

# 問題 1

$$(a) \begin{array}{r} 10101 \\ +) 110 \\ \hline 11011 \end{array} //$$

$$(b) \begin{array}{r} 10011 \\ -) 1101 \\ \hline 110 \end{array} //$$

$$(c) \begin{array}{r} 1101 \\ \times) 101 \\ \hline 1101 \\ 1101 \\ \hline 1000001 \end{array} //$$

$$(d) \begin{array}{r} 1010 \overline{) 110010} \\ \underline{1010} \\ 1010 \\ \underline{1010} \\ 0 \end{array} //$$

# 問題 2

(1) (a)

$$-13_{(10)} \rightarrow 13 = 01101_2$$

$$\rightarrow 10010 + 1 = 10011_2 //$$

(b)  $-5.625_{(10)}$

$$5.625 = 0101.101_2$$

$$\rightarrow 1010.010 + 1$$

$$= 1010.011_2 //$$

(2) (a)  $14 - 3$

$$14 = 01110 \text{ (5桁)}$$

$$-3 \rightarrow 3 = 011 \rightarrow 100 + 1 = 101$$

$$\rightarrow 11101 \text{ (5桁)}$$

$$\begin{array}{r} 01110 \\ +) 11101 \\ \hline 101011 \end{array}$$

$$01011_2 //$$

$$\rightarrow 8 + 2 + 1 = 11_{(10)} //$$

(b)  $-2 - 10$

$$-2 \rightarrow 2 = 010 \rightarrow 101 + 1 = 110 \rightarrow 11110 \text{ (5桁)}$$

$$-10 \rightarrow 10 = 01010 \rightarrow 10101 + 1 = 10110 \text{ (5桁)}$$

$$\begin{array}{r} 11110 \\ +) 10110 \\ \hline 110100 \end{array}$$

$$10100_2 //$$

$$\begin{array}{r} 10100 \\ \rightarrow 1 \\ \hline 10011 \end{array} \rightarrow 01100_2$$

$$8 + 4 = 12$$

$$\therefore -12_{(10)} //$$

### 問題3

(a)  $14 + 5 - 9$

$14 = 01110$  (5桁)

$5 = 0101 \rightarrow 00101$

$-9 \rightarrow 9 = 01001$

$\rightarrow 10110 + 1 = 10111$

$$\begin{array}{r} 01110 \dots 14 \\ + 00101 \dots 5 \\ \hline A = 10011 \end{array}$$

$$\begin{array}{r} 10011 \dots A \\ + 10111 \dots -9 \\ \hline \boxed{101010} \quad 01010_{(2)} // \\ 8 + 2 = 10_{(10)} // \end{array}$$

(b)  $5 + 6 - 4$

$5 = 0101$

$6 = 0110$

$-4 \rightarrow 4 = 0100 \rightarrow 1011$   
 $\rightarrow 1$   
 $\hline 1100$

$$\begin{array}{r} 0101 \dots 5 \\ + 0110 \dots 6 \\ \hline 1011 = A \end{array}$$

$$\begin{array}{r} 1011 \dots A \\ + 1100 \dots -4 \\ \hline \boxed{10111} \quad 0111_{(2)} // \\ 4 + 2 + 1 = 7_{(10)} // \end{array}$$

### 問題4

(a)  $-5 \times 3$

$-5 \rightarrow 5 = 0101 \rightarrow 1010 + 1$   
 $= 1011_{(2)} (1+3)$

$3 = 011_{(2)} (1+2)$

$\rightarrow (1+5) = 6$  桁

$$\begin{array}{r} 111011 \dots -5 \\ \times 000011 \dots 3 \\ \hline 111011 \\ 111011 \\ \hline \boxed{10110001} \quad 6 \text{ 桁} \end{array}$$

$110001_{(2)} //$

$110001_{(2)} - 1 = 110000_{(2)}$

$\rightarrow 0011101 = 15_{(10)}$

$\therefore -15_{(10)} //$

(b)  $-3 \times (-3)$

$-3 \rightarrow 3 = 011 \rightarrow 100 + 1$   
 $= 101 (1+2)$

$\rightarrow (1+4) = 5$  桁

$$\begin{array}{r} 11101 \dots -3 \\ \times 11101 \dots -3 \\ \hline 011101 \\ 011101 \\ 111010 \\ \hline \boxed{1101001001} \end{array}$$

$01001_{(2)} //$

$8 + 1 = 9_{(10)} //$

## 問題5

000	0
001	5
010	10
011	15
100	20
101	25
110	30
111	35g

$$(a) 15g \rightarrow 011 //$$

$$(b) 101 \rightarrow 25g //$$

$$(c) 24g \rightarrow 25g (\text{最近}) //$$

$$24g \rightarrow \underline{101} \text{ 2" 表示}$$

$$\text{量子化誤差} = 25 - 24 = 1g //$$

$$(d) 1 \text{ ビット当り} = 5g //$$