**1** A toy store gives each of the toys it sells a unique code. The codes are 3-digit hexadecimal codes, for example A4B.

A computer is used to store a database of the codes. The computer has 12-bit registers.

**(a)** Give the largest hexadecimal number that can be stored in a 12-bit register.

..... [1]

**(b)** Give the largest denary number that can be stored in a 12-bit register.

..... [1]

**(c)** Two toys have the hexadecimal codes 429 and 1A3.

Convert the **two** hexadecimal codes to 12-bit binary numbers.

429 .....

1A3 .....
[2]

Working space

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**(d)** Two binary numbers that are stored in the registers are 100010100001 and 011100001011.

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

100010100001 .....

011100001011 .....
[2]

Working space

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**(e)** The hexadecimal code for each toy is stored in a barcode that is displayed on each toy.

Each time a customer buys a toy, the barcode is scanned and the amount of stock stored in the database for that toy is reduced by 1.

An item of hardware is used in this system to receive the hexadecimal code from the barcode scanner and find it in the database. The item of hardware is built into a single chip.

**(i)** Identify the name of the item of hardware.

..... [1]

**(ii)** Tick (✓) **one** box to show whether a barcode scanner is a type of input, output, process or storage device.

**A** input ☐

**B** output ☐

**C** process ☐

**D** storage ☐

[1]

**(iii)** The barcode scanner contains a sensor.

Identify the type of sensor that the barcode scanner could contain.

..... [1]

**(iv)** A backup of the database is made at the end of each day using optical storage.

Describe how the database is written to the optical storage.

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..... [4]