

$$1. (a) (111.111)_2 = 1 \times 2^2 + 1 \times 2^1 + 1 \times 2^0 + 1 \times 2^{-1} + 1 \times 2^{-2} + 1 \times 2^{-3} \\ = 4 + 2 + 1 + 0.5 + 0.25 + 0.125 \\ = (7.875)_{10}$$

$$(b) (116.C)_{16} = 1 \times 16^1 + 6 \times 16^0 + 12 \times 16^{-1} \\ = 16 + 6 + 0.725 \\ = (22.725)_{10}$$

$$(c) \begin{array}{r} 2 \overline{) 7} \quad 1 \uparrow \\ 2 \overline{) 3} \quad 1 \\ 2 \overline{) 1} \quad 1 \\ \hline 0 \end{array} \Rightarrow (7)_{10} = (111)_2$$

$$\begin{array}{r} 0.625 \\ \times 2 \\ \hline 1.250 \quad 1 \\ 0.25 \\ \times 2 \\ \hline 0.50 \quad 0 \\ \times 2 \\ \hline 1.00 \quad 1 \downarrow \end{array} \Rightarrow (0.625)_{10} = (0.101)_2$$

$$\text{So } (7.625)_{10} = (111.101)_2$$

$$(d) (3C7F)_{16} = 3 \times 16^3 + 12 \times 16^2 + 7 \times 16^1 + 15 \times 16^0 \\ = 12288 + 3072 + 112 + 15 \\ = 15487$$

$$(e) \begin{array}{r} 16 \overline{) 23} \quad 7 \uparrow \\ 16 \overline{) 1} \quad 1 \\ \hline 0 \end{array} \Rightarrow (23)_{10} = (17)_{16}$$

$$\begin{array}{r} 0.125 \\ \times 16 \\ \hline 2.000 \quad 2 \end{array} \Rightarrow (0.125)_{10} = (0.2)_{16}$$

$$\text{So } (23.125)_{10} = (17.2)_{16}$$

$$(f) \begin{array}{cccc} \underline{11} & \underline{00} & \underline{1000} & \underline{1010} & \underline{1001} \\ \downarrow & \downarrow & \downarrow & \downarrow & \downarrow \\ 1 \times 2^3 + 1 \times 2^2 & 1 \times 2^3 & 1 \times 2^3 + 1 \times 2^1 & 1 \times 2^3 + 1 \times 2^0 & \\ \downarrow & \downarrow & \downarrow & \downarrow & \\ 12 & 8 & 10 & 9 & \\ (C) & & (A) & & \end{array} = (C8A9)_{16}$$

$$\text{So } (11001000101001)_2 \\ = (C8A9)_{16}$$

2. (a)
$$\begin{array}{r|l} 2 & 196 \\ \hline & 0 \\ 2 & 98 \\ \hline & 0 \\ 2 & 49 \\ \hline & 0 \\ 2 & 24 \\ \hline & 0 \\ 2 & 12 \\ \hline & 0 \\ 2 & 6 \\ \hline & 0 \\ 2 & 3 \\ \hline & 1 \\ 2 & 1 \\ \hline & 1 \\ & 0 \end{array}$$

$(196)_{10} = (11000000)_2$
in 8 bits,
 $(196)_{10} = (01100000)_2$

(b)
$$\begin{array}{r|l} 2 & 172 \\ \hline & 0 \\ 2 & 86 \\ \hline & 0 \\ 2 & 43 \\ \hline & 1 \\ 2 & 21 \\ \hline & 0 \\ 2 & 10 \\ \hline & 0 \\ 2 & 5 \\ \hline & 1 \\ & 0 \end{array}$$

$(172)_{10} = (10010000)_2$
in 8 bits
 $(172)_{10} = (01001000)_2$
So $(-72)_{10} = (10111000)_2$

3. (a) in decimal,

H = 072, e = 101, l = 108, o = 111, c = 099, ! = 033,
, = 044, S = 083, U = 085, T = 084, h = 104.

change into hexadecimal,

H = 048, e = 065, l = 06C, o = 06F, c = 063, ! = 021,
, = 02C, S = 053, U = 055, T = 054, h = 068.

So the message "Hello, SuSTech!" in ASCII in hexadecimal is
048 065 06C 06C 06F 02C 053 055 053 054 065 063 06F 021

(b) A C E F