

計算機概論 Homework #1

1. (a)

$$0 \cdot 2^4 + 1 \cdot 2^3 + 1 \cdot 2^2 + 0 \cdot 2^1 + 1 \cdot 2^0$$

$$= 8 + 4 + 1 = \boxed{13} \#$$

(b)

$$0 \cdot 2^0 + 0 \cdot 2^1 + 0 \cdot 2^2 + 1 \cdot 2^3 + 1 \cdot 2^4 + 0 \cdot 2^5 + 1 \cdot 2^6$$

$$= 8 + 16 + 64 = \boxed{88} \#$$

(c)

整數部分:

$$0 \cdot 2^0 + 1 \cdot 2^1 + 1 \cdot 2^2 + 1 \cdot 2^3 + 1 \cdot 2^4 + 0 \cdot 2^5$$

$$= 2 + 4 + 8 + 16$$

$$= 30$$

小數部分:

$$0 \cdot 2^{-1} + 1 \cdot 2^{-2}$$

$$= 0.25$$

$$\rightarrow 30 + 0.25 = \boxed{30.25} \#$$

(d)

$$1 \cdot 2^4 + 1 \cdot 2^3 + 1 \cdot 2^2 + 1 \cdot 2^1 + 1 \cdot 2^0 + 1 \cdot 2^{-1} + 1 \cdot 2^{-2} + 1 \cdot 2^{-3}$$

$$= (16 + 8 + 4 + 2 + 1) + (0.5 + 0.25 + 0.125)$$

$$= 31 + 0.875$$

$$= \boxed{31.875} \#$$

2. (a)

$$\begin{array}{r} 144 \\ 8 \overline{) 1156} \\ \underline{8} \\ 35 \\ \underline{32} \\ 36 \\ \underline{32} \\ 4 \end{array}$$

$$\begin{array}{r} 18 \\ 8 \overline{) 144} \\ \underline{64} \\ 80 \\ \underline{64} \\ 16 \\ \underline{16} \\ 0 \end{array}$$

$$\begin{array}{r} 2 \\ 8 \overline{) 16} \\ \underline{16} \\ 0 \end{array}$$

$$\begin{array}{r} 0 \\ 8 \overline{) 0} \\ \underline{0} \\ 0 \end{array}$$

$$1156 \div 8 = 144 \dots 4$$

$$144 \div 8 = 18 \dots 0$$

$$18 \div 8 = 2 \dots 2$$

$$2 \div 8 = 0 \dots 2$$

$$\Rightarrow (2204)_8$$

(b)

$$\begin{array}{r} 12 \\ 8 \overline{) 99} \\ \underline{8} \\ 19 \\ \underline{16} \\ 3 \end{array}$$

$$\begin{array}{r} 1 \\ 8 \overline{) 12} \\ \underline{8} \\ 4 \end{array}$$

$$\begin{array}{r} 0 \\ 8 \overline{) 1} \\ \underline{0} \\ 1 \end{array}$$

$$99 \div 8 = 12 \dots 3$$

$$12 \div 8 = 1 \dots 4$$

$$1 \div 8 = 0 \dots 1$$

$$\Rightarrow (143)_8$$

(c) 整数部分

$$\begin{array}{r} 1 \\ 8 \overline{) 11} \\ \underline{8} \\ 3 \end{array}$$

$$\begin{array}{r} 0 \\ 8 \overline{) 1} \\ \underline{0} \\ 1 \end{array}$$

$$11 \div 8 = 1 \dots 3$$

$$1 \div 8 = 0 \dots 1$$

小数部分

$$\Rightarrow 0.4 \times 8 = 0.72 \rightarrow 0$$

$$0.72 \times 8 = 5.76 \rightarrow 7$$

$$\Rightarrow (13.71)_8$$

$$(13.71)_8$$

$$0.72$$

$$3.23$$

$$116$$

(d) 整数部分

$$\Rightarrow \begin{array}{r} 9 \\ 8 \overline{) 72} \\ \underline{72} \\ 0 \end{array}$$

$$\begin{array}{r} 1 \\ 8 \overline{) 8} \\ \underline{8} \\ 0 \end{array}$$

$$\begin{array}{r} 0 \\ 8 \overline{) 0} \\ \underline{0} \\ 0 \end{array}$$

$$72 \div 8 = 9 \dots 0$$

$$9 \div 8 = 1 \dots 1$$

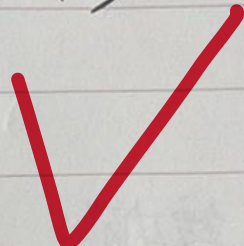
$$1 \div 8 = 0 \dots 1$$

小数部分

$$\Rightarrow 0.8 \times 8 = 6.4 \rightarrow 6$$

$$0.4 \times 8 = 3.2 \rightarrow 3$$

$$\Rightarrow (110.63)_8$$



3.

(a)

$$(00001101)_2$$

$$\begin{array}{c} \downarrow \quad \downarrow \\ 0 \quad 1 \cdot 2^3 + 1 \cdot 2^2 + 0 \cdot 2^1 + 1 \cdot 2^0 \\ = 8 + 4 + 1 = 13 \end{array}$$

$$\Rightarrow (D)_{16}$$

(b)

$$(01011000)_2$$

$$\begin{array}{c} \downarrow \quad \quad \quad \searrow \\ 0 \cdot 2^3 + 1 \cdot 2^2 + 0 \cdot 2^1 + 1 \cdot 2^0 \quad 1 \cdot 2^3 \\ = 4 + 125 \quad = 8 \end{array}$$

$$\Rightarrow (58)_{16}$$

(d)

$$(0011111.1110)_2$$

$$\begin{array}{c} \downarrow \quad \quad \quad \downarrow \quad \quad \quad \searrow \\ 1 \cdot 2^1 + 1 \cdot 2^0 \quad 1 \cdot 2^3 + 1 \cdot 2^2 + 1 \cdot 2^1 + 1 \cdot 2^0 \quad 1 \cdot 2^3 + 1 \cdot 2^2 + 1 \cdot 2^1 \\ = 3 \quad = 8 + 4 + 2 + 1 = 15 \quad = 8 + 4 + 2 = 14 \end{array}$$

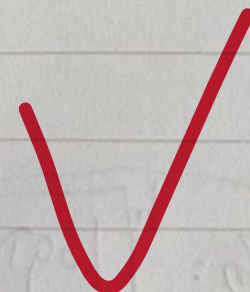
$$\Rightarrow (3F.E)_{16}$$

(c)

$$(00011110.0100)_2$$

$$\begin{array}{c} \downarrow \quad \quad \quad \downarrow \quad \quad \quad \searrow \\ 1 \quad 1 \cdot 2^3 + 1 \cdot 2^2 + 1 \cdot 2^1 + 0 \cdot 2^0 \quad 0 \cdot 2^3 + 1 \cdot 2^2 + 0 \cdot 2^1 + 0 \cdot 2^0 \\ = 14 \quad = 8 + 4 + 2 = 14 \quad = 4 \end{array}$$

$$\Rightarrow (1E.4)_{16}$$



4. ①
令 $2^x \geq 900$

当 $x=10$

$\Rightarrow 2^{10} = 1024 > 900$

当 $x=9$

$\Rightarrow 2^9 = 512 < 900$

$\rightarrow x$ 取值 10

$A = 10 \text{ bits} \#$

② 承①

$\rightarrow 1024 - 900$

$= 124$

$A = 124 \text{ patterns} \#$

③ $900 + 300 = 1200$

承①

$\rightarrow 1024 < 1200$

当 $x=11$

$\Rightarrow 2^{11} = 2048$

$2048 > 1200$

$\Rightarrow A$ 因为 $1200 > 1024$, 所以需要增加到 11 位元

5.

$$2^8 = 256$$

 $\Rightarrow 8 \text{ bits}$

$$8000 (1/s) \times 8 (\text{bits})$$

$$= 64000 (\text{bits/s}) \#$$

6. (a)

$$12 = (00001100)_2$$

$$\rightarrow (11110011)_2 + (1)_2$$

$$\Rightarrow -12 = (11110100)_2 \#$$

(b)

$$145$$

 \Rightarrow 无法表示 - 溢出

(c)

$$56 = (00111000)_2$$

(d)

$$142$$

 \Rightarrow 无法表示 - 溢出

7.

(a)

$$(01110111)_2$$

$$2^6 + 2^5 + 2^4 + 2^2 + 2^1 + 1$$

$$= 96 + 16 + 7$$

$$= 119 \#$$

(b)

$$(11111100)_2$$

$$\Rightarrow (11111011)_2$$

$$\rightarrow (00000100)_2$$

$$\Rightarrow 4$$

$$\text{加负} \Rightarrow -4 \#$$

(c)

$$(01110100)_2$$

$$2^6 + 2^5 + 2^4 + 2^2$$

$$= 96 + 16 + 4$$

$$= 116 \#$$

(d)

$$(11001110)_2$$

$$\Rightarrow (11001101)_2$$

$$\rightarrow (00110010)_2$$

$$\Rightarrow 2^5 + 2^4 + 2^1$$

$$= 32 + 18 = 50$$

$$\text{加负} \Rightarrow -50 \#$$

8.

(a) $127 + 0 = 127$

1 0 111111 1000 00000000000000000000

(b) $127 + 3 = 130$

0 1000010 1111 00000000000000000000

(c) $127 - 4 = 123$

0 0111011 01100 11000000000000000000

(d) $127 - 5 = 122$

1 0111010 0110 10000000000000000000