Chhetri Academy

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GCSE COMPUTER SCIENCE

2.2

Edexcel 1CP2 | Specification point 2.2.3

How analogue sound is represented in binary (amplitude, sample rate, bit depth, sample interval)

Untiered

Past paper question booklet

3	2019-2023	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** _____

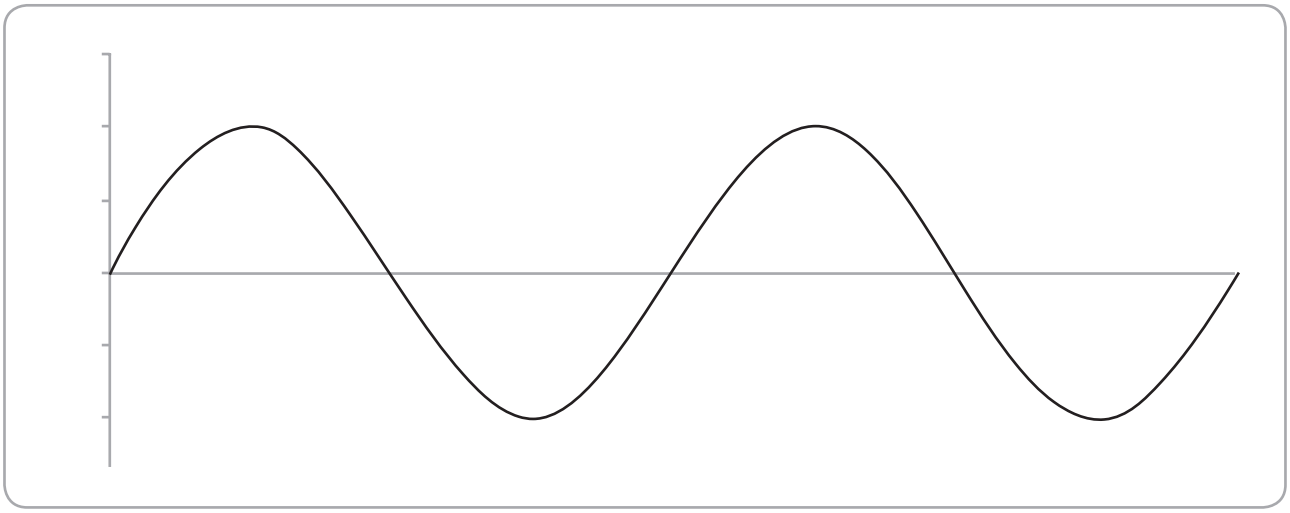
Whole questions are retained for context; some parts cover other points. Legacy sources are labelled.

4 A baby monitor uses a microphone to record sound.

(a) An analogue to digital converter is used to change the sounds received by the microphone into a form that can be processed by a computer.

(i) Complete the diagram to show sampling frequency and label both axes.

(3)



(ii) State the advantage of using a bit depth of 16 rather than a bit depth of 8.

(1)

.....

.....

(b) Identify the hardware component that holds a program that is currently being executed.

(1)

- ☒ **A** ALU
- ☒ **B** RAM
- ☒ **C** Hard drive
- ☒ **D** Control unit

(c) Construct an expression to show how many seconds it will take to transmit 20 MB of data using a network transmission speed of 2 Mbps

1 KB = 1024 bytes.

You do not have to do the calculation.

(4)

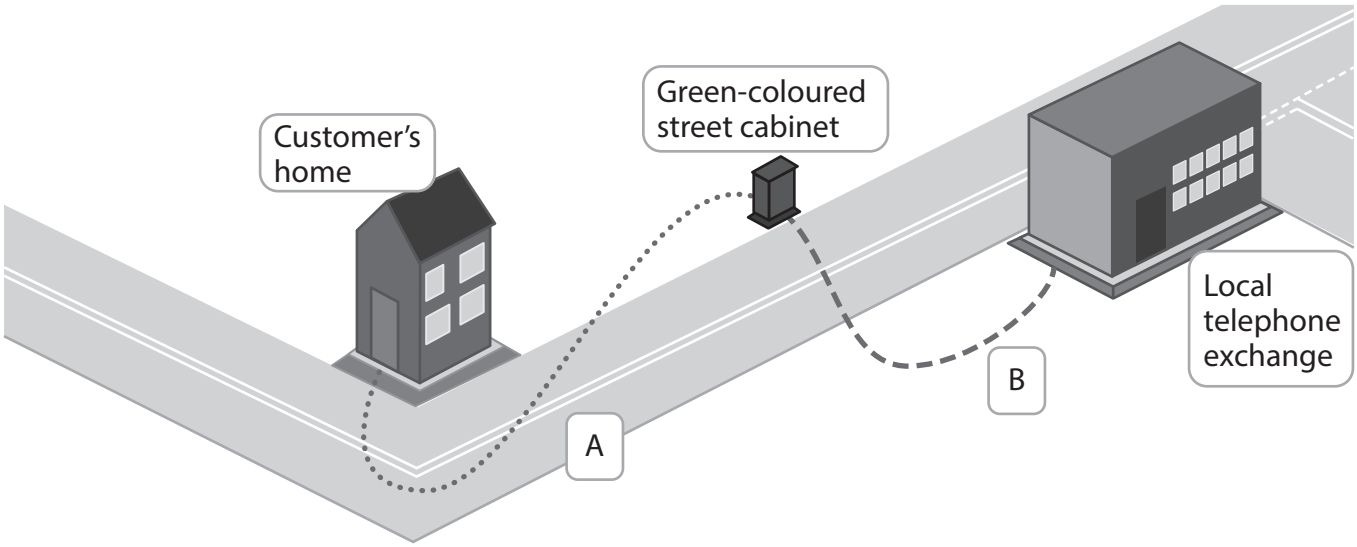
(d) Describe how an embedded system within a baby monitor can be used to alert parents about changes in room temperature.

(3)

(e) The diagram shows two **different** types of connectivity media.

State the different types of connectivity media used at A and B.

(2)



A .....

B .....

(Total for Question 4 = 14 marks)

4 Computers store and manipulate data.

(a) State the number of colours that can be represented with 5 bits.

(1)

(b) Convert the binary number 1010 1101 to hexadecimal.

(1)

(c) Convert the hexadecimal number E3 to binary and the result from binary to denary.

(2)

Binary

Denary

(d) The ASCII code for the character 'H' is 72 in denary.

Derive the ASCII code for the character 'E' in 8-bit binary.

(2)

(e) Compare the use of 8 bits and 24 bits to represent sound.

(2)

(f) The addition of these 8-bit binary numbers is required.

0011 1010

1011 0011

(i) Complete the table to show the result of the addition.

(2)

	0	0	1	1	1	0	1	0
+	1	0	1	1	0	0	1	1

(ii) The most significant bit (MSB) of the first binary number is changed.

Explain the effect of this change on the result of the addition.

(2)

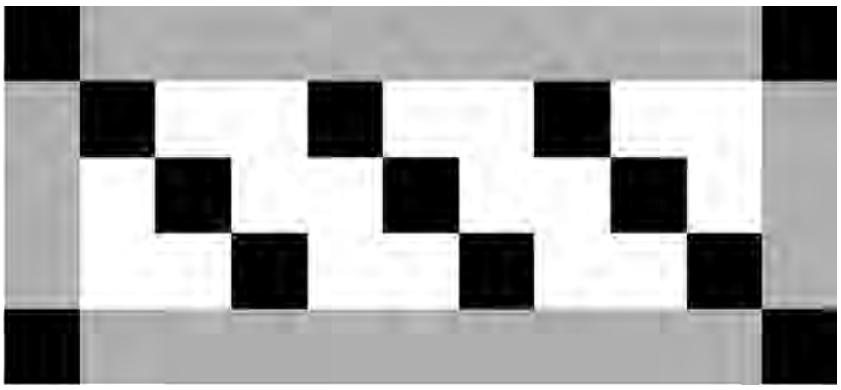
(Total for Question 4 = 12 marks)

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

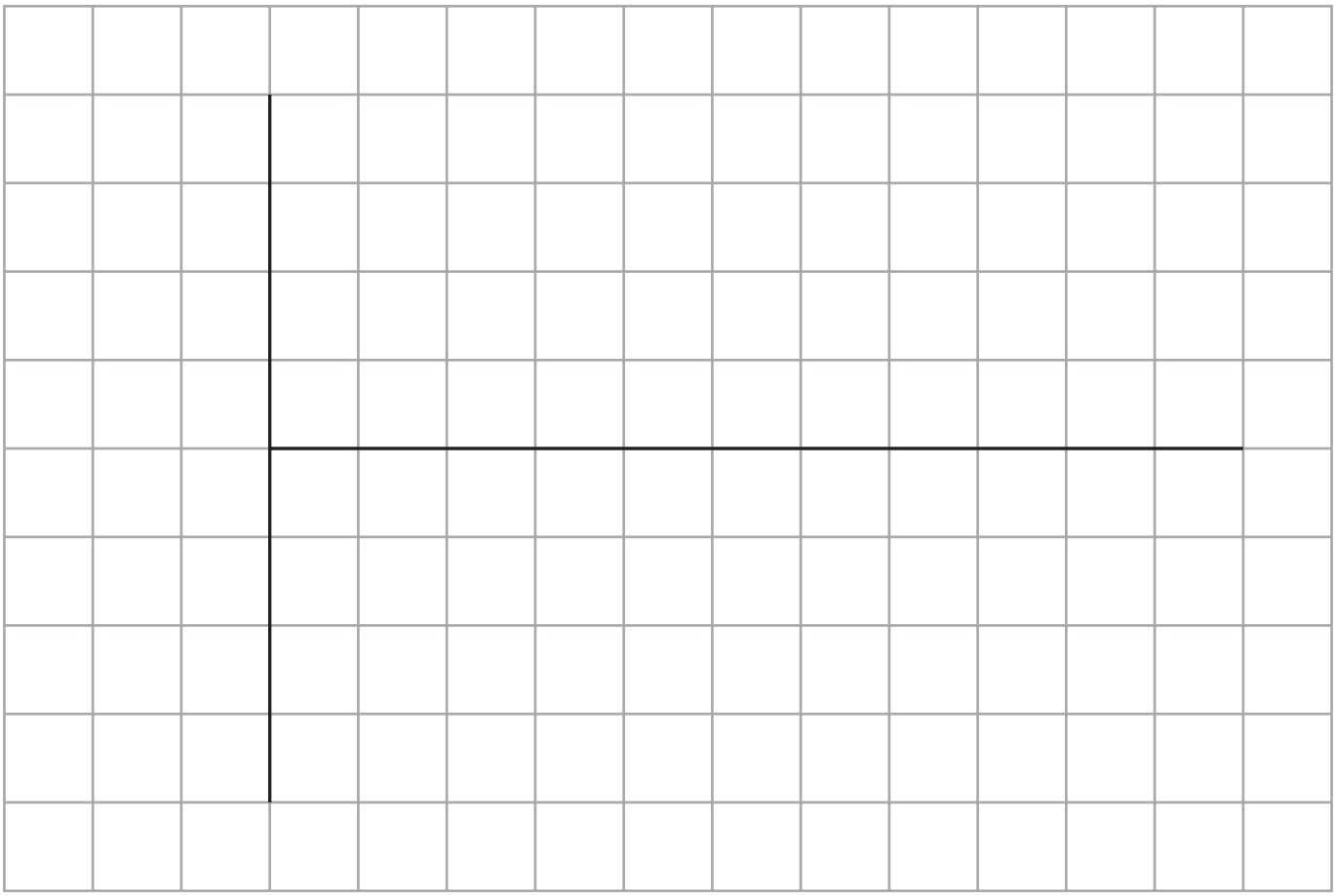
00000 00000 00001 00001 00001

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)