

①  $147 = 10010011$  (E)

$$\begin{array}{r}
 147 \div 2 \\
 \hline
 14 \mid 73 \mid 2 \\
 \hline
 07 \mid 6 \mid 36 \mid 2 \\
 \hline
 6 \mid 13 \mid 2 \mid 18 \mid 2 \\
 \hline
 1 \mid 12 \mid 16 \mid 8 \mid 9 \mid 2 \\
 \hline
 1 \mid 01 \mid 16 \mid 0 \mid 8 \mid 4 \mid 2 \\
 \hline
 0 \mid 0 \mid 2 \mid 1 \\
 \hline
 \end{array}$$

②  $189 = 10111101$  (D)

$$\begin{array}{r}
 189 \div 2 \\
 \hline
 18 \mid 94 \mid 2 \\
 \hline
 09 \mid 81 \mid 47 \mid 2 \\
 \hline
 8 \mid 14 \mid 4 \mid 23 \mid 2 \\
 \hline
 1 \mid 14 \mid 07 \mid 21 \mid 11 \mid 2 \\
 \hline
 0 \mid 6 \mid 03 \mid 10 \mid 5 \mid 2 \\
 \hline
 1 \mid 2 \mid 1 \mid 4 \mid 2 \mid 2 \\
 \hline
 1 \mid 2 \mid 1 \\
 \hline
 \end{array}$$

③  $191 = 10111111$  (C)

$$\begin{array}{r}
 191 \div 2 \\
 \hline
 18 \mid 95 \mid 2 \\
 \hline
 011 \mid 8 \mid 47 \mid 2 \\
 \hline
 10 \mid 15 \mid 07 \mid 23 \mid 2 \\
 \hline
 01 \mid 14 \mid 6 \mid 03 \mid 11 \mid 2 \\
 \hline
 10 \mid 1 \mid 2 \mid 10 \mid 5 \mid 2 \\
 \hline
 1 \mid 1 \mid 4 \mid 2 \mid 2 \\
 \hline
 1 \mid 1 \mid 0 \mid 1 \\
 \hline
 \end{array}$$



④  $247 = 1111\ 0111$  (B)

Handwritten conversion of 247 to binary using successive division by 2:

$$\begin{array}{r}
 247 \div 2 = 123 \text{ R } 1 \\
 123 \div 2 = 61 \text{ R } 1 \\
 61 \div 2 = 30 \text{ R } 1 \\
 30 \div 2 = 15 \text{ R } 0 \\
 15 \div 2 = 7 \text{ R } 1 \\
 7 \div 2 = 3 \text{ R } 1 \\
 3 \div 2 = 1 \text{ R } 1 \\
 1 \div 2 = 0 \text{ R } 1
 \end{array}$$

Reading the remainders from bottom to top:  $1111\ 0111$

⑤  $219 = 1101\ 1011$  (C)

Handwritten conversion of 219 to binary using successive division by 2:

$$\begin{array}{r}
 219 \div 2 = 109 \text{ R } 1 \\
 109 \div 2 = 54 \text{ R } 1 \\
 54 \div 2 = 27 \text{ R } 0 \\
 27 \div 2 = 13 \text{ R } 1 \\
 13 \div 2 = 6 \text{ R } 1 \\
 6 \div 2 = 3 \text{ R } 0 \\
 3 \div 2 = 1 \text{ R } 1 \\
 1 \div 2 = 0 \text{ R } 1
 \end{array}$$

Reading the remainders from bottom to top:  $1101\ 1011$

⑥  $0011\ 1101 = 61$

Handwritten expansion of the binary number 0011 1101 to decimal:

$$\begin{aligned}
 &0 \times 2^7 + 0 \times 2^6 + 1 \times 2^5 + 1 \times 2^4 + 1 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0 \\
 &0 + 0 + 32 + 16 + 8 + 4 + 0 + 1 \\
 &61
 \end{aligned}$$

⑦  $0110\ 0101 = 101$

Handwritten expansion of the binary number 0110 0101 to decimal:

$$\begin{aligned}
 &0 \times 2^7 + 1 \times 2^6 + 1 \times 2^5 + 0 \times 2^4 + 0 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0 \\
 &0 + 64 + 32 + 0 + 0 + 4 + 0 + 1 \\
 &101
 \end{aligned}$$



$$(8) \quad 0111 \quad 1011 = (123)$$

$$0 \times 2^7 + 1 \times 2^6 + 1 \times 2^5 + 1 \times 2^4 + 1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 1 \times 2^0$$

$$0 + 64 + 32 + 16 + 8 + 0 + 2 + 1$$

$$(9) \quad 1110 \quad 1010 = (234)$$

$$1 \times 2^7 + 1 \times 2^6 + 1 \times 2^5 + 0 \times 2^4 + 1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 0 \times 2^0$$

$$128 + 64 + 32 + 0 + 8 + 0 + 2 + 0$$

$$(10) \quad 1101 \quad 1110 = (222)$$

$$1 \times 2^7 + 1 \times 2^6 + 0 \times 2^5 + 1 \times 2^4 + 1 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 0 \times 2^0$$

$$128 + 64 + 0 + 16 + 8 + 4 + 2$$

$$(11) \quad 247 = (F7)$$

$$\begin{array}{r} 247 \quad \underline{16} \\ 16 \quad 15 \\ \hline 087 \\ 80 \\ \hline 07 \end{array}$$

$$(13) \quad 193 = (C1)$$

$$\begin{array}{r} 193 \quad \underline{16} \\ 16 \quad 12 \\ \hline 033 \\ 32 \\ \hline 01 \end{array}$$

$$(12) \quad 291 = (123)$$

$$\begin{array}{r} 291 \quad \underline{16} \\ 16 \quad 18 \quad \underline{16} \\ \hline 1231 \quad \underline{16} \\ 128 \quad 02 \\ \hline 003 \end{array}$$

$$(14) \quad 237 = (ED)$$

$$\begin{array}{r} 237 \quad \underline{16} \\ 16 \quad 14 \\ \hline 077 \\ 64 \\ \hline 13 \end{array}$$



$$15 \mid 171 = AB$$

$$\begin{array}{r} 171 \\ 16 \\ \hline 011 \end{array}$$

$$16 \text{ } 9A = 154$$

9A

$\begin{array}{l} \angle 10 \times 16' = 10 \\ \angle 9 \times 16' = 144 \end{array} > 154$

(17) CA = (202)

CA

$\hookrightarrow 10 \times 16 = 10 = 202$

$\hookrightarrow 12 \times 16 = 192$

$$(18) \quad ES = (229)$$

ES  
 $\angle 5 \times 16^\circ = 5 - 229$   
 $\angle 14 \times 16^\circ = 224$

19 FA = 250

FA

L <sup>LD</sup>	$10 \times 16^{\circ} = 10 = 250$
L <sup>LD</sup>	$15 \times 16' = 240$

$$\textcircled{20} \quad 7f = \textcircled{127}$$

$$\begin{aligned} 7F &\rightarrow 15 \times 16' = 15 = 127 \\ L_D &7 \times 16' = 112 \end{aligned}$$