

1.5 (a)

$$\begin{array}{r} \text{1111 (Add)} \\ +1010 \\ \hline 11001 \end{array}$$

$$\begin{array}{r} \text{1111 (Sub)} \\ -1010 \\ \hline 0101 \end{array}$$

$$\begin{array}{r} \text{1111 (Multiply)} \\ \times 1010 \\ \hline 0000 \\ 1111 \\ 11110 \\ \hline 0000 \\ 011110 \\ \hline 1111 \\ \hline 10010110 \end{array}$$

1.5 (b, c) See FLD p. 692 for solutions.

1.6, 1.7, See FLD p. 692 for solutions.

1.8

1.10 (a) 1305.375_{10}

$$\begin{array}{r} 16 \overline{) 1305} \\ \underline{16 \overline{) 81}} \quad r9 \\ \quad \quad \quad 5 \quad r1 \end{array} \quad \begin{array}{r} 0.375 \\ \underline{\quad 16} \\ (6).000 \end{array}$$

$\therefore 1305.375_{10} = 519.600_{16}$

$$= \frac{0101 \ 0001 \ 1001.0110 \ 0000 \ 0000_2}{5 \quad 1 \quad 9 \quad 6 \quad 0 \quad 0}$$

1.10 (b) 11.33_{10}

$$\begin{array}{r} 16 \overline{) 111} \\ \quad \quad \quad 6 \quad r15 = F_{16} \end{array} \quad \begin{array}{r} 0.33 \\ \underline{\quad 16} \\ (5).28 \\ \underline{\quad 16} \\ (4).48 \end{array}$$

$\therefore 11.33_{10} = 6F.54_{16}$

$$= \frac{0110 \ 1111.0101 \ 0100_2}{6 \quad F \quad 5 \quad 4}$$

1.10 (c) 301.12_{10}

$$\begin{array}{r} 16 \overline{) 301} \\ \underline{16 \overline{) 18}} \quad r13 \\ \quad \quad \quad 1 \quad r2 \end{array} \quad \begin{array}{r} 0.12 \\ \underline{\quad 16} \\ (1).92 \\ \underline{\quad 16} \\ (14).72 \end{array}$$

$\therefore 301.12_{10} = 12D.1E_{16}$

$$= \frac{0001 \ 0010 \ 1101.0001 \ 1110_2}{1 \quad 2 \quad D \quad 1 \quad E}$$

1.10 (d) 1644.875_{10}

$$\begin{array}{r} 16 \overline{) 1644} \\ \underline{16 \overline{) 102}} \quad r12 \\ \quad \quad \quad 6 \quad r6 \end{array} \quad \begin{array}{r} 0.875 \\ \underline{\quad 16} \\ (14).000 \end{array}$$

$\therefore 1644.875_{10} = 66C.E00_{16}$

$$= \frac{0110 \ 0110 \ 1100.1110 \ 0000 \ 0000_2}{6 \quad 6 \quad C \quad E \quad 0 \quad 0}$$

1.11 (a) $101 \ 111 \ 010 \ 100.101_2 = 5724.5_8$

$$= 5 \times 8^3 + 7 \times 8^2 + 2 \times 8^1 + 4 \times 8^0 + 5 \times 8^{-1}$$

$$= 5 \times 512 + 7 \times 64 + 2 \times 8 + 4 + 5/8$$

$$= 3028.625_{10}$$

$1011 \ 1101 \ 0100.1010_2 = BD4.A_{16}$

$$B \times 16^2 + D \times 16^1 + 4 \times 16^0 + A \times 16^{-1}$$

$$11 \times 256 + 13 \times 16 + 4 + 10/16$$

$$= 3028.625_{10}$$

1.11 (b) $100 \ 001 \ 101 \ 111.010_2 = 4157.2_8$

$$= 4 \times 8^3 + 1 \times 8^2 + 5 \times 8^1 + 7 \times 8^0 + 2 \times 8^{-1}$$

$$= 4 \times 512 + 1 \times 64 + 5 \times 8 + 7 + 2/8$$

$$= 2159.25_{10}$$

$1000 \ 0110 \ 1111.0100_2 = 86F.4_{16}$

$$= 8 \times 16^2 + 6 \times 16^1 + F \times 16^0 + 4 \times 16^{-1}$$

$$= 8 \times 256 + 6 \times 16 + 15 + 4/16$$

$$= 2159.25_{10}$$

1.12 (a) $375.54_8 = 3 \times 64 + 7 \times 8 + 5 + 5/8 + 4/64$

$$= 253.6875_{10}$$

$$\begin{array}{r} 3 \overline{) 253} \\ \underline{3 \overline{) 84}} \quad r1 \\ \quad \quad \quad 3 \overline{) 28} \quad r0 \\ \quad \quad \quad \quad \quad 3 \overline{) 9} \quad r1 \\ \quad \quad \quad \quad \quad \quad \quad 3 \overline{) 3} \quad r0 \\ \quad \quad \quad \quad \quad \quad \quad \quad \quad 3 \overline{) 1} \quad r0 \\ \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad 0 \quad r1 \end{array} \quad \begin{array}{r} 0.69 \\ \underline{\quad 3} \\ (2).07 \\ \underline{\quad 3} \\ (0).21 \\ \underline{\quad 3} \\ (0).63 \\ \underline{\quad 3} \\ (1).89 \end{array}$$

$\therefore 375.54_8 = 100101.2001_3$

1.12 (b) 384.74_{10}

$$\begin{array}{r} 4 \overline{) 384} \\ \underline{4 \overline{) 96}} \quad r0 \\ \quad \quad \quad 4 \overline{) 24} \quad r0 \\ \quad \quad \quad \quad \quad 4 \overline{) 6} \quad r0 \\ \quad \quad \quad \quad \quad \quad \quad 4 \overline{) 1} \quad r2 \\ \quad \quad \quad \quad \quad \quad \quad \quad \quad 0 \quad r1 \end{array} \quad \begin{array}{r} 0.74 \\ \underline{\quad 4} \\ (2).96 \\ \underline{\quad 4} \\ (3).84 \\ \underline{\quad 4} \\ (3).36 \end{array}$$

$\therefore 384.74_{10} = 12000.233113_4...$

1.12 (c) $A52.A4_{11} = 10 \times 121 + 5 \times 11 + 2 + 10/11 + 4/121$
 $= 1267.94_{10}$

9		1267		0.94
9		140	r7	9
9		15	r5	(8).46
9		1	r6	9
0			r1	(4).14

$\therefore A52.A4_{11} = 1267.94_{10} = 1657.8427_9 \dots$

1.13 $544.1_9 = 5 \times 9^2 + 4 \times 9^1 + 4 \times 9^0 + 1 \times 9^{-1}$
 $= 5 \times 81 + 4 \times 9 + 4 + 1/9$
 $= 445 \frac{1}{9}_{10}$

16		445		1/9
16		27	r13	16
16		1	r11	(1)7/9
		0	r1	16
				(12)4/9
				16
				(7)1/9

$\therefore 544.1_9 = 1BD.1C7_{16}$
 $= 1 \ 1011 \ 1101.0001 \ 1100 \ 0111_2 \dots$

1.14 (a), (c) $16 \mid 97$.7
(b), (c) $16 \mid 6$ r1 16
0 r6 (11).2
- 16
 (3).2

$\therefore 97.7_{10} = 61.B3333 \dots_{16}$
(a) $61.B3333 \dots_{16}$
 $= 110 \ 0001.1011 \ 0011 \ 0011 \ 0011 \ 0011 \dots_2$
(b) $1 \ 100 \ 001.101 \ 100 \ 110 \ 011 \ 001 \ 100 \ 11 \dots_2$
 $= 141.5 \ 4631 \ 4631 \dots_8$

1.14 (d) $3 \mid 97$.7
3 | 32 r1 3
3 | 10 r2 (2).1
3 | 3 r1 3
3 | 1 r0 (0).3
0 r1 3
 (0).9
 3
 (2).7

$\therefore 97.7_{10} = 10121.2002 \dots_3$

1.14 (e) $5 \mid 97$.7
5 | 19 r2 5
5 | 3 r4 (3).5
0 r3 5
 (2).5

$\therefore 97.7_{10} = 342.322 \dots_5$

1.15 1110212.20211_3
 $01 \ 11 \ 02 \ 12.20 \ 21 \ 10 = 1425.673_9$

Base 3	Base 9
00	0
01	1
02	2
10	3
11	4
12	5
20	6
21	7
22	8

1.16 (a) $2983 \ 63/64_{10} =$

8		2983		0.984
8		372	r7	8
8		46	r4	(7).872
9		5	r6	8
0			r5	(6).976

$\therefore 2983 \ 63/64_{10} = 5647.76_8$ (or 5647.77_8)
 $= 101 \ 110 \ 100 \ 111.111 \ 110_2$
(or $101 \ 110 \ 100 \ 111.111 \ 111_2$)

1.16 (b) 93.70_{10}

8		93		0.70
8		11	r5	8
8		1	r3	(5).60
0			r1	8
				(4).80

$\therefore 93.70_{10} = 135.54_8 = 001 \ 011 \ 101.101 \ 100_2$

1.16 (c) $1900\ 31/32_{10}$

8	1900	0.969
8	273	8
8	29	(7).752
9	3	8
0		(6).016

$\therefore 1900\ 31/32_{10} = 3554.76_8$
 $= 011\ 101\ 101\ 100.111\ 110_2$

1.16 (d) 109.30_{10}

8	109	0.30
8	13	8
8	1	(2).40
0		8
		(3).20

$\therefore 109.30_{10} = 155.23_8$
 $= 001\ 101\ 101.010\ 011_2$

1.17 (a)

$\begin{array}{r} 1111 \\ 1001 \\ \hline 11000 \end{array}$	(Add)	$\begin{array}{r} 1111 \\ 1001 \\ \hline 0110 \end{array}$	(Subtract)
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(Multiply)

1111	1001
1111	
0000	
01111	
0000	
001111	
1111	
10000111	

1.17 (b)

$\begin{array}{r} 1101001 \\ 110110 \\ \hline 10011111 \end{array}$	(Add)	$\begin{array}{r} 1101001 \\ 110110 \\ \hline 110011 \end{array}$	(Sub)
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(Mult)

1101001	110110
0000000	
1101001	
11010010	
1101001	
1001110110	
0000000	
1001110110	
1101001	
10010000110	
1101001	
1011000100110	

1.17(c)

$\begin{array}{r} 110010 \\ 11101 \\ \hline 1001111 \end{array}$	(Add)	$\begin{array}{r} 110010 \\ 11101 \\ \hline 10101 \end{array}$	(Sub)
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(Mult)

110010	11101
110010	
000000	
0110010	
110010	
11111010	
110010	
1010001010	
110010	
10110101010	

1.18

(a) $\begin{array}{r} 10100100 \\ 01110011 \\ \hline 0110001 \end{array}$	(b) $\begin{array}{r} 10010011 \\ 01011001 \\ \hline 00111010 \end{array}$
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(c) $\begin{array}{r} 11110011 \\ 10011110 \\ \hline 01010101 \end{array}$

1.19(a)

101	101110	Quotient
	111101001	
	101	
	1001	
	101	
	1000	
	101	
	110	
	101	
	11	Remainder

1.19(b)

1110	11011	Quotient
	110000001	
	1110	
	10100	
	1110	
	11000	
	1110	
	10101	
	1110	
	111	Remainder

1.19(c)

$$\begin{array}{r}
 \overline{1100} \text{ Quotient} \\
 1001 \overline{)11110010} \\
 \underline{1001} \\
 1010 \\
 \underline{1001} \\
 110 \text{ Remainder}
 \end{array}$$

1.20(a)

$$\begin{array}{r}
 \overline{10111} \text{ Quotient} \\
 110 \overline{)10001101} \\
 \underline{110} \\
 1011 \\
 \underline{110} \\
 1010 \\
 \underline{110} \\
 1001 \\
 \underline{110} \\
 11 \text{ Remainder}
 \end{array}$$

1.20(b)

$$\begin{array}{r}
 \overline{100011} \text{ Quotient} \\
 1011 \overline{)110000011} \\
 \underline{1011} \\
 10001 \\
 \underline{1011} \\
 1101 \\
 \underline{1011} \\
 10 \text{ Remainder}
 \end{array}$$

1.20(c)

$$\begin{array}{r}
 \overline{1011} \text{ Quotient} \\
 1010 \overline{)1110100} \\
 \underline{1010} \\
 10010 \\
 \underline{1010} \\
 10000 \\
 \underline{1010} \\
 110 \text{ Remainder}
 \end{array}$$