

# Problems

①

Decimal	Binary	Octal	Hexa-decimal
33	100001	41	21
117	1110101	165	75
451	111000011	703	1C3
431	00011010111	0657	1AF

$\Rightarrow (33)_{10}$  to Binary.

int	Quotient	Remainder	Coefficient
$33/2$	16	1	$a_0 = 1$
$16/2$	8	0	$a_1 = 0$
$8/2$	4	0	$a_2 = 0$
$4/2$	2	0	$a_3 = 0$
$2/2$	1	0	$a_4 = 0$
$1/2$		1	$a_5 = 1$

$$(33)_{10} = (100001)_2$$

$\Rightarrow \underline{(33)_{10}}$  to octal

<u>Quotient</u>	<u>Remainder</u>	<u>Coefficient</u>
<u><math>\frac{33}{8}</math></u>	4	<u><math>a_0 = 1</math></u>
<u><math>\frac{4}{8}</math></u>	0	<u><math>a_1 = 4</math></u>

$$(33)_{10} = (41)_8$$

$\Rightarrow \underline{(33)_{10}}$  to hexadecimal

<u>Quotient</u>	<u>remainder</u>	<u>Coefficient</u>
<u><math>\frac{33}{16}</math></u>	2	<u><math>a_0 = 1</math></u>
<u><math>\frac{8}{16}</math></u>	0	<u><math>a_{12} = 2</math></u>

$$(33)_{10} = (21)_{16}$$

$\Rightarrow \underline{(1110101)_2}$  to decimal

$$(1110101)_2 \rightarrow 1 \times 2^6 + 1 \times 2^5 + 1 \times 2^4 + 0 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0$$

$$\Rightarrow 64 + 32 + 16 + 4 + 1$$

$$\Rightarrow (117)_{10}$$

$\Rightarrow (1110101)_2 \rightarrow (N)_8$

$$\begin{array}{r} 001 \\ \downarrow \\ 1 \end{array} \quad \begin{array}{r} 110 \\ \downarrow \\ 6 \end{array} \quad \begin{array}{r} 101 \\ \downarrow \\ 5 \end{array}$$

$$\Rightarrow (165)_8$$

$\Rightarrow (1110101)_2 \rightarrow (N)_{16}$

$$\begin{array}{r} 0111 \\ \downarrow \\ 7 \end{array} \quad \begin{array}{r} 0101 \\ \downarrow \\ 5 \end{array} \quad \Rightarrow (75)_{16}$$

$\Rightarrow (703)_8 \rightarrow$  Decimal

$$(703)_8 \rightarrow 7 \times 8^2 + 0 \times 8^1 + 3 \times 8^0$$

$$\Rightarrow 448 + 0 + 3$$

$$\Rightarrow (451)_{10}$$

$\Rightarrow (703)_8 \rightarrow$  Binary

$$703 \rightarrow \begin{array}{ccc} & + & 0 \\ & \downarrow & \downarrow \\ (111 & 000 & 011)_2 \end{array}$$

$\Rightarrow (703)_8 \rightarrow$  Hexadecimal

$$(703)_8 \rightarrow (111000011)_2$$

$$\begin{array}{rccccc} 0001 & & 1100 & 0011 & & \\ \downarrow & & \downarrow & & & \\ ! & & C & & 3 & \\ & & & & & \end{array}$$

$\Rightarrow (1C3)_{16}$

$\Rightarrow (1AP)_{16} \rightarrow$  Decimal

$$\hookrightarrow 1 \times 16^2 + 10 \times 16^1 + 15 \times 16^0$$

$\Rightarrow (431)_{10}$

$\Rightarrow (1AP)_{16} \rightarrow$  Binary

$$\hookrightarrow \begin{array}{ccc} 1 & A & F \\ 0001 & 1010 & 1111 \end{array}$$

$\Rightarrow (000110101111)_2$

$\Rightarrow (1AP)_{16} \rightarrow$  Octal

$$\hookrightarrow 000110101111$$

$$\begin{array}{cccccc} \downarrow & \downarrow & \downarrow & \downarrow & \downarrow \\ 0 & 6 & 5 & 7 & \end{array} \Rightarrow (0657)_8$$

② Decimal	Binary	Octal	Hexadecimal.
29.8	11101.11001	35.62	1D.C8
5.8125	101.1101	5.64	5.D
3.1093	011.000111	3.07	3.1C
12.5078	1100.10000010	14.404	C.82

$\Rightarrow 29.8 \rightarrow \text{Binary}$

<u>Intg.</u>	<u>Quotient</u>	<u>Remainder</u>	<u>Coeff</u>
$\frac{29}{2}$	14	1	$a_0 = 1$
$\frac{14}{2}$	7	0	$a_1 = 0$
$\frac{7}{2}$	3	1	$a_2 = 1$
$\frac{3}{2}$	1	1	$a_3 = 1$
$\vdots$	0	1	$a_4 = 1$

$$(29)_10 \Rightarrow (11101)_2$$

	<u>Intg.</u>	<u>Fraction</u>
$0.8 \times 2$	1	$0.6$
$0.6 \times 2$	1	$0.2$
$0.2 \times 2$	0	$0.4$
$0.4 \times 2$	0	$0.8$
$0.8 \times 2$	1	$0.6$

$$(0.8)_{10} = (11001)_2$$

$$\therefore (29.8)_{10} = (11101.11001)_2$$

$\Rightarrow (11101 \cdot 11001)_2 \rightarrow \text{Octal.}$

$$\begin{array}{cccc} \hookrightarrow & 011 & 101 & 110 \\ & \downarrow & \downarrow & \downarrow \\ & 3 & 5 & 6 \end{array} \quad \begin{array}{c} 010 \\ \downarrow \\ 2 \end{array}$$

$$\Rightarrow (35.6)_8$$

$\Rightarrow (11101 \cdot 11001)_2 \rightarrow \text{Hexadecimal.}$

$$\begin{array}{cccc} \hookrightarrow & 0001 & 1101 & 1100 \\ & \downarrow & \downarrow & \downarrow \\ & 1 & D & C \end{array} \quad \begin{array}{c} 1000 \\ \downarrow \\ 8 \end{array}$$

$$\Rightarrow (1D.C8)_{16}.$$

$\Rightarrow (101 \cdot 1101)_2 \rightarrow \text{Decimal}$

$$\begin{array}{l} \hookrightarrow 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0 + 1 \times 2^{-1} + 1 \times 2^{-2} + 0 \times 2^{-3} + 1 \times 2^{-4} \\ \cancel{+ 0 \times 2^{-5} + 0 \times 2^{-6} + 0 \times 2^{-7}} \\ \hookrightarrow (5.8125)_{10} \end{array}$$

$\Rightarrow (101 \cdot 1101)_2 \rightarrow \text{Octal}$

$$\begin{array}{cccc} \hookrightarrow & 101 & 110 & 100 \\ & \downarrow & \downarrow & \downarrow \\ & 5 & 6 & 4 \end{array}$$

$$\Rightarrow (5.64)_8$$

$\Rightarrow (101 \cdot 1101)_2 \rightarrow \text{Hexadecimal}$

$$\begin{array}{cccc} \hookrightarrow & 0101 & 1101 \\ & \downarrow & \downarrow \\ & 5 & D \end{array}$$

$$\Rightarrow (5.D)_{16}$$

$\Rightarrow (3.07)_8 \rightarrow \text{Decimal}$

$$(3.07)_8 \rightarrow 3 \times 8^0 + 0 \times 8^{-1} + 7 \times 8^{-2}$$

$$\Rightarrow 3 + 0 + 0.193$$

$$\Rightarrow (3.193)_{10}$$

$\Rightarrow (3.07)_8 \rightarrow \text{Binary}$

$$\hookrightarrow 3 \cdot 0.07_8 \rightarrow (110001)_2 \leftarrow \text{Binary}$$
  
$$\downarrow \quad \downarrow \quad \curvearrowright$$
  
$$011 \quad 000 \quad 111000 \quad 1$$

$$\Rightarrow \cancel{011} (011 \cdot 000111)_2$$

$\Rightarrow (3.07)_8 \rightarrow \text{hexadecimal}$

$$\hookrightarrow (011 \cdot 000111)_2 \rightarrow (0000111)_2 \leftarrow \text{Binary}$$
  
$$\downarrow$$

$$0011 \cdot 00011100$$
  
$$3 \cdot 11C$$

$$(3.1C)_{16} \quad (1000011)$$

$\Rightarrow (C.82)_{16} \rightarrow \text{Decimal}$

$$\hookrightarrow 12 \times 16^0 + 8 \times 16^{-1} + 2 \times 16^{-2}$$

$$\hookrightarrow 12 + 0.5078$$

$$\rightarrow (12.5078)_2$$

$\Rightarrow (C.82)_{16} \rightarrow \text{Binary}$

$$\hookrightarrow C \cdot 8_2 \rightarrow$$
  
$$\downarrow$$
  
$$1100 \cdot 1000 \quad 0010$$
  
$$\Rightarrow (1100 \cdot 1000001)_2$$

$$\Rightarrow (C \cdot 8_2)_6 \rightarrow \text{Octal} \leftarrow (F_0 \cdot F_0)_8$$

$\xrightarrow{\quad}$  1100 + 1000 + 0010 (60, 8) ←  
 $\xrightarrow{\quad}$  001 + 100 + 100 000 100  
 $\Rightarrow 1 \quad 4 \quad 4 \quad 0 \quad 4$   
 $\Rightarrow (14 \cdot 404)_8$

③ Add  $\Rightarrow (1000.111)_2 + (1110)_2$

$$\begin{array}{r}
 1000.111 \\
 + 1110 \\
 \hline
 1010101
 \end{array}$$

④ Subtract  $\Rightarrow (1110000)_2 - (1111)_2$

$$\begin{array}{r}
 1110000 \\
 - 1111 \\
 \hline
 1100001
 \end{array}$$

⑤ Multiply  $\Rightarrow (101)_2 \times (10101)_2$

$$\begin{array}{r}
 101 \\
 \times 10101 \\
 \hline
 101 \\
 000 \times \\
 101 \times \times \\
 000 \times \times \times \\
 101 \times \times \times \times \\
 \hline
 1101001
 \end{array}$$

$(100000 \cdot 0011)_2$