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Sec: 4

(1.3) Convert the following numbers with the indicated bases to decimal

(a) $(4310)_5$

$= (4\times5^3)+(3\times5^2)+(1\times5^1)$

$= (580)_{10}$

(b) $(198)_{12} = \cancel{1\times}\ (1\times12^2)+(9\times12^1)+(8\times12^0)$

$= (260)_{10}$

(c) $(435)_8 = (4\times8^2)+(3\times8^1)+(5\times8^0)$

$= (285)_{10}$

(d) $(345)_6 = (3\times6^2)+(4\times6^1)+(5\times6^0)$

$= (137)_{10}$

(1.7) Convert 64CD to binary, then convert it from binary to octal.

64CD

$\downarrow$

$(0110\ 0100\ 1100\ 1101)_2$

Now, $(\underline{110}\ \underline{010}\ \underline{011}\ \underline{001}\ \underline{101})_2$

$\downarrow$

$(62315)_8$

(1.8) Convert $(431)_{10}$ to binary in two ways

(a) Convert directly to binary.

	Quotient	Remainder
$431 \div 2$	215	1
$215 \div 2$	107	1
$107 \div 2$	53	1
$53 \div 2$	26	1
$26 \div 2$	13	0
$13 \div 2$	6	1
$6 \div 2$	3	0
$3 \div 2$	1	1
$1 \div 2$	0	1

$$(431)_{10} = (110101111)_2$$

(b) Convert first to hexadecimal and then to binary

	Quotient	Remainder
$431 \div 16$	26	15 (F)
$26 \div 16$	1	10 (A)
$1 \div 16$	0	1

$$\therefore (431)_{10} = (1AF)_{16}$$

Now, $(1AF)_{16}$

$\downarrow$

$(0001\ 1010\ 1111)_2$

method 2 is faster.

(1.9) (a) $(10110.0101)_2 = 1\times2^4 + 0\times2^3 + 1\times2^2 + 1\times2^1$
$+ 0\times2^0 + 0\times2^{-1} + 1\times2^{-2} + 0\times2^{-3} + 1\times2^{-4}$
$= (22.3125)_{10}$

(b) $(16.5)_{16} = 1\times16^1 + 6\times16^0 + 5\times16^{-1}$
$= (22.3125)_{10}$

(c) $(26.24)_8 = 2\times8^1 + 6\times8^0 + 2\times8^{-1} + 4\times8^{-2}$
$= (22.3125)_{10}$

(d) $(DADA.B)_{16} = 14\times16^3 + 10\times16^2 + 14\times16^1 + 10\times16^0$
$+ 11\times16^{-1}$
$= 60138.6875$

(e) $(1010.1101)_2 = 8 + 2 + 0.5 + 0.625$
$= 10.8125$ (Ans:)

1.19 (a) 00010000

1's complement: 11101111

2's complement:

$$\begin{array}{r} 11101111 \\ +\ 1 \\ \hline 11110000 \end{array}$$

(b) 00000000

1's complement: 11111111

2's complement:

$$\begin{array}{r} 11111111 \\ +1 \\ \hline 00000000 \end{array}$$

(c) 11011010

1's complement: 00100101

2's complement:

$$\begin{array}{r} 00100101 \\ +1 \\ \hline 00100110 \end{array}$$

(d) 10101010

1's complement: 01010101

2's complement:

$$\begin{array}{r} 01010101 \\ 1 \\ \hline 01010110 \end{array}$$

(e) 10000101

1's complement: 01111010

2's complement:

$$\begin{array}{r} 01111010 \\ 1 \\ \hline 01111011 \end{array}$$

(f) 11111111

1's complement: 00000000

2's complement: 00000000

+ 1

00000001

1.18 (a) 10011 - 10010

Now, 0_10010

1's comp: 1_01101

2's comp: 1_01101

+ 1

1_01110

Hene,

0_10011

1_01110

0_00001

Check: 19 - 18 = +1

(b) 100010 - 100110

Now,

0_100110

1's comp: 1_011001

2's comp: 1_011001

1

1_011010

Hene,

0_100010

1_011010

1_111100

[Sign bit indicates that result is negative)

∴ 1's comp: 0_000011

2's comp: 0_000011

$$\begin{array}{r} 0\_000011 \\ 1 \\ \hline 0\_000100 \end{array}$$

Check: 34 − 38 = −4

(c) 1001 − 110101

Now, 0_110101

1's comp: 1-001010

2's comp: 1_001010

$$\begin{array}{r} 1\_001010 \\ 1 \\ \hline 1\_001011 \end{array}$$

Here,

$$\begin{array}{r} 0\_001001 \\ 1\_001011 \\ \hline 1-010100 \end{array}$$

[Sign bit is negative]

So, 1's comp: 0_101011

2's comp: 0_101011

$$\begin{array}{r} 0\_101011 \\ 1 \\ \hline 0\_101100 \end{array}$$

Check: 9 − 53 = −44

(d) 101000 − 10101

Now, 0-010101

1's comp: 1-101010

2's comp: 1-101010
+ 1

1-101011

Here,

0-101000
1-101011

0-010011 [Sign bit indicates the result is positive]

Check: 40-21 = 19

1.19 +9286 → 009286

+801 → 000801

−9286 → 990714

−801 → 999199

(a) (+9286) + (801) = 009286 + 000801 = 010087

(b) (+9286) + (−801) = 009286 − ~~999~~ 999199

= 008485

(c) (−9286) + (+801) = 990714 + 000801 = 991515

(d) (−9286) + (−801) = 990714 + 999199 = 989913

1.22 $(6514)_{10}$

BCD = 0110 0101 0001 0100

ASCII = 0_011_0110_0_011_0101_1_011_0001_1_011_0100

ASCII = 0011_0110_0011_0101_1011_0001_1011_0100

1.23 791

↓

BCD: 0111 1001 0001

658

↓

BCD: 0110 0101 1000

```
     0111 1001 0001
     0110 0101 1000
     --------------
     1101 1110 1001
     0110 0110
  -----------------
0001 0011 0100
0001 0001
0001 0100 0100 1001 (1449)
```

1.24

6 3 1 1	Decimal
0 0 0 0	0
0 0 0 1	1
0 0 1 1	2
0 1 0 0	3
0 1 1 0	4 (or 0101)
0 1 1 1	5
1 0 0 0	6
1 0 1 0	7 (or 1001)
1 0 1 1	8
1 1 0 0	9

6 4 2 1	Decimal
0 0 0 0	0
0 0 0 1	1
0 0 1 0	2
0 0 1 1	3
0 1 0 0	4
0 1 0 1	5
1 0 0 0	6 (or 0110)
1 0 0 1	7
1 0 1 0	8
1 0 1 1	9

1.25 6248

(a) BCD = 0110 0010 0100 1000

(b) Excess-3 : 1001 0101 0111 1011

(c) 2421 : 0110 0010 0100 1110

(d) 6311 : 1000 0010 0110 1011