# **Activity 1.2**

Convert the following denary numbers into binary (using both methods):

a	4 1	d	100	g	1 4 4	j	255	m	4095
b	67	е	1 1 1	h	189	k	33000	n	16400
С	8 6	f	127	i	200	l	888	0	62307

## The hexadecimal system

The **hexadecimal number system** is very closely related to the binary system. Hexadecimal (sometimes referred to as simply 'hex') is a base 16 system and therefore needs to use 16 different 'digits' to represent each value.

Because it is a system based on 16 different digits, the numbers 0 to 9 and the letters A to F are used to represent each hexadecimal (hex) digit. A in hex = 10 in denary, B = 11, C = 12, D = 13, E = 14 and F = 15.

Using the same method as for denary and binary, this gives the headings  $16^{\circ}$ ,  $16^{\circ}$ ,  $16^{\circ}$ ,  $16^{\circ}$ , and so on. The typical headings for a hexadecimal number with five digits would be:

Γ	(164)	(16³)	(16²)	(16¹)	(16°)	
	65 536	4096	256	16	1	
	2	1	F	3	А	

A typical example of hex is 2 1 F 3 A.

Since  $16 = 2^4$  this means that FOUR binary digits are equivalent to each hexadecimal digit. The following table summarises the link between binary, hexadecimal and denary:

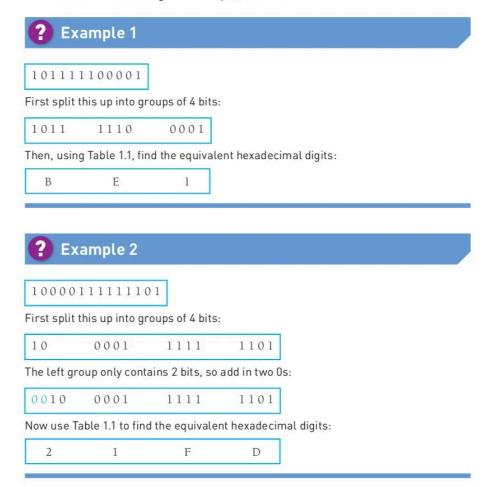
### ▼ Table 1.1

Binary value	Hexadecimal value	Denary value
0000	0	0
0 0 0 1	1	1
0 0 1 0	2	2
0 0 1 1	3	3
0 1 0 0	4	4
0 1 0 1	5	5
0 1 1 0	6	6
0 1 1 1	7	7
1000	8	8
1001	9	9
1010	А	10
1011	В	11
1100	С	12
1 1 0 1	D	13
1110	Е	14
1111	F	15

### **1 DATA REPRESENTATION**

# Converting from binary to hexadecimal and from hexadecimal to binary

Converting from binary to hexadecimal is a fairly easy process. Starting from the right and moving left, split the binary number into groups of 4 bits. If the last group has less than 4 bits, then simply fill in with 0s from the left. Take each group of 4 bits and convert it into the equivalent hexadecimal digit using Table 1.1. Look at the following two examples to see how this works.

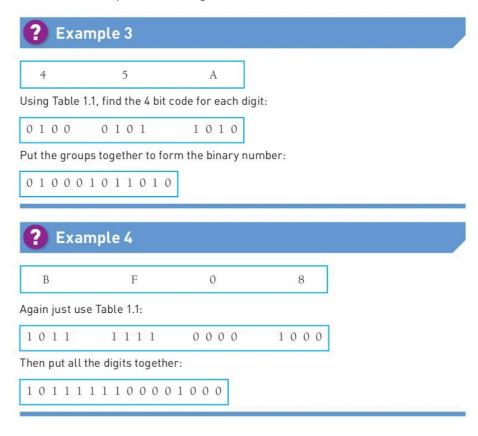


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1.1 Number systems

# Activity 1.3 Convert the following binary numbers into hexadecimal: a 1 1 0 0 0 0 1 1 b 1 1 1 1 0 1 1 1 c 1 0 0 1 1 1 1 1 1 1 d 1 0 0 1 1 1 0 1 1 1 0 e 0 0 0 1 1 1 1 1 0 0 0 0 1 f 1 0 0 0 1 0 0 1 1 1 1 1 1 0 g 0 0 1 0 0 1 1 1 1 1 1 1 0 h 0 1 1 1 0 1 0 0 1 1 1 1 0 0 i 1 1 1 1 1 1 1 1 1 0 1 1 1 1 1 0 j 0 0 1 1 0 0 1 1 1 1 0 1 0 1 1 1 0

Converting from hexadecimal to binary is also very straightforward. Using the data in Table 1.1, simply take each hexadecimal digit and write down the 4-bit code which corresponds to the digit.



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