

- 1** A student has an electronic calculator. The calculator has a screen that displays the result of calculations.

The calculator has 8-bit registers.

- (a)** State the highest denary number that could be stored in a single 8-bit register.

..... [1]

- (b)** Denary numbers are typed into the calculator. They are converted to binary numbers and stored in the 8-bit registers.

The student types in the denary number 23 and the denary number 168.

Give the 8-bit binary numbers that are stored in the registers for these **two** denary numbers.

23							
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168							
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[2]

Working space

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- (c)** The result of a calculation that is stored in a register is the binary number 00001011

Give the denary number that will be displayed on the screen for this binary number.

00001011 [1]

Working space

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- (d)** Another result of a calculation that is stored in a register is the binary number 01000010

Give the denary number that will be displayed on the screen for this binary number.

01000010 [1]

Working space

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- (e)** Two binary numbers stored in the registers are 01110110 and 00110000

Add the binary numbers using binary addition. Show all your working.

Give your answer in binary.

$$\begin{array}{r}
 01110110 \\
 + 00110000 \\
 \hline
 \end{array}$$

[3]

- (f)** The result of a calculation could be a negative denary number.

State how the calculator could represent a negative denary number as a binary number.

..... [1]

- (g)** The electronic calculator is an example of an embedded system.

Explain why it is an example of an embedded system.

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..... [2]

2 A clothes store has a ticket system to allow customers to speak to a personal shopper.

The ticket displays a ticket number in hexadecimal, for example 11B.

(a) The ticket system has an output device that creates a paper ticket.

Identify an appropriate output device to produce the paper ticket.

..... [1]

(b) Each ticket number is stored as a binary number in the ticket machine.

(i) Two ticket numbers are 14B and 97A.

Convert the **two** ticket numbers from hexadecimal to binary.

14B

97A

[2]

Working space

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(ii) Give **two** reasons why the ticket number is displayed as hexadecimal instead of binary.

1

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2

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[2]

(c) The ticket numbers could also be represented as denary.

(i) Convert the **two** ticket numbers from hexadecimal to denary.

02C

10B

[2]

(ii) Convert the **two** denary numbers into hexadecimal.

109

415

[2]

Working space

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1 The size of a file can be measured using different units.

(a) Tick (✓) **one** box to show which of these is **not** a unit of measurement for a file.

- | | | |
|----------|--------|--------------------------|
| A | bit | ☐ |
| B | bot | ☐ |
| C | nibble | ☐ |
| D | byte | ☐ |

[1]

(b) The size of a file can be reduced by compressing it.

(i) Give **two** types of compression that can be used to reduce the size of a file.

- 1
- 2

[2]

(ii) Give **three** benefits of reducing the size of a file for storage and transmission.

- 1
- 2
- 3

[3]

2 Data storage can be measured using different units of measurement.

(a) Identify the name of the smallest unit of measurement of data.

..... [1]

(b) State how many nibbles there are in 2 bytes.

..... [1]

(c) A 10 second sound effect is recorded for a movie.

It is recorded with a sample rate of 22,016 Hz and a sample resolution of 8 bits.

Calculate the file size of the sound effect in kibibytes (KiB). Show all your working.

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Answer KiB

[3]

(d) The sound effect file is compressed for storage.

(i) State what is meant by file compression.

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..... [1]

(ii) Give **one** benefit of compressing the file for storage.

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..... [1]