

3 A student has a portable device. He uses an on-screen keyboard to write messages to his friend.

(a) Explain how the text the student writes is converted to binary to be processed.

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[3]

(b) The device has 4 gibibytes (GiB) of random access memory (RAM).

(i) State the amount of RAM the device has in mebibytes (MiB).

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[1]

(ii) State the amount of RAM the device has in tebibytes (TiB). Your answer can be given rounded to 3 decimal places.

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[1]

Working space

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(c) Explain why the portable device needs RAM.

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[3]

(d) The device has a fingerprint scanner to allow the student to unlock the portable device.

Circle only **three** terms that can be used to describe the fingerprint scanner.

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|----------------|--------------|---------------|----------------|
| authentication | biometric | malware | parity check |
| firewall | input device | output device | storage device |

[3]

- 5 Text, images and sound are represented as binary to be processed by a computer.
- (a) Complete the table by writing the missing terms and descriptions about representing text, images and sound as binary.

Term	Description
character set	
	This is the number of samples taken each second when recording sound.
pixel	
resolution	
	This is the number of bits used to represent a colour in an image.

[5]

- (b) The size of an image file is 1000 bytes.
- Give the size of the image file in bits.
- [1]

- (c) The size of a sound file is 4096 mebibytes (MiB).
- Give the size of the file in gibibytes (GiB).
- [1]

Working space

- 3 An image is converted to binary to be represented by a computer.
- Complete the table with the missing terms and definition about representing an image.

Term	Definition
	This is the smallest component of an image.
resolution	
	This is the number of bits used to create each colour in an image.
	This is additional data that is stored with an image that can provide information such as the time and date the image was taken.

[4]

2 A student has an image file stored on their computer.

(a) The image file was taken by a digital camera.

Tick (✓) **one** box to show whether a digital camera is an example of an input, output, process or storage device.

- | | | |
|----------|---------|--------------------------|
| A | input | ☐ |
| B | output | ☐ |
| C | process | ☐ |
| D | storage | ☐ |

[1]

(b) The size of the image file is 3072 bytes.

(i) Give the size of the image file in kibibytes (KiB).

..... [1]

(ii) State the number of nibbles in 1 byte.

..... [1]

Working space

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(c) The image file has a colour depth of 32 bits.

(i) State what is meant by a colour depth of 32 bits.

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..... [1]

(ii) The colour depth of the image file is changed to 64 bits.

Explain what effect this change has on the image file.

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(d) The student uses lossless compression to compress the image file.

Explain how the image file is compressed using lossless compression.

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..... [3]

1 A student records himself singing a song for his music project. The recorded sound is converted to binary to be processed by a computer.

(a) Give **one** input device the student can use to record the song.

..... [1]

(b) The student uses sound editing software to edit the recorded sound.

Tick (✓) **one** box to show whether sound editing software is an example of application, security, system or utility software.

A application software ☐

B security software ☐

C system software ☐

D utility software ☐

[1]

(c) Two binary numbers stored from the recording are 00011001 and 10110100.

(i) Convert the **two** binary numbers to denary numbers.

00011001

10110100

[2]

Working space

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(ii) Convert the **two** binary numbers to hexadecimal numbers.

00011001

10110100

[2]

Working space

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(iii) A logical right shift of two places is performed on the binary number 10100100.

Give the binary number that would be stored after the logical shift has taken place.

..... [1]

Working space

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(d) The two's complement 8-bit binary integer 11001001 is also stored.

Convert the two's complement 8-bit binary integer to denary. Show all of your working.

Working space

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Denary value

[2]

(e) The table contains terms and descriptions about the process of converting analogue sound to binary.

Complete the table with the missing term and descriptions.

Term	Description
.....	This is the measurement of the height (amplitude) of a sound wave taken at regular time intervals.
sample rate	
sample resolution	

[3]

2 An artist creates an image on a computer.

(a) State what is meant by the colour depth of an image.

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..... [1]

(b) Describe the relationship between the resolution of the image and the file size of the image.

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..... [2]

(c) The artist compresses the image file before uploading it to their website. Users can download the image file from the website to print as a poster.

The image file is compressed using lossless compression.

(i) Explain the reasons why the artist chose lossless compression instead of lossy compression to compress this image file.

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..... [3]

(ii) Identify **one** lossless method of compressing an image.

Describe your chosen method.

Method

Description

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[3]

(i) Explain how a file is broken down into packets and transmitted over a network.

..... [5]

Complete and annotate the diagram to show the difference between serial full-duplex transmission between two computers and parallel simplex transmission between two computers.

Computer 1

Computer 2

Computer 1

Computer 2

[3]

An American standard code for information interchange (ASCII) character set is used to convert the text to binary.

..... [1]

The character 'm' is represented by the denary ASCII number 109.

65
109 [2]

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65
109 [2]

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(c) The character 'y' is represented by the binary ASCII number 01111001.

(i) Convert the binary ASCII number to denary.

..... [1]

Working space

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(ii) Convert the binary ASCII number to hexadecimal.

..... [1]

Working space

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(iii) A logical right shift of two places is performed on the binary ASCII number 01111001.

Give the binary number after the logical right shift of **two** places is performed.

..... [1]

Working space

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(d) The character 'T' is represented by the binary ASCII number 01010100.

The character 't' is represented by the binary ASCII number 01110100.

Add the **two** binary numbers using binary addition. Give your answer in binary. Show all your working.

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 [3]

5 A musician is recording herself playing the music for a song on the piano.

(a) Explain how the analogue sound is recorded and converted to digital.

..... [5]

(b) State **two** ways that the accuracy of the recording could be increased.

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2 [2]

(c) The musician compresses the sound file using lossless compression instead of lossy compression.

Explain why the musician would choose to use lossless compression instead of lossy compression.

..... [3]

(d) The musician types the words for the song into a document.

Two character sets that can be used when converting text to digital are the American standard code for information interchange (ASCII) and Unicode.

Explain the differences between the ASCII character set and the Unicode character set.

[4]

5 A band is recording their new song. They need to consider the sample rate and sample resolution of their recording.

(a) Give **one** benefit of using a higher sample rate to record the song.

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 [1]

(b) Give **one** drawback of using a higher sample rate to record the song.

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 [1]

(c) Describe what is meant by sample resolution.

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 [2]

(d) The band wants to compress the sound file, but they do **not** want any data to be permanently removed.

Identify the compression method that should be used.

..... [1]

3 When keys are pressed on a keyboard, the text is converted to binary to be processed by the computer.

(a) Describe how the text is converted to binary to be processed by the computer.

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 [3]

(b) Text that is input into a computer can be stored in a text file.

A text file can be compressed using lossless compression.

(i) State what effect this has on the file size.

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 [1]

(ii) Describe how lossless compression compresses the text file.

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 [4]

(iii) Give **two** reasons why the text file may have been compressed.

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 [2]