and $\mathbf{1BF_{16}} = 1 \times 16^2 + B \times 16^1 + F \times 16^0$

$= 1 \times 16^2 + 11 \times 16^1 + 15 \times 16^0$

$= 256 + 176 + 15 = \mathbf{447_{10}}$

Table 5.2 compares decimal, binary, octal and hexadecimal numbers and shows, for example, that

$$23_{10} = 10111_2 = 27_8 = 17_{16}$$

Table 5.2

Decimal	Binary	Octal	Hexadecimal
0	0000	0	0
1	0001	1	1
2	0010	2	2
3	0011	3	3
4	0100	4	4
5	0101	5	5
6	0110	6	6
7	0111	7	7
8	1000	10	8
9	1001	11	9
10	1010	12	A
11	1011	13	B
12	1100	14	C
13	1101	15	D
14	1110	16	E
15	1111	17	F
16	10000	20	10
17	10001	21	11
18	10010	22	12
19	10011	23	13
20	10100	24	14
21	10101	25	15
22	10110	26	16
23	10111	27	17
24	11000	30	18
25	11001	31	19
26	11010	32	1A
27	11011	33	1B
28	11100	34	1C
29	11101	35	1D
30	11110	36	1E
31	11111	37	1F
32	100000	40	20

Problem 11. Convert the following hexadecimal numbers into their decimal equivalents: (a) $7A_{16}$ (b) $3F_{16}$

(a) $7A_{16} = 7 \times 16^1 + A \times 16^0 = 7 \times 16 + 10 \times 1$

$= 112 + 10 = 122$

Thus $\mathbf{7A_{16} = 122_{10}}$

(b) $3F_{16} = 3 \times 16^1 + F \times 16^0 = 3 \times 16 + 15 \times 1$

$= 48 + 15 = 63$

Thus $\mathbf{3F_{16} = 63_{10}}$

Problem 12. Convert the following hexadecimal numbers into their decimal equivalents: (a) $C9_{16}$ (b) BD_{16}

(a) $C9_{16} = C \times 16^1 + 9 \times 16^0 = 12 \times 16 + 9 \times 1$

$= 192 + 9 = 201$

Thus $\mathbf{C9_{16} = 201_{10}}$

(b) $BD_{16} = B \times 16^1 + D \times 16^0 = 11 \times 16 + 13 \times 1$

$= 176 + 13 = 189$

Thus $\mathbf{BD_{16} = 189_{10}}$

Problem 13. Convert $1A4E_{16}$ into a denary number.

$1A4E_{16} = 1 \times 16^3 + A \times 16^2 + 4 \times 16^1 + E \times 16^0$

$= 1 \times 16^3 + 10 \times 16^2 + 4 \times 16^1 + 14 \times 16^0$

$= 1 \times 4096 + 10 \times 256 + 4 \times 16 + 14 \times 1$

$= 4096 + 2560 + 64 + 14 = 6734$

Thus $\mathbf{1A4E_{16} = 6734_{10}}$

To convert from decimal to hexadecimal:

This is achieved by repeatedly dividing by 16 and noting the remainder at each stage, as shown below for 26_{10}

16 | 26 Remainder

16 | 1 $10 \equiv A_{16}$

0 $1 \equiv 1_{16}$

most significant bit → 1 A ← least significant bit

Hence $\mathbf{26_{10} = 1A_{16}}$

Similarly, for 447_{10}

16 | 447 Remainder

16 | 27 $15 \equiv F_{16}$

16 | 1 $11 \equiv B_{16}$

0 $1 \equiv 1_{16}$

1 B F

Thus $\mathbf{447_{10} = 1BF_{16}}$
