

Example 3.1 – binary numbers

GCSE Computer Science (2013), June 2015, Q1(d), Q1(e)

- (d) The robot is 12 metres from an obstacle. 12 is positive denary.

Fill in the table to show the number 12 (denary) in 8-bit binary, using a sign and magnitude representation.

(1)

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- (e) The robot travels 14 metres. –14 is negative denary.

Fill in the table to show the number –14 (denary) in 8-bit binary, using a two's complement representation.

(1)

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Example 3.2 – binary arithmetic

GCSE Computer Science (2013), June 2015, Q1(f)

- (f) (i) Add these two 8-bit binary integers and write the result in the last row of this table.

(1)

0	1	0	1	0	1	1	0
0	0	1	0	1	0	1	1

Another 8-bit addition generates an overflow error.

- (ii) State what is meant by the term overflow error.

(1)

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- (iii) State what happens if the overflow error is ignored and the result is used in other calculations.

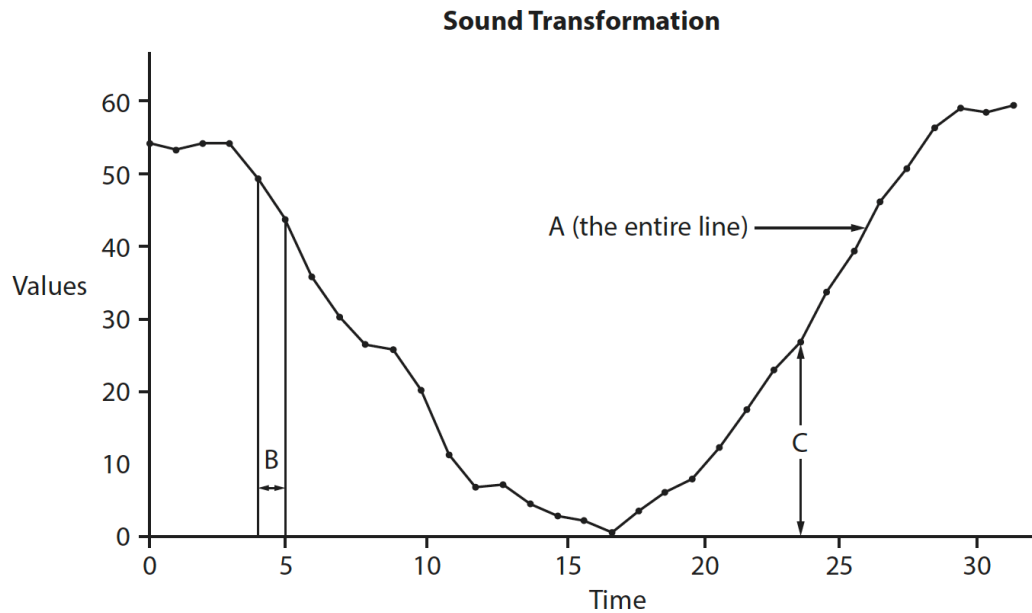
(1)

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Example 3.3 - data representation

GCSE Computer Science (2016), SAM Paper 1, Q7(b)

- (b) Sound can be stored on a digital device, but only after being converted from its naturally occurring state.



- (i) Identify each of the items (A, B, C) shown on the image in relation to the conversion required to store sound on a digital device.

(3)

A

B

C

Example 3.4 – compression

GCSE Computer Science (2016), SAM Paper 1, Q1(f)

2 Different types of compression are used for different purposes.

- (a) A travel company has designed some brochures that contain images and text in desktop publishing format. The travel company sends the documents electronically to a printing company for them to be printed.

Explain why the travel company uses lossless compression to send the documents.

(2)

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- (b) Compression normally reduces file size.

State **two** other characteristics of lossy compression.

(2)

1

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2

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- (c) Run length encoding (RLE) is a type of image compression. Some data for an image is shown.

b	b	b	r	g	g	g	g	r	r
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Show the result of compressing this data for the image using RLE.

(2)

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Example 3.5 – Calculating file sizes

GCSE Computer Science (2016), Specimen Paper 1, Q3(a)

- 3** A landscape photographer wishes to publish a series of preview images online. He is concerned about file sizes.

(a) The 24-bit RGB images are to be displayed on screen at a resolution of 400 x 250 pixels.

Construct an expression to calculate the size of one of the image files (KB). You do not need to carry out the calculation.

(3)

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Example 3.6 – encryption

GCSE Computer Science (2013), Paper 1, June 2016, Q1(b)

(b) Data transmitted over a network is sometimes encrypted.

(i) State **one** reason why data encryption is used on a network.

(1)

Candidate 1

So nobody can hack the data stored in the network

Candidate 2

If it were to be intercepted one could not be read without the key.

(ii) Complete the table using a Caesar cipher to encrypt and decrypt the text.

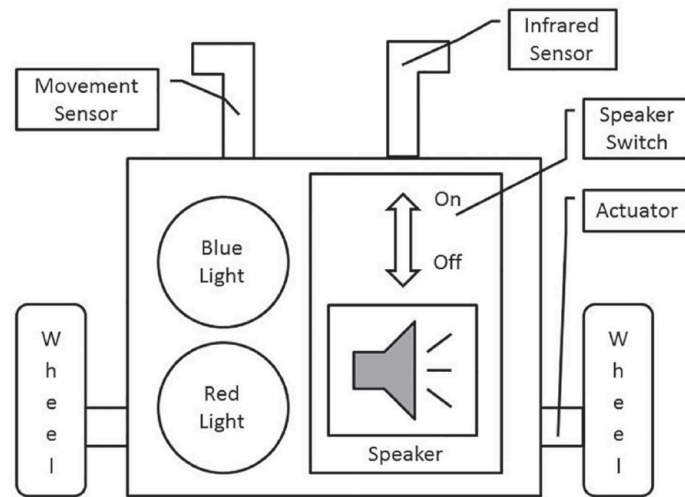
(2)

Plain text	Shift	Cipher text
digit	+3	
	-2	zglypw

Example 4.1 – input-process-output

GCSE Computer Science (2013), Paper 1, June 2015, Q1(a)

- 1 This is a block diagram of a robot.



- (a) Put a cross to identify whether each of these is an input, process, output, or none.

(3)

	Input	Process	Output	None
Actuator	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Infrared Sensor	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Wheel	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Calculate Distance	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Programming Language	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Movement Sensor	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Example 4.2 – sequential and parallel processing

GCSE Computer Science (2013), Paper 1, June 2016, Q4(b)(ii)

- (ii) Explain the difference between the sequential and parallel computational models.

(4)

A sequential computational model runs one instruction after another doing one operation per ^{single} clock cycle. A parallel computational model can execute multiple instructions in one full clock cycle. The parallel is used in dual/quadruple core processors while sequential is run on a processor with a single core.

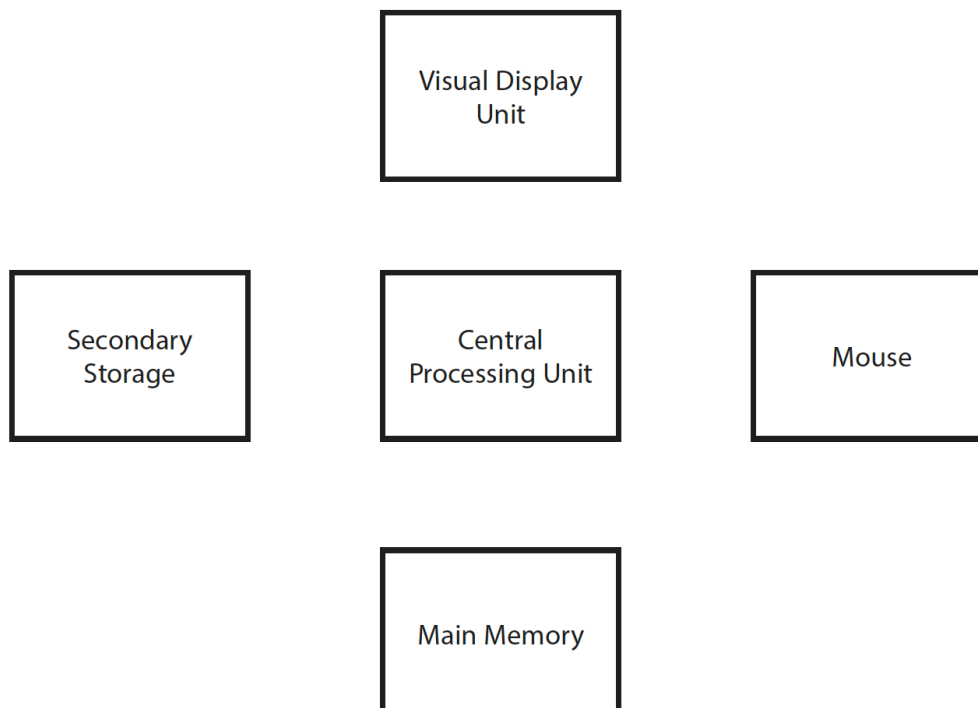


Example 4.3 – input-output

GCSE Computer Science (2013), Paper 1, June 2015, Q2(c)

- (c) Complete the diagram by adding **six** arrows to indicate the input and output relationships between the devices.

(3)



Example 4.4 – secondary storage

GCSE Computer Science (2013), Paper 1, June 2015, Q3(b)(ii)

- (b) Files for the website are stored on secondary storage media.

Complete this table with the name of the category of secondary storage described in each row.

(3)

Category of secondary storage	Description
	Uses metal platters coated in iron oxide. The platters rotate at high speeds.
	Small pits are burned in patterns onto a flat surface. A laser can be used to interpret light reflected from the flat or pitted surface.
	No moving parts; data is stored as an electrical charge.

Example 4.5 – truth tables

GCSE Computer Science (2013), Paper 1, June 2015, Q1(h)

(h) Refer to the robot diagram.

Assume **R** is the red light, **B** is the blue light, and **S** is the speaker switch.

(i) Complete the table to show the Boolean expression **Q=(NOT R) AND B**.

(3)

R	B	NOT R	Q
0	0		
0	1		
1	0		
1	1		

(ii) Construct a Boolean expression to determine **if either light is on** at the same time as the **speaker switch is on**.

(1)

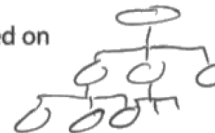
Example 4.6 – operating systems

GCSE Computer Science (2013), Paper 1, June 2016, Q3(a)

3 Shaneela is designing and coding a website. The files she creates will be stored on a computer.

(a) File management is a function that an operating system performs.

Describe how an operating system organises files.



(3)

It organises the files using a hierarchical structure. It simply starts searching for a file by starting at the top most folder, called the ~~root~~ root folder. Then it works its way down the ~~rows~~ second row ~~which~~, which is called a subdirectional, and then the last row to ~~the~~ find a file.

Example 4.7 – code translators

GCSE Computer Science (2013), Paper 1, June 2015, Q5(a)

5 A student has decided to learn how to program.

- *(a) Discuss the suitability of **compiled** and **interpreted** programming languages for the student.

(6)

Compiled languages such as Java are useful as they work on any machine. However, they are harder to identify errors in as all the code is translated into machine code before it is run. This is a contrast to interpreted high level languages like Python where the code is translated and run a line at a time - this allows for easier debugging for a beginner who is likely to make a lot of mistakes. However, a downside to interpreted languages are they are slower and require a special environment from which to run unlike a compiled language. Overall,

Example 5.1 – network protocols

GCSE Computer Science (2013), Paper 1, June 2016, Q1(a)(i)

1 (a) Computer networks are valuable to many businesses and individuals.

(i) State the purpose of network protocols.

(1)

Candidate 1

It protects your data and files.

Candidate 2

They act as rules so that the devices on the network can communicate.

Example 6.1 – Environmental impact

GCSE Computer Science (2013), Paper 1, June 2015, Q4(a)

- (a) AJ's chief executive is concerned about the environmental impact of using computers.

Give **three** possible **environmental** impacts of using computing devices.

Suggest **one** possible action AJ's could take to reduce the environmental impact.

(4)

Impact 1

Impact 2

Impact 3

Action

Impact 1
The CO ₂ emissions that are produced when supplying the computer with electricity
Impact 2
When the computers are broken they usually are thrown away into land fill
Impact 3
The manufacturing of the devices will cause damage to the environment.
Action
Use the postal service

Example 6.2 – AI

GCSE Computer Science (2013), Paper 1, June 2016, Q5(a)

5 Artificial intelligence is an emerging trend in computer science.

*(a) Discuss the use of artificial intelligence by describing some of its characteristics, the ways in which it may be used and the ethical issues associated with its use.

(6)

Candidate 1

Artificial ^{intelligence} ~~intelligence~~ is the study of computers ⁽⁶⁾ ~~replicating~~ ^{minimising} human thoughts or actions ~~(aware)~~ (Self aware). Artificial intelligence is normally found in games the AI controllers in games ^{talk bots & can even} ~~be found on~~ ^{or even Siri or Cortana} ~~on operating systems~~ operating systems helping the user via voice talking & having a conversation. Examples include Siri or Cortana. Artificial intelligence has progressed ^{within the last decade} ~~alot~~ ^{an} ~~AI computer~~ that was able to beat Chess ^{world} ~~champions~~ at chess. This technology could ~~be~~ potentially be dangerous ~~in the~~ hands of the military if computers are allowed to kill humans or fight wars instead of humans. Or if the Artificial intelligence ~~became~~ became very self aware & turned against humanity. There are ^{also} ethical issues ~~connected~~ with AI ^{development & application} ^{Such as} in the ^{military} ~~army~~ allowing ^{AI} ~~programs~~ to kill humans ^(Now drones have human operators for ethical reasons) ~~instead of humans~~ and creating ~~new~~ 'life'. Despite these points, there are ^{for many} ~~many~~ advantages to Artificial Intelligence Such as helping progress technology further, complex problem solving & if implemented into robots, the robots could go into dangerous Zones such as ~~an~~ a fallout zone or post ~~earth~~ earthquake to help survivors / discover new places. Also

if use robots are used in wars instead of humans, no humans have to die. There is also the ^{ethical issue} ~~issue~~ raised ^{that if the} if AI is 'aware' enough, would it be considered ^{a slave} ~~slavery~~ to humans and should they have equal rights.

Candidate 2

Artificial intelligence is the manufacturing of machines able to replicate human behaviour. Artificial intelligence can be as simple as a robot walking of its own accord, or a machine which can have an actual conversation with a human. It is mainly used in computer games, with artificial intelligence (AI) being able to complete objectives in a game or target the player character. AI can also be developed to be able to work better than factory machines, complete jobs such as pizza delivery and medical diagnosis, and to even operate phone calls. Issues arise due to AI being a machine, so there is always a chance of malfunction or error, and this could cause jobs to be done wrong. People may also say it's wrong to create artificial humans and that replacing humans with machines can cause unemployment. People also worry if machines could become smarter than us.