

NUMBER SYSTEM - 02

(a) Solve any 5 examples of decimal to octal

(a)

8	50	2
	48	6
	⑥	

(b) 50.01

Remainder

(b) 0.01

$$\begin{aligned}
 & 0.01 \times 8 = 0 + 0.08 \\
 & 0.08 \times 8 = 0 + 0.64 \\
 & 0.64 \times 8 = 5 + 0.12 \\
 & 0.12 \times 8 = 0 + 0.96 \\
 & 0.96 \times 8 = 7 + 0.68
 \end{aligned}$$

$$(50.01)_{10} = (62.00\ 507)_8$$

(2) 60.234

(a)

8	60	4
	56	7
	⑦	

Remainder

(b) 0.237

$$\begin{aligned}
 & 0.237 \times 8 = 1 + 0.872 \\
 & 0.872 \times 8 = 6 + 0.976 \\
 & 0.976 \times 8 = 7 + 0.808 \\
 & 0.808 \times 8 = 6 + 0.464
 \end{aligned}$$

$$(60.234)_{10} = (74. 1676)_8$$

(3) 72.77

(a)

8	72	0
	64	8
	8	1

(b) 0.77

$$\begin{aligned}
 & 0.77 \times 8 = 6 + 0.16 \\
 & 0.16 \times 8 = 1 + 0.28 \\
 & 0.28 \times 8 = 2 + 0.24 \\
 & 0.24 \times 8 = 1 + 0.48
 \end{aligned}$$

$$(72.77)_{10} = (110. 6121)_8$$

(4) 81.56

(a)	8	81	1
	8	10	2
	8	1	1

(b) 0.56
 $\cdot 0.56 \times 8 = 4 + 0.48$
 $\cdot 0.48 \times 8 = 3 + 0.84$
 $\cdot 0.84 \times 8 = 6 + 0.72$

$$(81.56)_{10} = (121.436)_8$$

(5) 88.45

(a)	8	88	0
	8	11	3
	8	1	1

(b) 0.45
 $\cdot 0.45 \times 8 = 3 + 0.6$
 $\cdot 0.6 \times 8 = 4 + 0.8$
 $\cdot 0.8 \times 8 = 6 + 0.4$
 $\cdot 0.4 \times 8 = 3 - 0.2$

$$(88.45)_{10} = (130.3463)_8$$

(b) Solve only 5 examples binary to octal.

(1) 101011.1001

(1) Binary to decimal

$$\begin{aligned}(101011.1001)_2 &= 1 \times 2^0 + 1 \times 2^1 + 0 \times 2^2 + 1 \times 2^3 + 0 \times 2^4 + 1 \times 2^5 + 1 \times 2^6 + \\ &\quad 0 \times 2^7 + 0 \times 2^8 + 1 \times 2^9 \\ &= (43.5625)_{10}\end{aligned}$$

(2) Decimal to octal

8	43	3	2	$8 \times 0.5625 = 4 + 0.5$
8	5	5	2	$0.5 \times 8 = 4 + 0$

Ans $\rightarrow 35.44$

(2) 110010.0011

$$(1) (110010.0011)_2 = 0 \times 2^0 + 1 \times 2^1 + 0 \times 2^2 + 0 \times 2^3 + 1 \times 2^4 + 1 \times 2^5 + \\ 0 \times 2^6 + 0 \times 2^{-2} + 1 \times 2^{-3} + 1 \times 2^{-4} \\ = 50.187$$

(4) Decimal to binary,

8	50	2	2
8	6	6	

$$\begin{aligned} & \cdot 0.187 \times 8 = 1 + 0.496 \\ & \cdot 0.496 \times 8 = 3 + 0.968 \\ & \cdot 0.968 \times 8 = 7 + 0.744 \end{aligned}$$

Ans, $(62.137)_8$

(3) 111000.0101

$$(1) (111000.0101)_2 = 0 \times 2^0 + 0 \times 2^1 + 0 \times 2^2 + 1 \times 2^3 + 1 \times 2^4 + 1 \times 2^5 + \\ 0 \times 2^6 + 1 \times 2^{-2} + 0 \times 2^{-3} + 1 \times 2^{-4} \\ = (56.3125)_{10}$$

8	56	0	2	$0.3125 \times 8 = 2 + 0.5$
8	7	7		$0.5 \times 8 = 4.0$

Ans, $(70.24)_8$

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$$(4) (1000011.110101)$$

$$\begin{aligned}(1) (1000011.110101)_2 &= 1 \times 2^0 + 1 \times 2^1 + 0 \times 2^2 + 0 \times 2^3 + 0 \times 2^4 + 0 \times 2^5 + \\ &\quad 1 \times 2^6 + 1 \times 2^7 + 1 \times 2^{-1} + 0 \times 2^{-2} + 1 \times 2^{-3} + 1 \times 2^{-4} + 0 \times 2^{-5} + 1 \times 2^{-6} \\ &= (99.213)_{10}\end{aligned}$$

$$\begin{array}{r} 8 | \begin{array}{cccc} 9 & 9 & 2 & 8 \\ 8 | \begin{array}{cccc} 1 & 2 & 4 & \\ 8 | \begin{array}{ccc} 1 & 1 & \end{array} & \end{array} & \end{array} & \begin{array}{l} 0.213 \times 8 = 1 + 0.704 \\ 0.704 \times 8 = 5 + 0.632 \\ 0.632 \times 8 = 5 + 0.656 \end{array} \end{array}$$

$$\text{Ans} \rightarrow (142.155)_8$$

$$(5) (1010010.0001)$$

$$\begin{aligned}(1) (1010010.0001)_2 &= 0 \times 2^0 + 1 \times 2^1 + 0 \times 2^2 + 0 \times 2^3 + 1 \times 2^4 + 0 \times 2^5 + 1 \times 2^6 \\ &\quad + 0 \times 2^7 + 0 \times 2^{-1} + 0 \times 2^{-2} + 0 \times 2^{-3} + 1 \times 2^{-4} \\ &= (82.094)_{10}\end{aligned}$$

$$(2) (82.094)_{10} \Rightarrow$$

$$\begin{array}{r} 8 | \begin{array}{cccc} 8 & 2 & 2 & 8 \\ 8 | \begin{array}{ccc} 1 & 0 & 2 \\ 8 | \begin{array}{cc} 1 & 1 \end{array} & \end{array} & \end{array} & \begin{array}{l} 0.94 \times 8 = 7 + 0.52 \\ 0.52 \times 8 = 4 + 0.16 \\ 0.16 \times 8 = 1 + 0.28 \end{array} \end{array}$$

$$\text{Ans} \rightarrow (122.741)_8$$

(C) Value of examples of octal to decimal

(1) 66.322

$$\begin{aligned}(66.322)_8 &= 6 \times 8^0 + 6 \times 8^1 + 3 \times 8^{-1} + 2 \times 8^{-2} + 2 \times 8^{-3} \\ &= 6 \times 1 + 6 \times 8 + \frac{3}{8} + \frac{2}{64} + \frac{2}{512} \\ &= (54.41015625)_{10}\end{aligned}$$

(2) 55.086 → 104.55

$$\begin{aligned}(104.55)_8 &= 4 \times 8^0 + 0 \times 8^1 + 1 \times 8^2 + 5 \times 8^{-1} + 5 \times 8^{-2} \\ &= 4 \times 1 + 0 + 64 + \frac{5}{8} + \frac{5}{64} \\ &= (68.703125)_{10}\end{aligned}$$

(3) 100.443

$$\begin{aligned}(100.443)_8 &= 0 \times 8^0 + 0 \times 8^1 + 1 \times 8^2 + 4 \times 8^{-1} + 4 \times 8^{-2} + 3 \times 8^{-3} \\ &= 0 + 0 + 64 + \frac{4}{8} + \frac{4}{64} + \frac{3}{512} \\ &= (64.56835)_{10}\end{aligned}$$

(4) 145.123

$$\begin{aligned}(145.123)_8 &= 5 \times 8^0 + 4 \times 8^1 + 1 \times 8^2 + 1 \times 8^{-1} + 2 \times 8^{-2} + 3 \times 8^{-3} \\ &= 5 \times 1 + 4 \times 8 + 64 + \frac{1}{8} + \frac{2}{64} + \frac{3}{512} \\ &= (101.16210)_{10}\end{aligned}$$

(5) 200.5666

$$\begin{aligned}(200.5666)_8 &= 0 \times 8^0 + 0 \times 8^1 + 2 \times 8^2 + 5 \times 8^{-1} + 6 \times 8^{-2} + \\&\quad 6 \times 8^{-3} + 6 \times 8^{-4} \\&= 0 + 0 + 128 + \frac{5}{8} + \frac{6}{64} + \frac{6}{512} - \frac{6}{4096} \\&= (128.73193359375)_{10}\end{aligned}$$

(a) Solve any 5 octal to binary conversion.

(a) 51.123

(1) Octal to Decimal

$$\begin{aligned}(51.123)_8 &= 1 \times 8^0 + 5 \times 8^1 + 1 \times 8^{-1} + 2 \times 8^{-2} + 3 \times 8^{-3} \\&= (41.162109375)_{10}\end{aligned}$$

(2) $(41.162109375)_{10}$

2	41	1
2	20	0
2	10	0
2	5	1
2	2	0
2	1	1

$$\begin{aligned}&0.162109 \times 2 = 0 + 0.324218 \\&0.324218 \times 2 = 0 + 0.648436 \\&0.648436 \times 2 = 1 + 0.296872 \\&0.296872 \times 2 = 0 + 0.593744 \\&0.593744 \times 2 = 1 + 0.187488 \\&0.187488 \times 2 = 0 + 0.374976\end{aligned}$$

$$\Rightarrow (51.123)_8 = (101001.001010)_2$$

(b) 104.22

(1) Octal to Decimal

$$\begin{aligned}(104.22)_8 &= 4 \times 8^0 + 0 \times 8^1 + 1 \times 8^2 + 2 \times 8^{-1} + 2 \times 8^{-2} \\&= 4 + 0 + 64 + \frac{2}{8} + \frac{2}{64} \\&= (68.28125)_{10}\end{aligned}$$

(2) Decimal to Binary

2	68	0	$\cdot 0.28125 \times 2 = 0 + 0.5625$
2	34	0	$\cdot 0.5625 \times 2 = 1 + 0.125$
2	17	1	$\cdot 0.125 \times 2 = 0 + 0.25$
2	8	0	$\cdot 0.25 \times 2 = 0 + 0.5$
2	4	0	$\cdot 0.5 \times 2 = 1.0$
2	2	0	
2	1	1	

$$(104.22)_8 = (1000100.01001)_2$$

(c) 412.56

(1) Octal to Decimal

$$\begin{aligned}(412.56)_8 &= 2 \times 8^0 + 1 \times 8^1 + 4 \times 8^2 + 5 \times 8^{-1} + 6 \times 8^{-2} \\&= 2 + 8 + 256 + \frac{5}{8} + \frac{6}{64} \\&= (266.71875)_{10}\end{aligned}$$

(2) Decimal to Binary

<u>2</u>	<u>266</u>	0	$0.71875 \times 2 = 1 + 0.4375$
<u>2</u>	<u>133</u>	1	$0.4375 \times 2 = 0 + 0.875$
<u>2</u>	<u>66</u>	0	$0.875 \times 2 = 1 + 0.75$
<u>2</u>	<u>33</u>	1	$0.75 \times 2 = 1 + 0.5$
<u>2</u>	<u>16</u>	0	$0.5 \times 2 = 1.0$
<u>2</u>	<u>8</u>	0	
<u>2</u>	<u>4</u>	0	
<u>2</u>	<u>2</u>	0	
<u>2</u>	<u>1</u>	1	

$$(412.56)_8 = (100001010.10111)_2$$

(e) 65.77

$$\begin{aligned}
 (1) (65.77)_8 &= 5 \times 8^0 + 6 \times 8^1 + 7 \times 8^{-1} + 7 \times 8^{-2} \\
 &= 5 + 48 + \frac{7}{8} + \frac{7}{64} \\
 &= 53.984375
 \end{aligned}$$

(2)

<u>2</u>	<u>53</u>	1	
<u>2</u>	<u>26</u>	0	$0.984375 \times 2 = 1 + 0.96875$
<u>2</u>	<u>13</u>	1	$0.96875 \times 2 = 1 + 0.9375$
<u>2</u>	<u>6</u>	0	$0.9375 \times 2 = 1 + 0.875$
<u>2</u>	<u>3</u>	1	$0.875 \times 2 = 1 + 0.75$
<u>2</u>	<u>1</u>	1	$0.75 \times 2 = 1.0$

$$(65.77)_8 = (11010.11111)_2$$