Chhetri Academy

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GCSE COMPUTER SCIENCE

2.2

Edexcel 1CP2 | Specification point 2.2.4

The limitations of binary representation of data when constrained by the number of available bits

Untiered

Past paper question booklet

2	2020-2025	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.

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)

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(Total for Question 7 = 12 marks)

1 Data

(a) Binary patterns consist of groups of bits.

(i) Identify the largest unit of measurement.

(1)

- ☒ **A** Gibibyte
- ☒ **B** Kibibyte
- ☒ **C** Mebibyte
- ☒ **D** Nibble

(ii) State the number of unique values that can be represented with 7 bits.

(1)

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(iii) The denary ASCII code for **D** is 68.

Give the denary ASCII code for **G**.

(1)

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(b) Hexadecimal is used to represent memory addresses.

(i) Give **two** characteristics of hexadecimal notation.

(2)

1 .....

.....

2 .....

.....

(ii) Explain **one** reason why programmers use hexadecimal to specify memory addresses.

(2)

(c) Audio and image files store data in binary.

(i) Explain **one** reason why lossy compression is used to reduce the size of an audio file.

(2)

(ii) An image is 315 pixels wide, 923 pixels high and has a colour depth of 7 bits.

Complete the expression to show the minimum file size in bytes.

You do not have to do the calculation.

(3)

$$\frac{\square \times \square \times \square}{\square}$$

(d) Computer systems manipulate bit patterns.

(i) Identify the result of applying an arithmetic shift right by two to the binary pattern 0110 1100

(1)

- ☒ **A** 0001 1100
- ☒ **B** 1101 1000
- ☒ **C** 0001 1011
- ☒ **D** 1011 0000

(ii) Convert the denary number 25 to 8-bit binary.

(2)

(iii) Convert the denary number –13 to 8-bit binary using two's complement.

(2)

(Total for Question 1 = 17 marks)