

Number representation

Table 2-1
Binary, decimal,
octal, and
hexadecimal
numbers.

<i>Binary</i>	<i>Decimal</i>	<i>Octal</i>	<i>3-Bit String</i>	<i>Hexadecimal</i>	<i>4-Bit String</i>
0	0	0	000	0	0000
1	1	1	001	1	0001
10	2	2	010	2	0010
11	3	3	011	3	0011
100	4	4	100	4	0100
101	5	5	101	5	0101
110	6	6	110	6	0110
111	7	7	111	7	0111
1000	8	10	—	8	1000
1001	9	11	—	9	1001
1010	10	12	—	A	1010
1011	11	13	—	B	1011
1100	12	14	—	C	1100
1101	13	15	—	D	1101
1110	14	16	—	E	1110
1111	15	17	—	F	1111

Figure 1: Binary, decimal, octal and hexadecimal numbers represented on 3 or 4 bits

Table 2-2 Conversion methods for common radices.

<i>Conversion</i>	<i>Method</i>	<i>Example</i>
Binary to		
Octal	Substitution	$10111011001_2 = 10\ 111\ 011\ 001_2 = 2731_8$
Hexadecimal	Substitution	$10111011001_2 = 101\ 1101\ 1001_2 = 5D9_{16}$
Decimal	Summation	$10111011001_2 = 1 \cdot 1024 + 0 \cdot 512 + 1 \cdot 256 + 1 \cdot 128 + 1 \cdot 64$ $+ 0 \cdot 32 + 1 \cdot 16 + 1 \cdot 8 + 0 \cdot 4 + 0 \cdot 2 + 1 \cdot 1 = 1497_{10}$
Octal to		
Binary	Substitution	$1234_8 = 001\ 010\ 011\ 100_2$
Hexadecimal	Substitution	$1234_8 = 001\ 010\ 011\ 100_2 = 0010\ 1001\ 1100_2 = 29C_{16}$
Decimal	Summation	$1234_8 = 1 \cdot 512 + 2 \cdot 64 + 3 \cdot 8 + 4 \cdot 1 = 668_{10}$
Hexadecimal to		
Binary	Substitution	$C0DE_{16} = 1100\ 0000\ 1101\ 1110_2$
Octal	Substitution	$C0DE_{16} = 1100\ 0000\ 1101\ 1110_2 = 1\ 100\ 000\ 011\ 011\ 110_2 = 140336_8$
Decimal	Summation	$C0DE_{16} = 12 \cdot 4096 + 0 \cdot 256 + 13 \cdot 16 + 14 \cdot 1 = 49374_{10}$
Decimal to		
Binary	Division	$108_{10} \div 2 = 54$ remainder 0 (LSB) $\div 2 = 27$ remainder 0 $\div 2 = 13$ remainder 1 $\div 2 = 6$ remainder 1 $\div 2 = 3$ remainder 0 $\div 2 = 1$ remainder 1 $\div 2 = 0$ remainder 1 (MSB) $108_{10} = 1101100_2$
Octal	Division	$108_{10} \div 8 = 13$ remainder 4 (least significant digit) $\div 8 = 1$ remainder 5 $\div 8 = 0$ remainder 1 (most significant digit) $108_{10} = 154_8$
Hexadecimal	Division	$108_{10} \div 16 = 6$ remainder 12 (least significant digit) $\div 16 = 0$ remainder 6 (most significant digit) $108_{10} = 6C_{16}$

Figure 2: Conversion methods for common radices