Chhetri Academy

chhetriacademy.com

GCSE COMPUTER SCIENCE

2.3

Edexcel 1CP2 | Specification point 2.3.2

The need for data compression and methods of compressing data (lossless, lossy)

Untiered

Past paper question booklet

3	2018-2023	Untiered
question groups	available papers	tier

Before you begin

1. Show working and use units where appropriate.
2. Use extra paper if you need more space.
3. Print at actual size (100%) for measurement questions.

Name _____ **Date** _____

Whole questions are retained for context; some parts cover other points. Legacy sources are labelled.

3 An organisation that supplies audiobooks over the internet is moving into a new office building.

(a) One reason for networking devices is to provide access to the internet.

(i) Give **two** other reasons for connecting devices to networks.

(2)

1 .....

.....

2 .....

.....

(ii) The organisation has chosen wireless connectivity over wired connectivity for its new office building. There is no significant difference in the cost of installing either.

Give **three** reasons why the organisation might prefer wireless connectivity.

(3)

1 .....

.....

2 .....

.....

3 .....

.....

(b) Each audiobook is compressed before it is released.

(i) A lossy compression algorithm reduces the size of a file by removing data.

Explain why data loss is acceptable when using lossy compression.

(2)

.....

.....

.....

.....

(ii) A run-length encoding (RLE) algorithm reduces the size of a file based on runs of repeated items. For example, wwwbbbwwbbbbbbwwww would be reduced to 3w3b2w6b4w.

Explain why RLE may **NOT** be a good choice for encoding a text file.

(2)

(c) The organisation calculates how long it takes to transmit the audiobook over the internet.

1 Mbps = 1000^2 bps

1 MB = 1024^2 bytes

The network transmission speed is 54 Mbps.

An audiobook file is 81 MB in size.

Construct an expression to show how many seconds it will take to transmit the audiobook file. Show your unit conversions. You do not have to do the calculations.

(5)

(Total for Question 3 = 14 marks)

7 A computer operates as a binary digital device.

(a) Explain why binary is used to represent computer data.

(2)

(b) 8-bit two's complement is used to represent the denary numbers -8 and -1.

Complete the table to show the binary addition on these two negative numbers.

(2)

-8								
-1								
Result								

(c) Explain why it is **not** possible to apply two's complement to the 8-bit unsigned integer 1111 1101.

(2)

(d) A musician wants to store hundreds of audio files to cloud storage.

She wants to compress the files before she stores them.

Compare using a lossless compression algorithm with using a lossy compression algorithm for this purpose.

(6)

.....

.....

.....

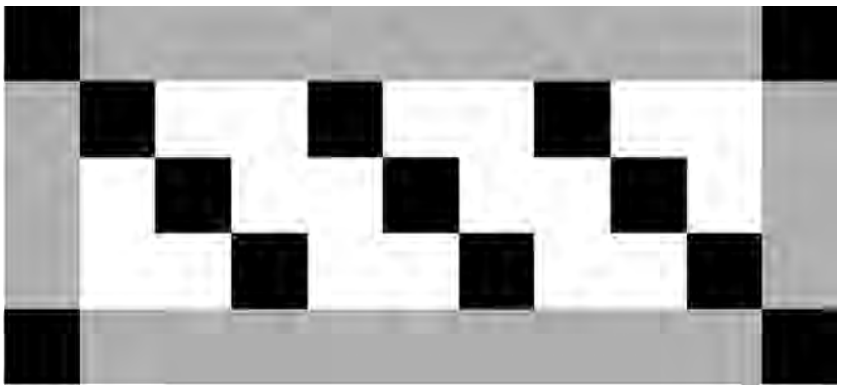
(Total for Question 7 = 12 marks)

5 Data

(a) Describe **one** effect of using lossy compression to reduce the size of a file.

(2)

(b) Here is an original image.



There is one bit available to represent each pixel.

Explain **one** reason why the image cannot be accurately represented using one bit for each pixel.

(2)

(c) Shifts are performed on binary patterns.

A **logical** shift right is performed on a pattern.

An **arithmetic** shift right is performed on the same original pattern.

Describe the reason the results will be different.

(2)

(d) Binary, denary and hexadecimal patterns represent numbers.

(i) Convert the binary pattern 0100 0010 to denary.

(1)

(ii) Convert the binary pattern 0101 1011 to hexadecimal.

(2)

(e) Data storage is measured in bits and bytes.

(i) State the number of unique values that can be represented with 6 bits.

(1)

(ii) A file format uses a 100 × 600 table of 32-bit integers.

The file uses 1 kibibyte of additional data.

Construct an expression to show the number of **bytes** of storage needed to store the file.

(3)

(f) An analogue sound is represented in digital form.

The sound is one second long and is sampled at 10 Hz.

The digital representation has a bit depth of 5 and is stored in two's complement.

Sound data:

00000 11111 11111 11111 11111

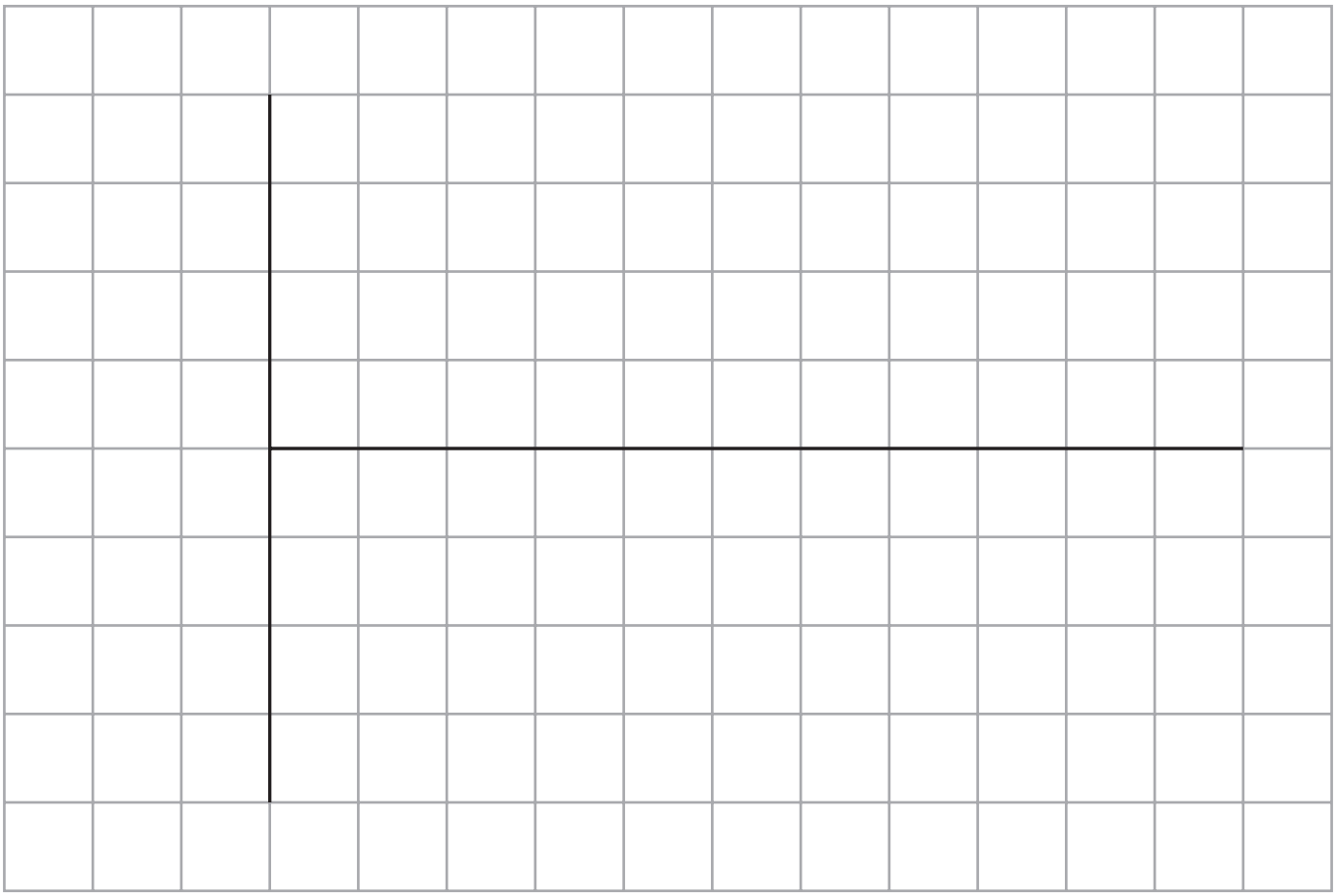
00000 00000 00001 00001 00001

Draw a graph to represent the data sampled.

You must include:

- labels for the x and y axes
- values for the x and y axes
- each sample plotted as an ×
- samples joined up to show the digital form.

(6)



(Total for Question 5 = 19 marks)