

1.8 (a)

$$\begin{array}{r} 2 \quad 234 \\ 2 \quad 117 \\ 2 \quad 58 \\ 2 \quad 29 \\ 2 \quad 14 \\ 2 \quad 7 \\ 2 \quad 1 \\ 0 \end{array} \quad \begin{array}{l} 0 \\ 1 \\ 0 \\ 0 \\ 1 \\ 1 \\ 1 \\ 1 \end{array} \quad \begin{array}{c} \downarrow \\ \end{array}$$

$$= (11101010)_2$$

(b) convert to base 10

$$(3345)_6 = 3 \times 6^3 + 3 \times 6^2 + 4 \times 6^1 + 5 \times 6^0 = 648 + 108 + 24 + 5$$

$$= (785)_{10}$$

convert to base 2

$$\begin{array}{r} 2 \quad 785 \\ 2 \quad 392 \\ 2 \quad 196 \\ 2 \quad 98 \\ 2 \quad 49 \\ 2 \quad 24 \\ 2 \quad 12 \\ 2 \quad 6 \\ 2 \quad 3 \\ 2 \quad 1 \\ 0 \end{array} \quad \begin{array}{l} 1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 1 \\ 0 \\ 0 \\ 1 \\ 1 \\ 0 \end{array} \quad \begin{array}{c} \downarrow \\ \end{array}$$

$$= (1100010001)_2$$

(c) convert to base 10

$$(875)_9 = 8 \times 9^2 + 7 \times 9^1 + 5 \times 9^0 = 648 + 63 + 5$$

$$= (716)_{10}$$

convert to base 11

$$\begin{array}{r} 11 \quad 716 \\ 11 \quad 65 \\ 11 \quad 5 \\ 0 \end{array} \quad \begin{array}{l} 1 \\ 10 \\ 5 \end{array} \quad \begin{array}{c} \downarrow \\ \end{array}$$

$$= (5101)_{11}$$

(d) $(0.3212)_4$

$$= 3 \times 4^{-1} + 2 \times 4^{-2} + 1 \times 4^{-3} + 2 \times 4^{-4}$$

$$= \frac{3}{4} + \frac{2}{16} + \frac{1}{64} + \frac{2}{256}$$

$$= \frac{230}{256} = (\frac{115}{128})_{10}$$

(e) convert to base 10

$$(87.35)_9 = 8 \times 9^1 + 7 \times 9^0 + 3 \times 9^{-1} + 5 \times 9^{-2}$$

$$= 72 + 7 + \frac{3}{9} + \frac{5}{81}$$

$$= (79\frac{32}{81})_{10}$$

convert to base 11

$$\begin{array}{r} 11 \quad 79 \\ 11 \quad 7 \\ 0 \end{array} \quad \begin{array}{l} 2 \\ 7 \end{array} \quad \begin{array}{c} \downarrow \\ \end{array}$$

$$\begin{array}{r} .395 \\ \times 11 \\ \hline 4.345 \\ \times 11 \\ \hline 3.795 \\ \times 11 \\ \hline 8.745 \\ \times 11 \\ \hline 7.995 \\ \times 11 \\ \hline 10.945 \\ \times 11 \\ \hline 10.395 \\ \times 11 \\ \hline 4.345 \end{array}$$

*repeats

$$= (72.43871010)_{11}$$

1.9 (a) $\frac{10}{2} \frac{11}{3} \frac{01}{1} \frac{00}{0} \frac{00}{0} \frac{10}{2} \frac{10}{2}$

$$= (2310.022)_4$$

(b)

$$\begin{array}{r} A \quad B \quad 1 \quad 4 \quad 3 \\ 010 \quad 10 \quad 1 \quad 011 \quad 000 \quad 1 \quad 01 \quad 00 \quad 0 \quad 011 \\ 2 \quad 5 \quad 3 \quad 0 \quad 5 \quad 0 \quad 3 \end{array}$$

$$= (2530503)_8$$

(c)

$$\begin{array}{r} 2 \quad 3 \quad 4 \quad 7 \quad 4 \quad 5 \\ 010 \quad 0 \quad 11 \quad 10 \quad 0 \quad 111 \\ 4 \quad E \quad 7 \quad 9 \quad 4 \end{array}$$

$$= (4E7.94)_{16}$$

(d)

$$\begin{array}{r} 0001 \quad 1011 \quad 1110 \quad 0100 \quad 0001 \quad 1000 \\ 1 \quad 8 \quad E \quad 4 \quad 1 \quad 8 \\ = (18E.418)_{16} \end{array}$$

1.10 $(130)_x = (28)_{10}$

$$1 \times x^2 + 3 \times x + 0 \times x^0 = 2 \times 10 + 8 \times 10^0$$

$$\rightarrow x^2 + 3x - 28 = 0$$

$$\rightarrow (x-4)(x-7) = 0$$

$$x=4 \text{ or } x=7$$

We pick up $x=4$ since x is positive.

1.11 (a)

$$\begin{array}{r} 11101 \\ + 1111 \\ \hline 101100 \\ + 1011 \\ \hline 110111 \end{array} \quad (b) \quad \begin{array}{r} 111000 \\ - 10101 \\ \hline 100011 \end{array}$$