Chhetri Academy

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GCSE COMPUTER SCIENCE

2.1

Edexcel 1CP2 | Specification point 2.1.4

Be able to add together two positive binary patterns and apply logical and arithmetic binary shifts

Untiered

Past paper question booklet

4	2021-2024	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 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)

4 A program converts a binary pattern to a positive denary integer. The user enters the binary pattern. The program loops continually until the user inputs an empty pattern to stop the program.

A multiplier doubles for each position from right to left, to generate the place values for the binary pattern, i.e. 128, 64, 32, 16, 8, 4, 2, 1. When a 1 appears in the pattern, the place value is added to the running total. When a 0 appears in the pattern, nothing is added to the running total.

The table shows accurate test results for three inputs.

Input	Output
1100	12
10101010	170
<empty>	Exits program

The lines of code in the program are mixed up. The indentation has been done for you.

Open file **Q04.py**

Amend the code to make the program work and produce the correct output. You will need to rearrange the lines.

Do **not** change the functionality of the given lines of code.

Do **not** add any additional functionality.

Save your amended code as **Q04FINISHED.py**

(Total for Question 4 = 15 marks)

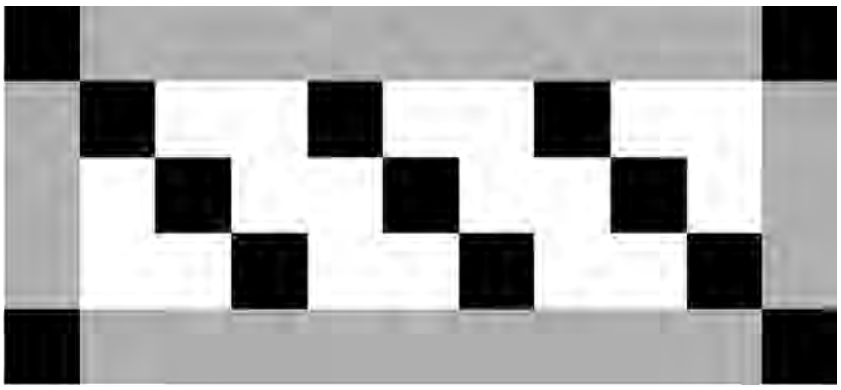
Suggested time: 20 minutes

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

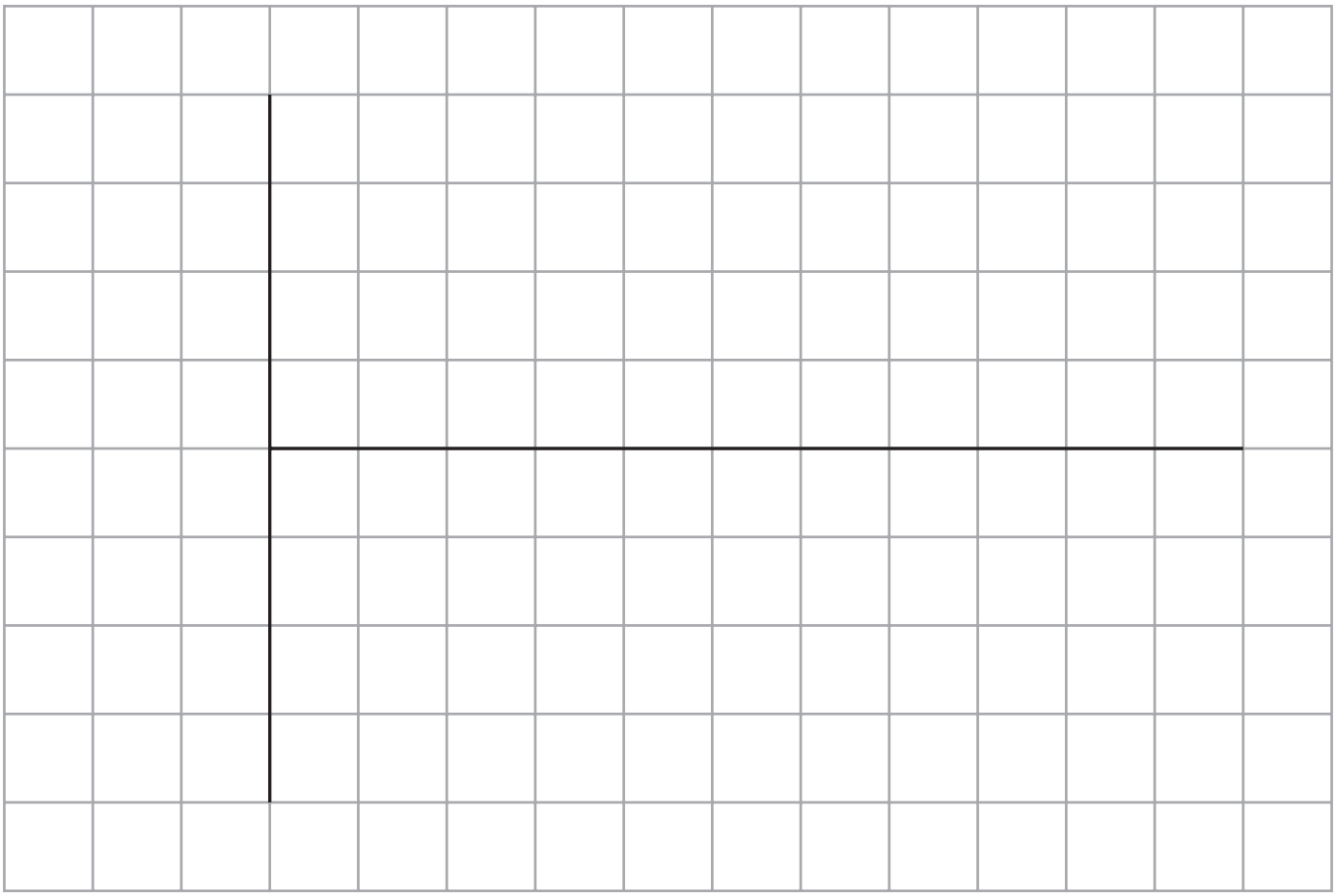
00000 00000 00001 00001 00001

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)

2 Data

(a) The ASCII system is used to represent letters and symbols.

(i) State the number of bits used to represent each letter or symbol in ASCII.

(1)

(ii) The ASCII code 65 represents the letter A.

Give the letter represented by the ASCII code 68.

(1)

(b) Sound waves are converted to binary using sample intervals.

Define the term 'sample interval'.

(1)

(c) Give an expression to calculate the size of a bitmap image, not the size of the file that stores the image.

(2)

(d) Computers manipulate binary patterns.

(i) Complete the table with the result of applying the shift to the binary pattern.

(2)

Binary pattern	Shift	8-bit binary result
1010 0011	Logical shift left by 3	
1100 1010	Arithmetic shift right by 2	

(ii) Identify the correct statement about overflow.

(1)

- ☒ **A** Causing the program to crash during an arithmetic operation
- ☒ **B** Requiring more bits to store a result than are available to store it
- ☒ **C** Switching between binary and hexadecimal number systems
- ☒ **D** Using an index less than 0 or greater than the length of an array

(iii) Convert the denary value +112 to 8-bit binary representation.

(2)

(iv) Give the 8-bit binary two's complement representation of denary –73

(2)

(e) The number of bits determines the number of patterns that can be represented.

(i) Identify the number of symbols available in the hexadecimal system.

(1)

- ☒ **A** 2
- ☒ **B** 8
- ☒ **C** 10
- ☒ **D** 16

(ii) The address bus of a computer is 8-bits wide.

State the number of unique addresses that can be accessed.

(1)

(f) Construct an expression to convert 40 681 930 227 712 bytes to tebibytes.

(2)

(Total for Question 2 = 16 marks)