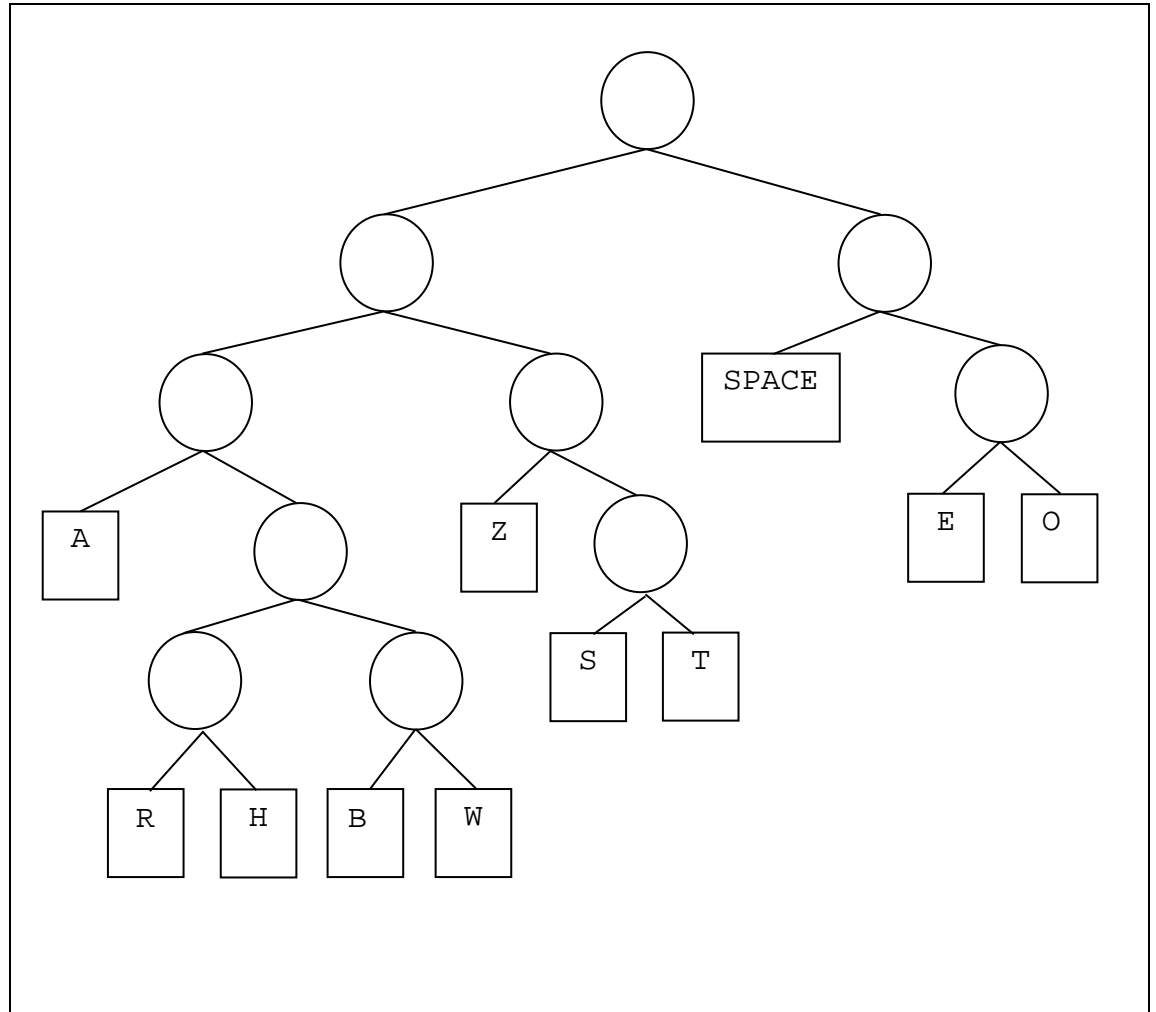
Using this Huffman tree the Huffman coding for the character E would be the bit pattern 110 because from the top of the tree E is to the right, then right again and then left.

The character Z is represented by the bit pattern 010 because from the top of the tree Z is to the left, then right and then left.

0 1 . 7 Using the Huffman code in **Figure 3**, complete the table to show the Huffman coding for the characters O, SPACE and B.

[3 marks]

Character	Huffman coding
O	111
SPACE	10
B	01100

First two answers are correct so two marks awarded.

2

0 1 . 8 Using Huffman coding the text ZOE SAW A ZEBRA AT THE ZOO can be stored in 83 bits.

Calculate how many additional bits are needed to store the same piece of text using ASCII. Show your working.

[3 marks]

124

It is very likely that the student has understood what to do here as there answer is very close to the correct one. However, their answer is wrong and they have not shown any working out. If they had shown working out it is likely that they would have got some marks but without this an incorrect final answer cannot be given any marks.

0

8
16

| 0 | 2 | | The Central Processing Unit (CPU) is one of the hardware components of a computer system. |

| 0 | 2 | . | 1 | Define the term hardware. |

[1 mark]

Physical components.

Correct answer.

1

| 0 | 2 | . | 2 | "Used to connect different components in the CPU" is a description of which of the following? Shade **one** lozenge to show the correct answer. |

[1 mark]

A   Control Unit   ⬭

B   Bus   ⬤

C   Arithmetic Logic Unit   ⬤

D   Clock   ⬭

E   Ethernet   ⬭

While the correct answer has been shaded so has an incorrect answer. Therefore, no mark awarded.

0

| 0 | 2 | . | 3 | Explain how main memory is used during the fetch-execute cycle. |

[4 marks]

Instructions are in the memory and so is data the instructions need to use. The fetch-

execute cycle uses the memory and goes fetch, decode, execute repeatedly the whole

time the computer is turned on.

This answer gets two marks – the first and third points on the mark scheme. The idea of program instructions being held in the main memory is worth one mark; so is the idea that the data being used by the instructions may also be there. The explanation of the fetch-execute cycle is accurate but not detailed enough to be worth any marks.

2

| 0 | 2 | . | 4 | Increasing the amount of cache memory and changing the type of cache memory can improve the performance of a CPU.

State **two** other ways of improving the performance of a CPU.

[2 marks]

Increase the clock speed. Increase the bus width.

Both answers are correct. One of the answers provided is not on the GCSE specification, students are not expected to know how bus width can impact on processor performance but it is a valid answer to the question and therefore will gain credit.

2

5

8

Turn over for Question 3

Turn over ▶

| 0 | 3 | | Most computer systems have a main memory that consists of both RAM and ROM.

| 0 | 3 | . | 1 | For each of the **two** statements below shade **one** lozenge to indicate if the statement is true or false.

[2 marks]

ROM is volatile memory.

A True ⬭

B False ⬤

In most desktop computers there is more ROM than RAM.

A True ⬭

B False ⬤

Correct answers.

2

| 0 | 3 | . | 2 | Most modern washing machines are embedded systems. Embedded systems normally have less main memory than non-embedded systems.

Describe **two** other likely differences between the main memory for a washing machine and the main memory for a non-embedded system.
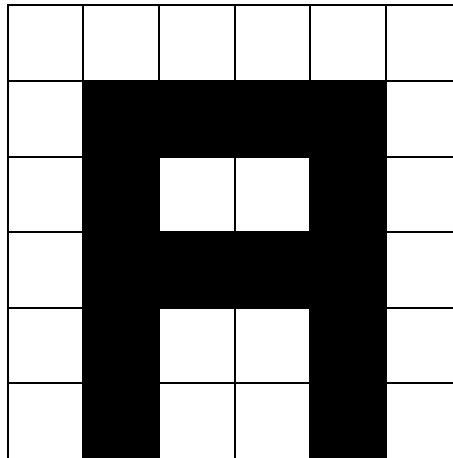
[2 marks]

Main memory in embedded machines is faster and physically smaller.

Both of these answers are incorrect – they may be true sometimes but the converse may also be true.

0

$$\frac{2}{4}$$

0 4 **Figure 4** contains a black and white image consisting of 36 pixels.

Figure 4

0 4 . 1 Explain why 36 bits are needed to represent the pixels in the image shown in **Figure 4**.

[2 marks]

There are 36 pixels in the image so 36 bits are needed.

This answer is only worth one mark as the statement provided is correct but does not explain why only 1 bit is needed for each pixel.

1

0 4 . 2 How many bits per pixel would need to be used if the image shown in **Figure 4** used 4 colours instead of 2?

[1 mark]

4

Incorrect answer.

0

| 0 | 4 | . | 3 | Define the term **pixel**.

[1 mark]

A part of a picture.

Not a precise enough answer for the mark to be awarded.

0

1
—
4

0 5   Most schools have a computer network.

0 5 . 1   Some schools allow teachers to access the school network from their home computers.

Give **one** reason why some schools allow this and **one** reason why some schools do not allow this.

[2 marks]

Reason for:

So that students can access resources to help them with their homework.

Reason against:

It might stop teachers having a social life.

<div style="color:red; border:1px solid red; padding:4px;">
The reason for is not worth a mark because the question asked about giving teachers access to the network and this answer is about students. The reason against is poorly-phrased but is equivalent to the idea of teacher work/life balance that is shown on the mark scheme.
</div>

1

PANs and LANs are two different types of network.

0 5 . 2   Describe **one** difference between a PAN and a LAN.

[1 mark]

LAN is a network in a small area but PANs cover an even smaller area.

<div style="color:red; border:1px solid red; padding:4px;">
Correct answer.
</div>

1

0 5 . 3   Give **one** example of where a PAN could be used.

[1 mark]

You could have Bluetooth headphones to listen to music from your phone. This would be a PAN.

<div style="color:red; border:1px solid red; padding:4px;">
Reasonable example so mark is awarded.
</div>

1

Question 5 continues on the next page

0 5 . 4 "Schools should use a wireless network instead of a wired network".

Discuss this statement.

[6 marks]

Schools should use wireless networks as it means that students can connect their

phones and tablets to the wireless network so that they can use their own devices

whenever they want to. This will also save the school money as they can let students

their own devices instead of having to buy lots of computers. Students can use their

phones and tablets when they are not in a computer classroom because the wireless

network will mean that they will be able to access the Internet and the school network

anywhere in the school. Finally, the school won't have to have lots of wires to connect

all the computers to the network as they can use the wireless network.

On the other hand, wired networks can be faster to use than wireless networks.

There are five valid reasons, which are quite well linked to the scenario for the question, but this answer is not worth five marks. To get a mark in the top range the answer needs to include at least two advantages of wireless networks (which is does – it has four) and at least two advantages of wired networks (but only one has been provided).

4

0 5 . 5 When two computers on a network communicate with each other they need to use the same protocol.

Define the term protocol.

[2 marks]

A protocol is a set of rules.

Correct, but not a detailed enough definition for two marks.

1

Question 5 continues on the next page

For questions $\boxed{0}\boxed{5}$. $\boxed{6}$ to $\boxed{0}\boxed{5}$. $\boxed{8}$, shade **one** lozenge to indicate the most suitable protocol to use in the situation described.

$\boxed{0}\boxed{5}$. $\boxed{6}$ Used to retrieve email stored on a server.

[1 mark]

A	HTTP	⬭
B	HTTPS	⬭
C	FTP	⬭
D	SMTP	⬭
E	IMAP	⬬

Correct answer.

1

$\boxed{0}\boxed{5}$. $\boxed{7}$ Used to make a payment securely when purchasing goods from a website.

[1 mark]

A	HTTP	⬭
B	HTTPS	⬬
C	FTP	⬭
D	SMTP	⬭
E	IMAP	⬭

Correct answer.

1

Question 5 continues on the next page

Turn over ▶

| 0 5 | . | 8 | Used to send an email from a client machine to an email server.

[1 mark]

A HTTP ◯

B HTTPS ◯

C FTP ◯

D SMTP ●

E IMAP ◯

Correct answer.

1

| 0 5 | . | 9 | TCP/IP is a protocol stack used in networking. There are 4 layers in the TCP/IP stack.

Complete the table by placing the four layers of the TCP/IP stack into order (1 – 4), where 1 is the top layer and 4 is the bottom layer).

[3 marks]

Layer	Order (1-4)
Transport	2
Data Link	3
Network	4
Application	1

The first and fourth rows are correct.

2

13

18

| 0 | 6 |

Explain the purpose of an operating system.

[4 marks]

The operating system manages the main memory, the input devices, the output

devices and the use of processor time.

Marks awarded for the points about main memory and processor time. Input and output devices are worth a mark but not a mark for each.

3

$$\frac{3}{4}$$

Turn over for Question 7

Turn over ▶

| 0 | 7 | | Organisations often spend a lot of money on cyber security.

| 0 | 7 | . | 1 | Penetration testing is an attack on its own computer system by an organisation to try and identify security weaknesses.

Describe **one** difference between black-box and white-box penetration testing.

[1 mark]

In black-box penetration testing the person doing the testing does not know how the

security of the system works, in white-box penetration testing they do.

Correct answer.   **1**

| 0 | 7 | . | 2 | Social engineering is often used to try to gain unauthorised access to a computer system. Phishing is a commonly used social engineering technique where emails are sent that pretend to be from a reputable organisation/company to try and obtain personal details.

Describe another **two** social engineering techniques. You should also explain measures that an organisation can take to try to reduce the security risks from phishing and the two other social engineering techniques you have described.

[6 marks]

To prevent problems from phishing the company could set up a firewall that controls

what emails can be read by employees, emails from unknown people will not be

passed onto employees. This would mean that phishing could not happen.

Two other social engineering techniques are pharming and blagging. Pharming is

when a fake website is set up that looks like a genuine website but isn't. People think

it is and enter their personal details into a form on the website and this data can then

be used by fraudsters. Blagging is when a criminal talks to an employee and

persuades the employee to tell them private information like their password. One way

and the criminal tells the employee that they need to know the employee's password to

install some new software on the employee's computer. To prevent pharming and

blagging the company should make sure that they provide security training to their

employees so that they don't fall for these tricks.

A good description of two social engineering techniques has been provided. The specific example of blagging is not necessary but examples can help to show that the topic has been understood.
An appropriate measure for reducing the risks from phishing has been included (though to say phishing "could not happen" is a bit strong, no security method is completely foolproof). An appropriate measure to reduce other social engineering techniques (staff training) has been provided but further security measures need to be described to get a mark in the 5-6 range.

4

$$\frac{5}{7}$$

Turn over for Question 8

| 0 | 8 |

Bob purchases a 4GB SD card for use as secondary storage in his phone.

| 0 | 8 | . | 1 |

Calculate how many megabytes there are in 4GB. Show your working.

[2 marks]

1000x4 = 4000

> Correct answer.

2

| 0 | 8 | . | 2 |

An SD card is a type of solid state storage.

State **two** advantages of solid state storage compared to magnetic storage.

[2 marks]

Solid state drives are smaller and generate less heat.

> Two correct answers.

2

| 0 | 8 | . | 3 |

Many modern desktop computers have both solid state drives and magnetic hard disk drives.

Give **two** reasons why desktop computers have a magnetic hard disk drive and a solid state drive instead of having just a solid state drive.

[2 marks]

Having both is cheaper than having just a big solid state drive as solid state is more

expensive than magnetic hard disks. It also means that if the solid state drive breaks

the magnetic storage is there as a back-up.

> The first reason is creditworthy but the second reason provided does not get a mark (it is unlikely that it would be useful as a back-up unless the same data was stored on both the solid state disk and the magnetic hard disk; more importantly it does not explain what a magnetic hard disk is also included as the same "benefit" could be obtained by having two solid state drives).

1

0 8 . 4 Describe how data is stored on, and read from, a magnetic hard disk.

[4 marks]

Data on a hard disk is stored as magnetic particles. To read the data, the disk spins

around and there is a read/write head that moves over the correct part of the disk

which can detect where the magnetic particles are.

Data being stored as "magnetic particles" is accurate enough to be awarded a mark. The concepts of the disk spinning and the read/write head being positioned are both worth marks. Detecting where the magnetic particles "are" is not accurate – the orientation of the magnetic particles is what is detected.

3

0 8 . 5 In recent years, there has been a large growth in the use of cloud storage.

Discuss the advantages and disadvantages of using cloud storage.

In your answer you should include an explanation of the reasons for the large growth in recent years and consider any legal, ethical and environmental issues related to the use of cloud storage.

[9 marks]

The main advantages of cloud storage are that it means that people can access their

data from anywhere and that they can access it from any device. If they did some

work on their desktop computer they will be able to access the work from their phone if

the work was stored using the cloud. Using cloud storage also means that there is

much more storage available to the user – each device they use will have a limited

amount of storage available but there is an almost unlimited amount of cloud storage

available. Cloud storage also makes it easy to share data with others as you can give

them access to your cloud storage account.

There are also disadvantages about using cloud storage. One disadvantage is that it

makes it easier for hackers to steal or copy your data as they could hack into your

cloud storage account. Another disadvantage is that accessing your cloud

storage means that you need to have a wireless connection or a strong network signal

without these you can't access your data and this means it is not as reliable as storing

Turn over ▶

without these you can't access your data and this means it is not as reliable as

storing your data locally.

While you can normally get some cloud storage for free getting a lot of storage costs

money and you have to pay for it every month which means that it will cost more than

just storing your data locally (eventually).

3

11
19

END OF QUESTIONS

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ANSWER IN THE SPACES PROVIDED

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