1.1.2 Hexadecimal

Friday, 19 February 2021 5:59 PM

1.1.2 Hexadeci...

Topic: 1.1.2 Hexadecimal

1. Express the denary value 109 as a hexadecimal number.
2. Express the denary number 78 as a hexadecimal number,
3. Convert the following Hexadecimal numbers into denary system and binary system:
   - (i) A1
   - (ii) 37
   - (iii) FF
   - (iv) 0D
   - (v) ABC

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9 Draw a line to connect each question to the correct answer.

Question	Answer
What is the denary (base 10) equivalent to the hexadecimal digit **E**?	8
If 1 GB = 2^X then what is the value of X?	12
How many bits are there in one byte?	14
If the broadband data download rate is 40 megabits per second, how many seconds will it take to download a 60 MB file?	19
What is the denary (base 10) value of the binary number 0 0 1 0 0 1 0 0?	30
What hexadecimal value is obtained when the two hexadecimal digits **C** and **D** are added together?	36

[5]

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10
(b) An encryption system works by shifting the binary value for a letter one place to the left. "A" then becomes:

1	1	0	0	0	0	1	0

This binary value is then converted to hexadecimal; the hexadecimal value for "A" will be:

C 2

For the two letters "L" and "G", shift the binary values one place to the left and convert these values into hexadecimal:

									hexadecimal
L:									....
G:									....

[4]

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4 (a) (i) Convert the following **two** hexadecimal numbers into binary:

F A 7	1	1	1	1	1	0	1	0	0	1	1	1
D 3 E	1	1	0	1	0	0	1	1	1	1	1	0

[4]

(ii) Now perform the AND (logic) operation on each corresponding pair of binary bits in the two numbers from **part (i)**.

1	1	0	1	0	0	1	0	0	1	1	0

[2]

(iii) Convert your answer in **part (ii)** into hexadecimal. [2]

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(b) (i) The following code shows HTML 'tag' pairs on either side of the text stating the colour that each creates.

```
<font color " # F F 0 0 0 0 " > RED </font>
<font color " # 0 0 F F 0 0 " > GREEN </font>
<font color " # 0 0 0 0 F F " > BLUE </font>
<font color " # X " > YELLOW </font>
<font color " # Y " > MAGENTA </font>
<font color " # Z " > CYAN </font>
```

Yellow is a combination of red and green, magenta a combination of red and blue and cyan a combination of green and blue.
State what 6-digit hexadecimal values should replace X, Y and Z in the above code. [3]

(ii) Describe how other colours, such as a darker shade of blue, are created. [2]

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3 (a) Convert the following hexadecimal number into 12-bit binary:

4 A F

0	1	0	0	1	0	1	0	1	1	1	1

[3]

(b) The 2016 Olympic Games will be held in Rio de Janeiro. A timer that counts down to the opening of the Games is shown on a microprocessor-controlled display. The number of hours, minutes and seconds until the Games open are held in three 8-bit registers.
The present register values are:

0	1	1	0	1	0	0	1	105 hours
0	0	1	0	0	0	0	0	32 minutes
0	0	0	1	0	1	0	0	20 seconds

The timer will count **down** in seconds.

(i) Show the values in each 8-bit register **30 seconds** after the time shown above:

0	1	1	0	1	0	0	1	hours
0	0	0	1	1	1	1	1	minutes
0	0	1	1	0	0	1	0	seconds

[3]

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(ii) Write the hexadecimal value of the **minutes** register from **part (b)(i)**. [1]

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11 A security system is installed in a house. A hexadecimal number is entered to activate or deactivate the alarm.
(a) The alarm code is set to hexadecimal number **2 A F**
Show how this number would be stored in a 12-bit binary register.

0	0	1	0	1	0	1	0	1	1	1	1

[3]

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10 (a) A manufacturer of aeroplane engines assigns a denary identification number (ID) to each engine. One engine has the ID: 0431
(ii) Show how this number would be represented in hexadecimal. [3]

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1 The memory of a computer contains data and instructions in binary.
The following instruction is stored in a location of the memory.

0	0	1	0	1	0	0	1	1	1	1	1	1	1	0	0

(a) Convert the instruction into hexadecimal. [2]
(b) Explain why a programmer might prefer to read the instruction in hexadecimal rather than in binary. [2]
(c) Give **two** other uses of hexadecimal. [2]

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1 A robot arm in a factory is programmed to move products.
The binary instructions to operate the robot arm are:

Operation	Binary Instruction			
UP	1	1	1	1
DOWN	0	0	0	1
LEFT	1	0	0	1
RIGHT	0	1	1	0
OPEN	1	1	0	0
CLOSE	0	0	1	1

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The instructions are entered as hexadecimal values.
An operator enters the values:

9 1 C 3 F

Convert the values and write down the operation (e.g. RIGHT) carried out by the robot arm.

9

1

C

3

F [5]

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1 (b) The display screen shows a hexadecimal error code:

E04

This error code means that the water will not empty out of the washing machine.

Convert this error code to binary.

1	1	1	0	0	0	0	0	0	1	0	0

[3]

(c) State why hexadecimal is used to display the error code. [1]

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2 Dheeraj identifies **three** hexadecimal numbers.
Write the **denary** number for each of the three hexadecimal numbers:

2A

101

21E [3]

10 RockICT is a music business that has a website to allow customers to view and buy the products it sells.
The website consists of web pages.
(a) Describe what is meant by HTML structure and presentation for a web page. [4]

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4 Jafar is using the Internet when he gets the message:

"D03, page is not available"

Jafar remembers that hexadecimal is often used to represent binary values in error codes.
Convert the hexadecimal number in the error message into 12-bit binary.

1	1	0	1	0	0	0	0	0	0	1	1

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1
(b) Each letter in ASCII can also be represented as a hexadecimal value.

The word KEY has the 8-bit binary values:

K	E	Y
01001011	01000101	01011001

(i) Convert the three 8-bit binary values into hexadecimal.

01001011 .... (4B)16

01000101 .... (45)16

01011001 .... (59)16

[3]

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(ii) Give **three** other uses of hexadecimal notation in computer science.

1 ..... HTML Colors

2 ..... MAC Addresses

3 ..... Assembly and machine Codes

4. Debugging. [3]

(iii) State **two** benefits of using hexadecimal notation to represent binary values.

Benefit 1 ....

Benefit 2 .... [2]

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4
The MAC address of a device is represented using hexadecimal.

A section of a MAC address is shown. Each pair of hexadecimal digits is stored using 8-bit binary.

(a) Complete the table to show the 8-bit binary equivalents for the section of MAC address. The first number has already been converted.

6A	FF	08	93
01101010	11111111	00001000	10010011

[3]

(b) Explain why data is stored as binary in computers.

Since computer is made up of gates in logic circuits and logic circuits only take bits 0 and 1 as input and give output as either bit 0 and 1. Thats why computer stores everything in binary. [2]