(1) a) 6712_8

$= 6 \times 8^3 + 7 \times 8^2 + 1 \times 8^1 + 2 \times 8^0$

$= 6 \times 512 + 7 \times 64 + 1 \times 8 + 2 \times 1$

$= 3530$

b) 31013_4

$= 3 \times 4^4 + 1 \times 4^3 + 0 \times 4^2 + 1 \times 4^1 + 3 \times 4^0$

$= 3 \times 256 + 1 \times 64 + 1 \times 4 + 3 \times 1$

$= 839$

(2) a) 101101110_2

$= 1\times2^8 + 0\times2^7 + 1\times2^6 + 1\times2^5 + 0\times2^4 + 1\times2^3 + 1\times2^2 + 1\times2^1 + 0\times2^0$

$= 256 + 64 + 32 + 8 + 4 + 2$

$= 366$

b) $CBA77_{16}$

Decimal	Hexadecimal
9	9_{16}
10	A_{16}
11	B_{16}
12	C_{16}

$= 12\times16^4 + 11\times16^3 + 10\times16^2 + 7\times16^1 + 7\times16^0$

$= 12\times65536 + 11\times4096 + 10\times256 + 7\times16 + 7\times1$

$= 834167$

(3) 237.237_8

$= 2\times8^2 + 3\times8^1 + 7\times8^0 + 2\times8^{-1} + 3\times8^{-2} + 7\times8^{-3}$

$= 2\times64 + 3\times8 + 7\times1 + \frac{2}{8} + \frac{3}{64} + \frac{7}{512}$

≈ 159.31

(4) a) Convert 2139 to octal (base 8).

	Q	R
$2139 \div 8$	267	3
$267 \div 8$	33	3
$33 \div 8$	4	1
$4 \div 8$	0	4

$2139 = 4133_8$

(4) b) Convert 0.84375 to base 4.

	I	N
0.84375 × 4	3	0.375
0.375 × 4	1	0.5
0.5 × 4	2 ↓	0

$0.84375 = 0.312_4$

c) Convert 301.640625 to base 4.

	Q	R
301 ÷ 4	75	1 ↑
75 ÷ 4	18	3
18 ÷ 4	4	2
4 ÷ 4	1	0
1 ÷ 4	0	1

	I	N
0.640625 × 4	2	0.5625
0.5625 × 4	2	0.25
0.25 × 4	1 ↓	0

$301.640625 = 10231.221_4$

(5)

	I	N
0.85×4	3	0.4
0.4×4	1	0.6
0.6×4	2	0.4
0.4×4	1	0.6
0.6×4	2	0.4
0.4×4	1	0.6

pattern continues

$$0.85 = 0.3\overline{12}_4$$

(6) a) 27.64_8

$= 010111.110100_2$

$= 10111.1101_2$

Octal	Binary
0_8	000_2
1_8	001_2
2_8	010_2
3_8	011_2
4_8	100_2
5_8	101_2
6_8	110_2
7_8	111_2

We can drop leading 0 in an integer, and trailing 0 in a decimal.

b) $11\ 111\ 010.110\ 1_2$

$= 011\ 111\ 010.110\ 100_2$

We can add leading 0 in an integer, and trailing 0 in a decimal.

$= 372.64_8$